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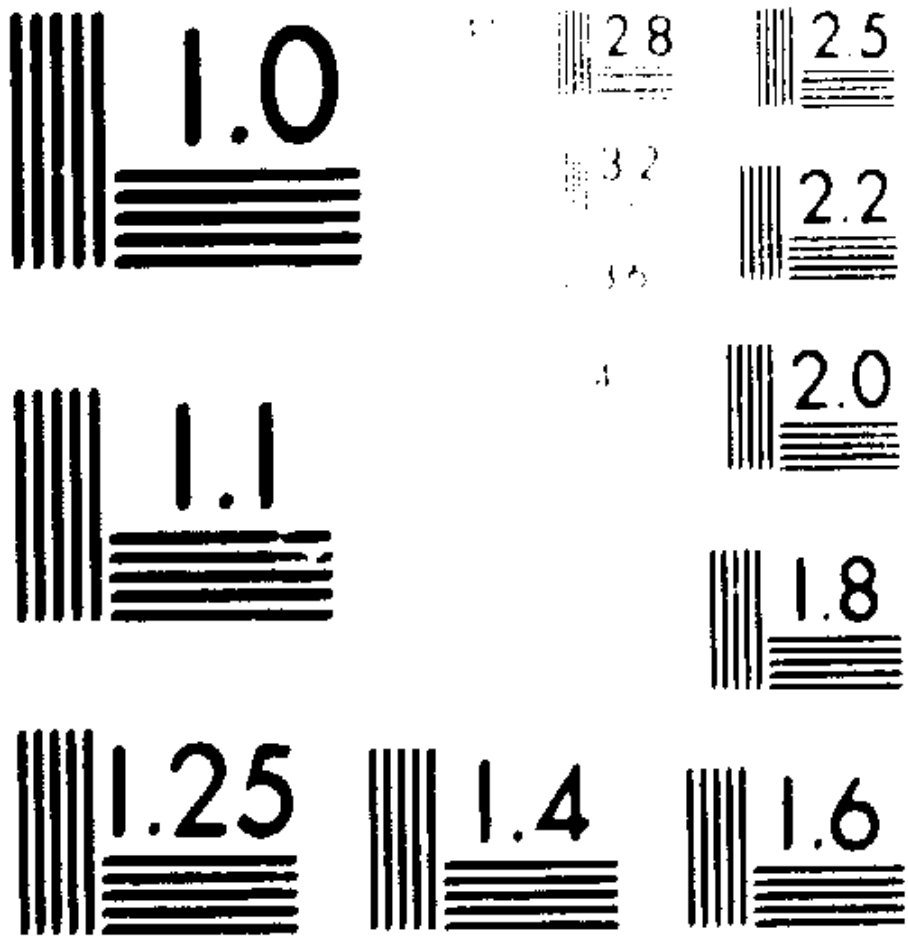

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24 July 1980
English

ASSISTANCE TO T.S.E. IN THE ESTABLISHMENT OF A PACKAGING CENTRE

DP/TUR/75/056/11-02

TURKEY

Terminal Report *

000106

Prepared for the Government of Turkey
by the United Nations Industrial Development Organization,
executing agency for the United Nations Development Programme

Based on the work of P.V. Narayanan, expert in testing in packaging

United Nations Industrial Development Organization
Vienna

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1. INTRODUCTION

1.1 BACK GROUND:

The project proposed now is the outcome of long standing studies by T.S.E. and UNIDO and is intended to assist T.S.E. in setting-up of a "Packaging Laboratory". Based on the visits of few experts earlier, the project DP/TUR/75/056/D/01/37 was drawn -up and the same was subsequently revised with the U.N.D.P. input amounting to US $ 1,75,300.

The government input include construction of the laboratory building, staffing and providing some of the equipment needed for the laboratory.

The project provides for four experts and the first expert completed the task during April-June 1977.

The construction of the laboratory building is completed by June 1979.

1.2 JOB DESCRIPTION:

Considering the existing situation and needs of the laboratory a job-description is drawn-up and the activities are outlined as given at annexure-I. This also includes areas added due to the extension of the expert's stay.

All the areas of activities identified are attended to and in the case of installation of some equipment details of requirements(as were not readily available) and method of installation are provided.

1.3 OFFICIAL ARRANGEMENT:

The mission was assigned through project unido correspondence DPRU 79/PPRS/APP/LL/ag, post DP/TUR/75/056/11-02/31.7.E dated 18th June 1979 and extension PRU 80/PPRS/APP/ag, DP/TUR/75/056/11-02/31.7.E dated 19th March 1980.

The expert entered the field on 5th December 1979 after being briefed by J.Belo UNIDO, Vienna.

The work plan was discussed with Mr.G.L. Narasimhan, S.I.D.F.A., UNDP, Ankara.

The expert carried out his duties at Turk... Standardlari Enstitusu (T.S.E.), Ankara and left the field on 28th May 1980.

1.4 COUNTERPART STAFF:

The chief counterpart staff is Mrs.Gulden Tarhan, Director, packaging laboratory and the heads of departments - Materials testing and Package testing. Details of areas of involvement are given at annexure-II.

1.5 OBJECTIVES OF THE PROJECT:

The immediate objectives and the development objectives remain the same as outlined in the original document.

2. SUMMARY

The expert entered the site on the 5th December 1979, after briefing session at Vienna.

The packaging laboratory building construction is already completed and ready for occupation. The estimated cost of the building is 10.33 M T.L.

The packaging laboratory is headed by Mrs.Gulden Tarhan, Director. The staff positioned include the head of material testing laboratory, head of transport package testing laboratory, a mechanical technician and a helping assistant.

All the ten equipment processed through U.N.D.P. are received at site(annexure-III). About twenty specific items of equipment required for the packaging laboratory are available at T.S.E. (annexure-IV). Some of these like drop tester are being fabricated by T.S.E. Workshop. Details of requirements of glassware, chemicals etc. are worked out and action is in progress for their procurement. Additional equipment needed and considered essential for the laboratory but not indigenously available are identified and specification details worked out. These are to be provided to the laboratory. The estimated cost of these equipment, spares and ancillaries is US $ 1,27,400 (annexure - V).

Of the six fellowships and one study tour, the study tour and one fellowship are utilised earlier. Details for three more fellowships are worked out and it was

suggested to process the papers immediately.

The layout plan for the four laboratories are completed (plates IV to VII). The positioning of the equipment (including those envisaged to be provided), power, water, air and vacuum requirements, and positions of the working table etc. are indicated. Standard size readily available tables are used for the laboratories.

The equipment presently available in the T.S.E. are already installed and ready for use. Erection/ fabrication of few like the drop tester and inclined impact tester are being fast completed and will be ready for use. Some of the UNDP equipment are also installed/checked for operation and are ready for use. Installation procedure and ancillary requirements for installation of the pending ones are given and action suggested.

Instead of either procuring or making a Rain chamber (water spray test) in the transport package testing laboratory, one of the wash-rooms available is suggested to be used for the purpose. Necessary details of pipe line connection, pressure head, valve control, pallet etc. are worked out and given (plates - I & II).

As part of training of the counterpart staff a series of explanatory technical discussion sessions are conducted and various aspects of packaging, packaging materials, testing and case studies are covered.

Detailed laboratory test procedures is drawn-up for testing and identification of plastics materials (annexure-VIII).

To enable the T.S.E. packaging laboratory to undertake the task of preparation of national standards for packaging materials, methods, tests and drawing-up of specifications a " Reference Standard Guide" is prepared (annexure -IX).

For better understanding of the equipment, test procedures and their effective application detailed discussions were held of various tests and properties of materials and a write-up prepared (annexure-X).

Use of various equipment available for generating technical data of packaging materials and for research purpose is also emphasised. As a beginning simple laboratory based but industry application oriented research projects are planned and conducted. Interpretation of the results and application of statistical analysis are also explained. More such projects are identified for the laboratory to follow-up.

Methodology for the preparation of " packaging manual" and " packaging machinery manual" are explained and broad outlines provided. Specific details are worked out in the machinery section (annexure - XI).

Formats for test report (annexure - XII) and estimation of test fee (annexure - XIII) are prepared.

Design and development/fabrication of equipment/ gadgets that could be undertaken by the packaging laboratory and the T.S.E. Workship and wherever with assistance of outside source are identified and action already commenced.

Design of five specific items of equipment are already completed (pla ›- III & VIII to XIII). One item (W.V.T.R. Dishes) already got fabricated. Action on others suggested. A few other equipment designs are also discussed for follow-up.

Necessary assistance for the effective participation in the technical seminar on " Food Packaging" is provided. Some background materials are also prepared and given.

Specific suggestions and recommendations are drawn-up considering the present and immediate future of the laboratory. Measures are recommended to popularise the activities of the laboratory for the benefit of the industry. Based on the spectrum of activities the laboratory is likely to undertake it is suggested to call it as " Packaging Centre".

3. SUBSTANTIVE SECTIONS
(ACTIVITIES & FINDINGS)

3.1 PRESENT STATUS:

The construction of the packaging laboratory building is completed at an estimated cost of 10.33 Million TL. This consists of four laboratories, training rooms, library, conditioning plant, storage rooms and office section.

The head of the packaging laboratory(Director) and heads of sections for packaging material testing and package testing (Mechanical), a mechanical technician and a helping hand are already positioned. Support function is provided by T.S.E. presently.

Details regarding equipment, laboratory set-up etc. are elaborated under the respective heads.

3.2 EQUIPMENT:

3.2.1 UNDP - Input:

Requisition for 10 equipment was placed and all these were procured by UNDP and received at the packaging laboratory, T.S.E. Details as at Annexure - III.

3.2.2 Government Input:

Quite a few equipment and instruments are already available at T.S.E., some of which would be shifted to the respective packaging laboratories. Others would be available for use as and when required. Details as at annexure - IV.

3.2.3 Additional Equipment:

An analysis of the equipment presently available at T.S.E. and received through UNDP. input would reveal that certain additional equipment are essential to enable the centre to cater to the basic needs of the industry. A list of additional equipment, thus identified, is drawn up also giving their technical specifications, probable sources of supply and approximate cost. The details are given at annexure-V.

While drawing-up the above list, equipment and accessories that could be either procured locally or made at T.S.E. Workshop are considered and eleminated.

3.3 FELLOWSHIP:

The project provides for a total of six orientation tour/fellowships and one study tour. The study tour and one fellowship programme are completed, during IV quarter 1977.

Considering the present staff position three orientation tour/fellowships could be utilised. These are

31.01	Packaging Management	- Director of packaging Centre.
31.02	Packaging Material Testing	- Head of testing laboratory.
31.03	Package testing	- Head of transport package (Mechanical) laboratory

3.4 LABORATORY LAYOUT:

3.4.1 Equipment placement:

The packaging laboratory is broadly divided into four laboratories viz.

i) Physical Laboratory

ii) Chemical Laboratory

iii) Analytical (Physico-chemical - including food)Laboratory, and

iv) Package Testing(Mechanical)Laboratory.

Considering the activities in each laboratory and function of the equipment/instruments, as the guide for the laboratory plan layout, the list of various equipment is drawn-up and a chart showing the placement of these equipment laboratory wise is prepared. While preparing this, additional equipment identified and elaborated at 3.2.3 were also considered. The details in the chart also include other requirements such as power and water supply. The chart is attached -annexure -VI.

Based on the above and other facilities available as well as those envisaged to be provided the layout plan for the four laboratories are worked out.

3.4.2 Physical Laboratory:

This laboratory will house mainly equipment used for testing of physical properties of packaging materials. The equipment are either manually operated(mechanical) or electrically operated.

A detailed layout plan is prepared as illustrated at plate-VII. As could be seen the plate gives details of the number of tables, power, air and vacuum line, placement of equipment, storage racks, sample conditioning areas, central table for sample cutting and preparation.

This is a centrally conditioned laboratory- the condition envisaged to be maintained is 20 deg. C and 65% R.H. The conditioning plant is already installed. The walls of the laboratory - particularly on one side might need replastering and painting or replastering and insulating wooden lining as considerable cracks have appeared. This might lead to variations in the humidity, temperature conditions.

3.4.3 Chemical Laboratory:

The layout plan prepared for the chemical laboratory is illustrated in plate-V. The placement of tables and equipment, power, water,(and sinks), air and vacuum are appropriately indicated.

Positioning of a chemical hood with exhaust is also shown, at one corner of the laboratory. A chemical hood is now readily available at T.S.E. and the same can be shifted to this laboratory.

Provision for adequate shelves/cup-board are made for storage of chemicals, glass ware reagents, etc. Adequate working table place is also made for conducting experiments.

Analysis and identification of packaging materials - based mainly on wet & dry chemical analytical methods and some instruments will form the principal work area of this laboratory.

3.4.4 Analytical(Physico-chemical) Laboratory:

Sophisticated instrumentation studies, package (consumer, retail) development work, unit package performance evaluation, shelf life determination, migration studies will be some of the main areas of work, this laboratory will be dealing with. Food packaging will get an emphasis.

Equipment/instruments selected to be positioned in this laboratory are based on the foregoing. The layout-plan for this laboratory is designed identifying equipment positioning, power, water(with sinks), air and vacuum requirements. The details worked out are given in plate -VI.

3.4.5 Package Testing(Mechanical) Laboratory:

The layout plan of the package testing(Mechanical) laboratory is detailed in plate-Iv. This includes the positioning of the testing machines/ equipment, power, water requirements etc.

While designing the layout adequate aisle space is provided for movement of packages. The aisle space can also be used for performing "rolling test".

Separate cardoned area is provided for static stack load performance test. Provision of space for installing a "compression tester" is also made. This tester is included in the list of additional equipment needed as the presently available one in T.S.E. has limitations and might not conform to the package testing requirement.

The layout plan also shows the area for conditioning of packages, storage space for tested packages and space for installing climatic chamber.

Separate concrete base blocks are already made for installation of drop testers and vibration tester. The open space between these blocks and ground level is recommended to be covered by suitably made contour shaped wooden blocks to avoid danger of trapping of legs of working personnel and to ease the movement of packages. The details are discussed with the counterpart staff for follow-up.

For handling of packages, the use of hand trolleys and fork-lift truck are considered adequate and suggested to be procured through indigenous sources. Use of overhead crane is

felt not essential at present and if demand arises, could be considered later.

3.4.6 General:

3.4.6.1 Power:

The equipments presently available at site and those identified as additionally required require either single phase, 220v or 3-phase, 380v. The total power requirement and power requirement laboratorywise - considering the various equipment positioned laboratorywise - is calculated and the electrical department/TSE requested for needful. While preparing the layout -plan the power points also are shown both with regard to single phase and three-phase.

The normal connections for lighting is already available in the packaging laboratory.

3.4.6.2 Water:

While water connection line is taken to the section, connections to the laboratories are to be made. The connections required in respect of each laboratory and the tap points and sinks are indicated in the layout - plans.

3.4.6.3 Air & Vacuum:

A central air(compressor) and vacuum system is already available at T.S.E. It is therefore suggested to extend these lines to the laboratories instead of setting-up a separate

system. This is informed possible. The air & vacuum lines shown in the layout-plan are those to be taken from the central system. The bi-pass line coming to each laboratory is suggested to be provided with individual control valve to adjust for the specific requirement of the laboratory/equipment.

3.4.6.4 Laboratory Tables:

T.S.E. had already procured a number of tables of certain standard types and sizes. These are generally in conformity to those already in use in other laboratories. In preparing the layout - plan, these are made use of and based on the types and sizes of tables and actual requirement, they are fitted into the plan.

Working tables for placement of items like humidity cabinets will have to be made after procurement of the equipment. It is envisaged that the same could be made at T.S.E.Workshop.

3.4.6.5 Others:

In the laboratory layout plan, placement of equipment is so adjusted such that equipment of similar nature and sensitiveness are grouped together. The other criteria considered is the air and vacuum requirement.

Adequate cup-boards are provided for each laboratory.

Separate central tables are suggested for sample preparation and sample cutting. These tables are to be provided with glass top.

The physical laboratory is centrally conditioned. The samples are to be conditioned for adequate period of time as per standards. A simple design with sloping shelves of a rack is discussed and is to be made at T.S.E. Similarly plastic ropes could be spread in lines for hanging the samples for conditioning. Plastic clips could be used for holding the samples in position.

An additional rack is also provided in this laboratory for storage of tested samples, in the eventuality of the requirement for discussions and retesting. However, a maximum period of storage of such samples should be evolved which could be say a period of 6-8 weeks.

3.5 INSTALLATION OF EQUIPMENT:

The equipments available at T.S.E. are already installed in various laboratories. Of these quite a few are to be shifted to the packaging laboratory. Items such as Spectroscope, fedometer, Compression tester, would remain in the present laboratory, but would be available for use of the packaging section. Since they are already in installed condition and being used, the operation, maintenance and calibration requirements are explained to the counterpart staff.

The divided table top drop tester and inclined plane impact tester are being erected in the transport package laboratory. Work regarding the other two drop testers are yet to be commenced.

3.5.1 Viscometer:

A Falling Ball Viscometer is recently obtained and this equipment is set-up and experiments conducted. Further experiments discontinued owing to slight cracking of the tube and a fresh tube is requested through UNDP/UNIDO.

3.5.2 W.V.T.R. Dishes:

As per the drawings prepared, the two sizes of dishes are prepared and the use of these dishes explained. These are ready for experimental purposes.

3.5.3 Wood Moisture Meter:

A Wood Moisture Meter is also recently obtained by T.S.E. This apparatus is also set up and checked for its performance along with the counterpart staff. It is found in order and this is ready for use.

3.5.4 Dial Micrometer:

Two Dial Micrometers are obtained as UNDP input. The performance of these are checked and found in order. A series of experiments were organised for the benefit of the counterpart staff. Maintenance requirements are also explained.

3.5.5 Puncture Tester:

The Puncture Tester which is also one of the UNDP input is installed and calibrated. Operational details and other requirements are checked and explained to the counterpart staff. This tester is ready for use.

3.5.6 Polariscope - Strain Discs:

This also constitute one of UNDP inputs. The unit has been installed and checked for its operation. Operational details and interpretation of results are outlined. The bulbs in the Polariscope, however, need replacement for further use and request for the same has been made to UNDP/UNIDO.

3.5.7 Crush Tester:

The unit is installed but operation could not be checked due to non-availability of facilities. However, details are explained to counterpart staff for needful.

3.5.8 Other UNDP Equipment:

The five other equipment received through UNDP are examined and generally found in order. However these could not be put into operation in the absence of necessary ancilliaries and requirements but complete installation and operational details are discussed and sanction for obtaining the necessary ancillaries suggested. With the availability of the ancilliaries [illegible] felt that the counterpart staff would be able to operate these units.

Setting up of the equipment for the various chemical analysis are also discussed and therefore should not pose any difficulties to counterpart staff.

Inasmuch as most of the equipment are in installed condition, they are now to be positioned in the respective identified laboratories. The task of appropriately placing the working tables and shifting of the equipment could not be undertaken mainly due to other local and international activities proposed at the institute presently. In the light of the drawings provided and detail discussions held, it is envisaged that the packaging laboratory personnel would be able to carry out the function effectively.

3.5.9 Rain Chamber:

Instead of obtaining a water spray chamber, it was suggested to convert one of the presently available wash rooms near the package testing laboratory into a water spray test(Rain) chamber. The position and the capacity appears to be ideal. No elaborate changes are also required. This would also be more economical than procuring a new unit. The necessary details are provided in plates I & II.

3.6 TRAINING:

A series of explanatory technical discussion sessions are organised and conducted for the benefit of the counterpart staff. These are aimed at to appraise them of the various

facets of packaging technology and provide sufficient background information and lay a sound basis. Some of the more important topics covered during these sessions, include:

3.6.1 Packaging - Historical background, definitions, packaging vis-a-vis production and marketing, packaging for local distribution and export marketing, standards, markings, packaging laws and regulations, packaging aesthetics etc.

3.6.2 Paper & speciality papers - Manufacture, properties, tests and applications;

3.6.3 Cellulosic films - manufacture, properties, types and applications;

3.6.4 Corrugated board and wood;

3.6.5 Plastics - definition, classification, manufacture, conversion, properties and end uses;

3.6.6 Relative humidity and its effects;

3.6.7 Packaging cost and packaging economics;

3.6.8 Tests - material testing - physical, chemical and physico-chemical, conditioning, selection of tests and interpretation of test data. Various tests discussed are listed at annexure-VII;

3.6.9 Test procedures and properties of materials and their significance;

3.6.10 Case studies - a few cases were taken-up for discussion. These were discusse to explain the approach to identify a problem, possible defect areas, solutions, tests to be conducted and

analysis of observations made. The cases discussed include:

6.10.1 - Leakage in a glass bottle

6.10.2 - Pilferproof and screw caps

6.10.3 - Curling of labels and non-adhering of labels

6.10.4 - Smudging of printing in labels

6.10.5 - Orientation of products in a package

6.10.6 - Packaging specification for fruits and vegetables.

3.7 PLASTICS - TEST PROCEDURES:

One of the subjects covered in the explanatory technical discussion sessions is plastics. Plastics materials converted into various forms, find extensive applications for packaging of a wide variety of products. Identification of plastics thus constitute one of the major field of study. Plastics materials are also commonly used locally.

In order to enable the packaging laboratory and counterpart staff to equip themselves in this field, a detailed write-up on simple laboratory test procedures for identification of plastics, rubbers and cellulosics is prepared. The same is appended at annexure - VIII.

3.8 REFERENCE STANDARD GUIDE:

Standards followed in different countries, particularly for testing of packaging materials were discussed with a view to appraising the counterpart staff of the details. These were also used to prepare test data and laboratory requirement. This has helped the counterpart

staff to gain a basic knowledge on the tests and test procedures for packaging materials and equipment used and also to identify requirements for the laboratory.

In the light of above a comprehensive guide of reference standards for testing of properties of packaging materials is drawn-up and attached at annexure-IX. This table would clearly indicate that no Turkish standard exists at present for testing most of the properties of the packaging materials. The packaging laboratory could therefore undertake this task and the guide annexed would serve as a basis and provide necessary information.

3.9 SIGNIFICANCE OF TESTS/PROPERTIES:

Understanding of the equipment and testing alone would not be enough. The purpose of use of a particular test and the selection of a particular test or property is extremely important. Thus the significance of the various tests and properties of materials are highly relevant. To enable the counterpart staff to equip themselves better, a write-up giving the significance of tests and properties is prepared and given at annexure-X.

These aspects were also discussed in as detailed a manner as possible, while conducting the explanatory discussion sessions. Practical examples in the packaging field were cited as cases. These would help the counterpart staff in the understanding of various problems likely to be referred to them by the industry, better utilisation of the equipment and a useful approach to arrive at the solutions.

3.10 LABORATORY PROJECTS:

A series of equipment/tests based laboratory projects are planned for the counterpart staff. These are aimed at to help them to study the use and operation of equipment, analysis of test results and their relevance in packaging application. This methodology also should form the basis for generating technical data on various packaging materials indigenously available and correlation between the properties. The data thus collected would be helpful in their technical advisory services as well as in the preparation of national standards.

The projects undertaken and completed are:

Grammage Vs Caliper of Kraft liner

Grammage Vs Density of Kraft liner

Moisture content of paper

pH of acqueous and hot extracts

Chloride and sulfate content.

The results obtained are represented graphically. The results are also analysed statistically, standard deviation and values at 95% confidence limit calculated.

More such projects are identified to be undertaken at the laboratory.

3.11 PACKAGING MANUAL:

With the establishment of the packaging laboratory, the institute would obviously endeavour to render its testing and quality control services to the packaging industries - manufacturers, convertors and users. The liaison also will be essential to keep in contact with the

industry, to know of the changing trends and needs of the industry and accordingly update the testing services and add more equipment and tests to meet the new demands. As an initial step it is suggested to prepare a manual dealing with the details of packaging materials, manufacturers and convertors in Turkey. Methodology to be followed is given and further necessary guidelines provided.

A similar exercise is also suggested for the preparation of a packaging machinery manual. Details worked out for another specific area of work are made available to the counterpart staff for further follow-up.

3.12 PACKAGING MACHINERY:

CLASSIFICATION AND CRITERIA FACTORS:

" A capital goods project" is now in progress in Turkey. Packaging machineries form one of the major group of products identified in this project. The group identified is with special reference to " food packaging machinery".

A detailed classification of this group of machineries is drawn-up. Various criteria factors in respect of the machineries listed are also identified. These relate to type of machinery, mode and operation, capacity, speed, type of fill and close, feeder mechanism, product group and package type etc.

Contact is established with the machinery manufacturers associations in U.S.A. and U.K. and action initiated to get the packaging machinery directories published by these sources. To enable to collate further uptodate information, a list giving the names and addresses

(as are readily available) of the manufacturers/suppliers of these machinery is also prepared and provided.

The details worked out are submitted in two parts to T.Sinai Kalkinma Bankasi, Istanbul, through U.N.D.P. For ready reference these are given at annexure-XI.

3.13 TEST RECORD AND TIME COST SHEET:

3.13.1 Test Record (Report) Form:

Representation of the tests carried out and results obtained in an appropriate manner forms part of packaging laboratory's activities. A form is devised for the same and attached at annexure-XII. This format is mainly for packaging materials evaluation. For package evaluation tests and observations, the same need to be modified.

3.13.2 Time Cost Estimate:

Testing services would be an important revenue earning areas of the packaging laboratory. The testing charges/fee need therefore to be estimated. Various factors are to be considered while estimating the charges. Cost of the equipment, depreciation, utility ratio, time of test, personnel time, cost of chemicals and other ancillaries used, over heads constitute the major factors. A format is prepared on these lines and appended at annexure-XIII, to make the task easier in estimating the test fee.

3.14 DESIGN AND FABRICATION OF EQUIPMENT:

Quite a few equipment, ancillaries and gadgets that could be used for testing and calibration of testing equipment and sample preparation are envisaged to be prepared indigenuously. Some of these could also be designed and fabricated at the T.S.E. Workshop.

In the light of above design of some of the items are undertaken and completed. These include:

14.1 - W.V.T.R. Dishes (Plate-VIII)

14.2 - Wax-applicator for WVTR set-up(Plate-IX)

14.3 - Template for circular sample cutting(Plate XII & XIII)

14.4 - Bricks and platen for stack load test(Plate III)

14.5 - Creaser for WVTR samples (Plate X & XI)

Details for designing of sling and quick release mechanism for drop tester also have been discussed for further follow-up. Based on the design/drawings made, action also has been initiated for fabrication of the equipment/ancillaries. WVTR dishes(two different sizes)-20 number each required for water vapour permeability experiment are already got made through a local source.

3.15 TECHNICAL SEMINAR - PARTICIPATION:

A seminar on " Food Packaging" was organised by Ege university, Izmir.

A paper tittled " Packaging - Integrating the Disintegrated" was prepared and presented. Necessary information and write-ups were also prepared and provided to the counterpart staff for presenting a suitable paper highlighting "Standardisation of Packaging Materials" for the food industry and the proposed activities of the packaging centre.

4. RECOMMENDATIONS

1. One of the main objectives of the project is to establish necessary testing facilities at the Institute to enable to grant " Quality Mark" "TSE" to improve the standard of packaging. To extent such effective service on an industry oriented basis, the laboratory need to be equipped further. The basic minimum additional equipment needed are indicated in the report, with specification details. Action on procurement and installation of these equipment should be taken.

2. Although the T.S.E. Library has many standards and books and literatures, those dealing with packaging are negligible. A list of important and useful reference books is drawn-up. The library should be equipped with these. The Institute should also subscribe to atleast a few useful technical magazines like Modern Packaging.

3. A basic training to the counterpart staff is commenced with this expert's programme. To continue and strengthen their background the fellowships available in the project should be immediately processed.

Atleast one additional fellowship could be favoured to enable the project staff to get trained through a full fledged training programme on packaging, of the type conducted by the Indian Institute of Packaging.

4. The counterpart staff are generally new to the specific field of packaging and has had little opportunity to gain in-depth knowledge on packaging materials, systems,

methods and machinery. While efforts are made to bridge the gap through explanatory discussion sessions, visits to factories, for on-the-spot training could not be made due to lack of time. It is recommended that the technical staff of the packaging laboratory should visit as many factories as possible to equip themselves of the manufacturing and converting processes and systems as well as packaging processes at users' end.

5. With a view to understanding better of the usefulness of an equipment for practical orientation simple projects are initia ed and some completed. The methodology also is utilised to explain the calibration and maintenance of equipment. Such similar projects should be taken-up on a continual basis. This process in the long-run would help the Institute to prepare a complete data on basic packaging materials which will find extensive use in the training programmes, seminars and package development.

6. Based on the fellowship details, preparatory studies required for better utilisation of the fellowship is discussed and outline provided. This should be followed-up in all cases to get the maximum benefit of the proposed fellowship training.

7. The methodology in the preparation of a "Packaging Manual" and an outline of classification of industries is drawn-up. Based on this, attempt should be made to complete the information as soon as possible. This would help the Institute in its information services and testing facilities.

8. Similarly the preparation of "Packaging Machinery and Testing Equipment" manual could also be undertaken.

9. Presently no specific and detailed specification/ standards are available for many of the packaging materials. With the existing testing facilities available and those envisaged to be added, the task of preparing such specifications/standards could be undertaken by this laboratory. Some specific case studies discussed would help as forerunner in this direction.

10. Calibration and maintenance of the equipment are extremely important. This would require certain calibration charts, ancillaries etc. These are generally discussed and some specific ancillaries required are included in the additional equipment list and some are identified as could be made in the Institute's Workshop. The calibration and maintenance should be taken-up on a regular basis. Items such as pressure gauges could get calibrated through other concerned centres.

11. The layout plan of the four laboratories are completed. The details of the requirements for various laboratories are also provided. Concerted efforts should be made immediately, to complete the work on setting-up of these laboratories and shifting of the equipment to facilitate the effective functioning of the packaging laboratory. Certain additional requirements are identified for installation and putting into operation of a few equipment received. Action on this should also be taken on an urgent basis.

12. Considerable importance is given for exports in the National plan. Food products such as fruits and nuts constitute one of the major exports. Studies on packaging of such products could be taken-up on a priority basis to develop improved functional packaging systems.

13. With a view to extending the services of the packaging laboratory to as many industries and institutions as possible, it is necessary to make them aware of the establishment of this laboratory and its functional role. Towards this, the T.S.E. should immediately correspond with the various ministries concerned, Export Promotion bodies, Trade chambers, Industry associations, Universities and Research institutions. Brief meetings and one day seminars on " Packaging" could be organised in this connection.

A brochure briefing the packaging laboratory establishment and its activities, should be printed for distribution among various concerned organisations.

14. The terminology " Packaging Laboratory" is more likely to connote a meaning that this is mainly concerned with "testing". The functions of this laboratory would, however, be broader and include various other activities in the field of packaging such as " Technical consultancy service", " Training", " Information dessimination", " Equipment and Machinery Design and Development", and "Testing". It is therefore felt more appropriate to name the laboratory as " Packaging Centre".

Accordingly the organisational chart should be revised to include such of the above functional areas. A simple modified organisational chart is given at annexure-XIV. In line with this, suitable qualified and experienced staff should also be made available to the centre.

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LIST OF ANNEXURES AND PLATES

ANNEXURE - I

JOB ACTIVITIES - TASKS

1. To study the present status w.r.t. equipment, fellowship, experts, building and laboratory set-up.

2. Identification of further equipment needed and action plan.

3. Identification of equipment not ordered and assist in drawing-up specification and suggest on any new equipment needed.
Help to process fellowship forms.

4. Planning layout of laboratories with counterpart staff.

5. Installation of equipment as possible and help counterpart staff on operation, calibration and maintenance.
To list other laboratory items required such as glassware, chemicals and miscellaneous items.

6. To conduct a series of explanatory technical discussion sessions for training and benefit of counterpart staff on various aspects of packaging - packaging materials, material and package testing, test procedures and evaluation of test results, significance of tests and specific case studies.

7. Preparation of laboratory test procedures for testing of plastics materials.

8. Preparation of reference standards' guide for various tests.

9. To prepare a ready reckoner on " Properties/ tests for packaging materials and their significance".

10. To plan, organise and help counterpart staff on tests/ equipment based laboratory projects - to study the use of equipment, analysis of test results and their relevance to end use applications.

11. To draw-up an outline for the preparation of a "Packaging Manual" and " Packaging Machinery Manual" and discuss methodology to be adopted for compilation of the information.

12. Preparation of test record sheets and time-cost sheet.

13. Identification of equipment that could be made at T.S.E. Workshop and / or locally and render possible assistance.

14. To assist in the preparation/ participation of technical seminars in packaging and provide background write-ups.

15. Preparation of final report.

ANNEXURE - II

PROJECT COUNTERPART STAFF

Mrs. Gulden Tarhan	:	Director, Packaging Laboratory Chief counterpart staff Direct involvement on all areas of activities.
Mr. Hasan Acar	:	Head - Material Testing Laboratory Counterpart staff Laboratory projects, Laboratory ware and chemicals preparation scheme, participation in technical discussion and general assistance in other areas.
Mr. Akif Saklica	:	Head - Transport Package Testing Laboratory Counterpart staff Laboratory Layout plans, Equipment Design and Drawings Equipment Installation and general assistance in other areas.

ANNEXURE - III

EQUIPMENT ORDERED AND RECEIVED
(UNDP INPUT)

SL. NO.	EQUIPMENT ITEM	ACT. SCHEDULE OF ORDER	ACT. SCHEDULE OF ARRIVAL	FINAL COST
1.	Heat Sealing Device	April 1978	June 1979	3465 $
2.	Water Vapour permeability Tester	April 1978	May 1979	3000 $
3.	Gas Permeability Tester	April 1978	January 1979	1694 DM.
4.	Corrosion resistant Tester	April 1978	August 1979	29075 DM.
5.	Deep Freezer	April 1978	August 1979	34498 DM.
6.	Dial Micrometer (2 Nos.)	April 1978	November 1978	400 DM.
7.	Crush Tester	April 1978	November 1979	10528 DM.
8.	Puncture Tester	April 1978	November 1979	4190 $
9.	Polariscope	April 1978	August 1979	900 $
10.	Strain Discs	April 1978	February 1980	1745 $

TOTAL COST : US $ 49018.19

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ANNEXURE - IV

EQUIPMENT ALREADY AVAILABLE AT T.S.E

SL NO.	EQUIPMENT
1.	Compression Tester
2.	Tear (Elmendorf) resistance Tester
3.	Impact pendulam (for rubber)
4.	Bursting strength tester (for paper)
5.	Bursting strength tester (for board)
6.	Tensile strength tester
7.	Deep Drawing tester
8.	Gas chromatograph
9.	I. R. spectroscope
10.	Fedometer
11.	Glass apparatus (some)
12.	Oven (some)
13.	(Divided Table Top) Drop tester (being completed)
14.	Inclined Impact Tester (being completed)
15.	Drop tester for small packs (in Drg. stage)
16.	Drop Tester for sacks (in Drg. stage)
17.	Viscometer
18.	W.V.T.R. Dishes
19.	Wood moisture meter.

ANNEXURE - V

SPECIFICATION DETAILS FOR ADDITIONAL EQUIPMENT SUGGESTED

SL. NO.	EQUIPMENT	SPECIFICATION	PROBABLE SOURCE	APPROXIMATE COST-US $
1.	Vibration Table (for bulk package testing) (one number)	To test vibration effects on packages. Provided with variable speed transmission arrangement and also for variable amplitude. Provision for hormonic movement vertical and horizontal vibrations - simultaneously (combination) Timer attachment upto 60 minutes and automatic stop device. Rail attachments on rear and side of table for fastening loads. Amplitude (max.): 25.4 mm(variable) Frequency range : 80-800 r pm. (adjustable) Load capacity : upto 1000 kg. Table dimension : 1250 x 1500 mm. 220/380 v, 3 phase.	1. Lorentzen & Wettre Alstromergatan - 23, Post Box 49006, Stockholm-49, Sweden. 2. Testing Machine Inc., 400, Bayview Ave, Amity Ville, New York, 11701 U.S.A. 3. D.R.Lenk GmbH CH - 8274, Tager Wilen, Oberdorfstr, 15, Switzerland. 4. L.A.B. Corporation, P.O.Box G, Skaneateles, New York, 13152, U.S.A.	20,000
2.	Stiffness tester (Taber) with test specimen sample cutter (one number)	For evaluation of stiffness and resilient qualities of plastics, paper, cardboard, flexible materials, foil and other light metallic sheets. 1/8" clamp opening, load application of stiffness 1/5 gm. to 5cm sample test length. Deflection 15 degrees and variable. 210 - 220 v, single phase, 50 HZ, Motor operated.	1. T.M.I. (Testing Machine Inc.) 400 Bayview Ave.) Amityville, New York 11701, U.S.A.	2,200

		Specimen sample cutter - sizes 1½" x 2¾" and 1½" x 1½" - for material thickness upto 0.02" (Model TMI 150 - B)		
3.	Static Friction Tester (One number)	For measuring the firction and slip charecteristics of paper, film, coating rubber, plastics and similar materials. Capable of testing different sizes and specimen with interchangeable gauges of different force ranges. Flat bed plates 6.25 x 6.25 cm/ 12.5 x 25 cm sizes provided with micrometer height adjustment for upper platen pulling cable and constant speed motor with automatic shut off at the limit of travel with digital attachment. 210 - 220v, 50 HZ, single phase.	1. A.B.Lorentzen & Wettre, Alstromergatan 23, Stockholm, swedwn. 2. Testing Machine Inc., 400, Bayview Ave., Amityville, New York 11701, U.S.A. 3. Devenport(London) Ltd., Tewin Road, Walwyn Garden city, Hertfordshire, England. 4. T.N.O., Shoemakerstrasse, Delft, Netherland.	1,200
4.	Dynamic Friction Tester (One number)	For measuring the friction and slip charecteristics of film, coating rubber, plastics, and similar materials. Capable of testing different sizes and specimen with interchangeable gauges of different force range. Flat bed plates of 6.25 x 6.25 cm/ 12.5 x 25 cm sizes provided with micrometer height adjustment for upper platen pulling cable and constant speed motor with automatic shut off at the limit of travel with digital attachment.	1. A.B.Lorentzen & Wettre, Alstramergaten 23, Stockholm, Sweden. 2. Testing Machine Inc., 400 Bayview Ave., Amityville, New York 11701, U.S.A. 3. Devenport (London) Ltd., Tewin Road, Walwyn Garden city, Hertfordshire, England.	1,300

		suitable for <u>dynamic</u> conditions. 210 - 220 v, 50 HZ, single phase	4. T.N.O. Shoemakerstrasse, Delft, Netherland.	
5.	Hydraulic Pressure tester for glass bottles (Hydrostatic pressure tester) (One number)	For testing the resistance (Hydraulic) of glass bottles for pressure, complete with pressure gauge, pressure chamber, pump, different standard size clamp heads, etc. 210 - 220 v, 50 HZ, single phase. Ref. A.S.T.M. Test C - 147	1. American Glass Research Inc. P.O. Box 149, Butler, Pennsylvania, U.S.A.	8,060
			2. Sanso Co. Ltd., No. 31-6, 1 Chome, Hamamatsu - Cho, Minato - ku 105, Tokyo, Japan.	
6.	Humidity Cabinet a) PIRA (Two numbers) or b) Gallenkamp (One number)	For conditioning of packaging materials and packages to various climatic - temperature humidity conditions, for continuous use. Volume : $1m^3$ (Minimum) Temperature range : Ambient to 100 c; $\pm$ 1 c. Relative Humidity: 20% to 100% $\pm$ 2% R.H. Thermostatic temperature control shelves and Trays for humidity salt solutions, fan for circulation of air. Recorder charts/mechanism for temperature and humidity.	a) 1. P.I.R.A. Randalls Road, Leatherhead, Surrey, U.K.	10,000 (5,000 each) or

		Gallenkamp Conditions as above. Automatic temperature & relative humidity control and recording system. Attached inbuilt - refrigerated system for lower temperature. Arrangement for cyclic conditions - (Programme) Inbuilt ultraviolet system. Automatic temperature/humidity recordering charts/units.	b) 1. H.E. Messmer Ltd., 144 - c, Offord Road, Islington, London N-1, U.K. 2. Customs Scientific Instruments Inc., New Jersy, 07981, U.S.A.	10,000
			3. Tokyo Seiki Seisakusho Ltd., 15, 5 - Chome, Takinogawa, Kita-ku, Tokyo, Japan.	
7.	Psychrometer (Two numbers)	For measurement of humidity - Electronic type, + 20 to 50 C, with the registerproof mercury batteries (12 nos), 10 position switch box, cable 100 ft., battery recharger and A.C.Connection. 210 - 220 v, 50 HZ, single phase.	1. Sargent - Welch Scientific Co., 7300 N.Linden Avenue, Skokie, Illinois, 60076, U.S.A. 2. Negrett & Zambra Ltd., 15, New Bond Street, London W1Y OLL , U.K. 3. C.F.Casella & Co. Ltd., Regent House, Britannia Walk, London NI TND, UK.	275
			4. Oal Associates, P.O. 788, Westbury, New York, 11590, U.S.A. 5. Testing Machine Inc., 400, Bayview Ave, Amityville, New York 11701,U.S.A.	

8. Hygrometers (Hygrofils) (Two numbers)	Type - 4451 - 3, Hygrofil with sensor and extension cable type 4414/4 and equipment case to measure relative humidity.	1. Ultrakust Ceraetabau GmbH, Cokg 8 - 375, Ruhmannsfelden, West Germany.	275
9. Wet and Dry Thermometers. (Two numbers)	For measurement of wet and dry temperatures and relative humidity with calibration charts.	1. Sargent - Welch Scientific Co., 7300, N. Linden Avenue, Skokie, Illinois, 60076, U.S.A. 2. Negrett & Zambra Ltd., 15, New Bond Street, London, WIY OLL, U.K. 3. C.F.Casella & Co. Ltd., Regent House, Brittannia Walk, London N 17ND, UK. 4. Oal Associates, P.O. 788, Westburg, New York, 11590, U.S.A. 5. Testing Machine Inc., 400, Bayview Avenue, Amityville, New York, 11701, U.S.A.	200
10. Thermohygrographs (for 24 hrs. two numbers)	For measurement and recording of temperature and Relative Humidity.	1. Testing Machine Inc., 400, Bayview Ave., Amity Ville, New York, 11701, U.S.A.	
(for 7 days two numbers)	Thermohygrograph for 24 hour and 7 days, with recording clock work drive Maximum temperature : 50 C Relative Humidity : 0 - 100 %	2. Karl Frank GmbH, 694, Neikeum/ Bergester, P.O.Box 1320, F.R.G.	1,750

	2% R.H. deviations with pen kits and ink (2 colours) and 200 charts in each case.	3. A. Van der Korput, Sweden.	
11. Vacuum Packaging apparatus. (One number)	Laboratory model with evacuation and flushing (different gases) devices with vacuum pump gauge, sealing device and other accessories for flexible and rigid containers. 220 v, 50 HZ, single phase.	1. Multivac Export A.G., Baaresstrasse 112, CH 6300, ZUG/ Switzerland. 2. Paul Kiefel GmbH, D-8228, Freilassing, Industriestr 17-19, Postfach 537, F.R.G. 3. Komet Maschinen Fabrik, Ernst Deimold, 7000, Stuttgart, Kornhergstr 27-29, F.R.G.	5,000
12. Impact Tester for glass bottles. (One number)	For testing the impact resistance of glass bottles. Specification details to conform to AGR (American Glass Research Inc.) Accessories: a) Stainless steel cullet chute, b) Bar backstop with adjustable positioning guide for testing non-circular bottles(with hardened steel face) c) Small diameter pendulam head for striking places inaccesible to standard head.	1. American Glass Research Inc. P.O.Box 149, Butler, Pennsylvania, 16001, U.S.A.	2,000

13. Thermofil with accessories (One number)	Type 4444 in carrying case temperature range -60 C to + 250 C with thermofil semi conductor probes (a) H 117, (b) H 110 C, (c) H 112 C, (d) H 101 A to measure temperature ranges.	1. Ultrakust - Cereatebau GmbH, Cokg A - 375, Ruhmannsfelden, West Germany, F.R.G.	700
14. Slide Projector (One number)	Continuous automatic slide projector for use as audio-visual kit for training programmes and information activities.	1. Kodak A.G., Postfach 369, 7, Stuttgart 60, F.R.G.	500
15. Books	As per list at Annexure V-A	-	2,000
16. Electromagnetic drop table with peak-G meter, amplifiers, accelero meters, oscilloscope and Impactographes/ meters. (Two numbers)	To study the properties of cushioning materials in dynamic conditions with guided vertical drop dynamic testing machine A. Loading Apparatus: a) Adjustable crosshead and release mechanism (maximum height 180 cm) b) Drop head platen (minimum dimension : 50 x 50 cm) c) Box for lead shot (auxiliary weight) B. a) Crystal accelerometer for recording deceleration of dropping head during impact of cushioning materials (accelerometer range: 10 G, 30 G, 60 G, 100 G, 120 G, 300 G).	1. Testing Machine Inc., 4009 Bayview Ave, Amity Ville, New York 11701, U.S.A. 2. Tektronix Inc., P.O.Box No. 500, Beaverton, Oregon 97005, U.S.A.	20,000

b) High impedance cathode follower preamplifier, matching accelerometer to oscilloscope (oscilloscope 5111, 5000 series-tektronix)

c) Peak G- meter, power supply for cathode followers with attached meters of peak G values.

d) Low pass filter for crystal accelerometer.

e) Oscilloscope - 5111, 5 B 10 N plug - in unit 5 A 22 N plug - in unit, C 5 camera scope, 203 scope mobile.

010 - 6060 - 01 probe, voltage.

220 v, 50 HZ, single phase.

17. Concora(fluter) medium tester

(one number)

In conformity to:

a) T.M.I. catalogue No. 107-1- corrugated medium tester with 220 v, 50 HZ

b) T.M.I. catalogue No. 17-9-4 concore medium flute

Type of flute 'A' (Broad)
Type of flute 'B' (Narrow)
Type of flute 'C' (Medium)
Typeof flute 'E' (Micro)
Type of flute 'Jumbo'

c) Coated scotch tape

d) Concora sample cutter -

TMI catalogue No. 22 - 20-1

1. Testing Machine Inc., 400, Bayview Ave, Amity Ville, New York, 11701, U.S.A.

2. D.R.Lenk GmbH, CH - 8274, Tager wilen, Oberdorfstr, 15, Switzerland.

7,000

18. Continuous thickness gauge (One number)	To measure continuously effective thickness of paper, boards, films, foils, laminates, etc. Thickness 0.5 mm ± 0.0005 mm Accuracy sensitivity 0.0005 mm, complete with measuring amplifier and recorder. Feed rate 75 cm/minute. 220v, 50 HZ, single phase.	1. Testing Machine Inc, 400, Bayview Ave, Amity ville, New York 11701, U.S.A. 2. A.B.Lorentzen & Wettre, Alstromergaten, 23, Stockholm, Sweden. 3. D.R. Lenk GmbH, CH - 8274, Tagerwilen, Oberdorfstr- 15, Switzerland. 4,000 4. Karl Frank GmbH, 694, Keikeum, Bergester, P.O.Box NO.1320, F.R.G. 5. A Van Der Korput, Sweden.	
19. Compression Tester (for testing shipping containers and packaging materials) (One number)	For evaluating and measuring the resistance against compression of containers of different materials as well as packaging materials. Load range : 1000 & 5000 kgf (2 scale range) Load speed : 2.5 mm to 50 mm per min. Platen size: 1 M x 1 M(effective measuring area) Upper platen type : self aligned or fixed Platen opening : 1.5 M Grips : Grips for any specific tests	1. Karl Frank GmbH, 694, Weikeum, Bergester, P.O.Box 1320, F.R.G. 2. Testing Machines Inc., 36,000 400, Bayview Ave., Amity ville, New York 11701, U.S.A.	

Recording	:	Automatic load and deflection recorders with print-out graphs.
Power	:	Single phase, 220v, 50 HZ.
Others	:	Automatic disconnection drive to prevent excess loading top position of upper platen, botton end of pressure platen etc.
Graph sheets	:	2 Gross graph sheets - additional

General conformity to :

TAPPI T 804 m - 45
ASTM D 642 - 47

Operation, maintenance and installation manuals in English - 2 copies.

20. Accessories spares and calibration units	As per list at Annexure V - B	-	5,000

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ANNEXURE - V A

BOOKS

SL. NO.	TITLE	PUBLISHER'S NAME
1.	Materials Handling Hand Book (by Bolg Harold A)	The Ronald Press Company, New York.
2.	Packaging Management (by Briston J.H. and Neill T)	Gower Press Ltd, London
3.	Package Design Engineering (by Brow K.)	John Wiley & Sons Inc, New York.
4.	Packaging for climatic Protection (by Cairns J.A., Oswin C.R & Paine F.A.)	Newnes - Butterworths, London.
5.	Packaging, the sixth sense (by Dichter Ernest)	Canners Books, U.S.A.
6.	Package and Print (by Davis A)	Faber and Faber Ltd., London
7.	The selling power of Packaging (by Fladager V.L.)	McGraw - Hill Book Co Inc New York.
8.	Industrial Packaging (by Friedman W F and Kipnees J.J.)	John Wiley and sons, New York.
9.	Integrated Product testing and evaluation (by Gilmore H.L. and Schwartz H.C.)	Wiley Interscience, John Wiley and sons, New York.
10.	Packaging is Marketing (by Guss L.M.)	American Management Association Inc., New York.
11.	Hand book of paper and paperboard, 2 Vols. (by Higham, Robert R.A.)	Business Book Ltd., London.
12.	Hand book of package Engineering (by Hanlom J.F.)	McGrow - Hill Book Co., U.S.A.
13.	Packaging in Glass (by Moody B.E.)	Hutchin son & Co., London
14.	Plastics, films and Packaging(by Oswin C.R.)	Applied Science publishers Ltd., London.
15.	Fundamentals of Packaging (by Paine F.A.)	Blackie & Sons, London

16.	Packaging and the Law	Newnes-Butterworths and Co., Publishers Ltd., London.
17.	Packaging Materials and containers.	Blackie and sons Ltd., London.
18.	Packaging evaluation - the testing of filled transport packages	Newnes - Butterworths and Co., publishers Ltd., London
19.	Packaging Media	Blackie and sons Ltd., London.
20.	Modern Packaging films (by Pinner S.H.)	Newnes - Butterworths and Co., publishers Ltd., London.
21.	Package Production Management Ed. 2 (by Raphael H.J.W olsson D.L.)	AVI Publishing Co. Inc., US.A.
22.	Corrugated Box Manufacturer's Handbook	S&S Corrugated Paper Machinery Co., Inc., New York.
23.	Basic guide to plastics in Packaging (by Sacharows, and Griffin R.C.)	Cahners Publishing Co. Inc. Boston.
24.	Wood Hand book	United States Department of Agriculture, U.S.A.
25.	Hand book of physical Distribution Management, by Wentworth Felix	Gower Press Ltd., London
26.	Performance Evaluation of Packages (by Paine F.A.)	
27.	Food Packaging (by Sacherow S.)	
28.	Pulp & Paper Vol. I, II & III (by Wiley)	
29.	Modern Packaging Enclopaedia (1971 to 1979)	McGraw - Hill Book Co. Inc. New York.
30.	IMCO code Vol I, II, III and Annexure - I.	
31.	IATA Regulations - for Packaging	
32.	Training kit(slides) for corrugated fibre board and printing	P.I.R.A., Leatherhead, U.K.
33.	Guidelines for shrink Packaging (by the Shrink Packaging industry Committee)	Australian Government Publishing Service, Canberra.
34.	Food Protection Manual of recommended Laboratory Methods(by Tanya Parrow)	Syracuse University Research Corporation, Syracuse, New York.
35.	An introduction to Vibration Measurement	Bruel and Kjaer, DK-2850 NAERUM, DENMARK.

ANNEXURE - V B

ACCESSORIES, SPARES AND CALIBRATION UNITS

SL.NO.	ITEM
1.	Rubber diaphragms for Mullen Burst Tester (12 each for paper and Board Machines.)
2.	Standard calibration foil for Mullen Burst Tester (12 each in the range - low, medium and high).
3.	Accelerometers (for cushion testing, 2 each between 10 G and 300 G).
4.	Microswitch for Inclined Impact Tester.
5.	Recording charts for thermohygrographs and Gallenkamp humidity cabinet (1 Gross each)
6.	Set of Stanley cutting knives (6 Nos.) and blades(3 dozens)
7.	Templates - Type TMI - 22 - 13 - 1 TMI - 22 - 4 (15 x 150 mm)
8.	One set of bulbs (4 Nos.) for polariscope model 110
9.	Viscometer tube (for falling ball Viscometer - 100 mm length)
10.	Calibration spring for Crush tester.

ANNEXURE - VI

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EQUIPMENT POSITIONING LABORATORYWISE
AND WATER, POWER REQUIREMENTS

SL. NO.	EQUIPMENT	POSITIONING LABORATORY				REQUIREMENTS	
		PHYSICAL	CHEMICAL	PHYSICO CHEMICAL	TRANSPORT	WATER	POWER
1.	2.	3.	4.	5.	6.	7.	8.
1.	Heat Sealing Device	@	-	-	-	-	220v, SP
2.	WVTR Tester	@	-	-	-		220v, SP
3.	Gas Permeability Tester	@	-	-	-	-	220v, SP
4.	Corrosion resistance Tester	-	-	-	@		
5.	Deep Freezer	-	-	-	@		
6.	Dial micrometer	@	-	-	-	-	Manual
7.	Crush Tester	@	-	-	-	-	380v, 3P
8.	Puncture Tester	@	-	-	-	-	Manual
9.	Polariscope	-	-	@	-	-	220v, SP
10.	Strain Discs	-	-	@	-	Attached to 9	
11.	Stiffness Tester	@	-	-	-	-	220v, SP
12.	Friction Tester(Static)	@	-	-	-	-	220v, SP
13.	Friction Tester(Dynamic)	@	-	-	-	-	220v, SP
14.	Hydraulic Pressure Tester for glass bottles	-	-	@	-	@	220v, SP
15.	Psychrometers(2 Nos.)	@	-	-	-	-	-
16.	Hygrometers (2 Nos.)	@	-	@	-	-	-
17.	Wet & Dry thermometers (2 Nos.)	-	@	-	@	-	-
18.	Thermohygrographs(4 Nos.)	@	-	-	-	-	-
19.	Vibration table	-	-	-	@	-	220v, SP
20.	Vacuum Packaging Apparatus	-	-	@	-	-	220v, SP

1.	2.	3.	4.	5.	6.	7.	8.
21.	Thermofil	@	-	-	-	-	-
22.	Books	-	-	-	-	(Library)	
23.	Concora fluter	@	-	-	-	-	220v, SP
24.	Electromagnetic Drop table with accessories	@	-	-	-	-	220v SP / 380v 3P
25.	Continuous thickness gauge	@	-	-	-	-	220v, SP
26.	Accessories & spares	@	-	-	-	-	-
27.	PIRA Humidity cabinets (2 Nos.)	-	-	@	-	-	220v, SP
28.	Drop Tester(divided table top)	-	-	-	@	-	220v, SP
29.	Inclined plane Impact Tester	-	-	-	@	-	220v, SP
30.	Drop Tester for small packs	-	-	-	@	-	220v, SP
31.	Drop Tester(for sacks)	-	-	-	@	-	220v, SP
32.	Compression Tester	-	-	-	@	-	-
33.	Tear Tester	@	-	-	-	-	Manual
34.	Impact Pendulam(for rubber)	@	-	-	-	-	Manual
35.	Bursting strength tester (for board)	@	-	-	-	-	220v, SP
36.	Tensile Tester	@	-	-	-	-	220v, SP
37.	Deep drawing Tester	-	-	@	-	-	-
38.	Gas Chromatograph	-	-	@	-	-	220v, SP
39.	Balance (3 Nos.)	@	@	@	-	-	220v, SP
40.	Cobb Tester(3 Nos.)	-	@	-	-	-	-
41.	Wood moisture meter	@	-	-	-	-	-
42.	Templates (several)	@	-	-	-	-	-
43.	Impact Tester fpr bottles	-	-	@	-	-	-

1.	2.	3.	4.	5.	6.	7.	8.
44.	Softening point Tester	-	@	-	-	-	220v, SP
45.	Thin layer chromatography	-	-	@	-	-	
46.	Water bath with thermostat	-	@	-	-	@	220v, SP
47.	Oven	-	@	-	-	-	220v, SP
48.	Glass apparatus and Glass wares	-	@	-	-	-	-
49.	Centrifuge	-	@	-	-	-	220v, SP
50.	pH meter	-	@	-	-	-	220v, SP
51.	Viscometer	-	@	-	-	-	-
52.	Refractometer	@	-	-	-	-	-
53.	WVTR Dish method apparatus & dishes (1 + 40 dishes 20 Nos. 50 cm^2, 20 Nos. 100 cm^2)	-	@	-	-	-	-
54.	Rain chamber	-	-	-	-	Separate room)	220v, SP
55.	Glass Verticality Tester	-	-	@	-	-	-
56.	Handling Equipment(2 Nos.) 1 tonne & ½ tonne capacity)	-	-	-	@	-	-
57.	Weighing Scale (1 tonne)	-	-	-	@	-	-
58.	Stack Load Test	-	-	-	@	-	-
59.	Slide projector	-	-	-	-	Library	220v, SP

N.B. Electrical requirements may change in the case of equipments supplied by different parties. The technical catalogues should be referred for confirmations.

3 P - 3 - Phase
S.P. - Single Phase
@ - Equipment positioning Laboratorywise

ANNEXURE - VII

TEST DETAILS COVERED THROUGH EXPLANATORY DISCUSSION SESSIONS

A. 1. Alkali staining number
2. Ash content
3. Arsenic content
4. Benzene soluble matter
5. Chlorides
6. Copper content/number
7. Ether soluble matter
8. Ether extractable fatty acids
9. Fibre analysis
10. Iron content
11. Lead and lead compounds
12. Moisture content
13. pH, Acidity & Alkalinity
14. Reducible sulfur
15. Sulfates

B. 16. Air permeability
17. Bending test
18. Bleeding resistance
19. Blocking resistance
20. Breaking length
21. Brightness
22. Bulk density
23. Bulk factor
24. Bursting strength
25. Cobb test
26. Compression resistance
27. Cupping test
28. Edge crush
29. Elongation
30. Exudation
31. Fastness to light
32. Flat crush

33. Flexural resistance and deflection
34. Folding endurance
35. Gloss
36. Grease resistance
37. Odour
38. Oil absorbancy
39. Opacity
40. Ply separation
41. Puncture (test) resistance
42. Rigidity and stiffness
43. Roughness and smoothness
44. Ring crush
45. Scuff resistance
46. Softness and hardness
47. Substance and Ream weight (Grammage)
48. Tearing resistance
49. Tensile strength and stretch
50. Thickness (caliper)
51. Water absorbancy
52. Water penetration
53. Water proofness
54. Water resistance
55. Water-vapour permeability
56. Wax absorptiveness
57. Wax pick number

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ANNEXURE - VIII

IDENTIFICATION OF PLASTICS

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CONTENTS

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FOR VINYL GROUP

PVDC	:	Saran
PVC	:	Vinophane
PVC/PVA	:	Rdodapan, Breon, Vinolyte
PVA	:	Fevalon.

1. Laminates:

Edges peel back while burning or heating on a block at 65-75 degrees C. Skid a rubber covered rod over the top. Sample laminated by thermoplastic adhesive usually separates.

2. Coated film:

Heat the film gently (in case of coating blisters/ bubbles appear) and separate by heating in a water bath.

3. Identification of chlorine:

Belestein copper wire heated, wiped with film, kept in a flame : Green colour shows.

4. Flame test:

PVC (Sp.gr. 1.28 - 1.38)	:	Self extinguishes Yellow orange with green edge, Darkens rapidly, softens and decomposes. Chlorine smell.
PVC/PVAC (Sp.gr. 1.16 - 1.35)	:	Self extinguishes Dark yellow with white smoke softens Chlorine smell
PVDC (Sp.gr. 1.68)	:	Self extinguishes Yellow with green edge to green Black hard residue Chlorine smell.

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PVA	:	Extinguishes slowly Yellow with grey smoke Swells and softens, turns brown Pungent odour.

5. Films containing chlorine:

a) Refer 3.

b) Libermann - Storch - Morwshi test:

A small piece of film is placed on the spot plate and covered with a few drops of acetic anhydride. One drop of conc. sulfuric acid is added so that it enters the liquid. The colours in the liquid are observed for a period of half an hour.

Film	:	Colour
PVC/PVAC	:	Green-blue-brown solution
PVC	:	Blue (slowly)
PVDC	:	Yellow (slowly)
R. Hcl	:	None.

c) Morpholine test:

A small quantity of film is immersed in morpholine. If it slowly darkens and within a few minutes, it becomes opaque and nearly black in colour - indicates P.V.C. The other chlorine containing compounds give a negative test. The test is true (positive) for PVDC/VDC Copolymer.

PVDC Coatings:

Two types are encountered (i) acqueous and (ii) Solvent polymers depending upon their method of application. These polymers usually contain 90 - 95% PVDC and the rest others.

d) Weber test:

This test is developed for natural rubber in raw natural and modified states and can be used for identification of rubber hydrochloride.

A small amount of the sample is placed in a test tube and 5 ml. of bromine is added (10% volume bromine in ccl_4). It is placed in a hot water bath and slowly evaporated. 10% of phenol in ccl_4 is added and heated for 15 minutes. A faint but definite violet colour appears in the presence of rubber hydrochloride.

e) Phyridine test:

5 ml of 0.1% solution of the film in pyridine is gently boiled for a minute and 5 ml of 2% metholic caustic soda is added. A brown to black colouration which on standing converts to a brown, charecteristic of it. In case of PVDC the colour black.

f) Solubility test:

If on (e) positive results are obtained a small amount of the polymer is shaken with 5 ml. of tetrachloro-ethane. PVC and PVDC are insoluble whereas rubber hydrochloride is soluble.

POLY VINYL ALCOHOL:

	EXPERIMENT	OBSERVATION	INFERENCE
a)	A small amount of the sample: is heated	Substance dissolves	PVA
b)	Reaction with Iodine Two drops of 0.1N I in KI solution is added to 5 ml. of neutral acqua solution of the film and diluted with water.	Blue/Green/Yellowish green colour is barely visible	PVA
	0.2 g of borax is added	An intense blue colour appears.	PVA

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5 ml of Conc.Hcl is added	Intense green colour appears	PVA
c) Reaction with tannic acid To the acqueous solution of the film 5% acqueous tannic acid solution is added	A yellowish flocculent precipitate or milky white turbityl appears.	PVA
Polymer is covered with 1 ml of I_2 solution	Blood red colour appears	PVAC

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POLYETHYLENE & POLYPROPYLENE

PE and PP float in water. They are distinguished by their melting point and specific gravity.

	M.Pt.	Sp.gr.
LDPE	110 - 115 C.	0.92
HDPE	130 - 135 C.	0.96
PP	145 - 150 C.	0.91

DENSITY METHOD:

0.01 g, polymer is placed in 250 ml cylinder containing 100 ml water. Methane is added from a burette in 0.5 ml portions with vigorous stirring after each addition until the polymer remains suspended at a constant level in the liquid. The percentage of methanol in the mixture is calculated.

0.96	31% v/v
0.92	57% v/v
0.91	62% v/v

FLAME TEST:

PE film when subjected to flame, burns, melts and drips like candle wax.

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POLYSTYRENE

PS. - Sp.gr. : 1.04 to 1.09

Flame Test:

Yellow orange with black sooty flame.
Softens and decomposes
Floral like smell.

Chemical Test:

About 1 gm of the polymer is refluxed with 20 ml Conc. HNO_3 for one hour, using a long air condenser in a fume cupboard. Pour it in 100 ml of water and extract it with ether twice. The etherial layer is extracted with 1N NaoH twice. Acidify the acqueous layer with Conc.Hcl with 20 ml excess amount. Add 5 g of Zinc. Heat it on a water-bath for a few minutes. Cool it below 5 degrees c. Add 0.1g/2 ml $NaNo_2$. Pour it over 0.05 g/10 ml 5N NaoH, alkaline solution.

A scarlet colour indicates the presence of styrene.

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NYLON (POLYAMIDES)

Sp.gr. : 1.06 - 1.14

Flame test:

Self extinguishing
Blue with green top flame
Melts and drips
Burning hair smell.

The polymer is placed in cotton wool dipped with p-dimethyl amino benzaldehyde	Red dye is formed Green colour is seen	Nylon Polycarbonate

Action with Dinitrofluorobenzene:

Two percent Di-nitrofluoro-benzene solution is added to a 2% solution of Na_2CO_3 in benzene to the polymer and it is heated for 2-4 hrs.	A yellow dinitrophenyl derivative	Nylon

Action with O - nitrobenzaldehyde:

A filter paper moistened with freshly prepared saturated solution of O-nitrobenzaldehyde in 2N NaoH is inserted in the mouth of an ignition tube containing the polymer which is gently heated.	A deep mawe colour appears	Nylon

Melting Point:

Nylon 6	215 degrees c.
Nylon 66	260 degrees c.
Nylon 610	22[illegible] degrees c.
Nylon 11	185 degrees c.

POLYESTERS (POLYTEREPHTHALATES)

Sp.gr. : 1.38

Flame test

Burns steadily with a yellow black smoke
Gets softened
Burns steadily giving vigorous odour.

Action with O-nitrobenzaldehyde:

0.1g of the film is placed in a test tube heated to 400 degrees c. Heavy vapours which rise with the portion meets the filter paper moistened with a freshly prepared saturated solution of O-nitrobenzaldehyde in 2N NaoH which is kept on the mouth of the tube.	A greenish blue colour with yellow margin appears on the paper Polyester
The paper in the above case is washed with dil. H_2SO_4 and rinsed with water (same for alkyd)	A blue/pale indigo colour results Polyester

Action with Phenol:

To 0.5 ml of water, 2 ml of H_2SO_4 and 0.05 g of polymer are added, boiled for 5 minutes, and cooled. A portion of the liquid (0.5 ml) is added to 0.1 g of phenol, boiled cooled and filtered. Filtrate is made alkaline with 0.1N NaoH.	A red of phenolphthalein appears. Pthalates

POLYCARBONATE

Flame test:

Self extinguishes
Burns with yellow orange colour
Gives black smoke
Decomposes giving pleasent vigorous odour.

Pyrolise the sample in an ignition tube plugged by cotton wool. The cotton wool is immersed in 2 ml of p-dimethylaminobenzaldehyde in methanol (1%) and 1 drop of 5N Hcl is added	Blue colouration which with water gives muddy violet	Polycarbonate
0.5 ml of Hcl is added to original undiluted solution	Red dye formation	Polycarbonate
Dilute the red dye with organic solvents	Blue colour	Polycarbonate

Both blue to red and red to blue are irreversible.

POLYACRYLONITRILE

CYANIDE DETECTION IN PYROLYSATE

About 0.5 g of the polymer is heated in an ignition tube, transferred to a test tube and 0.5 ml, 5 N NaOH and 3 drops of freshly prepared 5% acqueous $FeSO_4$ are added. The mixture is boiled and acidified with 5N H_2SO_4 and 1 drop 0.5N $FeCl_3$

A blue precipitate is obtained (ferric ferrocyanide - prussian blue)

Cyanide

POLYVINYL PYROLIDONE

0.05g of sample is dissolved in 10 ml of water and 1 ml of 0.01N acqueous iodine is added. The colour is compared with a blank containing no polymer.	Colour of iodine intensified	Polyvinyl Pyrolidone

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POLYMETHYL METHACRYLATE

0.1g of the polymer is heated in an ignition tube and the pyrolysate collected is wrapped in a wet filter paper. Conc. HNO_3 is added to the distillate, heated to boiling and cooled. 0.5 ml H_2O and 0.1g $NaNO_2$ are added.	Blue colouration	PMMA

(xxxx)

PHENOL FORMALDEHYDE

0.05g of polymer is boiled with 1 ml of Million's reagent for 2 months.

A red colour is indicative

Phenol formaldehyde

Million's reagent:

Dissolve 10g of mercury in 10 ml of Conc. HNO_3 (no heating), then dilute with 20 ml of water. Precipitate is filtered and discarded.

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UREA FORMALDEHYDE

0.05 g of sample is refluxed for 30 minutes with 25 ml of 20% CH_3COOH. It is cooled and filtered. To the filtrate 2 ml of xanthydrol in 1% methanol is added and the mixture is boiled for 1-2 minutes.

A bulky white precipitate

Urea

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MALAMINE FORMALDEHYDE

0.5g of sample is refluxed with 25 ml of 80% CH_3COOH for 30 mts. The mixture is cooled and filtered. The filtrate is evaporated to dryness on a steam bath and the residue is besurated on the steam bath for 5 mts. with 2 ml H_2O. It is cooled and filtered. An acqueous saturated solution of picric acid is added.	Substantial yellow precipitate	Malamine formaldehyde
	Slight haze	Urea formaldehyde

FORMALDEHYDE

To a mixture solution of 1.5 ml H_2SO_4 and 1 ml H_2O chromotropic acid and 0.01g polymer are added, heated in water bath for 10 mts. at 65-75 degrees c.	Violet colour appears	Formaldehyde

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EPOXIDE

It is based on 4-4 dihydroxy diphenyl 2-2, propane.

C.02g of the polymer is dissolved in 1 ml Conc.H_2SO_4 with slight warming. The solution is cooled and 1 ml Conc. HNO_3 is added. It is poured into 100 ml 1N acqueous NacN.

A bright red colouration

Epoxide

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SHELLAC

0.05g of the substance is dissolved in ethanol(1 ml), warmed and cooled. To this	Violet red colour	Shellac
1 ml of H_2O is added to give white emulsion like precipitate. 2 drops of 5N NaoH is added.	Brown colour	Chlorine bleached shellac
5N Hcl is added	Reversed	Shellac confirmed

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RUBBER

POLYURETHENE RUBBER (PUR)

1ml Conc. H_2SO_4 and 4 ml H_2O are added to 0.05g of rubber and boiled	Disintegrates	PUR

VINYL PYRILINE RUBBER (VPR)

Fuse 0.1g of sample with KOH (0.2g) in a test tube, cool and shake with 2ml H_2O. Acqueous layer is poured off, acidified with 5N Hcl(excess). Meyers' reagent (3g mercuric chloride + 10g KI in 200ml water) is added	Yellow precipitate which disappears on warming	VPR

NITRILE RUBBER

	Negative to above two	Nitrile Rubber

POLYSULFIDE RUBBER

A small amount(0.05g) of sample is dropped into cold Conc. HNO_3(2ml)	A vigorous reaction with evolution of brown fumes	Polysulfide

POLYCHLOROPRENE RUBBER

A small quantity(0.05g) of the sample is boiled with 2ml Conc. HNO_3.	Disintegrates with evolution of brown fumes	Polychloro-prene rubber

(In the case of chlorinated butyl and chlorosulphonated polyethylene, no disintegration occurs).

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CHLORINATED BUTYL RUBBER(BR)

(Depends on the presence of isobutylene in the pyrolysate).

The test tube containing 0.2g of polymer is heated gently and a filter paper is dipped in freshly prepared mercuric sulfate - is inserted in the mouth of the tube.	Bright yellow colouration	Isobutylene

(Mercuric sulfate: Yellow mercuric oxide, 1g, in boiling 5N H_2SO_4, 20 ml and cocling afterwards).

CHLOROSULFONATED POLYETHYLENE

Negative test for above two(polychloroprene rubber and chlorinated butyl rubber)

CHLOROTRIFLUOROETHYLENE

0.05g of sample is boiled with 2 ml Conc. HNO_3 for few minutes. If disintegration occurs then " Section A" procedure is followed, otherwise "Section B" is followed.

SECTION A:

NATURAL POLYISOPRENE RUBBER

0.1g of sample is heated in a water bath with 5 ml chromic acid solution (2g Cro_3 in 5 ml water and 1.5ml H_2SO_4)	Odour of acetic acid	Polyisoprene
Weber Test	A faint, definite violet colour	Rubber

STYRENE BUTADIENE RUBBER

DIAZOTISATION TEST	Scarlet red dye	Styrene

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POLYBUTADIENE RUBBER

Negative test for rubber test and dye test		Butadiene rubber

SECTION - B

ACRYLATE RUBBER

0.1 g of sample is boiled with 5 ml acetic acid	Dissolves/swells	AR

BUTYL RUBBER

Isobutylene test	Positive	Butyl rubber
Weber test	Positive	Butyl rubber confirmed

SILICONE RUBBER

0.2g polymer ignited on a spatula and the flame is allowed to play on the centre of a small watch glass. The glass is covered with little HF and evaporated.	Glass gets coated with white deposit	Silicone
	Silica dissolves and no residue(deposit) after heating	Silicone confirmed
Negative for section - B		Ethylene propylene rubber

SILICONE

Same as silicone rubber
If it contains glass, it does not burn readily.

ISOBUTYLENE

Same as Butyl rubber.

POLYURETHENE

Melting point - 180 degrees c.
Difficult to differentiate between Nylon & Pu.

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CELLULOSIC GROUP

	Film (Density)	Self Extinguishing	Flame characteristics	Behaviour	Odour
1.	Cellulose (1.48)	No	Yellow-orange grey smoke	Burns fast	Burnt paper
2.	Cellulose Acetate	No	Yellow mauve with blue base	Melts, burns quickly leaving irregular charred beads	Burnt Vinegar
3.	Cellulose acetate/ Butyrate	No	Dark yellow with blue edge	Melts and drips	Rancid butter
4.	Hexa ethylene cellulose	No	Dark yellow with blue edge	Cellulosic	
5.	Cellulose nitrate		Yellow	Burns instantaneous	Aird

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A small fragment of film is added to a test tube containing 85% H_3PO_4. The mouth of the test tube is covered with filter paper moistened with 50% CH_3COOH, $C_6H_5NH_2$. Sample is heated till chars.	Pink spot	Positive for cellulose nitrate.
0.5ml C_6H_6 and 1 ml of 98% H_2SO_4 with 1g of film is warmed in a water bath.	An intense yellow followed by reddish colour.	Cellulosic group.
To the above solution 0.5ml of C_2H_5OH is added.	A blue/green ring appears	Cellulosic confirmed
Warm 0.5g of sample with 10ml of 15% solution of aqueous NaoH for 15 mts. Distil ⅓ of the volume. Add Cao to the remainder. Residue heated to dryness, with the filter paper on the top of the tube.	Presence of acetone	Acetate
<u>MOLISH TEST</u>		
0.05g of polymer is shaken with 1ml of H_2O and 2 drops of fresh naphthol in CH_2Cl_2. 4ml 10% W/W Conc. H_2SO_4 is added carefully through the sides	Violet ring(when shaken violet colour)	Cellulose polymer.
Warm to hot water added	Soluble	Ethyl cellulose
0.1g of sample is boiled with 5ml of acetone in a water bath	Soluble Insoluble	Secondary Acetate Triacetate
0.1g of sample is boiled with 5ml of ccl_4 in a water bath.	Soluble Insoluble	Triacetate Secondary Acetate

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CELLULOSICS

MSAT, PSAT, QSAT.
(Coated & uncoated)

Treat the sample with 6% diphenylamine in 90% H_2SO_4.	Intensive blue colour or brown	Nitrocellulose coating.
Prepare pouches of above fill with blue silica gel. Store at 75% R.H. for 4 hours and compare	Pink Bleach No change	PSAT QSAT MSAT

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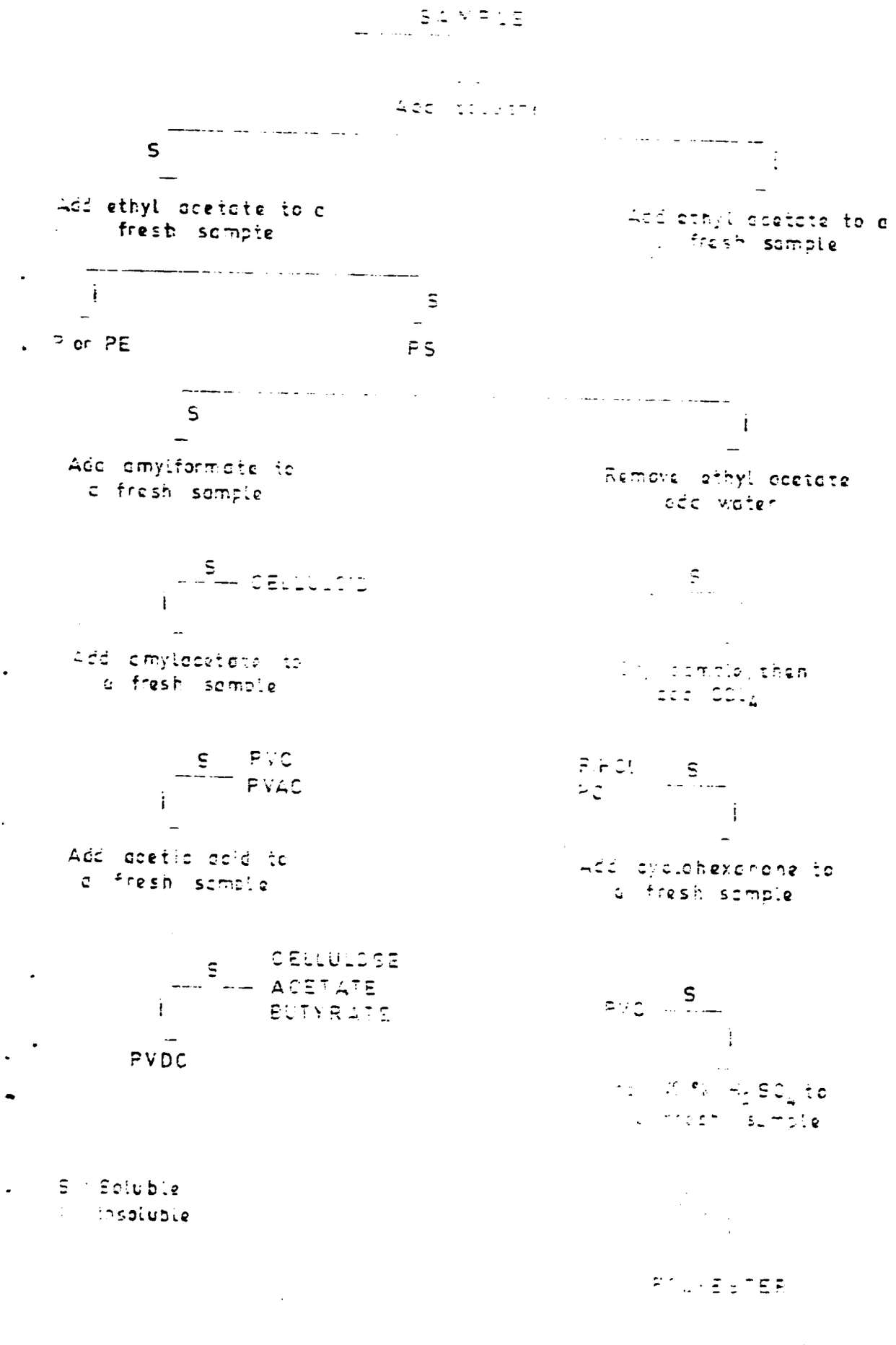
CASIN

0.02g is dissolved in 2ml Conc. HNO_3, boiled for 5 minutes, cooled and excess 5N NaoH is added.	Orange colouration	Phenyl group


SAMPLE
Add ethyl acetate
S
Add ethyl acetate to a fresh sample
Add ethyl acetate to a fresh sample
S
I
P or PE
PS
S
Add amylformate to a fresh sample
I
Remove ethyl acetate add water
S
CELLULOID
Add amylacetate to a fresh sample
S
sample, then add CCl_4
S
PVC
PVAC
PVC
S
I
Add acetic acid to a fresh sample
Add cyclohexanone to a fresh sample
S
CELLULOSE ACETATE BUTYRATE
PVC
S
I
PVDC
S Soluble
I Insoluble

ANNEXURE IX

GUIDE FOR REFERENCE STANDARDS FOR TESTING OF PROPERTIES OF PACKAGING MATERIALS

TEST/PROPERTIES	REFERENCE STANDARD						
	I.S.O.	ASTM	TAPPI	BS	TNO	IS	TS
1.	2.	3.	4.	5.	6.	7.	8.
Abrasion loss of paper & paper board			T476m	BS3110-1959			
Acid soluble Iron in paper	ISO/R779-1968E		T434m	BS4897			
Acidity or Alkalinity, water soluble		D548	T428m			IS1060-1969 Part III	
Adhesive performance (Gummed paper tape)		D773	T463m			IS4185-1967	
Adhesiveness of seals and closures for packages			T805sm				
Adhesion strength of adhesives				BS 647		IS2257-1970	
Adhesion strength of pressure sensitive cellulose tape				BS3887			
Air resistence	ISO3687			BS2925-1958 (part II)			
Alkalinity of glass						IS2091-1973 IS2303-1963	
Alkali staining number						IS1060-1969 part III	

1.	2.	3.	4.	5.	6.	7.	8.
Alpha cellulose content(B&R)		D588	T429m			IS1060-1969 part II	
Anchorage of adhesive in pressure sensitive cellotape				BS1133-21		IS2880-1971	
Ash content	ISO/R-1962-D586 1970 E ISO2144-1974		T413m	BS3631			TS1302 TS1121
Bacteriological test			T449m			IS2860	
Basis weight	ISO/R 60-1958 E	D646	T410 os	BS3432	1vV1.1,1966	IS1060-1966 part I	TS3122
Beading test			T474m			IS1060-1960 partII	
Bitumen content						IS1398-1968	TS 114
Bleeding resistance for asphalted papers		D917	T475m			IS1398-1968	
Blocking resistance		D918	T477m			IS4006-1966 (Part I)	
Breaking length						IS1060-1966 Part I	
Bulking thickness	ISO/R438 1965	D527	T426m	BS3983		IS1060-1966 Part I	

1.	2.	3.	4.	5.	6.	7.	8.
Bursting strength(and factor)	ISO2758 ISO2759 ISO3689	D774	T403m	BS31371959	1vV2.2,1966 1vV2.1,1966 1vV2.3,1966	IS1060-1966 Part I	TS3124 TS3123 TS1119
Caliper[thickness]	ISO TC6 ISO3034	D645	T411m	BS4817	1vV1.3,1966	IS1060-1966 Part I	TS1119 TS3119 TS3120
Chloride content		D1161				IS1060-1966 Part II	
Conditioning & Weathering		E41(35,41)					
Conditioning for testing	ISO/R-187 1961E	D685	T402m	BS3431	1vV0.3,1966		TS 636
Conditioning of paperboard & fiberboard for testing		D641	T402m		1vV0.3,1966		TS 636
Copper number		D919	T430m			IS1060-1969 Part III	
Crack resistence of blow moulded plastic containers		D2561(36)					
Crease retention of wrapping papers		D928 (Discontinued)	T446m				
Creasing paper for permeability test		D1027	T465sm				
Curl and sizing		D826	T466m				
Chromo coating of paper & board						IS2880-1971	
Creasing quality-carton board				BS4818			
Density						IS2508-1963	
Determination of stability of pressure sensitive tapes						IS2880-1971	

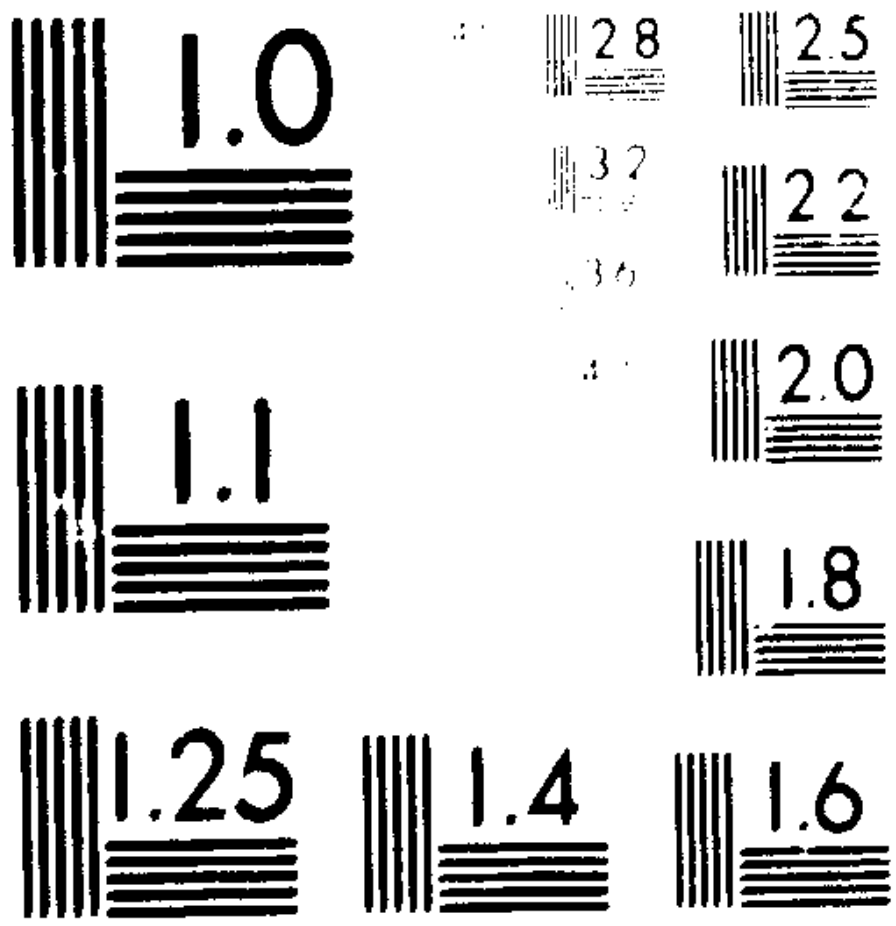
1.	2.	3.	4.	5.	6.	7.	8.
Dimensional change in paper/film	ISO5635 ISO5637	D1042-51 (35)					
Dimension of carton/ Box/paper		D2658-68					TS2889
Edge crush (for CFB)						IS7063 (part II)	
Effectiveness of temporary corrosion preventive						IS1674-1960	
Efficiency of closure wads		D2561		1679-1965		IS3101-1965	
Exudation test(for bitumenised paper)						IS1060-1960 Part II	
Fastness to light	ISO/R-877, 878,879-1968E			BS2732-540A 4618 4618		IS 101-1974	
Fibre analysis		D1030	T401m			IS1060-1966 Part I	
Fillers - Microscopical Identification			T488 sm				
Flamability of treated paper board and film		D777	T461m				
Flat crush resistance	ISO 3035	D1225	T808	BS4686	1vV2.10-1966	IS4006-1972 Part II	
Flexural properties of rigid,semi-rigid plastics	ISO 178-1972E	D790-91		BS2782/3			
Flute height						IS2771-1977 Part I	TS1119

1.	2.	3.	4.	5.	6.	7.	8.
Friction test-dynamic Static			T815 T815				
Friction-Coefft.of,plastic film		D1894					
Folding endurance	ISO5626	D643	T423m	BS4419			
Fungus resistance		D2020	T487m				
Grammage of paper of 3 ply of 5 ply of 7 ply of others	ISO536 1976 ISO3039 ISO5638	D646	T410as	BS3432		IS1060-1966 IS7063 IS7063 IS7063 IS7063 (All part I)	TS3122
Gloss contrast at 57.5 deg.		D1222	T424m				
Gloss specular at 75 deg.		D1223	T480m				
Gloss of waxed paper at 20 deg.		D1834	T653ts				
Grease resistance(Turpentine test)		D722	T454m T454ts		1vV3.4,1968		
Heat seal strength(Fin & lap seal)		F88(21)					
Heat shrinkage of plastics films	I8060,61	D1204(35)		BS2782/6			
Humidity-relative,method of determination		E337					TS1301
Hydrogen ion concentration of paper extracts(pH)		D778	T453m	BS2924		IS1060-1966 (Part I)	
Hydrostatic pressure test for glass/plastic bottles						IS1107-1974	

1.	2.	3.	4.	5.	6.	7.	8.
Ink absorption of blotting papers			T431m	BS4574			
Insect resistance			T478m				
Leak in heat seal flexible pouches		D3078					
Machine/cross direction of paper & paper board		D528	T409os				
Mildew(fungus)resistance		D2020	T487m				
Mineral coating(quantitative determination)		D687	T407m				
Mineral filler and Mineral coating(qualitative)		D686	T421os				
Mineral filler(qualitative analysis)		D686	T421m				
Modulas of elasticity(for thin plastic sheets)		D882(35)					
Moisture	IS0287-1978	D644	T412m T412os	BS3433-1961	1vV3.7,1967	IS1060-1966 Part I	TS1301
Moisture by toluene distillation			T484m				
Nitrogen in paper & paper board		D982	T418os	BS4497			
Odour of packaging materials			T483sm	BS3755-1964		IS4006-1972 Part II	
Oil penetration(proofness)		D202			1vV3.4,1968		
Opacity	IS02471 1977 2469 2470	D589	T425m	BS4432			

1.	2.	3.	4.	5.	6.	7.	8.
Package cushioning materials Dynamic properties		D1596		BS1133-12			
Package cushioning materials testing		D1372		BS1133-12			
Pallet(non expendable)testing		D1872(22)					
Paraffin		D590					TS2906
Paraffin wax absorptiveness		D983					
T-peel test for gummed paper/ adhesives		D1876(22)					
Peeling resistance		D1029					
Peel test for gummed paper/ other packaging materials		D903(49) (22)					
pH of acqueous solutions- determination of		E 70		BS2924		IS1060-1966 Part I	
Pinholes in glassine & grease proof papers etc.		D1221	T485m		1vV3.6,1968		
Ply adhesion(pin adhesion test -CFB)	IS03038	D825	RC269		1vV2.9,1967		
Ply separation of combined container board		D1028				IS4006-1972 Part II	
Porter/shots(ends/picks)of hessian						IS2818-1971 Part II IS1963-1969	
Presence of impurities in paper board							
Qualitative analysis				BS1820-1961		IS6622-1972	
Quantitative analysis				BS1820-1961		IS6622-1972	
Printing ink permeation (Castor oil test)		D780	T462m				

1.	2.	3.	4.	5.	6.	7.	8.
Puncture & stiffness test	ISO3036	D781	T803m	BS4816	1vV2.5,1966 1vV2.6,1966		
Reflectance		D985 E97 D726	T452m				
Ream weight						IS1060-1961 Part I	
Resistance to acetic acid (for tinplate container)						IS5818-1970	
Resistance to sulfur staining (for tinplate container)						IS5818-1970	
Rigidity, stiffness &softness			T451m				
Ring crush		D1164	T472m			IS4006-1966 Part I	
Rosin		D549	T408os				
Sampling	ISO/R186 1966E	D585	T400m	BS3430	1vV0.1-1966	IS1060-66 Part I	TS635
Scuffproofness				BS3110-1959		IS4006-1966 Part I	
Seamstrength-fabrics & other properties						IS3790-1970	
Sizing properties(qualitative test)						IS1060-1966 Part I	
Smoothness of paper	ISO2494		T490m	BS4420			
Smoothness of printing paper			T479sm				
Sodium Benzoate in paper				BP1973			
Softener content in films/paper				BS1820-1961		IS1796-1961	
Staining of paper by alkali		D723	T440m				



1.	2.	3.	4.	5.	6.	7.	8.
Starch		D591	T419m				
Stiffness	ISO2493		T489m	BS3748 BS2782/3	1vV2.6,1966	IS1060-1969 Part III	
Stretch		D987	T457m				
Sulfur, reducible		D984	T406m				
Surface strength			T459m				
Surface Wettability		D724	T458m				
Sulphate content		D1099	T468m			IS1060-1960 Part II	
Tear strength & Tear factor	ISO/R1974-1971E	D689	T414m	BS4468	1vV2.7,1966	IS1060-1966 Part I	
Tenacity of fabrics	ISO/R527 rigid					IS6192-1971 IS1670-1960	
Tensile strength-Dry	ISO/R1184-films 1970E	D828	T404os	BS4415 BS2782/3 (plastics)	1vV2,8,1966	IS1060-1966 Part I	TS3121
Wet	ISO/R1924-1971E	D829	T456m				
of straps,fabrics	ISO3781					IS2508-1963 IS1670-1960 IS6192-1971	
Thickness	ISO TC6 ISO/R534 1967	D645	T411m	BS4817(cfb)			TS3119
Tincoating in tinplate						IS1327-1966	TS1715 TS1716
Tincontent(percentage) of soft solder						IS998-1959	
Titamium di oxide content		D921					
Total solids in adhesives						IS2257-1970	

1.	2.	3.	4.	5.	6.	7.	8.
Verticality test(for glass bottles)						IS1662-1972	
Water absorbancy			T441m T492sm	BS2916		IS1060-1960 Part I	TS609
Water absorption of plastics	ISO/R62-1958E	D570(35)		BS2782			
Waterproofness-cobb test	ISO535-1976		T441m	BS1133-Section 7	1vV3.1,1966	IS1060-1960 Part I IS4006-1966 Part I	TS1119
Water immersion of paper board		D	T491sm				
Water resistance(Dry indicator method)		D779	T433m		1vV3.5-1966		
Water resistance of glue bond by immersion						IS7063-1976 Part III	
Water soluble matter		D1162					
Water vapour transmission rate	ISO/TC 61-656E ISO2528	E96	T464m	BS3177-1959	1vV3.2,1965	IS1060-1960 Part II	
Wax absorptiveness						IS1060-1969 Part III	
Wax content(Ether extraction method)				BS4685		IS3263-1965	
Weight of surface wax on waxed paper		D2423					
Wax coverage						IS1060-1966 Part II	
Wax pick number(Denmison wax number)						IS1060-1966 Part II	
Weight of hessain						IS2818-1971 Part I	

1.	2.	3.	4.	5.	6.	7.	8.
Wire and felt side		D725	T455m				
Yield tolerance						IS2508-1963	

ABBREVATIONS USED:

I.S.O. : International Standards Organisation.

A.S.T.M. : American Society For Testing And Materials. (Figures in brackets indicate ASTM Part number, wherever no figure is indicated, it refers to ASTM Part 20)

TAPPI : Technical Association of the Pulp and Paper Industry.

B.S. : British Standards.

BP : British Pharmacopea.

T.N.O. : Inst. TNO for Packaging Research

I.S. : Indian Standards.

T.S. : Turkish Standards.

ANNEXURE - X

SIGNIFICANCE OF TESTS

TEST/PROPERTY	SIGNIFICANCE
1. Acidity and pH	The acidity or alkalinity in paper or board is due to the chemical residues left in the manufacturing process or special chemical treatment imparted to get certain special property. Contamination from atmosphere and handling can also lead to this. The fibre strength and durability will get deteriorated due to high acidity or alkalinity. The term pH is used to designate the acidity or alkalinity level. Rigid control of acidity is required for paper required for permanent use such as documents, bond and index papers. The property may be of relatively less significance where paper for temporary use is considered. Acidity also should be controlled for wrapping papers used for packaging of metal items as otherwise this would lead to corrosion problems. pH control of adhesives and labels also is necessary to avoid discolouration and marring of printed labels. Highly alkaline adhesives can also result in delamination of plies and spoilage of print on the outerply of corrugated boxes. Incompatibility of pH between adhesive surface, glue and label can result in poor adhesion and peeling of labels.
2. Air permeability	Air permeability is related to porosity but the latter is not an index or measure of the same. The size, number, shape and pattern of distribution of the pores, however, have an influence on air permeability. Air permeability represents the ability to permit flow of air from one side to the other under a pressure difference and the same principle could be extended to permeation of different gases. Conversely resistance to passage of air is inverse to the permeability. Air permeability is normally expressed as the

volume of air permeating through unit area in unit time under unit pressure gradient, for the given thickness of the material.

The value of air permeability would give an indication of the compactness and uniformity of the material. Thus, it is an useful quality control measure at the manufacturing stage. It also helps to know the spread and penetration of inks, adhesives etc. It has higher significance in automatic bag filling of powdery products. In terms of gas permeation, it is important for products that are sensitive to specific gases like oxygen leading to oxidative rancidity and deterioration. This property could also give an indication of the permeability to oils and other organic fluids.

3. Ash

The source of ash or mineral content is the basic pulp, loading, filler, coating and colourants used, sizing agents, and contaminations from atmosphere, water and manufacturing process itself. Because of this, ash content would vary from as low as two percent to as high as 35 percent. The additives are meant for, to obtain different end use or conversion properties such as for increased opacity for better printing, reducing transparency, increased ink acceptability, better formation, improved finish on calendering and feel, higher bulk, improved coverage with whiter and brighter surface for liners etc. Thus the minerals affect a number of paper and board charecteristics. The effect will vary according to the type and quantity of the filler. The properties afforded or affected could be summarised as formation, absorbancy, penetration. Because

basic pulp contributes mainly to the strength properties of paper, addition of any such fillers obviously affect the bulk and final strength. A very high filler content will give smoothness/ softness but may result in dusting. Presence of hard materials in fillers will affect the conversion machinery and components like abrasion of printing plates.

4. Basis weight

Basis weight represents the weight of paper or Board of a selected area. The term grammage is used for paper and board representing the weight in grams of a square meter area. In the case of paper board often this is expressed as ream weight representing the weight in pounds of 480 or 500 sheets of a definite size. Because basis weight represents an absolute value and does not charecterise any specific property, it cannot be considered as a fundamental property. However, many other properties - particularly of physical in nature - are related to this property.

The paper and board trade since years buy and sell paper and board on weight basis. Thus basis weight has a specific significance to the seller, buyer and converter as well as consumer. A higher weight per unit area will result in less yield to the convertor but a higher margin to the seller. A lower weight per unit area will be converse to above, but may result in poor performance at the converting and user's ends. In converted and packed form, and where packs are made-up and marked for gross weight, consumers will stand to lose, if the pack tare weight is high, resulting from higher grammage of the basic material.

5. Blocking Resistance

Blocking is the charecteristic of adjascent layers of packaging materials sticking together due to pressure, temperature and relative humidity. Blocking resistance refers to the property of the material to resist the above. Blocking could happen when the material is in web or sheet form. Blocking would lead to problems in unwinding the web or sheet feeding by manual, mechanical or pnuematic means. Blocking of labels in bundles can result in loss of time and materials, so also in automatic/ semi-automatic labelling machines. Coated and impregnated materials could more easily exhibit this phenomenon if the chemicals used are sensitive. Freshly printed or varnished surfaces, if not adequately dried can lead to blocking on piling.

Blocking resistance is therefore important in storage of material., in deciding packaging requirements for storage and transport and as a quality acceptance measure depending on the inventory requirements.

6. Bursting strength

A composite of basic structure and formation of the paper and boards contribute to this property, although tensile strength and elongation are the principal ones. The value of bursting strength is expressed as pounds per square inch or kg. per square cm. Measurement is made on standard machines either hydraulically or pneumatically. The test is used for paper, films and foils as well as for board materials. While tensile property is now more commonly used for some basic materials, bursting strength continues to be used for container board liners and boards.

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This gives a fair indication of resistance to puncture and therefore is useful for performance assessment of bags, wrappers etc. where tensile has an important role. Significance of this property is however more adopted in liners for boards and boards - which contribute to the performance of the ultimate converted boxes/ forms.

The increase in bursting strength is found to be more pronounced in lighter substance papers than in heavier ones. It, however, decreases irregularly with increased calender pressure. The behaviour towards increasing and decreasing relative humidity levels is of hysterisis in nature.

7. Caliper

Also referred to as "thickness", is the distance between the upper and lower surfaces (two principal points) under specified conditions. Moisture variations affect caliper. Measurement of thickness should be made with accurate and calibrated instruments as pressure as well as surface area under test both could influence the value.

The thickness assumes significance in respect of end use applications and some properties. A higher degree of variance will create problems with punching (card), feeding (tabulating cards); In applications like news print, text book papers, and other print materials thickness should be governed to see through properties. A positive tolerance in caliper can affect storage space, and bulk of converted material. The stiffness property of boards also is influenced by caliper.

8. Cellulose - Alpha, Beta & Gamma content

Alpha cellulose represents the pure cellulose content in the fibre, that is not degraded in the process. This would obviously constitute the higher percentage of the cellulosics. It is determined from the previously swellen (with sodium hydroxide solution) fibers dissolved again in sodium hydroxide solution. Beta cellulose is the fraction that could be precipitated by acedifying of the filtrate and gamma that remains in the solution.

The presence of higher percentage of alpha cellulose is expected to give a higher chemical stability and therefore permanance of paper.

9. Colour

Although colour is a common term, in the paper and board industry it refers to a physical charecteristic of the spectral reflectence when compared to a specific illuminant. It is measured as a percentage reflectence by a three dimensional method - Munsell system or using a three colour reflectomater against a standard surface calibrated against a magnesium oxide surface.

Paper and boards may vary in their shades/ colour from process to process, lot to lot and may even in small lots. Physical appearance often is taken as a criteria for judging the property. The uniformity of shade and colour is of higher significance for many applications. These include printing, wrapping and writing. An instrumental analysis of the variation in the quality is preferred over physical observation, to avoid process variation. Colour standards also, often is taken as an index for grading of peper and boards. A reasonable correlation exists between colour and brightness.

10. Copper Number

The copper number is indicative property of permanence of paper and can be taken as an index of impurities of reduceable nature in fibre-cellulose. A higher copper number value is not lesireble as this will indicate the breakdown of the cellulose during and continually after the process, affecting permanance and other properties. However, this test will not be applicable and accurate if copper reducing non-cellulosic agents are present. Permanance charecteristic is important for document, bond, record and similar papers. It is also said that copper number could be an index of parchmentising in parchment and greaseproof papers.

11. Elongation(Stress)

This property should be clearly differentiated from expansion. This refers to the increase in length along the direction of pull and should be specified as the increase over a given test length because this could vary for different materials and in the two directions. The stretch depends on the paper formation and composition and the subsequent treatments. The elongation is invariably measured alongwith tensile and has its significance both at conversion and at users' end like automatic/ semi-automatic packaging as well as at specific consumer packs. Both tensile and stretch increases with loading rate.

12. Fiber Analysis

Different kinds of raw materials are used in the manufacture of paper and board. The type and mixture of raw materials used, the process and other factors govern the ultimate property of the material.

The fibre identification can be made either by staining techniques or microscopical analysis.. It is however preferred to conduct microscopical analysis to get a better result.

The object of the analysis is to obtain information on the type of raw material(s) used, chemical and mechanical treatment given to the pulp and the process of pulping. Identification of the presence of extraneous matters like man made fibres is important because they would reduce the physical properties.

13. Flat Crush

Flat crush is a property associated to flute charecteristics in single face and single-wall (2-ply and 3-ply) corrugated fibre boards, but not recommended for higher ply boards. It is the measure of the resistance of the flutes to a force applied in perpendicular when the board is placed flat.

Variation in humidity conditions will affect this property. The test should be performed with undamaged samples.

The flat crush value is dependent on the material quality and good conversion technique and process. Any defect in the corrugations, use of low grade materials, improper storage, type of adhesive used and the like can affect the flat crush value often giving a low value. The process of conversion like die cutting and printing of board can also damage flutes. The value obtained on good specimen can therefore be used as basis, for interpreting any damage and lower values obtained after conversion. No specific correlation however is made between flat crush and performance of converted box.

14. Folding endurance

Folding endurance is a combination of tensile strength stretch and pliability and is adopted to measure the durability of specific materials like currency paper for wear resistance over repeated folding. This however, is different from bending charecteristic used more for thicker materials, for conversion processes, which may involve single or dual folds over 180 degrees.

Folding endurance is related to burst and tensile in that all these increase with increased beating, and decreases irregularly with increased calendering pressure. But increased moisture reduces burst and tensile whereas the folding property shows an improved value. This is attributed to the fact that higher moisture results in higher pliability which in turn positively influences the folding. However, no correlation exists between moisture variation and folding endurance values. Values of folding endurance obtained in the two directions of paper would help to assess the squareness of the paper.

This property is also used as a measure of the stability of paper against aging and is done by evaluating the values on specimens exposed to higher temperature conditions and comparing the values. This would give an idea of degree of deterioration and permanence of record materials.

15. Grain Direction - (Machine and cross Direction) (M.D. & C.D.)

The machine direction refers to the direction of paper (substrate) along the forward movement of the machine and the cross direction is perpendicular to the above. The direction of the paper is important because the properties differ in the two directions.

Most of the physical properties show a higher value in the machine direction.

In the paper making, the fibres generally tend to lie parallel to the machine direction and this attributes to higher test values along this direction of some physical properties. The direction by itself does not represent any physical property but refers to the arrangement of fibres and thus the structure. Thus they have an influence on the physical properties. In the case of paper and board, this property also helps in the proper creasing quality - being better obtained along the grain. Due to the curling nature of paper along the axis of machine direction, this also guides in the printing of labels.

16. Grease (Proofness) resistance

This test is done to evaluate the resistance to penetration of oils, fats, grease or wax present in the product or products coated with anti-corrosives of above nature. Thus the test assumes significance from application point of view. The general method followed is to use turpentine as it is found to be rapid and the test an accelerated one. This is used as a control method and for specific accurate method actual product package study is recommended under selected conditions. Since this test is not a precision one, a large number observations are recommended - comprising atleast of 30 specimens, split equally for both sides.

17. Moisture Content

All cellulosics are susceptible to moisture gain and loss (absorption & desorption) under changing atmospheric relative humidity conditions and temperature. They tend to equlibrate with the exposed conditions. Moisture content in paper and board is normally determined either by oven dry method or toluene distillation method. For more accurate determination of moisture content drying at 110 degrees c. in a stream of dried nitrogen or in a vacuum oven is recommended.

Moisture content could be expressed either on " wet basis" or " dry basis".

Moisture content, probably, is one of the most significant properties, as variations in moisture content can grately influence other charecteristic. nd conversion processes. Because of this, the sampling and conditioning (recommended to condition to a lower dry stage and recondition at the desired humidity level) should be done more carefully. Neither high moisture level nor bone dry condition are desirable. Strength properties like tensile, burst, fold, tear etc. either get enhanced or depreciated due to varying moisture conditions. Likewise higher moisture level affects surface properties like glass, smoothness thereby affecting the print, and ink receptivity, resulting in poor reproduction. Other properties like permeability, scuff resistance besides conversion of boards and paper are also influenced by moisture variation.

18. Oil Penetration / absorbancy (Ink receptivity)

The test is related to printing. The test helps to determine the time required for a standard oil to penetrate from one side to the other of a substrate or time required for a uniform spread of the oil on the surface. Since the substrates or inks as well as processes of the printing processes vary over a wide range, this method could at best can be only indicative. Transfer of ink will depend on the surface, so also the printing process and print run. selection of ink is governed by these. Drying of ink could be by absorption, oxidation, evaporation or by combination of absorption with either of the other two.

Oil penetration figures give the printing quality of the paper/ board. This property can essentially be used in the quality control of the manufacture of quality printing papers. To illustrate, a quick penetration will affect the second side of the sheet. The reverse action viz. a slow absorbancy rate can result in the lift of print and adhering to the reverse side of the next layer affecting the appearance of both.

19. Opacity

Opacity often is associated to other terms. While reflectance and transmittence are related, the use of terms like transparency, and translucency does not appear to bear relevance. Opacity refers to the degree of imperviousness the material could offer to light. The incident light falling on a body partly gets reflected, absorbed and scattered depending on the opacity of the body. This has a direct significance on end-use application of the material. Products requiring light protection would select themselves more opaque materials (measured in terms of transmittance) whereas for better appearance such as printed materials, posters, and pictures-

a higher degree of reflectance would be charecteristic.

Opacity is either expressed in terms of contrast ratio, or transmittance of light. The opacity of paper is dependent on degree of bleaching, fillers and coatings used, etc. Opacity could be an essential manufacturing quality control measure and for the user for comparing purposes for a specific end use.

20. Paraffin (Wax content)

Paraffin as a coating or lamination medium is used in paper and boards to impart water vapour resistant and water resistent properties to the substrates. Such materials have a wide range of applications in the packaging industry. The wax application is either done by dry waxing, wet waxing or for lamination. Wet waxed substrates are more commonly adopted, the applications including wrappers for butter, cheese, bread, milk cartons etc. The blend of wax used for such applications vary in their formulations and the ingrediants commonly used include paraffin wax, micro-crystalline wax, polyethylene, whitening agent, and plasticizers. The quantitative estimation of wax coated is normally done by soxhlet extraction method.

The quantitative and qualitative aspects of wax coating relate to properties such as waterproofness, water vapour proofness, heatsealing and lamination properties. Poor quality of wax used and improper blend or higher coating quantity can lead to problems of yellowing and cracking.

21. Puncture

Puncture has been recognised as a more useful property over burst, since the recent past in some parts of the world. It measures the resistance to puncture of paperboard including solid and corrugated, by piercing heads, box corners and sharp points. This property is considered more performance oriented and combines in itself a number of basic properties particularly tear and stiffness. The puncture value thus gives the resistence to tear and force required to bend. The same equipment is also used for assessing the stiffness charecteristics. The puncture value is expressed in terms of energy absorbed per unit of tear.

22. Ring Crush

The test is carried out on a flat-crush compression tester and determines crush force value giving the edge-wise compression resistance. Thus, it is related to stiffness. This is more commonly adopted for liners and corrugating medium. Inaccuracies in sample cutting and poor alignment of platens will appreciably affect the test value. Variation in moisture content will also give differing values. No specific correlation has yet been arrived at between these test values and the strength/performance of the converted system. Therefore, the test could at best be used for comparative purposes and evaluating against a standard one.

23. Side (Wire & felt side)

The property by itself does not connote much importance but has an influence on other properties. The wire side is that side which is in contact with the wire of the paper making machine, and the other side which is in contact with the smoother felt is the felt or top side. The smoothness, glass differ in either sides. The absorptive property of the two sides also will be found different, the felt side showing a higher rate. The knowledge of the sides

is important in respect of single side or double side printing. If only one side printing is needed, normally the smoother side is selected. Ink consumption on the wire side is found to be relatively higher.

24. Stiffness and Rigidity

Stiffness could be considered more of a manufacturing manupulation. It is affected by moisture, pulp concentration, sizing, beating and calendering. The width and thickness of the sample affects stiffness directly (proportionally) whereas it is inversely affected by the length of the sample.

Stiffness is the force required for a specified bending. The opposite of stiffness is normally referred to as limpness. A higher stiffness could relate to a stronger board but this need not be always true as other parameters do come into play.

Rigidity is the resistance to force of bending.

25. Surface Bond

This property is related to printing on paper or other substrates. Herein properties associated with paper are discussed. The bond strength is the resistance for any attempt of fibre or coating separation from the paper surface. The separation of the plies in the board, however, is to be regarded separately. The fibres coming out is referred to as picking. The picking need not be due to poor surface but could also be due to weekness of coating, high tacky ink used, heavy print impressions etc. The conventional method used to assess this property is to dotermine the wax pick number although other tests are also added and invogue now.

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Unlike many physical properties, this property is directly related to performance and of utility. The test has assumed more significance with modernisation of printing processes and adoption of multicolour prints. Picking primarily will result in spot formation, marring and blurring of prints, picked materials mixing with ink leading to process problems etc. One of the means to overcome the situation is to use a low tack ink.

26. Tearing Strength

The tearing strength represents the force required to continue the tear along the preslit made in a given sample. This is known as the internal tear. The external tear however, is different and gives the total force required to commence and continue the tear.

Tear resistance is influenced by surface moisture film on fibres that resist peeling of fibres wherein shearing tear is being predominant. Tear resistance decreases irregularly with increasing calendering pressure. The decrease in tear property appears more pronounced in lighter substance papers than in heavier ones. Surface treatment and moisture content influence tear values, and tearing strength and inner paper structure are fairly related. The longer the fibre structure and bulkier the paper higher is the tearing strength.

This test is a long standing one and is used as a control factor at the mills. This also has significance at conversion plants like paper bags, pouches, wraps etc. There are specific end use applications where relatively low tear resistance materials are required. (Sugar pouches at break-fast table) and on the other side materials with high tear resistance.

27. Tensile strength

It is the force required to cause failure in a specimen and expressed in kg. for specified specimen width and length, the force applied being parallel to the plane of the specimen. Often alongwith the tensile force, the stretch of the sample is also measured and if graphically illustrated this would also help to study the tensile energy absorption pattern.

Tensile strength is one of the fundamental properties and could be measured in both the directions of paper, which in turn would help to identify anyabnormal anamolies. In mills it is used as a general control property. The quality of fibre, treatment and formation of sheet, as well as moisture content influence the tensile property. Increased moisture level(relative humidity) tend to reduce tensile strength. Tensile increases with increased loading rate, as well as increased beating.

Both when used in sheet form or web form the tensile property has an application value. In wrapping and bundling papers it depicts serviceability and durability and in continuous web feeding it gives resistance to break under tension. Some are applicable to other materials like gum tape, cords, threads, straps etc.

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ANNEXURE- XI

PACKAGING MACHINERY

GENERAL CLASSIFICATION
AND
CRITERIA FACTORS

(annexure xiv)

A-MAIN CLASSIFICATION:

1.	Filling machines :	Liquids Solids Semi solids
2.	Filling and closing machines :	Liquids Solids Semi solids
3.	Form, fill and seal machines :	Liquids Solids Semi solids Viscous liquids
4.	Cartoning machines	
5.	Shrink packaging machines	
6.	Cling wrapping machines	
7.	Over wrapping machines :	Product group Types of seals
8.	Shell and tray packaging machines	
9.	Vacuum packaging machines	
10.	Vacuum packaging and Gas flushing machines	
11.	Cleaning, washing, and drying and rinsing machines	
12.	Coding and marking machines and stencilling and stencil cutting machines	
13.	Labelling machines	
14.	Closing machines	
15.	Corking and plug(press-in plug) machines/wadding machines	
16.	Gluing and pressing machines	
17.	Stitching machines and stapling machines	
18.	Sealing machines(adhesive and thermal)	
19.	Seaming machines	
20.	Crating, decrating machines	
21.	Baling machines	
22.	Strapping machines	
23.	Palletising and depalletising machines	
24.	Sterilising machines	
25.	Typing machines	
26.	Testing machines including electronic and optical detecting machines.	
27.	Nailing machines	
28.	Case and Tray Handling machines.	

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B-POSSIBL. CRITERI. FOR SUB-C SSIFICATION

FILLING M.CHINE

a) Product group	: Liquids	:	Milk, ayron, beverages, beer, soft drinks.
	Solids	:	Granules, free flowing powder, fluffy powders, tablets, cakes.
	Semi-solids	:	Jams, jellies, ketchups.
	Viscous products	:	Syrups, honey, concentrates, oils.

b) Mechanism :
Gravity
Vacuum
Pressure,
Vacuum and pressure
Gas flushing
Pressure and gravity
Diaphram volumetric.

c) Mode :
Volumetric,
Gravimetric
Volumetric filling and gravimetric checking.

d) Operation :
Automatic(high speed and medium speed and low speed) high speed-400 per min.
Semi-automatic -(10-20 units/min.)
Batch -(upto 120 units/min.)

e) Speed :
Units/time unit
No. of filling heads
Container size.

f) Container type :
Glass
Plastics(wide and narrow mouth),
Cartons,
tubes,
Pouches,
Bags,
Gussetted bags,
Tin plate,
Aluminium cans.

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g) Measure type	:	Volumetric	: Cup Container Augur Cup and augur
	:	Weight	: Net Gross
	:	Number	
h) Feeder type	:	Gravity Vibratory Belt Augur Vacuum gravity Cone and finger	
i) Accessory attachments	:	Check weighing	
j) Material of construction of machine parts	:	Stainless steel Glass lined	

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FORM, FILL AND SEAL MACHINES:

Type	:	Horizontal Vertical
Product group	:	Liquids Solids
Seal type	:	Overlap vertical seal(centrel) Four side seal Gusset and four side seal Strip with central or fourside seal Peal seal Screw capper Plug placing and Screw capping.
Pack size (Volume)		
Material	:	Flexibles(paper, laminates,plastic films), Trays, Cartons, Bottles
Packaging type	:	Tubular, Flat, Gussetted, Trays, Tetrahedron, Bottles.

+ Criteria of filling machine on type of filling
feeder mechanism
speed etc.

+ Criteria for seal machine.

CARTONING MACHINES

Mode of operation	:	Automatic	
		Semi-automatic	
Type of loading	:	Horizontal	
		Vertical	
Type of motion	:	Continuous	
		Intermitant	
Carton type/design	:	Tuck end type	: reverse tuck
			straight tuck
		Glue end cartons:	Butt flaps
			Economy flaps
			Full flaps
		Tuck end & Glue end	
		Trays & sleeves	
		Shallow cartons	
Multipack cartoners	:	Type of cartons:	Trays
			Cartons
			Sleeves
			See thro' pks.
		Speed	: Range 20-30-40 mte.
Attachments - for	:	Leeflet feeding:	Sheet feeding
			Web feeding
		Folding & inserting	
		coding	
		Code verifier	
		Detectors(skip detectors) (for products)	
		Detectors(for missing cartons)	
		Overload senser	
Carton feed mechanism	:	Vacuum feed	
		Mechanical feed	

Loading system
- a) Horizontal machine
- b) Vertical machine

Closing system
- a) Horizontal machine Mechanical tuckers
- b) Vertical machine Flow tuckers

Gluing system	:	a)1.	Cold glue
		a)2.	Hot melt glue
		b)1.	Single gluing
		b)2.	Double gluing.

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SHRINK PACKAGING MACHINERY:

Seal type	:	Trim seal L-sealer(hand operated,automatic) Seal bar with magnetic clamps (direct wrap for product/with tray) Manual : 8-10 min. S.automatic : 15 min. Automatic : 30 min. (will vary)
Type of overwrap	:	Complete overwrap Sleeve wrap
Speed	:	pks/unit time
Size limit (Package size or tunnel size)		
Temperature range	:	Related to material film film gauge operation product
Type of conveyor	:	Belt Roller
Size of tunnel	:	For small pks. For pallets.

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OVER WRAPPING MACHINES:

Product group	:	Dairy products Candy and confectionary Crakers and cookies Tablets and cakes Cigaratte and other Regular sized carton pks. Irregular products(Bakery products)
Type of wrap	:	Direct wrap Twist wrap Die fold wrap Over wrap : regular shaped Irregular shaped Tight wrapping(wet wrapping) Multiple wraps(for gps) Bundling
Type of closure	:	Simple adhesive Heat seal
Type of overwrap material	:	Cellophane Plastics films laminates paper
Size	:	Min to max. range
speed	:	Min to max.range
Operation	:	Semi automatic Manual Automatic

(xxxxxxxxxxxxi)

CLOSING MACHINES

For screw caps and Ro PP/PP caps

Container	: Glass bottles) Plastics bottles) Aluminium bottles) Jars)	: Narrow mouth) Wide mouth)	: Type of threading
Mouth size	: Narrow (mm to mm) Wide (mm to mm)		
Chuck size	: ranges)	: Torque also for 1/2 threading	
Chuck pressure	: ranges)		
Speed	: No. pe. minute		
Operation	: S. Automatic) Automatic)	: Manual feeding of container automatic feeding of container, and caps.	
Wad used for caps	: Paper PVC Cork.		

ADHESIVE SEALING MACHINE(for closures and diaphrams)

Containers	: Glass Plastic Metal Carton/bags/pouches
Types of adhesive	: Casein Synthetic Hot melt
Mode of application	: Spot Complete
Pressure	:
Speed	:
Feeding type of closure/diaphram	:

BAG STITCHING MACHINE

Type of bag	:	Jute
		Jute laminate
		Plastics : PE, PVC, PP
		Woven plastic
		Paper sacks.
		Textile
Type of stitching	:	Chain
		Direct
		Overlap
Thread material	:	Textile
		Nylon
		PE
		Jute
Type of machine	:	Over heed
		Hand stitching
		Stationery machine
Type of feeding	:	Manual
		automatic
Speed	:	No. per minute.

SEALING MACHINE (Thermal)

Type of material	:	Plastics
		Plastic laminates
Form of pkg.	:	Bags, pouches, Gussetted bags, containers, sacks.
Type of seal	:	Band
		Wire
		Weld
		Bar
		Impulse heat seal
		Electronic seal
Operation	:	Mode : automatic/SA in feeding type
		System : Hand operated, foot operated, moving band(rotary)
		Control : Time(dwell time), Temperature, pressure
		Speed(output)

(xxxxxxxxxiii)

SEAMING MACHINE:

Type of seam	:	Single seam Double seam
Can size	:	diameter(mm)
Chuck size	:	
Chuck pressure	:	
Speed	:	
Operation	:	Manual feed automatic feeding.

STRAPPING MACHINES (for shipping containers)

Material	:	Steel strap Steel wire Al. wire Plastic strap Rayon strap.
Mode	:	Hand operated Semi automatic Automatic : Single direction both direction
Width range (strap)	:	10mm 15mm 20mm and strap gauge -Min.mm 25mm (Thickness) Max.mm
Type of seal	:	Closed seal Open seal Or heat seal for plastic strap
Dimensional limitation	:	Refers to box dimensions (Min. and Max. size)
Speed	:	No. of units/min.
No. of straps that could be put simultaneously	:	

(xxxxxxxxxiv)

CASE AND TRAY HANDLING MACHINE:

(Case packing machines).

Type of machine	:	Horizontal packing -25-30 cases/mte. Vertical packing -40 cases/mte. Continuous motion (for high speed) 100 tray/mte 40 cases/mte.
Sequence of operation: (Related to Semi-automatic or automatic)		Case/Tray erection Case/Tray opening Packing Sealing(flap closing) Dispensing.
Type of product to be handed	:	
Type of cbntainer	:	Bottles, cartons, tins.
Flow of product/ Container	:	From In-line Batch feeding
Product/container nature-for casing	:	Shape weight Size Stability Sturdiness Compressibility Fragility
Production range & Charge over needs	:	
Production speed (refers to inflow of containers)	:	
Speed range	:	
Size range	:	
Automatic		
Semi-automatic	:	(10-12 cases/mte).
Intermediate speed	:	(15-18 cases/mte).
Closure mechanism	:	Glue Stapling Hot melt Wrap around.

PACKAGING MACHINE SUPPLIERS
LIST OF ADDRESSES

MACHINERY TYPE	ADDRESS OF MACHINE MANUFACTURERS/ SUPPLIERS
1.a)Form,fill & Seal pouch machines b)Roto-wrap machine c)Strip packing machine	Prath manufacturing corporation, 3097, W.Mill Road, Milwaukee, WI 53209.
2.a)Vacuum and Gas packaging machinery	Standard Packaging Corporation, Clifton, N.J., U.S.A.
3.a)Thermoplastics - Vacuum & Pressure forming	A.A.A. Plastic equipment,Inc., 2617N, Ayers, Fortworth, Texas-76103 U.S.A.
4.a)Wrapping and Bundling Equipment	Scandia Packaging Machinery Co., Clifton, N.J., U.S.A.
5.a)Cartoning Equipment	Redington incorporated, Belwood II, U.S.A.
6.a)Code marking and imprinting	Adolph Gottscho, Inc., Union, N.J., U.S.A.
7.a)Filling Machines -Liquids and semi-liquids	Horix Manufacturing Co., Pittsburgh, Pa., U.S.A.
8.a)Pouch, Carton and container filling	Packs and process Inc. 1400 - B Street, Wilmington, DEL - 19801.
9.a)Automatic capping equipment	Consolidated packaging Machinery Co.,Buffalo, N.York, U.S.A.
10.a)Decapper/capping Machine	Product Diversification Inc., 10832, Chandler Boulevard, North Hollywood, CA 91601.
11.a)Bottling line units b)Dry products filling machines	Pnematic scale corporation, Quincy, Mass, U.S.A.
12.a)Tablet filling, counting machine	Fairchilds Inc, 7314, Laurel canyon Blvd, North Hollywood,Ca 91605.
13.a)Filling machines(for free flowing, non-carbonated liquids, semi-solids,line and rotary filling) b)Labelling machines c)Filling & labelling (automatic) machines	Biner-Ellison Manufacturing Co., 1101 N, Main street, Los Angeles, Calif, 90012.

(xxxxxxxxxvi)

14.a) Flexible pouch packing machines - powders, granules & liquids b) Printers c) Photo Eye detectors	Pack Rapid Inc., 10th Ave & Colwell Lane, Conshohocken, Pa 19428.
15.a) Hot melt hand gun closures for cartons and boxes	Nordson Corporation, Amherst, Ohio.
16.a) Hot melt case sealer	Wilkins Engineering Inc., 912/986 -6491, Box 815, Gray, Georgia 31032.
17.a) Case & Tray handling Equipment	Standard - knapp Div., Emhart Corporation, Portland, Conn.
18.a) Case erector/bottom Sealer, b) Case packer c) Case sealer d) Unloader e) Treyformer (Semi automatic, automatic)	A.B.C. Packaging Machine Corporation, 811 Liveoak street, Tarponsprings, Florida-33589.
19 a) Coding & Labelling Machine	Marsh Stencil Machine Co., Dept.58E, Belliville, 111,62222.
20.a) Carton closing	Power line sales Inc., 10180, Valley Blvd, El Mon te, Ca 91734.
21.a) Shrink packaging b) Stretch packaging	i) Weldotron Corporation, Piscataway, N.J. ii) Doboy packaging Machinery, Domain Industries Inc., New Richmond, Wisc.54017. iii) Packart (iv) Perks engineering, Kondivita Industrial Estate, Kondivita, Andheri(East), Bombay, India.
22.a) Labelling Machines (Glue & thermosetting)	New Jersey Machinery Inc., Hoboken, N.J.
23.a) Bagging & Sealing Machines (Food, bakery products)	Packaging Machinery Div., Errich International Corporation, New York, N.Y.
24.a) Form, Fill & Seal Machines	i) Packaging Machinery Co., East Longmeadow, Ma. ii) Pulsamatic, Triangle Machine Co., iii) Wright machinery Co.

25.a)Thermoforming machines and packers.	i) American Packaging Corporation ii) U.S.Packaging Corporation. iii) Lakso Co. iv) Zed Industries. v) The Port land Co.
26.a)Stapling machines b)Stitching machines c)Nailing machines(Staple)	i) Container Stapling Corporation, 27th street & I.C.C.R.Herrin, Illinois -62948. ii) Midstates steel & Wire packaging systems 310, S.Oak st., Crawfordville, Ind. 47933. iii) Padlock Machinery Div., Loveshaw corporation, 61-E, Industry ct.Deer park, N.Y.11729. iv)Spot nails Inc., 1100 Hicks Rd., Rolling Meadows, Illinois 60008. v)V & D Associates, A-15, West End Colony, New Delhi -21, India.
27.a)Heat Sealing Machines	i) D.R.Lenk GmbH,CH-8274, Tager wilen,Oberdorfstr-15, Switzerland. ii) Doboy Packaging Machinery, Domain Industries Inc., New Richmond, WISC 54017.
28.a)Vacuum Packaging machines	i) Multivac Export A.G., Baaresstrasse 112, CH 6300 Zug, Switzerland. ii) Komet Maschinen Fabrik, Ernst Diemold,7000 Stuttgart, Kornbergstr 27-29, F.R.G.
29.a)Strapping Machinew/ devices - metal wire, strap, plastic strap & plastic strap heat seal	i) Showa Bolki Co. Ltd., No.46, 2-Chome, Edobori kamidori, Nishi-ku, Osaka, Japan. ii) Gerrard Industries Ltd., 96-104, Birmghthigh Street, London, SE-1, U.K. iii) Brained Strapping Div., Sharon Steel Corporation, P.O.Box 591,Warren, Ohio 44482, U.S.A. iv) Signode Corporation Deptt., 446, PMC,2600N, Western Ave, Chicago, Illinois,60647. v) Stanley Strapping Systems, Div. of Standley Works, 1300,Corbin Ave, New Britain,CONN,06050.

(xxxxxxxxxviii)

ANNEXURE-XII

TURK STANDARDLARI ENSTITUSU

INSTITUT TURC DE NORMALISATION(TSE) TURKISH STANDARDS INSTITUTION

PACKAGING LABORATORY

TEST REPORT

1. NAME & ADDRESS OF COMPANY :
2. LETTER REFERENCE :
3. SAMPLE DETAILS :
4. TESTS REQUIRED :
5. STANDARD REFERENCE :
6. TEST CONDITIONS :

SL.NO.	SAMPLE	TESTS	STD VALUES	TEST VALUES	REMARKS

TESTED BY CHECKED BY DIRECTOR PACKAGING LABORATORY SECRETARY GENERAL,TSE

P.S. This is only a technical report and should not be used for commercial or litigation purpose.

NOTE.

Telgraf adresi:STANDARD-ANKARA;Posta adresi:NECATIBEY CADDESI,112, BAKANLIKLAR;
TEL: 187240(10HAT)

ANNEXURE - XIII

TIME-COST SHEET FOR ESTIMATION OF TEST CHARGES

Factors involved

A. Personnel time : Directorate
Director
Head of deptt.
Mechanic
Support staff.

B. Equipment : Type of equipment - Manual, electrical, pneumatic or hydraulic.
Cost of equipment
Utility ratio
Time factor per test
Use of chemicals, gadgets, ancillaries etc., & their cost.

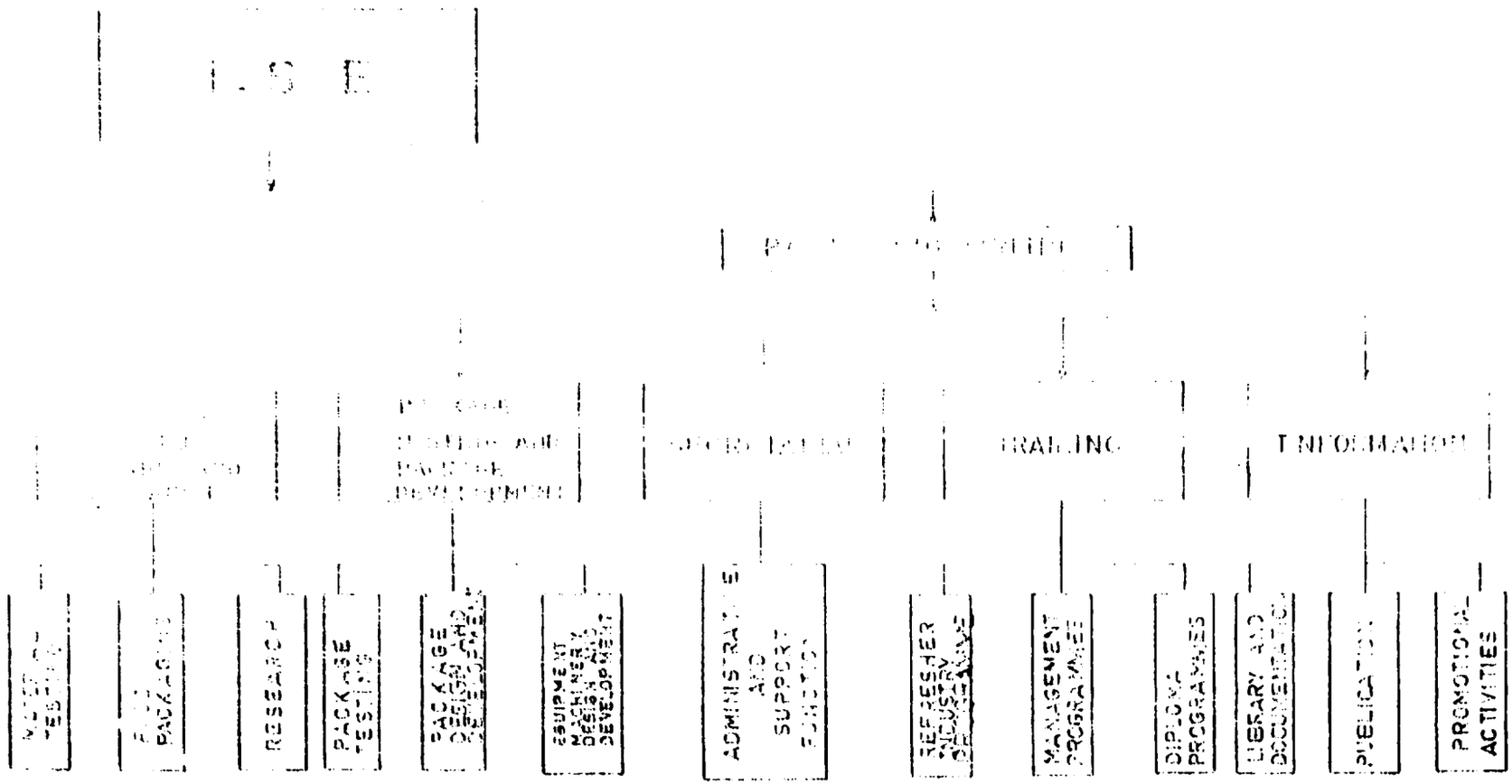
C. Others : Stationery
Postage

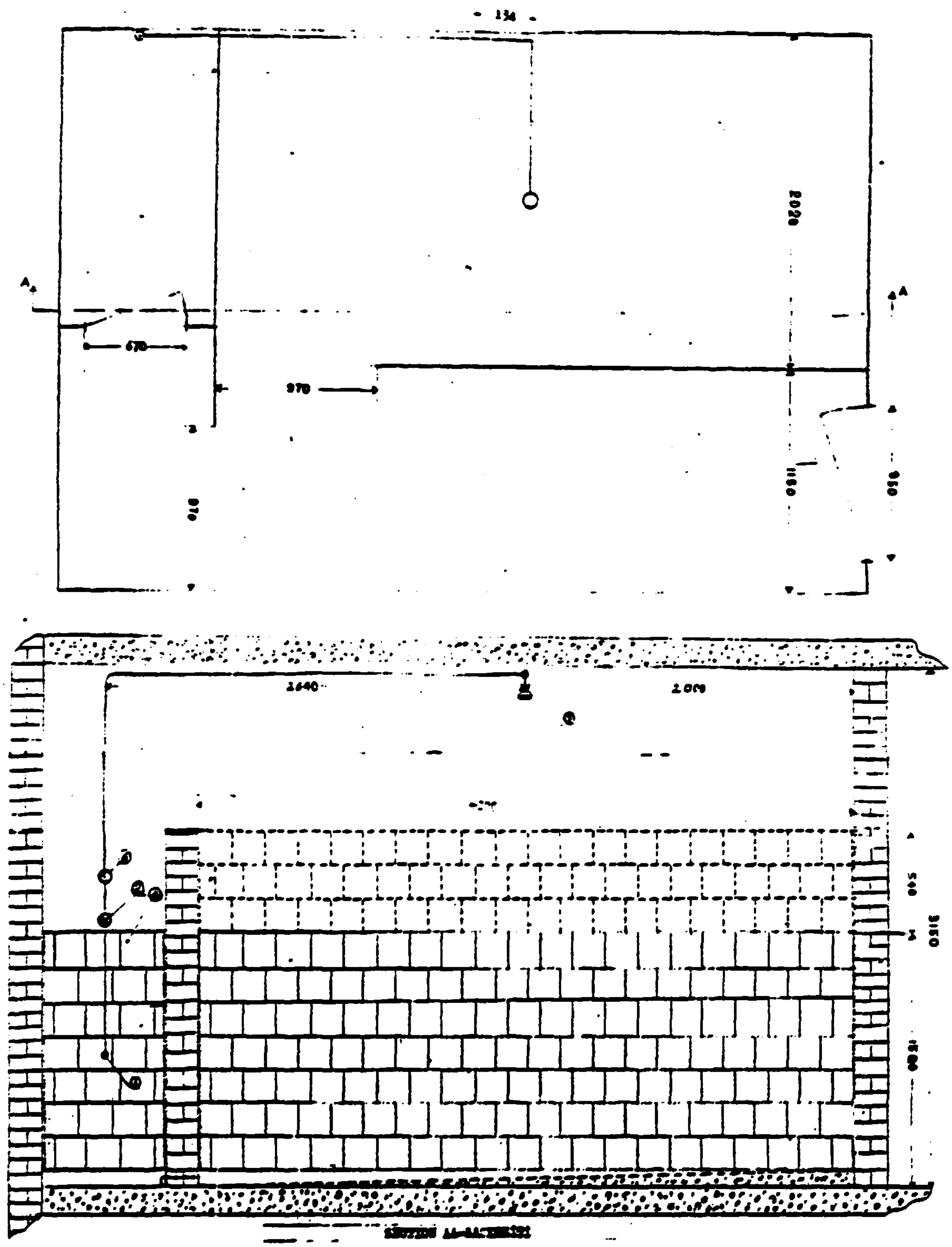
D. Overheads :

Status	Personal Time	Rate	Fee TL.	Equipment Time-cost	Rate	Fee TL.	Others %	TL.	Overheads % of a+b+c	TL.	Mark-up %	TL.	Total (a+b+c+d+e) TL.
	a.			b.			c.		d.		e.		f.

ANNEXURE - XIV

PROPOSED ORGANISATIONAL CHART





1 [illegible]
Su Tesisatı

2 Valve
Vana

3 Adjustable Spray Nozzle
Ayarlanabilir süzgeç

4 Ceramic
Fayans

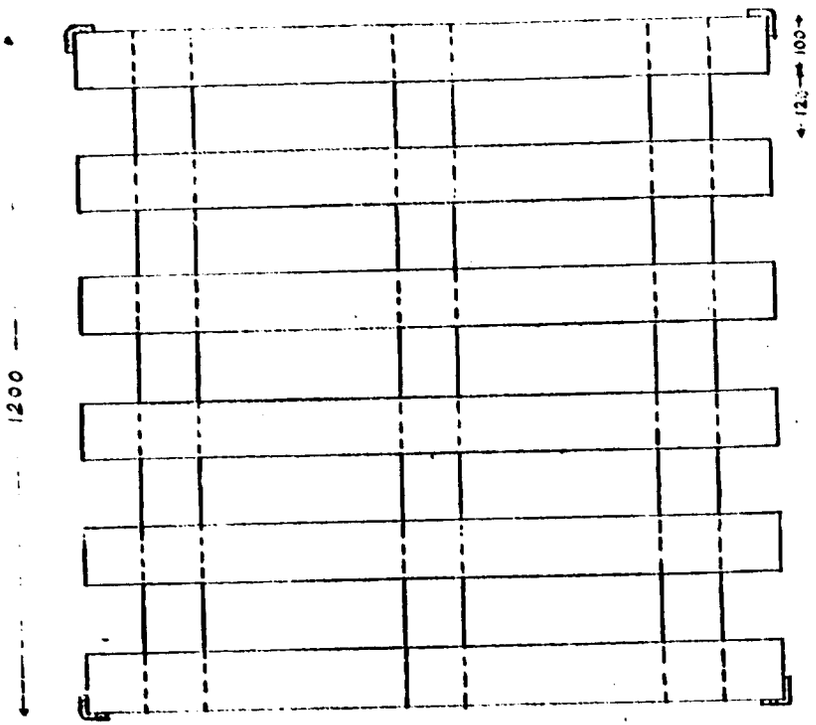
- - - - Additional Parts
Ek Kısımlar

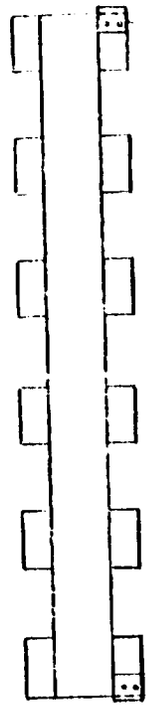
5 Slope
Eğim

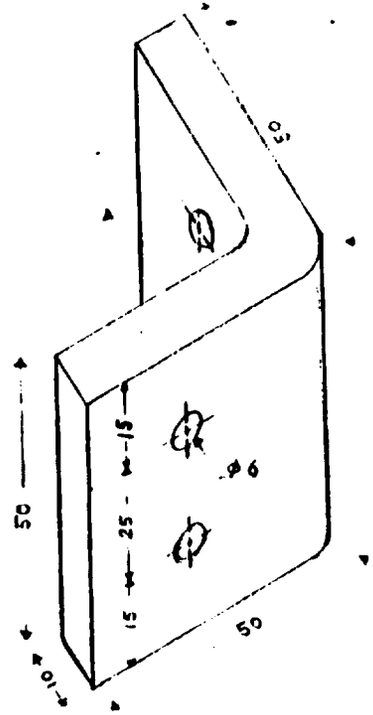
6 Pressure Gage
Manometre

(Dimensions are in mm. - Uzunluklar mm olarak verilmiştir.)

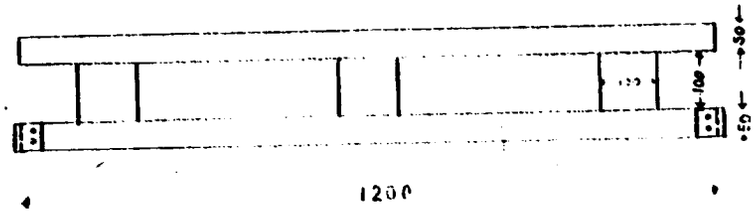
	Date-Tarih	Name - Sign / İsim - İmza	INSTITUTE OF TURKISH STANDARDS Packaging Laboratory TÜRK STANDARDLARI ENSTITÜSÜ Ambalaj Laboratuvarı
Drawn by Çizen	27.2.1980	AKİF SAKLICA	
Controlled by Kontrol			
Std.Dpt. / Std.Dept.			
SCALE ÖLÇEK 1/20	RAIN CHAMBER UNIT YAĞMURLAMA BİRİMİ		PLATE I







STEEL EQUAL ANGLE
ÇELİK KÖŞEBENT



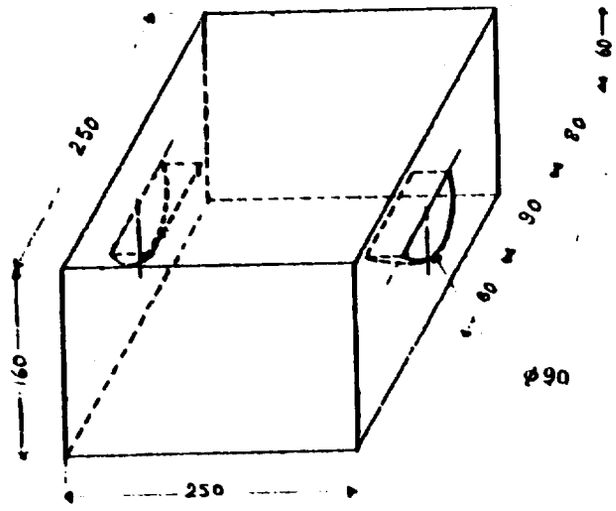
(Dimensions are in mm – Uzunluklar mm olarak verilmiştir)

	Date-Tarih	Name – Sign İsim – İmza	INSTITUTE OF TURKISH STANDARDS Packaging Laboratory TÜRK STANDARDLARI ENSTİTÜSÜ Ambalaj Laboratuvarı
Drawn by Çizen	27.2.1980	AKİF SAKLICA	
Controlled by Kontrol			
Stand.Cont. Stand.Kont.			
SCALE ÖLÇEK 1/10	DETAILS OF PALLET FOR RAIN CHAMBER YAĞMURLAMA DİNİNİN PALET DETAYI		PLATE II

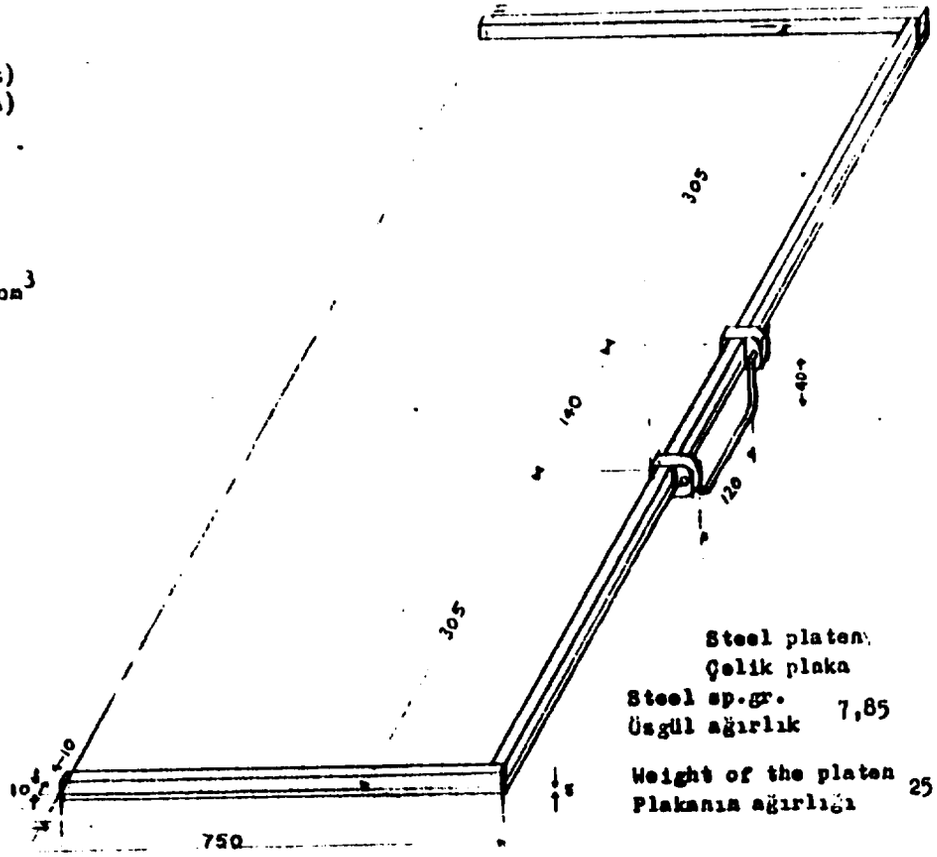
Suggested Mixture for Concrete Brick (by weight)
Beton Blok İçin Kullanılacak Karışım (ağırlıkça)

Cement - Çimento	12,5 %
Sand - Kum	32,0 %
Coarse aggregate - Çakıl	47,5 %
Water - Su	8,0 %

Specific gravity ..... 2,5 gm/cm^3
Özgül ağırlık
Weight of the Brick ..... 25 kg
Bloğun ağırlığı



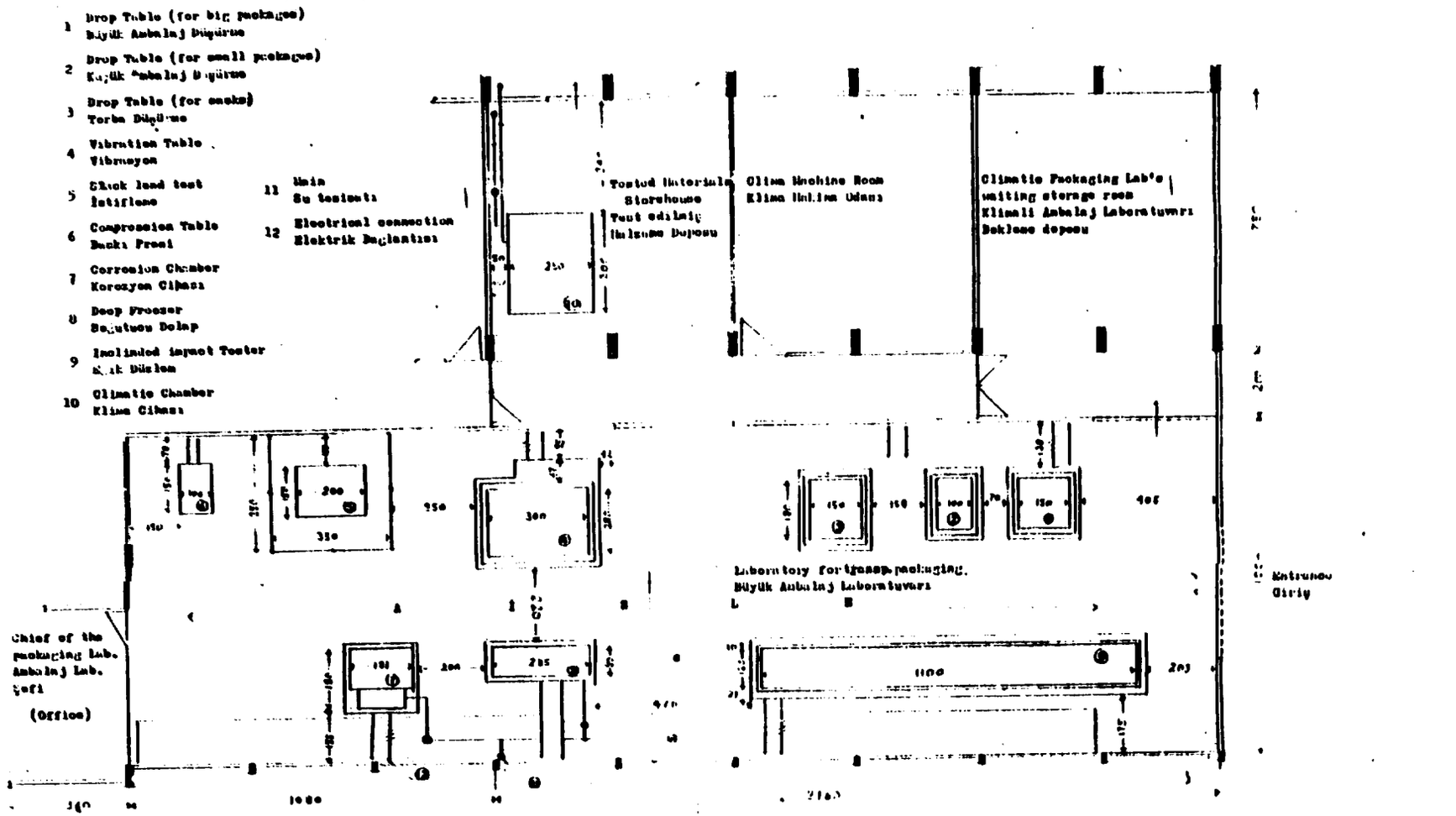
Concrete brick - beton blok



Steel platen
Çelik plaka
Steel sp.gr. 7,85
Özgül ağırlık
Weight of the platen 25 kg
Plakanın ağırlığı

	Date-Tarih	Name - Sign İsim - İmza	INSTITUTE OF TURKISH STANDARDS
Drawn by Çizen	27.2.1980	AKİF SAKLICA	Packaging Laboratory
Controlled by Kontrol			TÜRK STANDARDLARI ENSTİTÜSÜ
Stand.Cont. Stand.Kont.			Ambalaj Laboratuvarı
SCALE ÖLÇEK 1/5	DETAILS OF UNITS FOR STACK LOAD TEST İSTİFLEME BİRİMİ İÇİN ŞEKİLLİ MALZEME DETAYI		PLATE III

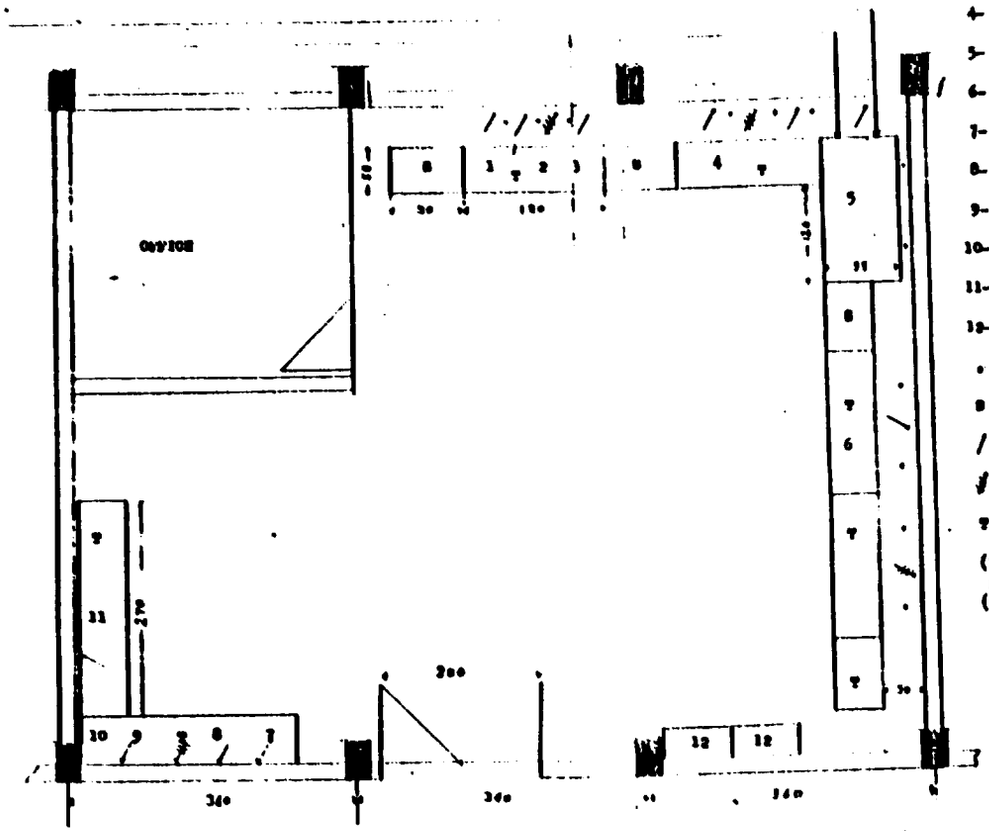
(Dimensions are in mm - Ölçüler mm olarak verilmiştir)



- The aisle space will be used for rolling test also.
- Brick loads designed for stack load test can be used. for vibration test also. (Vibration under load condition)
- Provision for an Universal Compression Tester is provided as the presently available H/C at TSE has limitations.
- A corden for stack bad area is indicated from safety point of view.
- Space for a climatic chamber (10) is provided for package exposure studies.

(Dimensions are in cm-Ölçüler cm. olarak verilmiştir.)

	Date-Tarih	Name-Sign İsim-İmza	TURKISH STANDARDS INSTITUTION
Drawn by Çizen	4.3.1980	AKİF BAKLICA	Packaging Laboratory TÜRK STANDARDLARI ENSTİTÜSÜ Ambalaj Laboratuvarı
Contr. by Kontrol			
Stand.Cont. Stand.Kont.			
SCALE ÖLÇEK 1/100	LAYOUT OF TRANSPORT PACKAGING LABORATORY BÜYÜK AMBALAJ LABORATUVARI YERLEŞİMİ		PLATE IV

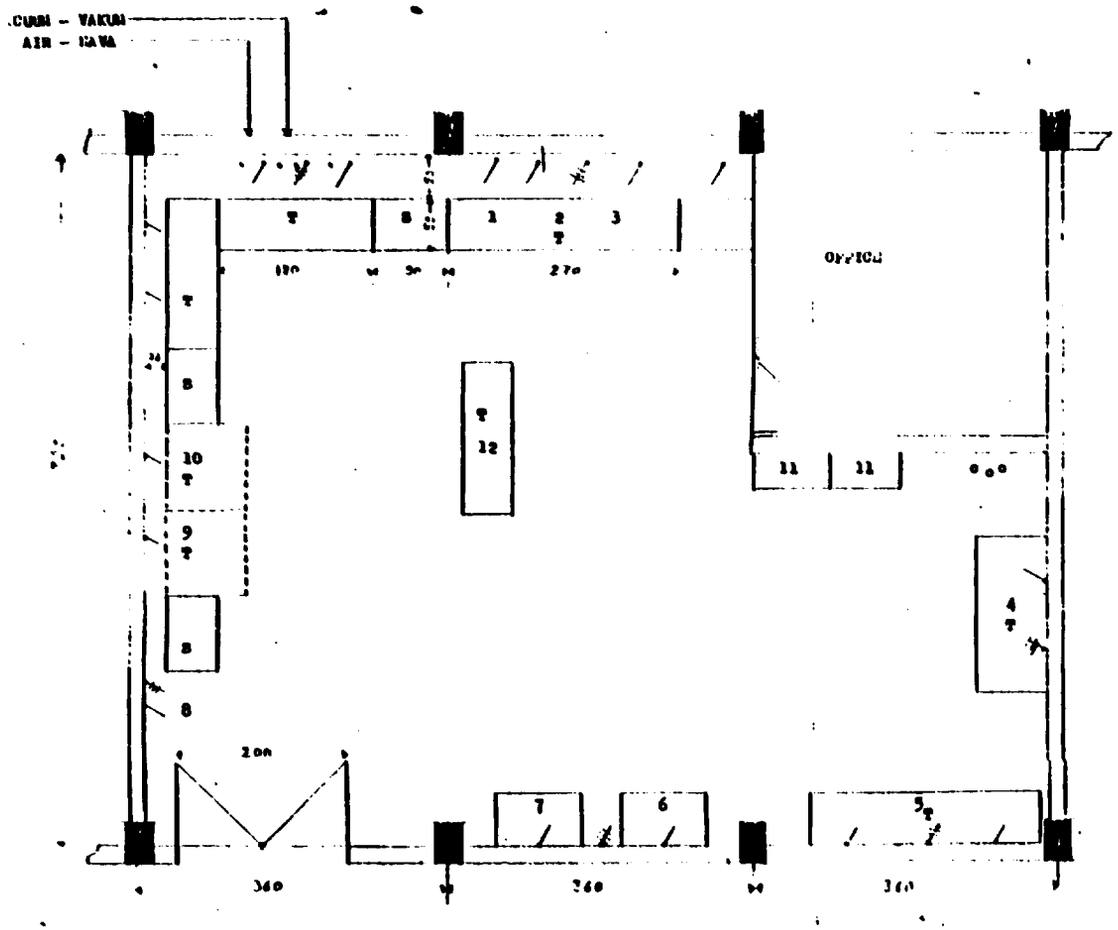


1- WTR disk method set-up
Su buharı geçirgenliği deney düzeni
2- Oven
Etüv
3- Heating mantles
Isıtıcılar
4- Waterbaths with thermostat
Termostatlı su banyosu
5- Hood with water, gas, air and vacuum connections and exhaust
Su, havagazı, hava vakum bağlantıları ile gazlar emi
6- Cobb test set-up
Cobb test düzeni
7- Viscometer
Viskosimetre
8- pH meter
pH metre
9- Centrifuge
Santrifüj
10- Balance
Terazi
11- Densimeters
Densimetre
12- Cup boards
Dolap
Gaslı dolap
Gas line connection
Havagazı bağlantısı
Sink with water connection
Lavabo
Electric connection with single phase, 220 V
Monofaze elektrik bağlantısı
Electric connection with three phase, 380 V
Trifaze elektrik bağlantısı
2 tables (270 cm - 1),- 270 cm uzunluğunda 2 adet tezgah
5 tables (180 cm, one with sink) - 180 cm uzunluğunda beş adet

(These also will be working tables and also for burette, pipette, test tube stands, etc.)
(Aynı zamanda büyüsel analizler masaların üzerinde yapılacak ve gerekli cam malzeme yerleştirilecektir.)

	Date-Tarih	Name - Sign İsim - İmza	TURKISH STANDARDS INSTITUTION Packaging Laboratory TÜRK STANDARDLARI ENSTİTÜSÜ Ambalaj Laboratuvarı
Drawn by Çizen	13.3.1980	Akif Baklacı	
Contr. by Kontrol Stand.Cont. Stand.Kont.			
SCALE ÖLÇEK 1/50	LAY OUT CHEMICAL LABORATORY KİMYA LABORATUVARININ YERLEŞİMİ		PLATE V

Some are in cm - Ölçüler cm olarak verilmiştir)



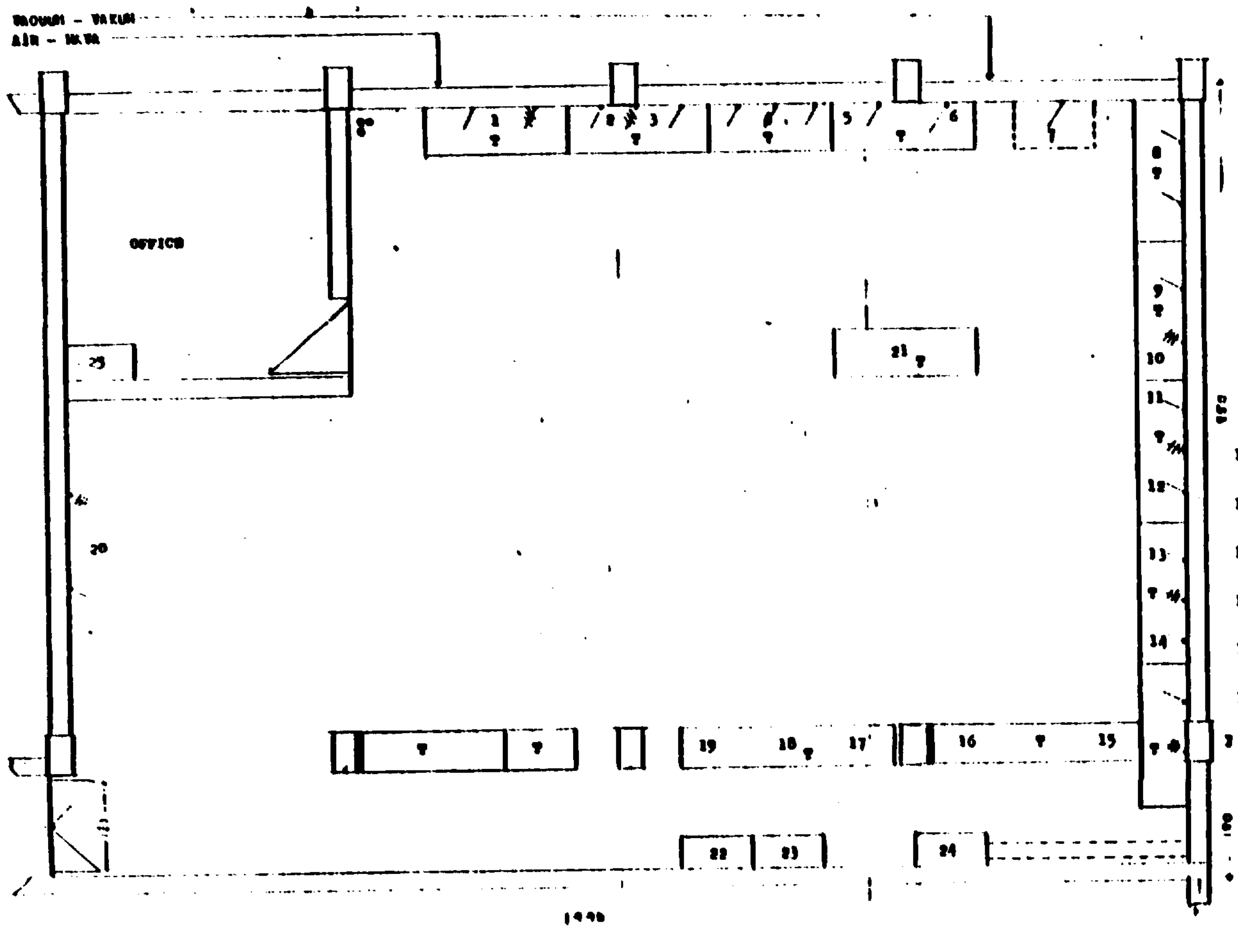
T 3 tables (270 cm-l), one with attached sink - 2,70 cm. uzunluğunda birisi lavabolu tezgah (3 adet)
1 table (180 cm-l), - 180 cm. uzunluğunda bir adet tezgah
2 Lower height tables for humidity cabinets (to be made later) - Nem sağlayan kabinler için iki adet alçak masa (Daha sonra yapılmak üzere)
1 Table with gas chromatograph as readily available - Gaz kromatografi cihazı için laboratuvarda bulunan bir adet masa

(Dimensions are in cm - Ölçüler cm olarak verilmiştir.)

1. Impact tester for glass bottles.
Cam şişeler için çarpma dayanımı tayin deney düzeni
2. Glass verticality tester
Cam malzemede ekzen kaçıklığı tayin cihazı
3. Polariscope
Polariskop
4. Gas chromatograph
Gaz kromatografi
5. Balance
Terazi
6. Vacuum Packaging apparatus
Vakumlu ambalaj cihazı
7. Deep drawing apparatus
Derin çekme cihazı
8. Hydraulic pressure Tester
Hidrolik basınç dayanımı tayin cihazı
9. Humidity cabinet
Nem sağlayan kabin
10. Humidity cabinet
Nem sağlayan kabin
11. Cup boards
Cam dolap
12. Central working table with glass top for sample cutting and preparation
Üzeri camlı çalışma masası
Gas cylinders
Gaz tüpleri
Gas line connection
Havagazı bağlantısı
Sink with water connection
Lavabo
Electric connection with single phase, 220 V
Monofaze elektrik bağlantısı
Electric connection with three phase, 300 V
Trifaze elektrik bağlantısı

	Date-Tarih	Name - Sign İsim - İmza	TURKISH STANDARDS INSTITUTION Packaging Laboratory TÜRK STANDARDLARI ENSTİTÜSÜ Ambalaj Laboratuvarı
Drawn by Çizen	13.3.1980	Akif Saklica	
Contr. by. Kontrol			
Stand.Cont. Stand.Kont.			

SCALE ÖLÇEK 1/50	LAY OUT OF PHYSICO-CHEMICAL LABORATORY FİZİKO-KİMYA LABORATUVARININ YERLEŞİMİ	PLATE VI



1. Gas Transmission rate - equipment
Gas geçirgenliği cihazı

2. Thermohygrograph
Termohigrograf

3. WVTR equipment
Su buharı geçirgenliği test cihazı

4. Hot sealer
Rezistanslı torba kapatma cihazı

5. Refractometer
Refraktometre

6. Balance
Terazi

7. Tensile Tester
Çekme Deneyi Cihazı

8. Stiffness Tester
Düzgünlük Tayin Cihazı

9. Dynamic Friction Tester
Dinamik sürtünme test cihazı

10. Static friction Tester
Statik sürtünme test cihazı

11. Continuous thickness gauge
Kalınlık ölçme cihazı

12. Corrugated medium fluter
Oluk yapma makinesi

13. Flat crush tester
Kartonda ezilme dayanımı [illegible]

14. Bursting strength tester
Karton patlatma cihazı

15. Impact pendulum
Çarpma sarkacı

16. Puncture Tester
Yırtılma dayanımı test cihazı

17. Tear tester
Yırtılma test cihazı

18. Dial gauge
Kalınlık tayin cihazı

19. Quadrant scale
Kağıt terazisi

20. Electromagnetic drop table
Elektromanyetik düşürme deney cihazı

21. Central Table with glass top for sample preparation
Numune hazırlamak için üzeri camlı masa

22., 23. Racks for material storage
Raflar

24. Conditioning shelf / area
Kondisyonlama düzeni

25. Cup board
Camlı dolap

°,° Gas tubes
Gaz türleri

T 2 tables (270 cm-1) - 270 cm. uzunluğunda 2 tezgah
10 tables (100cm -1) - 100 cm. uzunluğunda 10 tezgah
1 tables (90 cm-1) - 90 cm. uzunluğunda 1 tezgah

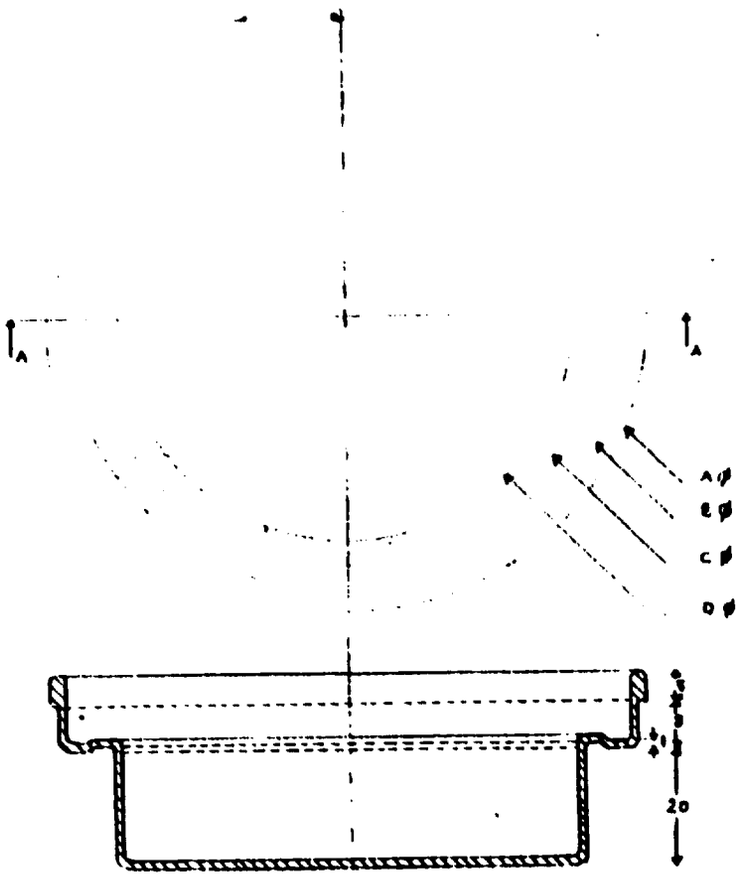
(Dimensions are in cm - Ölçüler cm olarak verilmiştir.)

/ Electric connection with single phase, 220 V
Monofaze elektrik bağlantısı

Electric connection with three phase, 380 V
Trifaze elektrik bağlantısı

(Templates, auxiliary units and others to be placed in drawers.)
(Numune kesici ve yardımcı parçalar çekmeceye konulacaktır.)

	Date-Tarih	Name - Signature İsim - İmza	TURKISH STANDARDS INSTITUTION Packaging Laboratory TÜRK STANDARDLARI ENSTİTÜSÜ Ambalaj Laboratuvarı
Drawn by Çizen	17.3.1980	Akif Şeklisen	
Contr. by Kontrol			
Stand. Cont. Stand. Kont.			
SCALE ÖLÇEK 1/50	LAY OUT OF PHYSICAL LABORATORY FİZİK LABORATUVARININ YERLEŞİMİ		PLATE: VII

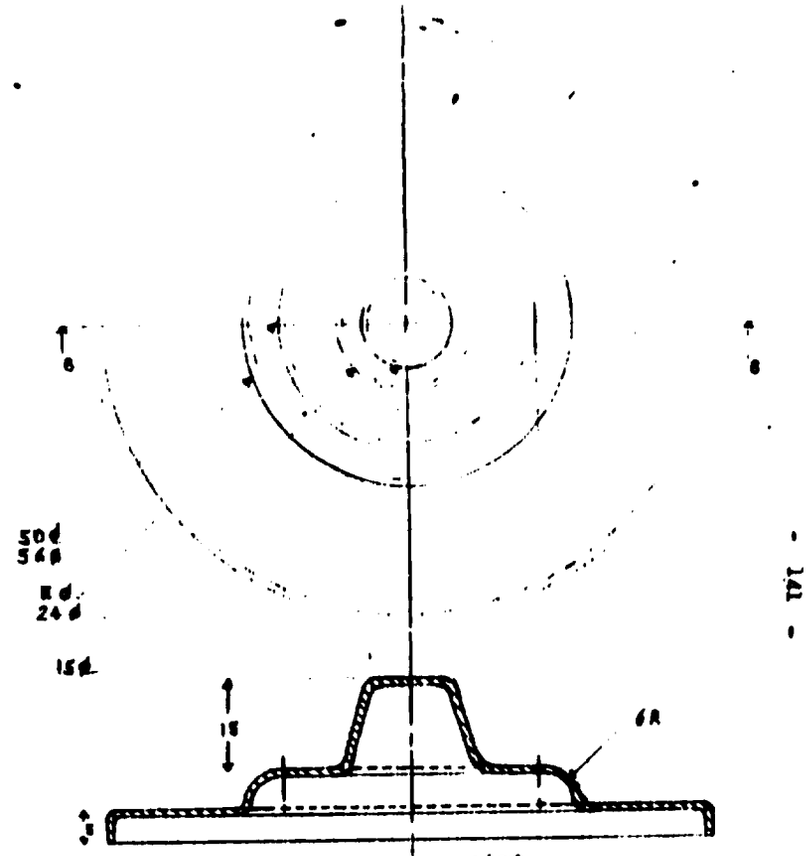


SECTION AA – AA KESİTİ
COVER – KAP

Alternative Dimensions – Alternatif Ölçüler

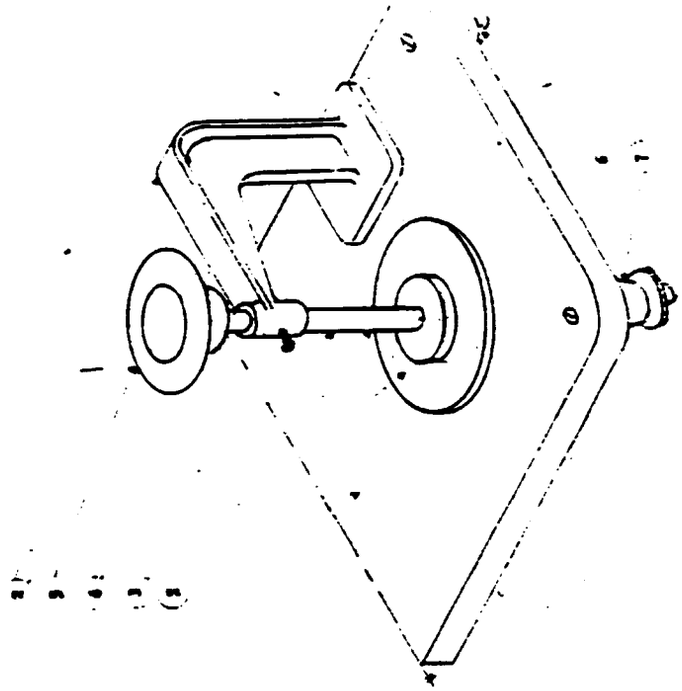
A	102	137
B	98	133
C	86	121
D	78	113
E	106	141
Bottom Surface Area Taban Yüzey Alanı	48 cm^2	100 cm^2
Thickness of the Al Alüminyumun Kalınlığı	1 mm	1 mm

(Dimensions are in mm–Ölçüler mm.olarak verilmiştir.)



SECTION BB – BB KESİTİ
LID – KAPAK

	Date–Tarih	Name – Sign İsim – İmza	TURKISH STANDARDS INSTITUTION Packaging Laboratory TÜRK STANDARDLARI ENSTİTÜSÜ Ambalaj Laboratuvarı
Drawn by Çizen	4.3.1980	AKİF SAKLICA	
Contr. by Kontrol			
Stand. Cont. Stand. Kont.			
SCALE ÖLÇEK 1/1	WATER VAPOR PERMEABILITY TEST DISH SU BUHARI GEÇİRGENLİĞİ TEST KABI		PLATE VIII



ASSEMBLY DRAWING OF MAP OF APPLICATION SET - UP

DESSIN D'ENSEMBLE DU DISPOSITIF D'APPLICATION DE LA CARTE

	Date-Tarih	Name - Sign Isim - Imza
Drawn by Dessin Desin. by Kontrol Pl.ed.Gest. Standkont.	12.3.1980	AKIF BARLAS

TURKISH STANDARDS INSTITUTION
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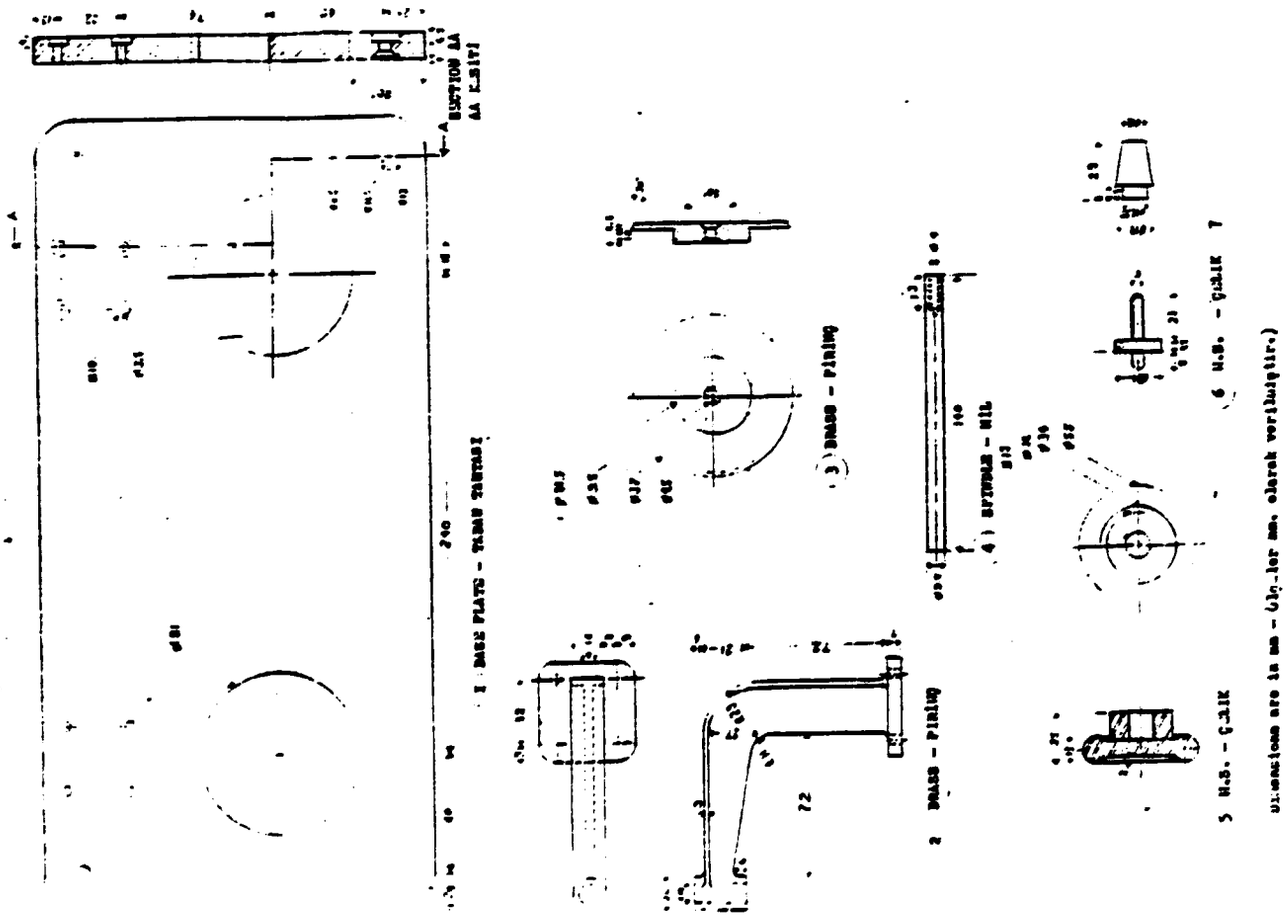
Ambalaj Laboratuvarı

DETAILS AND ASSEMBLY OF WAX APPLICATION
DETAILS ET ASSEMBLAGE DU DISPOSITIF D'APPLICATION DE LA CIRE

SCALE
ÜLÇEK
1/2

PLATE
PLANCHE



1 BASE PLATE - TABLE TABANI

SECTION AA
AA KESİTİ

2 BRASS - PIRINÇ

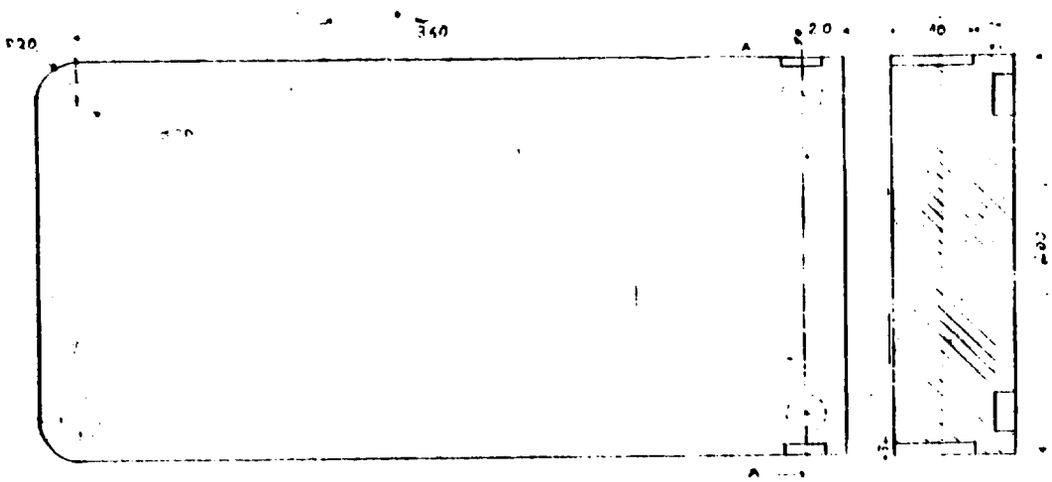
3 BRASS - PIRINÇ

4) BRASS - PIRINÇ

5 N.B. - ÇELİK

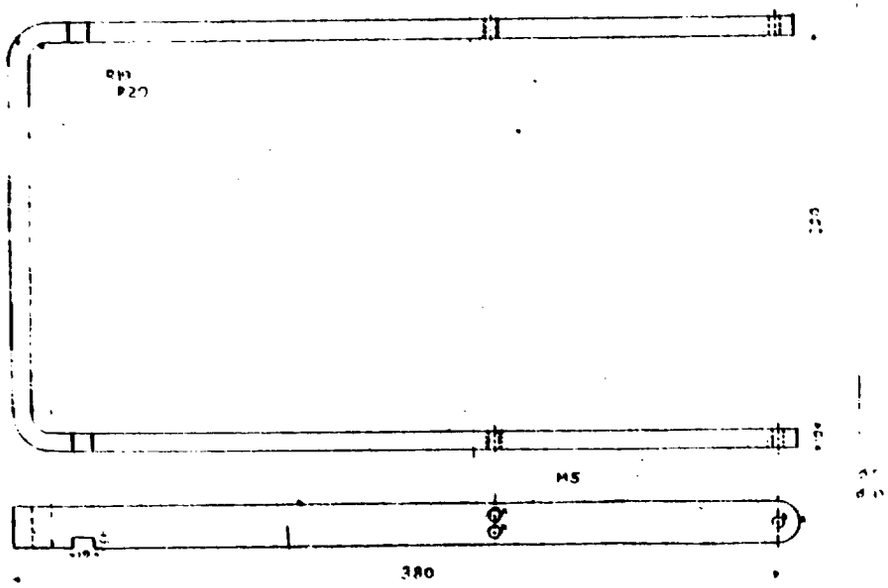
6 N.B. - ÇELİK 7

Dimensions are in mm - Ölçüler mm. olarak verilmiştir.

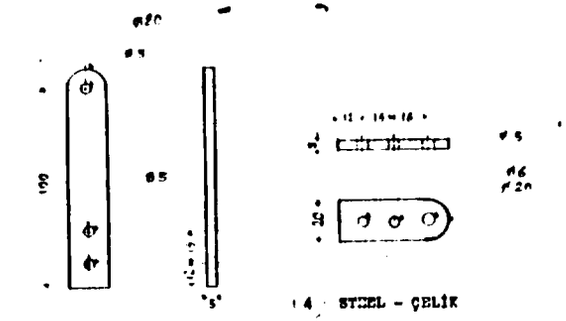


1) WOODEN BASE PLATE - TABAN TAHTASI

SECTION A-A
A-A KESİTİ

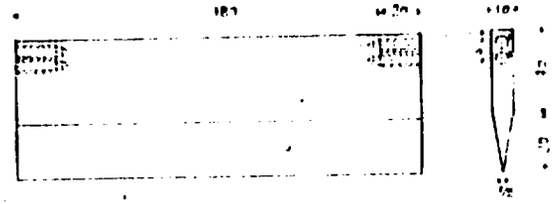


2) STEEL ARM - ÇELİK KOL

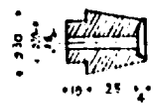


3) STEEL - ÇELİK

4) STEEL - ÇELİK

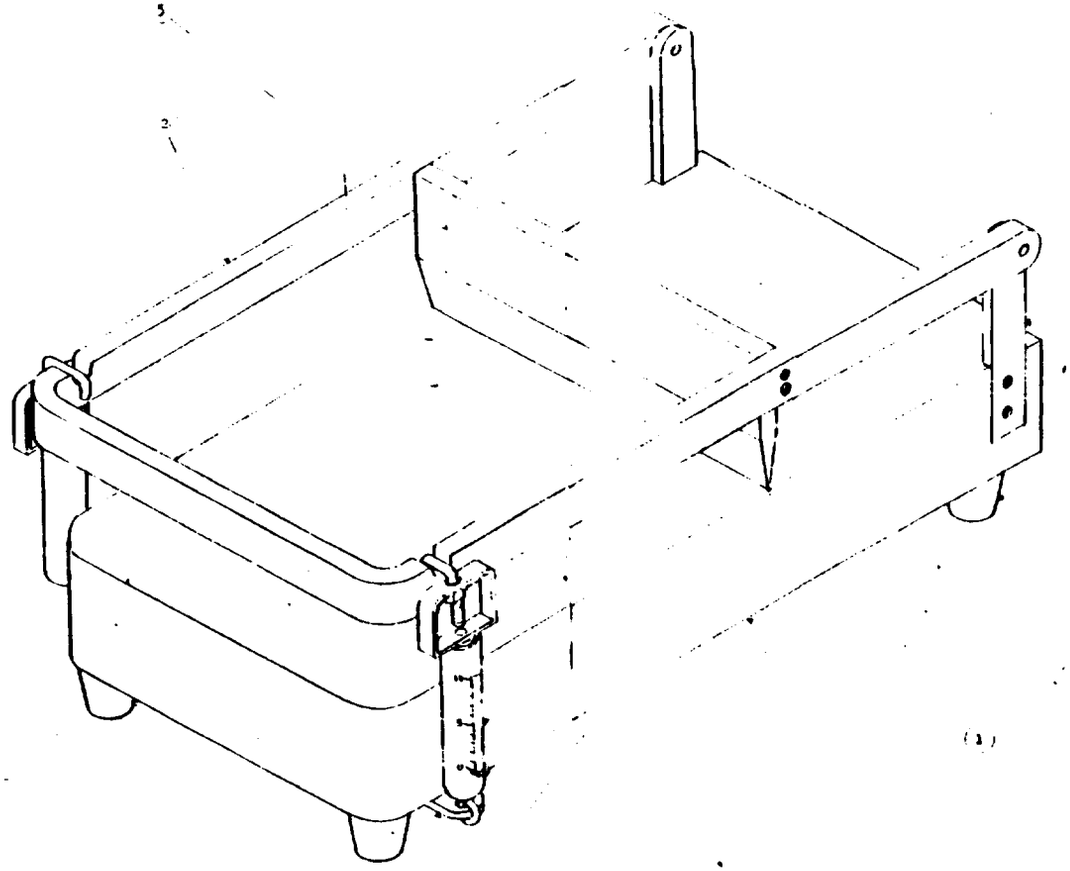


5) STEEL BLADE - ÇELİK BIÇAK



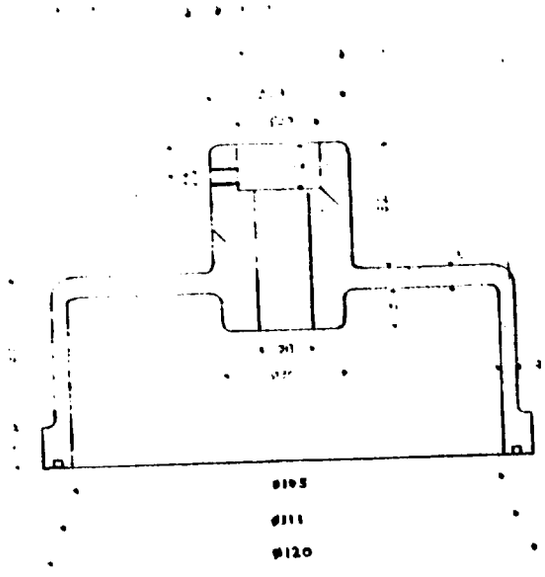
6) RUBBER - LASTİK

	Date-Tarih	Name - Sign İsim - İmza	TURKISH STANDARDS INSTITUTION Packaging Laboratory TÜRK STANDARDLARI ENSTİTÜSÜ Ambalaj Laboratuvarı
Drawn by Çizen	9.5.1980	AKİF SAKLICA	
Contr. by Kontrol			
Stand.Cont. Stand.Kont.			
SCALE ÖLÇEK 1/2	DETAILS OF PAPER CUTTER KAĞITTA İZ YAPMA DİKİMİ		PLATE X

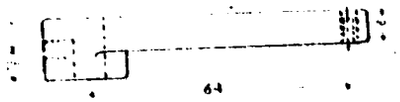


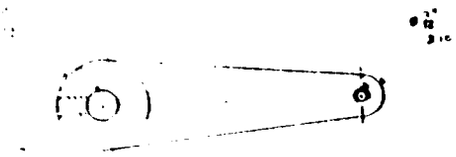
...ING MECHANISM
U JULAMA YÜKÜ ÖLÇME DÜZENİ

	Date-Tarih	Name - Sign İsim - İmza	TURKISH STANDARDS INSTITUTION Packaging Laboratory
Drawn by Çizen	12.5.1980	AKİF BAKLICA	
Contr. by Kontrol			TÜRK STANDARDLARI ENSTİTÜSÜ Ambalaj Laboratuvarı
Stand.Cont Stand.Kont			
SCALE ÖLÇEK 1/2	ASSEMBLY DRAWING OF PAPER CRADLE (FOR WATER SAMPLE) KAĞITTA İZ YAPMA DÜZENİNİN MONTAJ RESİMİ ÇİZİMÜ		PLATE XI

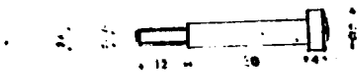


1 MAIN BODY - ÇELİK GÖVDE
MAT. N.S.



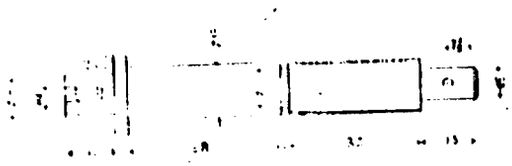


2 HANDLE LEVER - ÇELİK DÖNDÜRME KOLU
MAT. N.S.

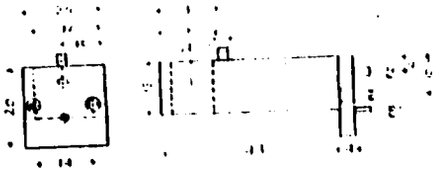


9 HANDLE SCREW - DÖNDÜRME KOLU MİLİ
MAT. N.S.

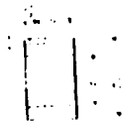
11 HEX. NUT(3/16") HEX. SOMUN



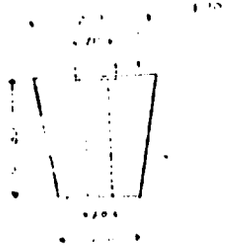
3 SPINDLE - ÇELİK MİL
MAT. N.S.



4 BLADE HOLDER - ÇELİK BIÇAK TUTUCU
MAT. N.S.

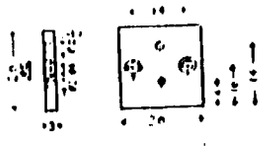


6 BUSH - ÇELİK BUŞ
MAT. N.S.



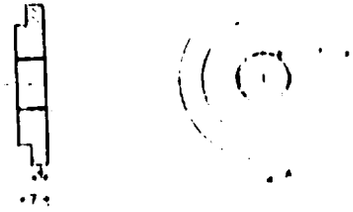
8 BACKELITE KNOB - BAKALİT SAP

12 WASHER - PUL



5 PLATE - ÇELİK BIÇAK TUTUCU KAPAĞI
MAT. N.S.

10 BLADE - BIÇAK



7 WASHER - ÇELİK PUL (İKİ ADET)
MAT. N.S.

	Date-Tarih	Name - Sign
Drawn by Çizen	13.5.1980	AKİF BAKLICA
Contr. by Kontrol		
Stand.Cont. Stand.Kont		
SCALE ÖLÇEK	DETAILS OF CIRCULAR CUTTER FOR 48 Sq. cm SAMPLE CUTTING 48 cm^2'lik NUMUNE KESİCİ AYRINTILARI	PLATE XII

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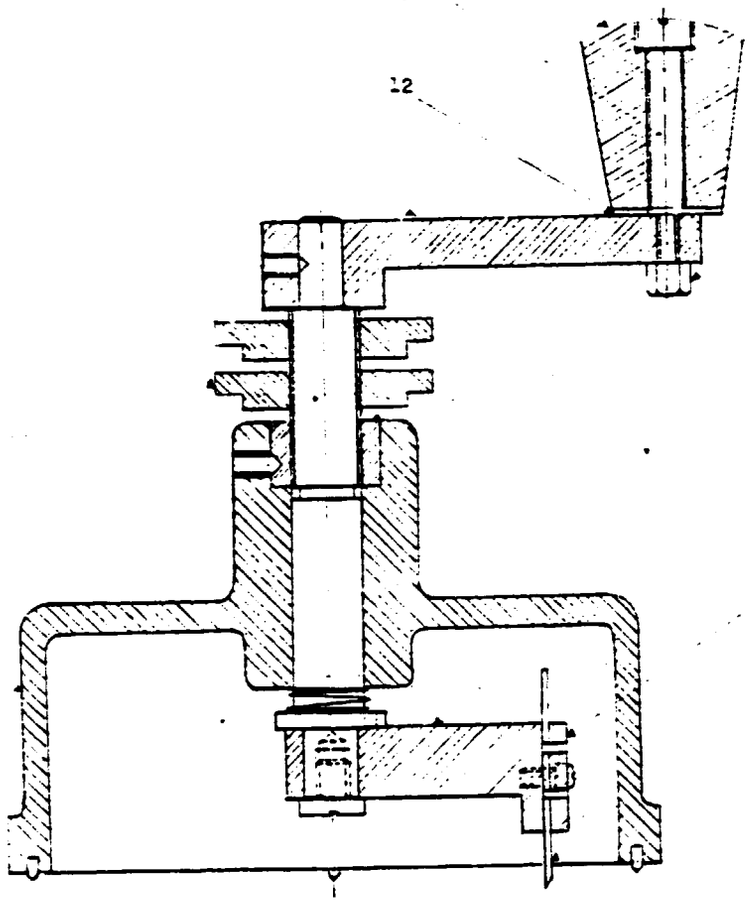
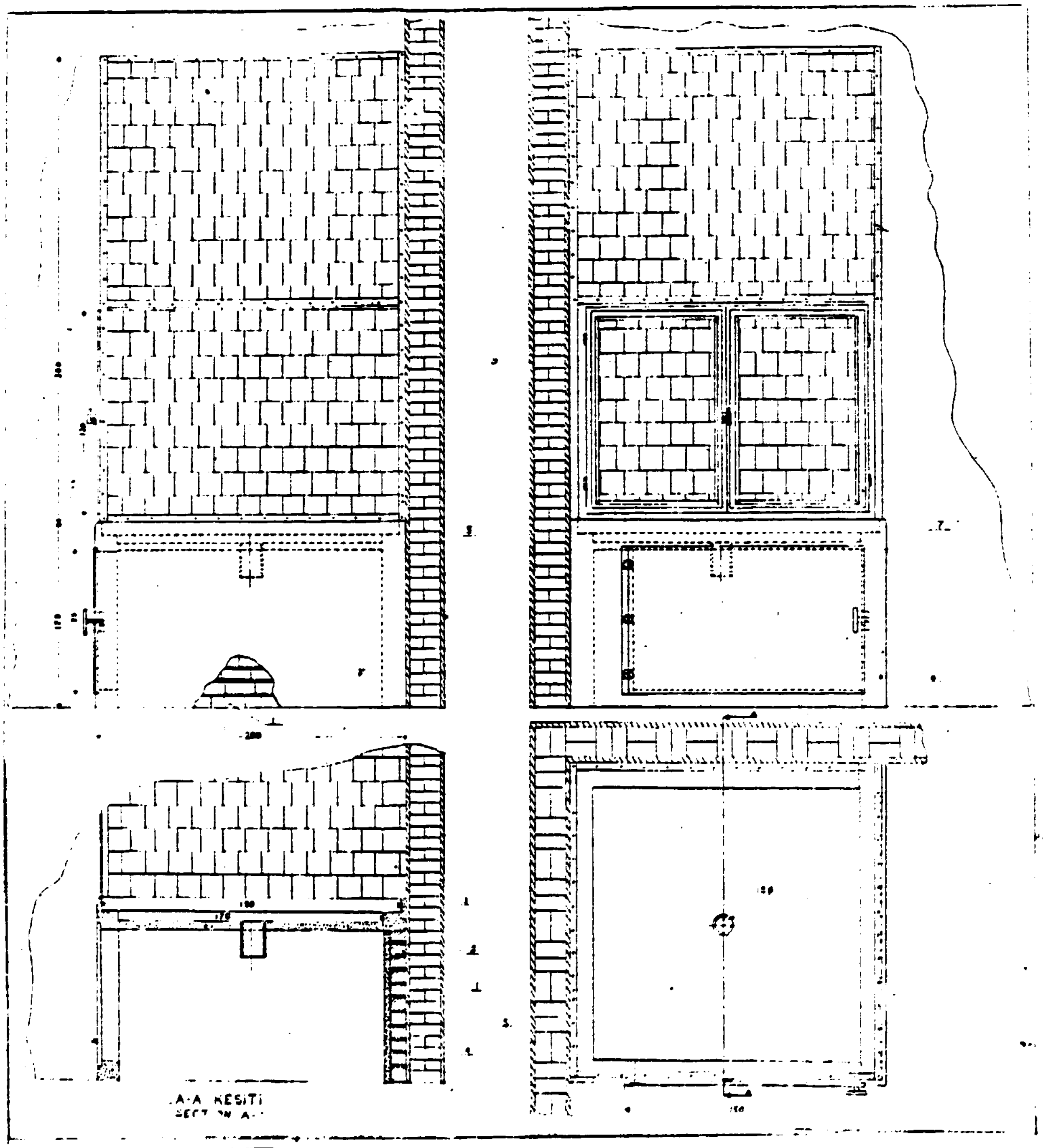


	Date-Tarih	Name - Sign İsim - İmza	TURKISH STANDARDS INSTITUTION Packaging Laboratory TÜRK STANDARDLARI ENSTİTÜSÜ Ambalaj Laboratuvarı
Drawn by Çizen	15.5.1980	AKİF SAKLICA	
Contr. by Kontrol			
Stand. Cont. Stand. Kont.			

SCALE ÖLÇEK 1/2	ASSEMBLY DRAWING OF CIRCULAR CUTTER FOR 48 Sq cm SAMPLE CUTTING 47 cm^2'LIK NUMUNE KESİCİ PERSPEKTİF GÖRÜNÜŞÜ	PLATE XIII



(Dimensions are in cm).

	Date–Tarih	Name – Sign / [illegible]
Drawn by / Cizen	[illegible]	[illegible]
Contr. by / Kontrol		
Stand.Cont. / Stand.Kont.		

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NOT TO SCALE

DETAILS OF RAIN CHAMBER
(ALTERNATIVE PROJECT TO PLATE)

PLATE
XIV

1 BRICK (19 x 9 x 5)(TS704)
2 CONCRETE
3 CERAMICS (15 x 15)(TS [illegible])
4 STEEL PIPE
5 STEEL EQUAL ANGLE
6 STEEL PLATE
7 WOOD
8 GLASS
9 STEEL [illegible]