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10 October 1988  
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**STRENGTHENING OF THE ROYAL DRUGS RESEARCH LABORATORY**

**DP/NEP/80/003**

**NEPAL**

**Terminal report\***

Prepared for the Government of Nepal  
by the United Nations Industrial Development Organization,  
acting as executing agency for the United Nations Development Programme

**Based on the work of Mr. W.V.D. Henry, expert in glass blowing**

Backstopping Officer: K.O.B. Wijesekera  
Chemical Industries Branch

United Nations Industrial Development Organization  
Vienna

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\* This document has not been edited.

V.88 29312

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## I

This report is the result of a two month mission to Nepal, the objective of which was the introduction of glass blowing technology to the Royal Drug Research Laboratory (RDRL). The RDRL has an ongoing scientific and technological work programme and this mission's major work consisted of initiating a Glass Blowing Unit which should eventually serve as a specialised services unit for the country.

Installation of the equipment and attending to initiation of standard procedure was an initial requirement of the mission. Training of local staff and assesment of future requirements for this important unit constitutes the basic of the report.

## II Recommendations

1. HMG has initiated a programme of scientific and technological work for the RDRL and accordingly the building up of a glass blowing technology unit within RDRL to serve its own needs as well as those of the Institutions should be fully supported.
2. A basic need of equipment to begin such a unit has been acquired and it is recommended that a liberal supply of glass tubing and selected starting material be obtained.
3. Manpower training is the crucial requirement in the building - up process. Accordingly the present staff should be given ample opportunities. A minimum staff manning table is recommended.
4. National training groups should be organised by the RDRL to further develop the art of glass blowing in Nepal.

### 111. Job Description

To enable HMG of Nepal through the Royal Drug Research Laboratory to acquire the necessary capabilities to generate the research and technology for production of pharmaceuticals from medicinal plants. An expert will be required to train local staff in glass blowing technology with particular reference to the repair and fabrication of the laboratory glass equipment.

#### IV Body of the Report

##### A. General Remarks.

1. Glass Blowing is a highly specialised work, where a glass blowing technician is able to twist and turn to any angle and form a glass tubing end into any shape after melting over an Oxy/L.P. gas flame and form the glass into a scientific glass apparatus. This needs a well developed skill and aptitude. It also requires a combination of manipulative skills and dexterity together with qualities for aesthetic appreciation and eye for design.

2. There are scientific glass blowing laboratories and factories established in most developed countries of the world. Now more scientific glass apparatus are needed for every day research work as well as normal routine work in laboratories. If these glass apparatus are to be imported from developed countries, it is very costly and it takes a long time to receive them, and thereby the work gets delayed. Therefore a glass blowing unit manned by a trained glass blowing technician is a great necessity, particularly in the developing country context, where even if funds are available equipment is not procurable from local dealers.

##### B. RDRL Glass Blowing Unit and work carried out.

3. The proposed glass blowing unit organised by UNIDO/UNDP is a blessing to the RDRL, of Nepal which is a developing country. During my short mission to RDRL as an expert glass blowing technician it was possible to install all the equipment donated by UNIDO/UNDP with the utmost cooperation and assistance of my counterpart glass blowing technician and others. I take this opportunity to thank them all who co-operated with this task. A description and location of equipment of the RDRL glass blowing unit is given in Annex.1.

4. After completing the installation work I started turning out a few apparatus with the limited quantity of raw materials available. Also the repair work on some of the damaged glass apparatus were attended to.
5. Furthermore as stated in my job description issued to me by UNIDO/UNDP, dated 10th November 1986 (job description Annex.11), I commenced training in elementary glass blowing and two minor staff personnel working in the unit were the beneficiaries. I found them capable of doing this type of work.
6. In addition a mid-term progress report was submitted to Dr.Nitya Anand, the special planing adviser for the project - NEP/80/003 who was concurrently on mission in katmandu in the RDRL conference which commenced on 31.07.88. copy of the report annex. 111.
7. Even though the time period given to me as an expert to orgmise a glass blowing unit was relatively too short, no problem arose as my national counterpart happened to be a trained glass blowing technician. It was possible to achieve a great deal giving the necessary instructions through my own experience, to benefit his expertise.

C. Some equipment problems

8. Some of the equipment received by the RDRL were not according to its requirements, and the specifications provided by RDRL. This is already brought to the notice of RDRL Conference. Annex IV.

The lathe supplied to this unit is not a Universal Lathe, which was assessed to be the prior need. Instead, RDRL was supplied with a lathe, with which only ground glass joints could be turned out. The lathe supplied to turn out only ground joints is also useful for the reason that it is far more cheaper to purbhase glass tubing and to locally turn out ground glass joints, But the requirement of ground glass joint seen at present very limited. However the prime need for this unit is the universal lathe. The glass apparatus of large capacities cannot be fabricated if there is no universal lathe. The error of equipment delivery which was clearly a suppliers mistake, was brought to the notice of UNIDO/UNDP.(Vide annex IV).

9. The universal lathe which had been ordered by RDRL was also found to be too elaborate for the intended purpose, the specification for a more simpler universal glass blowing lathe was accordingly drawn up and submitted to RDRL and to the UNIDO special technical adviser, (annex - V). This lathe as now recommended will cost less to the RDRL as a replacement for the glass blowing lathe already supplied for turning out ground glass joints.

. Training requirements

10. Glass blowing is a rare expertise all over the world and in the view of the present expert, the glass blowing national counterpart, who has been trained in glass blowing in India is very promising. The national glass blowing technician, I have observed is competent enough to turn out some of the common scientific glass apparatus, maintaining a high standard of work. Mindful of the quality and enthusiasm of the present glass blowing technician, it is recommended that he be given a further specialised training. Undoubtedly a training in specialised glass blowing would be available in a neighbouring country, like India or China. However, in view of the fact that this national counterpart had been already trained in India, what he further requires is expertise in designing and new techniques in fabricating glass apparatus for special purposes. Further, the knowledge he has gained during his course of training is limited to simple glass apparatus. However, in more of the fact that this national counterpart had been already trained in India, it is strongly recommended that he may be granted an opportunity of training in a country like Federal Republic of Germany.

11. Further inputs needed to acquire expertise in carrying out function are schematically indicated below.

1. Training	Specialised glass blowing Techniques in fabricating Special glass apparatus Knowledge of designing glass apparatus.	Present technicians to be sent to Federal Republic of Germany.
	General training for glass blowing technicians.	Technical assistants can be sent to India.

#### 11. Space Requirements

The space for further expansion of the unit is available in the same premises, adjoining the present glass blowing unit where necessity arises.

#### 111. Further items needed.

Bench glass blowing burner - one  
Surface glass grinding machine - one (vide diagram Annex.IV)  
Borosilicate glass tubing  
Oxygen gas cylinder - one  
Oxygen gas regulator with  
two stages - one  
L/P Gas cylinder with  
regulator - one

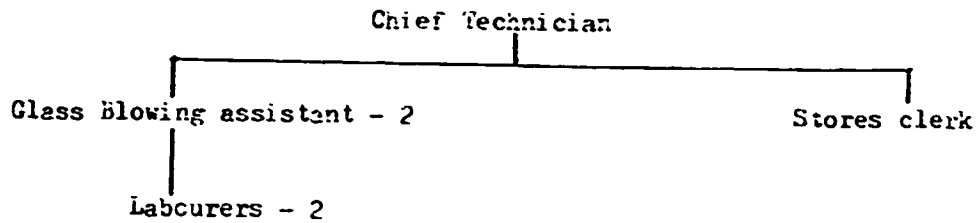


E. Expanded activities

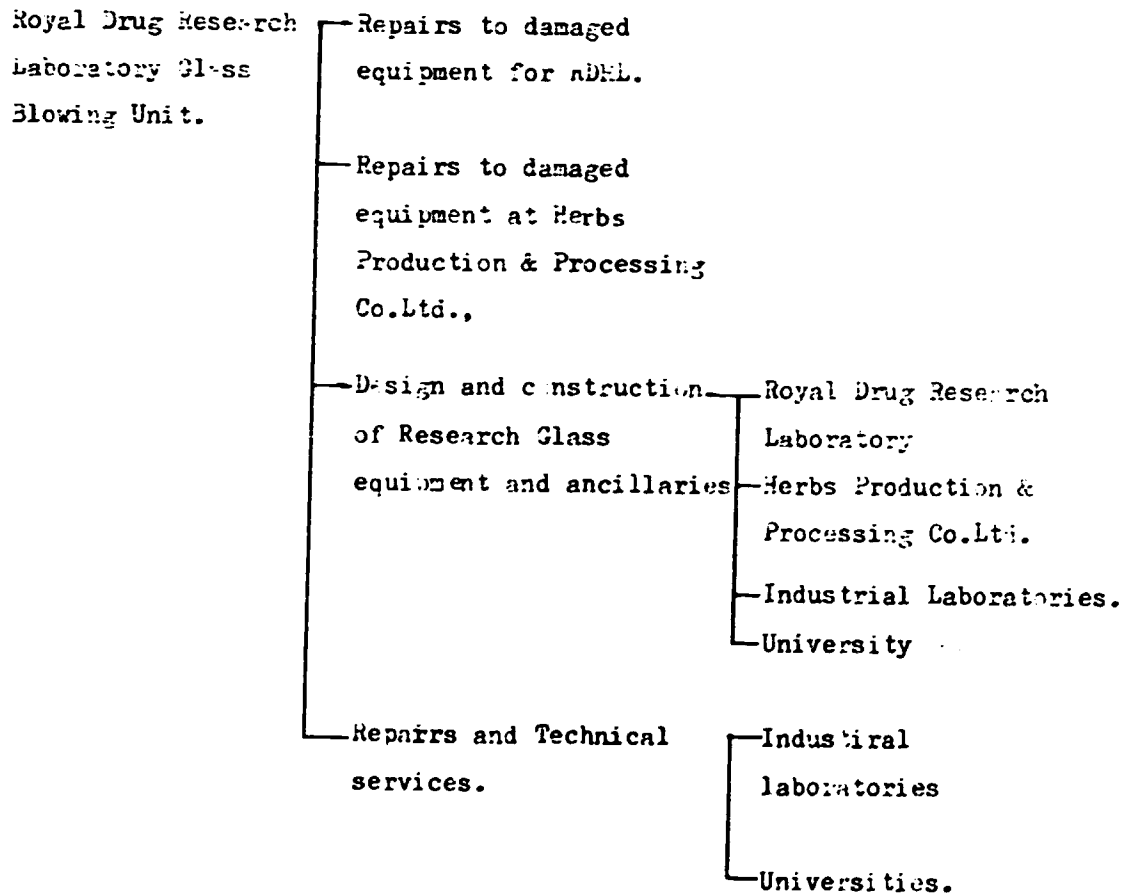
12. After further training of the national counterpart, he can be the nucleus for further expansion and development of this glass blowing unit to serve a wider purpose, by rendering his services to other technical institutions and universities. Thereby the country could make wide use of the unit, and RDRL could be enabled to develop a useful service and a source of income to the RDRL. Further in order that this unit function more efficiently additional technical assistants, minor staff, stores clerk and additional space are required.

13. The RDRL's glass blowing unit is seen as a national centre for laboratory glass blowing. It is proposed future cadre should be expanded to reach a situation such as represented next page.

1. CADRE



11. Functions



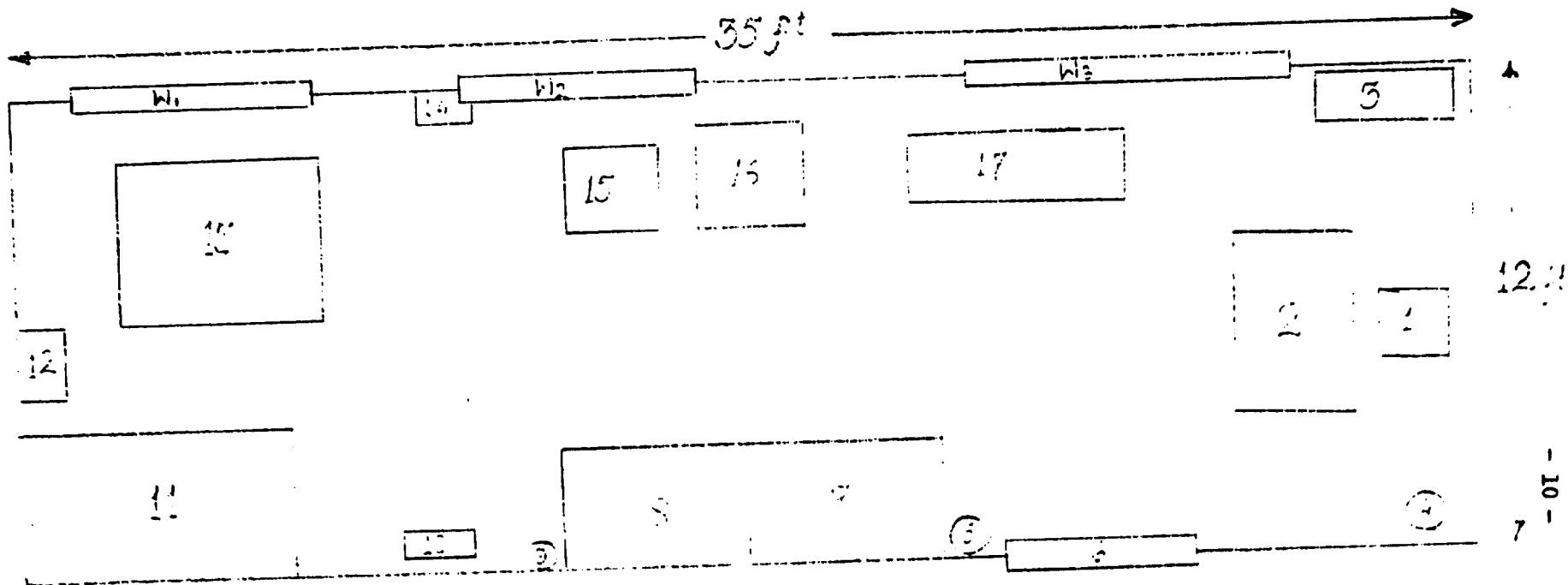
14. It is also recommended that this unit conduct local training courses for batches of technicians, so that glass blowing technology would develop in general in the country and the trainees would find employment in this Institution or in other locations.

The technical assistants may be selected by conducting a local manual aptitude test. The present national counterpart can conduct the course after the selection, and if necessary he could be assisted at initial stages by a UNIDO/UNDP short term consultant for one month. The duration of the course is estimated at six months. At the end of the course, the best performers may be selected to the RDRR glass blowing unit after a due practical examination. Those not selected would be able to find employment in other institutions, and should therefore, be issued with a certificate of competency in glass blowing. The outline of a model Training Programme is given below.

- 1st week - Introduction of glass blowing techniques, types of glass tubing used in glassblowing, their compositions, how far this technique is able to meet the requirements of different laboratories, industries etc.
  
- 11 nd week - Introduction of equipment used in glassblowing and their operations, handling of glass tubing, preparation before the work commences.
  
- 111 week - Handling of glass tubing and rods in the flame, rotation of the glass tubing in the flame, drawing a jet, bending a glass tubing to different angles.
  
- IVth Vith week - Joining of two tubes of same diameter together, joining of two tubes of different diameters together.
  
- VIIth - Xth week - making T joints, Y joints, making very simple apparatus and blowing bulbs.

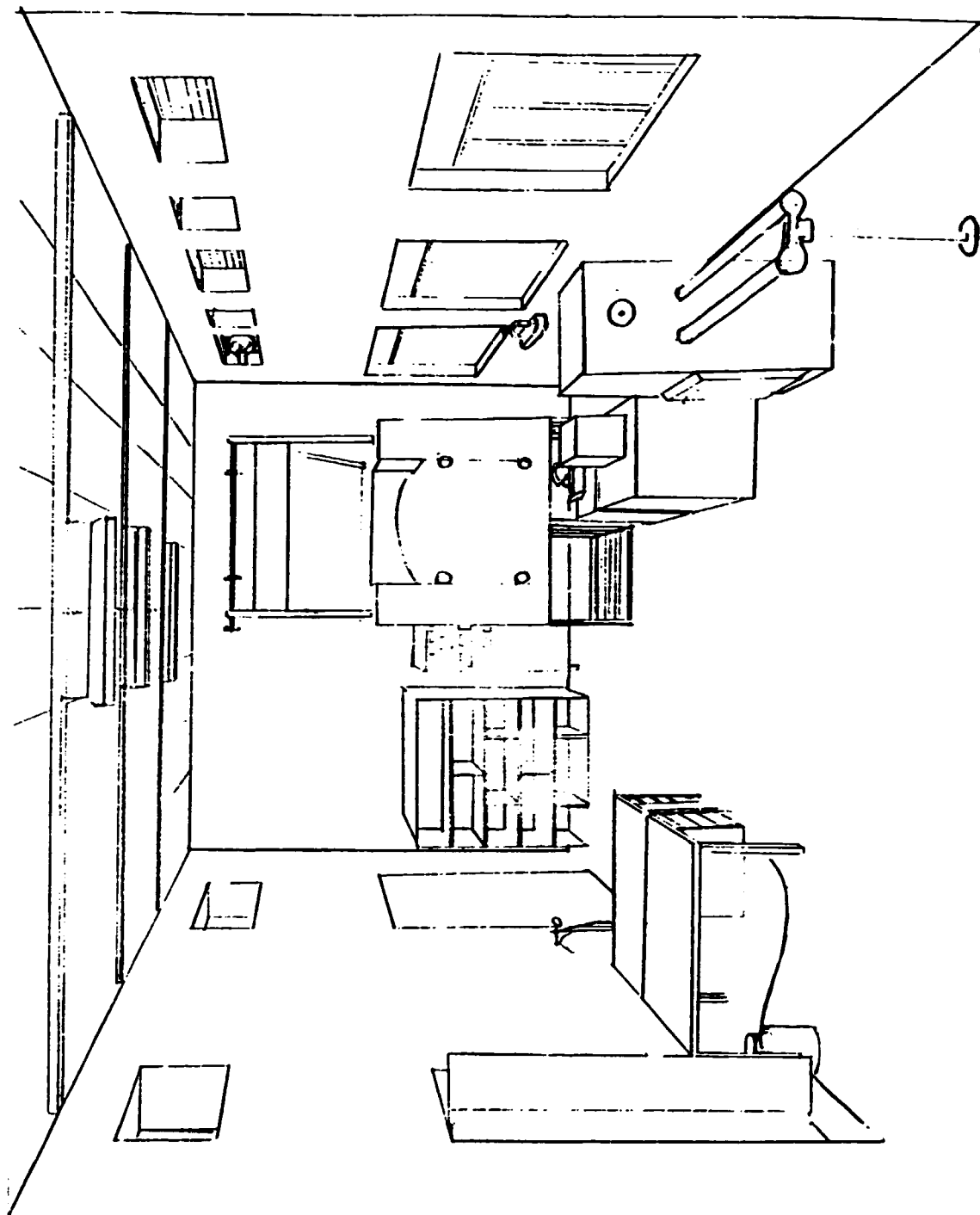
- XIth - XIVth week - Lathe work joining glass tubes in the lathe, blowing bulbs, shaping to various shapes.
- XVth - XVIIIth week - Making ground sockets and cones, stopcocks Grinding sockets cones etc.
- XIXth - XXIVth week - Making larger apparatus, annealing, why annealing necessary, annealing temperatures of various types of glass.

16. Finally, this type of glass blowing unit is only meant for laboratory glass blowing, repairs and maintainance of laboratory glass apparatus, Turning out of industrial level glass apparatus can only be carried out in suitably equipped glass factories. R.D.S. Glass Blowing unit can service, breakages in laboratories of schools and universities and save H&G valuable foreign exchange.



- |                       |                            |
|-----------------------|----------------------------|
| 1. Chair              | 10. Air compressor         |
| 2. Master Table       | 11. Rack for Glass blowing |
| 3. Almirah            | 12. Controller of Over     |
| 4. Stand for          | 13. Oven                   |
| 5. L.P.G. Cylinder    | 14. Sink                   |
| 6. Door               | 15. Glass cutting machine  |
| 7. Glassblowing table | 16. Grinding machine       |
| 8. Glassblowing table | 17. Glass working lathe    |
| 9. Oxygen cylinder    | W1, W2, W3 - Windows.      |

Layout of "Glassblowing Unit"  
 Royal Drugs Research Laboratory  
 Kathmandu - Nepal



- 11 -

Inside View of  
Glassblowing unit  
at RDRL



UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

UNIDO

10 Nov. 1986

PROJECT IN THE KINGDOM OF NEPAL

**JOB DESCRIPTION**

DP/NEP/80/003 /11.56/32.1.D

**Post title** Glass Blowing Technician.

**Duration** 3 months

**Date required** ASAP

**Duty station** Kathmandu

**Purpose of project** To enable His Majesty's Government of Nepal through the Royal Drugs Research Laboratory to acquire the necessary capability to generate the research and technology for production of pharmaceuticals from medicinal plants.

**Duties:** Expert will be required to organise a glass blowing workshop and to train local staff in glass blowing technology with particular reference to the repair and fabrication of laboratory glass equipment.

**Qualifications:** Practical experience in glass blowing technology in the repair of glass apparatus, their design and fabrication.

Ideally, the candidate should have had at least 10 years experience in a large research establishment or in industry.

Some experience in teaching glass blowing to junior technicians will be an added qualification.

...../..

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Applications and communications regarding this Job Description should be sent to:  
Project Personnel Recruitment Section, Industrial Operations Division  
UNIDO, VIENNA INTERNATIONAL CENTRE, P.O. Box 300, Vienna, Austria

Language

English.

Background information

Nepal is a land-locked country which has a population of approximately 12 million with an annual growth rate of 2.4%. Over 80% of the population live in rural areas and over 60% of them in the mountain zones. An estimated 80% of rural folk utilise plant-preparations for their therapeutic requirements and the traditional system of medicine is very similar, and related to the Ayurvedic system prevalent in the Indian Sub-Continent. The wealth of medicinal plants can be considered as one of the country's most important natural resources. The country lies in the Central Sector of the great Himalayas and occupies one third of their total length. The diversity of physiography due to altitudinal and climatic variations has produced a great variety of species of plants within the flora of this small country (area - 145,305 sq.km.) Much of this flora is used in medicine and the Royal Drugs Research Laboratory (RDRL) which functions with the Department of Medicinal Plants of the Ministry of Forests is responsible for the R and D efforts leading to the production of pharmaceuticals based on the traditional remedies. The RDRL has been assisted by UNDP for the past two years to enhance its capabilities as an R and D institution, and to provide technical assistance to the Herb Production and Processing Company. The Herb Production and Processing Company is charged with commercialising the technology generated by producing economically useful and export oriented products. It is also the recipient of FAO assistance in developing capabilities for the large-scale cultivation of medicinal plants.

A suitably integrated institutional framework therefore already exists in the country for the systematic cultivation, research and development and processing of plant-derived products. The present projects are designed to develop this capability further in order to enhance the Government's health-care programmes.



MID TERM REPORT ON GLASS BLOWING UNIT

The glass blowing equipments received through UNIDO assistance have been installed at the glass blowing unit of the Royal Drug Research Laboratory, with these equipment and other tools available at RDRL, the following Laboratories glass apparatus could be turned out once the necessary sizes of glass tubing which are on order is received.

The items that can be turned out are:-

filter funnels  
leibig condensers  
double surface condensers  
spiral condensers  
chromatography columns  
round bottom flasks upto 150 ml capacity  
classin flasks upto 150 ml capacity  
soxhlet extrators capacity 100 - 150 ml  
classin flasks  
other apparatus of similar diamensions to diagrams provided  
repairs of laboratory broken glassware apparatus, where possible.  
When a universal lathe is received larger capacity glass apparatus could also be fabricated.

With the raw materials available at present we have turned out a few glass apparatus, as well as repaired broken glass apparatus and handed over to sections.

In view of the present expert, the glass blowing national counterpart technician is a very promising young person; he is competent enough to turn out any of the above apparatus maintaining a high standard of work. He can be the nucleus for further expansion and development of the glass blowing unit to serve a wider purpose.

In view of the quality and the enthusiasm of the counter part technician. It is recommended that he be given further specialised training in the following specialised techniques:

- a. Fabrication of specialised apparatus
- b. Designing of apparatus
- c. Repairing and maintaining techniques of specialised apparatus.

This training is required because

1. He has taken training only for six months which is not sufficient to be a competent glassblowing technician as this technology covers a vast range of techniques to fabricate and to design scientific glass apparatus.
2. He has very limited capability in the related field.
3. A knowledge of designing and fabricating techniques are most essential for a competent technician.
4. This glassblowing unit of Royal Drug Research Laboratory is to be a central and leading unit for the whole country and there is no any technician to guide in the particular field, so he must have a thorough knowledge of related technology.
5. As such he needs a further specialised training for advance technology with well equipped and established scientific glass apparatus producing company.

6. UNIDO may help this person by arranging a training programme as per his requirements with appropriate institution.

With the impressive list of equipment made available to the glass blowing unit of RDRL, the counterpart national technician could make wider use of the services of this unit by rendering a glass blowing services to the other technical institutions and universities of the country. This could enable RDRL to develop a useful service and an additional income to RDRL.

It is also recommended that this unit conduct local training courses for batches of technicians, so that glass blowing technology would develop in general in the country and the trainees could find employment in other locations.

**Wewita V.D. Henry**  
**Glass Blowing Technician**  
**(Consultant)**

WVDH/bbb:

Report on the equipment received for  
glassblowing section under UNDP/UNIDO  
Project-NEP/80/003:R0RL.

1. Glassblowing Lathe

The original order no. Vienna/UNIDO/DC 16/10 item no.12 was for a glassblowing lathe with the purpose for shaping st.goints, stop cocks, flanges, bulbs etc. having 3 jaws double chuck, V shape bed. These specifications are mentioned in the packing list also. But the machine received is not with of required specifications and mentioned capability. It can only make ground joints and stop cocks which we are able to make by the facility, already we have. So it should be replaced or another Universal glass blowing lathe should be added for this section as per the specifications given below for convenience.

Manufacturer: Herbert Arnold  
629 WELLBURG/LAHN  
Weilstrns Be6  
Post fach 1220  
West Germany.

- Type 3100
- Bore of Spindle - 110mm
- Height of Centre- 300mm
- Useful length excluding chuck-1140mm
- Steplessly variable speed range-0-300 rpm.

- Single phase, A.C. 220 Volt, 50 Hz.
- With blowing attachment
- One set of jaw extension to chuck upto 50cm (500 mm)
- First burner attached.
- Clockwise and anticlockwise motion.

2. Glass Cutting machine

The original order Vienna/UNIDO/DC 16/10 item no.10 was for a glass cutting machine with a diamond wheel and these specifications are also correctly reproduced in the packing list no.LT-87134/1 enclosed with the equipments. However, the machine on opening was found to be fitted with a carborundum wheel instead of the expected diamond wheel and the carborundum wheel supplied was also totally broken. The suppliers may please be asked to replace the broken wheel immediately with a diamond wheel with the following specifications. This machine is lying idle in the lack of above wheel.

- |                     |                |
|---------------------|----------------|
| - Manufacturer      | Herbert Arnold |
| - Cat. no.          | 1              |
| - Size              | f              |
| - Diameter          | 250mm          |
| - Width of edge     | 10mm           |
| - Approx. thickness | 1.25m          |
| - Centre bore       | 25mm.          |

3. Grinding Machine

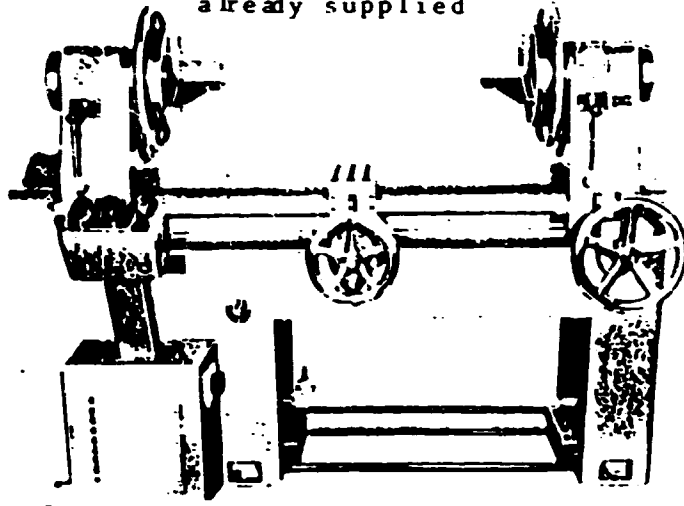
As per our order the grinding machine would be for grinding stop cocks, streight joints, flanges etc. with 3 jaws chuck, heavy construction, 5 speeds, clockwise and anticlockwise motion with roserve pedal switch and accessories grinding disc for grinding flanges etc. But the machine supplied can grind only female joints, which is a very limited capability. So we would like it to be replaced with machine having our specification including the grinding disc.

Specifications

- 3 jaws chuck
- Heavy construction
- 5 Speeds controlled by switch.
- Clockwise and anticlockwise motion with reverse pedal switch
- Single phase, A.C. 220 Volt.

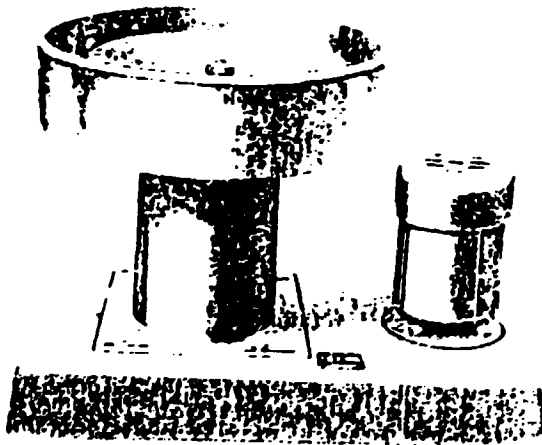
If the grinding disc is not going to be supplied with the grinding machine discribed above with properly fitting a "Surface grinding machine" as per Herbert Arnold's cat no.6 type no.551 should be added.

Suggested lathe in place of lathe  
already supplied

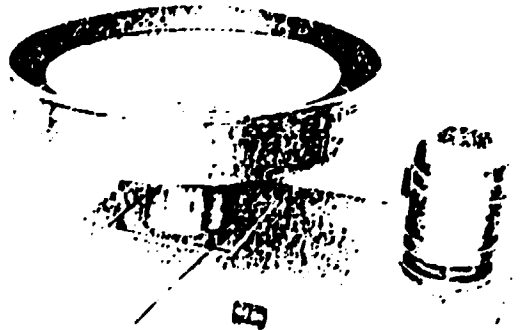


Type Standard

Universal Glass Working Lathes - Standard Type



Surface glass grinding  
machine , additional  
equipment



Horizontal plane grinding machines, -Laboratory Model-, drive shaft in  
ball and thrust bearing, grinding disc, front and rear  
Changeable voltage speed, by means of a 4 groove pulley for models No. 550  
551, 552, and 553. Models 550-10, 550-12, 551-10, and 553-12, are  
equipped with a steplessly variable speed drive. Power supply: 220-000 volt,  
3 phase, 50 cycles, or 220 volts, single phase, 50 cycles, other voltage, upon  
request.