

DIVISION OF NARCOTIC DRUGS
Vienna

**STAFF SKILL
REQUIREMENTS
AND
BASIC EQUIPMENT
FOR NARCOTICS
LABORATORIES**

**MANUAL
FOR USE BY NATIONAL AUTHORITIES
ON ESTABLISHMENT
AND OPERATIONAL NEEDS
OF NARCOTICS LABORATORIES**



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INTRODUCTION

The constantly changing pattern in the illicit production, trafficking and consumption of drugs of abuse has led, in recent years, to increased interest on the part of Governments of developing countries in establishing or strengthening national narcotics laboratories. A number of Governments have examined existing resources to ensure the availability of both the basic skills and equipment necessary for an effective narcotics laboratory; the United Nations has received a range of requests for advice and assistance concerning the training of staff and the selection of appropriate equipment and reference material.

United Nations experience in responding to requests for technical assistance from Member States in connection with narcotics laboratories has repeatedly indicated the crucial importance of ensuring that available technical skills are commensurate with the choice, acquisition, use and maintenance of available equipment. Experience has also shown that many of the basic skills and equipment needed for a national narcotics laboratory may already exist either, for example, in government laboratories which have been established for such other purposes as public health and drug quality control and in university facilities.

A first step, when considering the establishment or strengthening of national narcotics laboratories is therefore to review existing resources and to consider establishing narcotics laboratories in close proximity to relevant existing facilities, thus avoiding costly duplication of expensive items of equipment and dissipation of technical skills.

Purpose and scope

This manual has been prepared by the United Nations Division of Narcotic Drugs to provide practical assistance to national authorities by listing the basic requirements in skills, equipment and reference material which are needed to operate a narcotics laboratory. It may also serve as a guide to national authorities in assessing existing resources in government and university facilities. Not all of the equipment listed is necessarily required in every national narcotics laboratory. Requirements may vary, for example, as a result of local trends in the illicit traffic and with the availability of narcotics laboratory facilities on a regional basis.

The Division of Narcotic Drugs can provide advice to Governments in determining possible needs for additional equipment and appropriate staff training. However, United Nations resources are limited and the Division of Narcotic Drugs does not itself dispose of funds for direct disbursement; it would therefore be very helpful to be assured that any requests from Member States for advice and assistance have been preceded by a careful advance review of all available national resources.

Skill requirements

Chemists or pharmacists engaged upon the identification of suspected illicit drugs should possess the basic education and skills needed to

analyse narcotic drugs and psychotropic substances through the use of at least the basic equipment described below in order to apply appropriate analytical techniques. Adequate training is therefore a matter of priority in cases where the staff of national laboratories lack these qualifications. Staff of national laboratories must also be able to ensure the continuous operation and maintenance of laboratory equipment. It is also important that staff of national narcotics laboratories should rapidly acquire skills not only in drug examination but also in standard forensic procedures. These include the collection and handling of exhibits, the interpretation of national legislation, report writing and the presentation of evidence in courts of law. Individual members of staff should be encouraged to establish close practical liaison with staff of national drug law enforcement agencies. In addressing basic skill requirements in this manual emphasis has been placed on the need for experience in practical as well as theoretical aspects of reliable, versatile and cost-effective analytical methods.

Equipment

In listing equipment, the Manual aims to be both comprehensive and specific, suggesting equipment and instruments that require minimum servicing and taking into consideration the possible need, in certain countries, for quantitative as well as qualitative analysis. Basic equipment may vary; in some States climatic and other local conditions may necessitate items that are not needed elsewhere. Thus, in certain countries, air-conditioners, dehumidifiers and voltage and water-pressure regulators could be considered basic, if not essential.

Reference material

Also of great importance to a narcotics laboratory is the availability of textbooks on drugs of abuse and on analytical techniques; reference indices; chemical encyclopedias and dictionaries; texts of relevant national drug legislation and interpretation of such legislation as well as copies of the relevant basic United Nations publications.

Suggestions for books and other reference material contained in this manual take into account not only the role of the chemist with regard to the identification and analysis of seized material but also the need to prepare evidence for legal proceedings. For example, law enforcement officials who have made preliminary identification of drugs of abuse through use of the United Nations Drug Identification Kit will need to have these initial findings verified by a recognized laboratory as part of the preparation of evidence for consideration by the legal authorities.

There is, in addition, a need for information on current trends in analysis; this may be obtained through subscriptions to specialized periodicals. Another way of ensuring awareness of the latest trends is to foster liaison between national narcotics laboratories in a geographical region as well as on a world-wide basis. Such interaction enables effective information exchange on new drugs, on unusual illicit drug samples and other related developments.

In order to assist Governments in planning for future requirements, examples of appropriate layouts for a narcotics laboratory appear in the Annex.

Acknowledgements

In view of the technical nature of the subject matter and of the varying requirements of national laboratories in different regions, this Manual has been compiled with the co-operation of and in consultation with a wide range of experts and officials closely connected with the analysis of drugs, and the Division of Narcotic Drugs wishes to express appreciation to all those who have generously contributed comments and suggestions. In particular, the Division wishes to express special thanks to:

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Appreciation is also expressed for the contribution of Mr. R. Edgley, who in his report following a consultancy mission carried out in the Asia and Far East region on behalf of the Division of Narcotic Drugs, identified various operational problems confronting national authorities in the establishment and maintenance of national narcotics laboratories. It is hoped that the contents of this manual will be of assistance in overcoming problems of this kind when they arise.

The Division of Narcotic Drugs would welcome observations on the contents and usefulness of the present manual. Comments and suggestions may be addressed to:

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Division of Narcotic Drugs
United Nations Office at Vienna
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Suggestions on reference books and other information material in languages other than English would be particularly useful in assisting national authorities to assemble appropriate reference collections.

I. BASIC STAFF SKILL REQUIREMENTS

The most important component of a narcotics laboratory is its professional scientific staff who are responsible for carrying out its functions. In many countries these scientists appear as expert witnesses in court and therefore must have the education and experience to carry out this responsibility. These staff members should have a minimum of a baccalaureate (first) degree in natural science, preferably in chemistry. Also, all staff members should have successfully completed an extensive training programme in the examination and analysis of drugs of abuse. Since the materials seized in the illicit drug traffic are rarely in a pure state, the staff members of a narcotics laboratory should also have the skill requirements listed below, which emphasize separation identification techniques such as extraction, thin-layer chromatography and, where appropriate, gas-liquid chromatography.

A. General

1. Familiarity with literature on drugs of abuse, and particularly with literature concerned with analytical aspects of drugs most commonly encountered in the illicit traffic.
2. Knowledge of safety procedures in a narcotics laboratory, including correct methods for handling compressed gases as well as flammable and corrosive substances.
3. Awareness of security procedures, including the safe storage of reference samples of drugs as well as material seized in the illicit traffic.
4. Capability of handling samples of suspected material, including the careful observation of all physical characteristics (e.g. liquid, powder, tablet, colour, particle size and other); knowledge of appropriate procedures for the preparation for accurate analysis of a representative sample from the material submitted for investigation, taking into account the physical state of the suspected material (e.g. liquid, tablets, powder, soft or hard capsules, resin, oil or herbal).
5. Adequate practice in the determination of melting point and mixed melting points as an initial indication of sample purity using known drugs and mixtures of known drugs; experience in the practical application of this technique to samples from the illicit traffic.
6. Experience in the use of extraction techniques, including dry and immiscible solvent extraction for the separation and isolation of individual drugs from known mixtures (i.e. prepared physical mixtures of individual drugs) as well as from samples from the illicit traffic; good understanding of acid/base equilibria and partition coefficients; experience in microanalysis.
7. Knowledge of the principles of microscopy and its applications; ability to use a microscope to identify cannabis.

8. Experience in the operation, care and maintenance of equipment, including proper use, "troubleshooting" (recognition and correction of malfunctions), testing, adjustment, cleaning and routine maintenance, safety precautions and emergency procedures.

B. Colour reactions

1. Knowledge of the principles and use of colour reactions; awareness of their preliminary nature as well as their limitations (e.g. lack of specificity).
2. Ability to prepare colour reagents and to use these reagents to test for drugs most commonly encountered in the illicit traffic (e.g. opium and opiates, cannabis, cocaine, amphetamines, barbiturates, LSD and other groups of psychotropic substances).

C. Thin-layer chromatography (TLC)

Theoretical

1. Knowledge of the principle of TLC and of its separation mechanism(s).
2. Awareness of the factors which affect separation including the adsorbent layer's thickness and its water content, the saturation of the developing chamber, the amount of sample spotted, impurities and the operating conditions.
3. Knowledge of the eluotropic series and of the general criteria for the selection of appropriate solvent systems, taking into account safety, health hazards and cost.
4. Familiarity with visualization techniques (ultraviolet light and spray reagents) for various applications, and with the significance of R_f values.
5. Knowledge of various visualization spray reagents for various applications; ability to prepare and screen visualization reagents yielding clearly defined spots and stable colours with the substances sprayed, thus allowing the accurate determination of their R_f values and, by comparison with reference substances, their positive identification.
6. Awareness of possible problems (e.g. distorted solvent front, undermigration, overmigration and other), and their most likely causes.

Experimental

1. Familiarity with TLC equipment and operational procedures; extensive practice in proper spotting techniques, plate introduction into developing tanks and plate preparation for visualization; experience in plate evaluation as to sensitivity and specificity as well as for spot overlapping and tailing.

2. Ability to apply TLC methodology to reference samples of drugs most commonly encountered in the illicit traffic as well as to samples from the illicit traffic in order to determine detection limits for representative substances (e.g. tetrahydrocannabinol for cannabis or morphine for opium).
3. Practice in the comparison of suitable solvent systems and in the selection of systems for optimum separation; experience in the preparation and evaluation of solvent systems by varying the nature, number and proportion of their components, in order to obtain the best possible resolution of the principal constituents of a given sample (e.g. cannabinal, cannabidiol and tetrahydrocannabinol in cannabis), and their clear separation from other substances in the sample.
4. Ability to design and use multi-development and two-dimensional TLC experiments aimed at improving the separation of substances otherwise too close to each other when only one-dimensional and single-development TLC is used; practice in the use of high-performance TLC (HPTLC).
5. Familiarization with the methodology involved with preparative TLC plates for the separation of drug mixtures.
6. Experience with techniques used to isolate discrete amounts of substances from such plates and work-up procedures to isolate sample components for confirmatory analyses by UV-Vis. or IR spectroscopy.
7. Ability to prepare and activate silica gel or other adsorbent (with or without fluorescent indicator) TLC plates as well as to test such plates for the effective separation and positive identification of as many drug samples as possible.

D. Gas-liquid chromatography (GLC) .

Skills for this testing technique would be necessary should it be considered desirable to acquire the required equipment.

Theoretical

1. Knowledge of the theory and mechanism of separation including the properties and the role of the carrier gas.
2. Familiarity with the various instrumental components (injection port, column and detector) and with their functions.
3. Awareness of common operational problems and their possible causes (i.e. peak tailing, appearance of spikes, loss of sensitivity, longer retention times and other).

Experimental

1. Familiarity with the instrumentation and operational procedures; ability to determine conditions for optimum separation and detector response, as well as to value the significance of retention times; ability to correct routine instrumental malfunctions.
2. Adequate practice in the application of GLC methodology to the identification and analysis of drugs most commonly encountered in the illicit traffic, using reference substances as well as samples from the illicit traffic under isothermal operation conditions; ability to design experiments using temperature programming and where appropriate derivatization techniques to separate peaks otherwise not satisfactorily resolved or buried under the solvent's peak under isothermal conditions.
3. Ability to design experiments aimed at selecting operating conditions for optimum separation of sample components and optimum detector response: (e.g. type of column packing, temperature of the injector, column and detector as well as the flow rate of the carrier gas)
4. General knowledge of packed columns (support, liquid phase) and of the criteria for the choice of a suitable column; familiarity with various types of stationary phases available (e.g. OV-17, OV-1, OV-101 and SE-30) and their uses; ability to screen stationary phases for various applications.
5. Adequate practice in the preparation of packed columns, in the conditioning of such columns and in their practical testing, using reference substances as well as samples from the illicit traffic.
6. Experience in quantitative analysis using, inter alia, the internal standard method; ability to evaluate appropriate internal standards for the quantitative assaying of various drugs, taking into consideration ready availability, safety, health hazard and cost.

E. Ultraviolet-visible spectroscopy (UV-Vis.)

Skills for this testing technique would be necessary should it be considered desirable to acquire the required equipment.

Theoretical

1. Theory and mechanism of molecular light absorption and electronic transitions; awareness of the electromagnetic spectrum and the definition of electromagnetic radiation.
2. Understanding of wave properties of radiation, wavelength-frequency relationship and radiation energy.
3. Knowledge of molecular energy states (vibrational, rotational and electronic) and molecular energy changes.

4. Awareness of chromophores, auxochromes and conjugation, and their effects on spectra.
5. Familiarity with the effects of solvent and pH on λ max and band intensity.
6. Basic understanding of the characteristics of light source and detector, and the effect of detector-source combination on spectral response.
7. Knowledge of basic laws of light absorption for quantitative analysis.

Experimental

1. Familiarity with the instrumentation and operational procedures.
2. Ability to optimize operating controls including wavelength, zero absorbance, slit width, amplifier gain and scanning speed.
3. Ability to choose appropriate solvents and to establish calibration curves for quantitative analysis.
4. Experience in studying solvent and pH effects on spectra.

F. Infra-red spectroscopy (IR)

Skills for this testing technique would be necessary should it be considered desirable to acquire the required equipment.

Theoretical

1. Theory and mechanism of absorption of infra-red radiation frequencies and their conversion by organic molecules into rotational and vibrational energies.
2. Knowledge of the infra-red range within the electromagnetic spectrum, wavelength-frequency and wavelength - wave number relationships.
3. Awareness of the requirements for absorption and the number of fundamental vibrational modes for linear and non-linear molecules; understanding of the factors limiting or increasing the number of observed absorption bands and of frequency changes due to the molecular environment.
4. Knowledge of characteristic infra-red group frequencies and ability to draw structure-spectra correlations.
5. Knowledge of the laws of light absorption; ability to make absorbance measurements and to establish calibration curves for quantitative analysis.

Experimental

1. Familiarity with the instrumentation and operational procedures.
2. Ability to select operating parameters for best results, including gain, slit width and scanning speed; basic understanding of the effects of such parameters on spectra.
3. Experience in preparing and handling liquid, mull and KBr disc samples; experience in quantitative IR analysis.

II. CHECKLIST OF EQUIPMENT, ACCESSORIES AND MATERIAL

National or regional authorities planning to establish or to strengthen narcotics laboratories may wish to consider the following list of basic equipment and material for the identification and analysis of drugs most commonly encountered in the illicit traffic. As noted above, not all items will be needed in every laboratory. By contrast, and in some cases, additional items may be needed because of unusual conditions and drug-related situations in specific countries or regions.

However, it is clear that provision must be made for a confirmatory analytical method to be available. This method can be either ultraviolet-visible or infra-red spectroscopy, but not necessarily both. In cases where funds are already available from other sources the Division of Narcotic Drugs can, subject to availability of resources, advise government authorities, at their request, on appropriate requirements in specific situations.

National authorities should, after having decided that additional equipment is required, pay special attention to such matters as purchasing (including competitive bidding and tender procedures), service contracts, warranty requirements, training facilities and the availability of operating and maintenance manuals in local languages.

The attention of national authorities also is drawn to the usefulness of the United Nations Drug Identification Kit prepared by the Division of Narcotic Drugs. This can serve, *inter alia*, as a basic teaching tool for use by the staff of narcotics laboratories in demonstrating basic techniques for primary identification of suspect material seized from the illicit traffic by law enforcement personnel. National and regional laboratories are encouraged to write to the Division of Narcotic Drugs at the address given in the Introduction with a view to making the necessary arrangements to acquire the Drug Identification Kit for this purpose.

Relatively expensive equipment has been marked with an asterisk (*) in the list below; Governments considering the acquisition of such equipment may wish to review all national resources to determine whether these items are already available.

A. Volumetric measurement

- Graduated cylinders, assorted from 5 to 1000 ml
- Pipettes, assorted from 1 to 20 ml
- Volumetric flasks, assorted from 5-1000 ml

B. General glassware

- Beakers, assorted from 5 to 1000 ml
- Erlenmeyer flasks, assorted from 10 to 1000 ml
- Test tubes, length 130 mm, diameter 25 mm
- Dessicator, diameter 250 mm
- Glass tubing
- Glass rods
- Flasks fitted with eye-droppers
- Glass stoppers, assorted
- Reagent flasks
- Reagent labels

C. General equipment and material

- Melting point apparatus
- * Wide field microscope
- * Refrigerator, explosion proof
- Hot plates or heating mantles
- Water bath
- Mortars and pestles
- Spot plates
- Spatulas, assorted
- Tweezers
- Test tube stands
- Support, rectangular base with clamps
- Ring support with clamp
- Tubing, regular and thick-walled for vacuum

D. Weight measurement

- * Analytical balance, to 0.1 mg
- Rough balance, top loading, to 0.01 g
- Weighing paper

E. Extraction and separation

1. Equipment
 - Mechanical shaker
 - Centrifuge

2. Material and accessories
 - Soxhlet apparatus
 - Thimbles
 - Separatory funnels 50, 100 and 200 ml
 - Funnels for gravity filtration, diameter 40-60 mm
 - Buchner funnels for vacuum filtration, diameter 65-85 mm
 - Suction flasks, 100 - 500 ml
 - Funnel rubber adaptor set
 - Filter paper, assorted from 7 to 12.5 cm
 - Centrifuge tubes

F. pH estimation

- pH paper, 0-14

G. Distillation and evaporation

1. Equipment
 - Water distillation apparatus
 - Rotary evaporator for flash evaporation

2. Material
 - Water condensers
 - Round bottom flasks, assorted from 50-1000 ml
 - Supports for round bottom flasks, assorted
 - Laboratory jacks

H. Thin-layer chromatography (TLC)

1. Equipment
 - Spreading table with levelling device
 - TLC spreader

* These instruments, although desirable, are relatively expensive.

Drying rack for 20 x 20, 20 x 10 and 20 x 5 cm TLC plates
Drying cabinet
TLC plate storage cabinet, temperature range 40-250°C
TLC spray box
Developing tanks for 20 x 20 cm plates
Atomizers with rubber bellows for spray reagents
Air blower

* Ultraviolet detection lamp, 254 and 366 nm

2. Material

Glass plates 20 x 20, 20 x 10 and 20 x 5 cm
Silica gel with and without fluorescent indicator; alumina and
other adsorbent layers
Micropipettes, 5 ul
Spotting guide(s)

I. *Gas-liquid chromatography (GLC)*

1. Instrumentation

* Gas-chromatograph equipped with flame ionization detector
* Reporting integrator

2. Accessories and material

Glass columns, length 2 m, internal diameter 2 mm
OV-17 (3%) on Chromosorb W-HP, 90-100 mesh and other commonly
used phases (e.g. OV-1, OV-101, SE-30)

Silane-treated glass wool

Vibrator

* Vacuum pump

Ferrules

Septa

Nuts

Column caps

Syringes, 10 ul

Viials

Carrier gases

J. *Ultraviolet-visible spectroscopy (UV-Vis.)*

1. Equipment

* Ultraviolet-visible spectrophotometer (190-800 nm) with strip
chart recorder

2. Accessories and material

Matched cells, assorted window material with Teflon stoppers

Spectroscopy grade solvents

K. *Infra-red spectroscopy (IR)*

1. Equipment

* Infra-red spectrophotometer with strip chart recorder.

2. Accessories and material

KBr die, 13 mm

Ultra micro KBr die

Paper rings for 13 mm die

* These instruments, although desirable, are relatively expensive.

Micro disc holder
Agate mortar and pestle
Manual hydraulic press, 15 ton
Demountable cell mounts
Rectangular and circular NaCl windows
Assorted rectangular and circular Teflon spacers
Stoppers
Syringe, 2 ml
Nujol
Fluorolube
KBr

*L. Other***

Air-conditioner
Dehumidifier
Constant voltage regulator
Water pressure regulator

** If required in view of local climatic and other conditions.

III. REFERENCE BOOKS AND OTHER INFORMATION MATERIAL

In addition to qualified staff and basic equipment, information of a scientific and technical nature should be available to narcotics laboratories. This information should include reference and text books on various analytical methods and instrumentation, chemical indices and handbooks as well as texts on drugs of abuse. Texts of this nature may already have been acquired by university libraries and government facilities, and a search of existing resources would be useful to avoid duplication of expensive reference works.

Also necessary for the efficient functioning of a national laboratory is the availability of texts of relevant national drug legislation and of United Nations material including the international Conventions on drugs of abuse and the United Nations Multilingual Dictionary of Narcotic Drugs and Psychotropic Substances under International Control.

Maintenance manuals and operator's handbooks for equipment items should be readily available. In the case of major items of equipment, service manuals and spare part lists should also be acquired, especially where local servicing facilities may not be fully developed. Copies of handbooks, safety precautions, service handbook (if any) and the names/telephone numbers of local service agents should be available near the equipment.

In addition, and depending on the resources available, acquisition of specialized publications, review articles and periodicals dealing with drug analysis could be useful.

A. Basic Texts

*Items costing more than US\$ 100 at 1984 prices

Bloss, F.D. An Introduction to the Methods of Optical Crystallography. New York, Holt, Rinehart and Winston, 1961. 301 p.

Bobbitt, J.M. Introduction to Chromatography. New York, Van Nostrand Reinhold, 1968. 160 p.

British Pharmacopoeia 1980. Infra-red Reference Spectra, 1st Suppl. London, H.M.S.O., 1981. 82 p.

- * Clarke, E.G.C. (Ed.). Isolation and Identification of Drugs in Pharmaceuticals, Body Fluids and Post-mortem Material. London, Pharmaceutical Press, Vol. 1, 1969; Vol. 2, 1975.
- * Feigl, F. Spot Tests in Organic Analysis, 7th edn. New York, Elsevier, 1966. 772 p.

- Fulton, C.C. Modern Microcrystal Tests for Drugs: The Identification of Organic Compounds by Microcrystalloscopic Chemistry. New York, Wiley-Interscience, 1969. 466 p.
- Goodman, L.S. and A. Gilman (Eds.). The Pharmacological Basis of Therapeutics, 6th edn. New York, Macmillan, 1980. 1843 p.
- Grover, F. Laboratory Organization and Management, London, Butterworths, 1979. 241 p.
- Horwitz, W. (Ed.). Official Methods of Analysis of the Association of Official Analytical Chemists, 12th edn. Arlington VA, USA, A.O.A.C. 1980. 1038 p.
- * Instrumental Data for Drug Analysis. By Terry Mills and others. New York, Elsevier, 1982. 2 v.
- Mason, C.W. Handbook of Chemical Microscopy. 4th edn. New York, Wiley. 1983. Vol. 1. 505 p.
- * Reynolds, J.E.F. (Ed.). Martindale: The Extra Pharmacopoeia. 28th edn. Pharmacopoeial Press, London, 1982. 2025 p.
- Shriner, R.L., R.C. Fuson and D.Y. Curtin. Systematic Identification of Organic Compounds, New York, Wiley, 1980. 604 p.
- Silverstein, R.M. and G.C. Bassler. Spectrometric Identification of Organic Compounds. 4th edn. New York, Wiley, 1981. 442 p.
- Skoog, D.A. and D.M. West. Fundamentals of Analytical Chemistry. 4th edn. London, Saunders College, 1982. 859 p.
- Stahl, E. (Ed.). Drug Analysis by Chromatography and Microscopy: A Practical Supplement to Pharmacopoeias. Ann Arbor; MI, USA, Arbor Science Publishers, 1975. 238 p.
- Sunshine, I. (Ed.). CRC Handbook of Spectrophotometric Data of Drugs. Boca Raton; FL, USA, CRC Press, 1981. 496 p.
- Walker, J.Q., M.T. Jackson and J.B. Maynard. Chromatographic systems. Maintenance and troubleshooting. New York and London, Academic Press, 1972. 289 p.
- * West, R.C. Handbook of Chemistry and Physics. 63rd edn. Boca Raton; FL, USA, CRC Press, 1982. 2432 p.
- Windholz, M. (Ed.) Merck Index (The): An Encyclopedia of Chemicals and Drugs. 10th edn. Rahway; NJ, USA, Merck, 1983. 2052 p.
- * Zweig, G. and J. Sharma (Eds.). Handbook of Chromatography. Cleveland; OH, USA, CRC Press, 1972. 2 v. Vol. 1, 784 p; Vol. 2, 343 p.

B. United Nations Publications and Documentation

United Nations. Single Convention on Narcotic Drugs, 1961, as amended by the 1972 Protocol Amending the Single Convention on Narcotic Drugs, 1961, including schedules; Final Acts and Resolutions as agreed by the 1961 United Nations Conference for the Adoption of a Single Convention on Narcotic Drugs and by the 1972 United Nations Conference to Consider Amendments to the Single Convention on Narcotic Drugs, 1961, respectively. New York, United Nations, 1977. 53 p. Sales No. E.77.XI.3.

United Nations. Convention on Psychotropic Substances 1971, including Final Act and Resolutions, as agreed by the 1971 United Nations Conference for the Adoption of a Protocol on Psychotropic Substances, and the Schedules annexed to the Convention. New York, United Nations, 1977. 33 p. Sales No. E.78/XI.3.

United Nations. Division of Narcotic Drugs. Part C of annual reports of Governments reporting on illicit traffic (E/IT/Series). Quarterly summaries of illicit transactions and seizures (E/NS.Series).

United Nations. Division of Narcotic Drugs. Multilingual Dictionary of Narcotic Drugs and Psychotropic Substances under International Control. 347 p. (ST/NAR/1) Sales No. E/F/R/S 83.XI.5.

United Nations. Division of Narcotic Drugs. Bulletin on Narcotics. Special issue on the role of Narcotics Laboratories in combating the illicit traffic, vol. 36. 1984.

United Nations. Division of Narcotic Drugs. Staff Skill Requirements and Basic Equipment for Narcotic Laboratories. Manual for use by National Authorities on Establishment and Operational Needs of National Narcotics Laboratories.

United Nations. Commission on Narcotic Drugs. Review and implementation of the programme of strategy and policies for drug control: report of the expert group to co-ordinate research on the physical and chemical characteristics of heroin to trace its origin and movement in the illicit traffic. 15 November 1982. 12 p., including annexes (E/CN.7/1983/2/Add.4).

United Nations. Division of Narcotic Drugs. The identification by enforcement officers of drugs of abuse: report of a consultant group. Geneva, 15-18 January 1974. 22 p., including annexes (MNAR/2/74).

C. Specialized books, articles and pamphlets

*Items costing more than US\$100 at 1984 prices

Baker, P.B. and G.F. Phillips. The Forensic analysis of drugs of abuse. Analyst (London) 108:1288:777-807. 1983.

Baselt; R.C. Disposition of Toxic Drugs and Chemicals in Man. 2nd edn. Davis; CA, USA, Biomedical Publications, 1982. 800 p.

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Analysis of Drugs of Abuse by Chromatographic Methods (reprints of selected articles). Collected and arranged by E. Berman and S. Preston. Niles; IL, USA, Preston Publications, 1978. 325 p.

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ANNEX

SUGGESTED LABORATORY LAYOUTS

Layout A

Layout B

Layout C

SUGGESTED LABORATORY LAYOUTS

The physical facilities of a narcotics laboratory must be designed to ensure maximum efficiency, safety and security, taking into consideration local climatic and other factors. The costs of establishing a laboratory facility will vary from region to region depending on the local building code and on the nature and specifications of construction materials. In addition, it should be noted that the building in which a laboratory is placed will dictate the distribution and location of rooms and equipment. The laboratory layouts shown in the following pages are intended as examples to assist authorities in planning for the establishment of a narcotics laboratory.

From the standpoint of cost effectiveness, existing laboratory facilities established for general health purposes and for drug quality control should also be surveyed with a view to identifying and adapting a suitable section or sections for the identification and analysis of drugs.

In general, the layout design should provide for adequate space and for such services as electricity, water, gas, ventilation and waste drain lines.

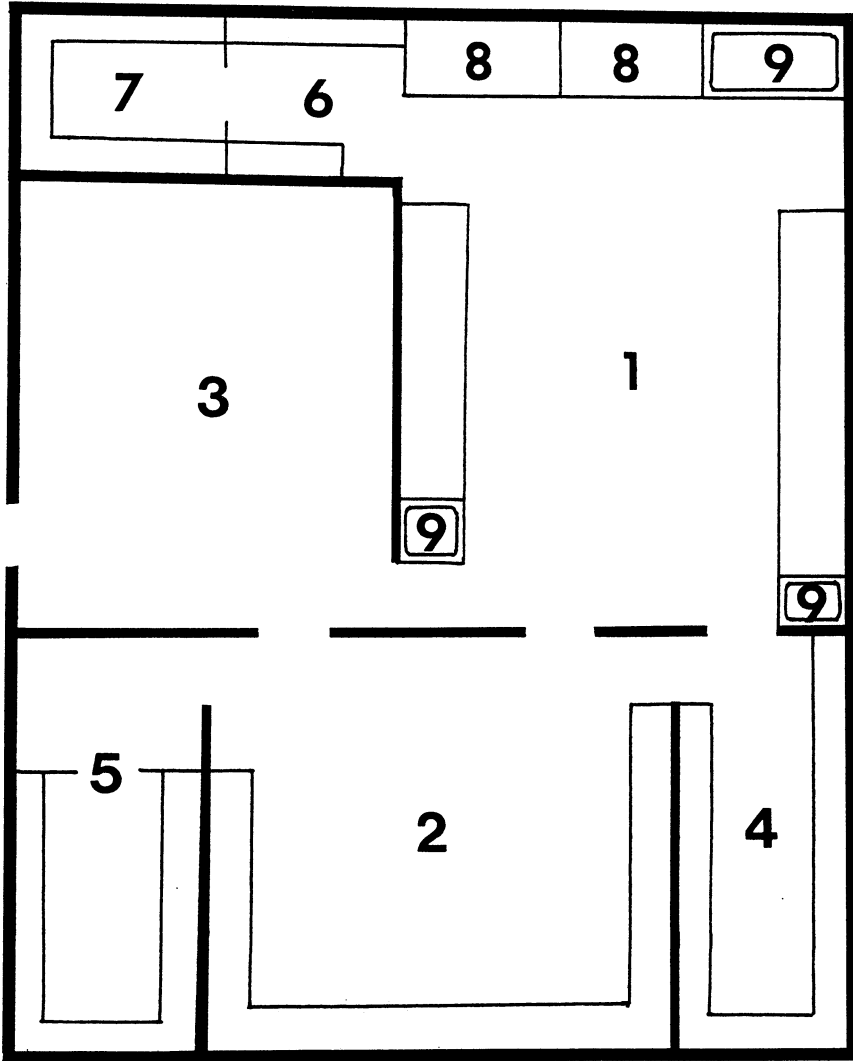
Provision should also be made for fume cupboards as well as for a vibration-free area where analytical balances can be placed on marble or other heavy supports.

Volatile solvents should be stored in a separate and adequately ventilated room, fitted with spark-free electrical switches and well-insulated explosion-proof light bulbs.

In addition, efforts should be made to ensure that the drain lines as well as the bench tops are acid-resistant; emergency showers, eye and face wash fountains as well as appropriate fire extinguishers should be installed.

Finally, the facilities must be provided with a vault inside the laboratory to ensure the secure storage of reference samples of drugs of abuse as well as of material seized from the illicit traffic.

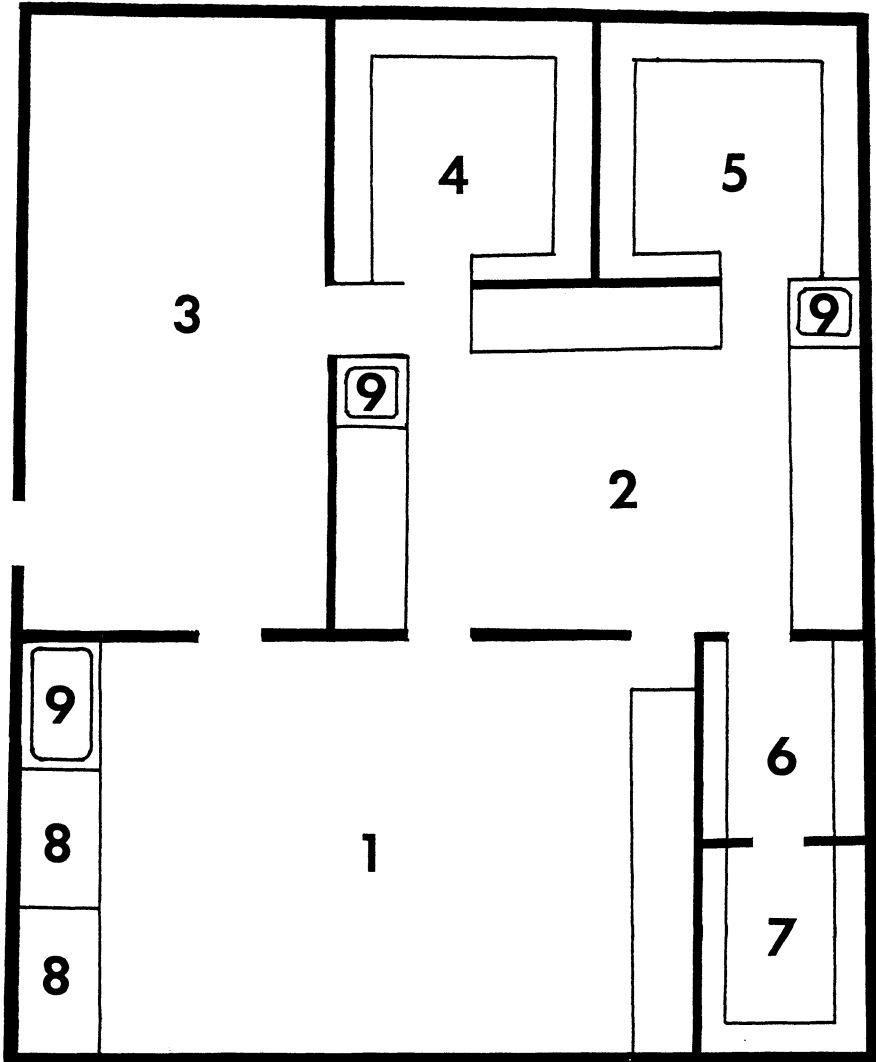
LAYOUT C



- 1. LABORATORY AREA
- 2. INSTRUMENTAL AREA
- 3. BUSINESS OFFICE
- 4. BALANCE ROOM

- 5. STRONG ROOM
- 6. GENERAL STORAGE ROOM
- 7. SOLVENT STORAGE ROOM
- 8. FUME CUPBOARDS
- 9. SINK

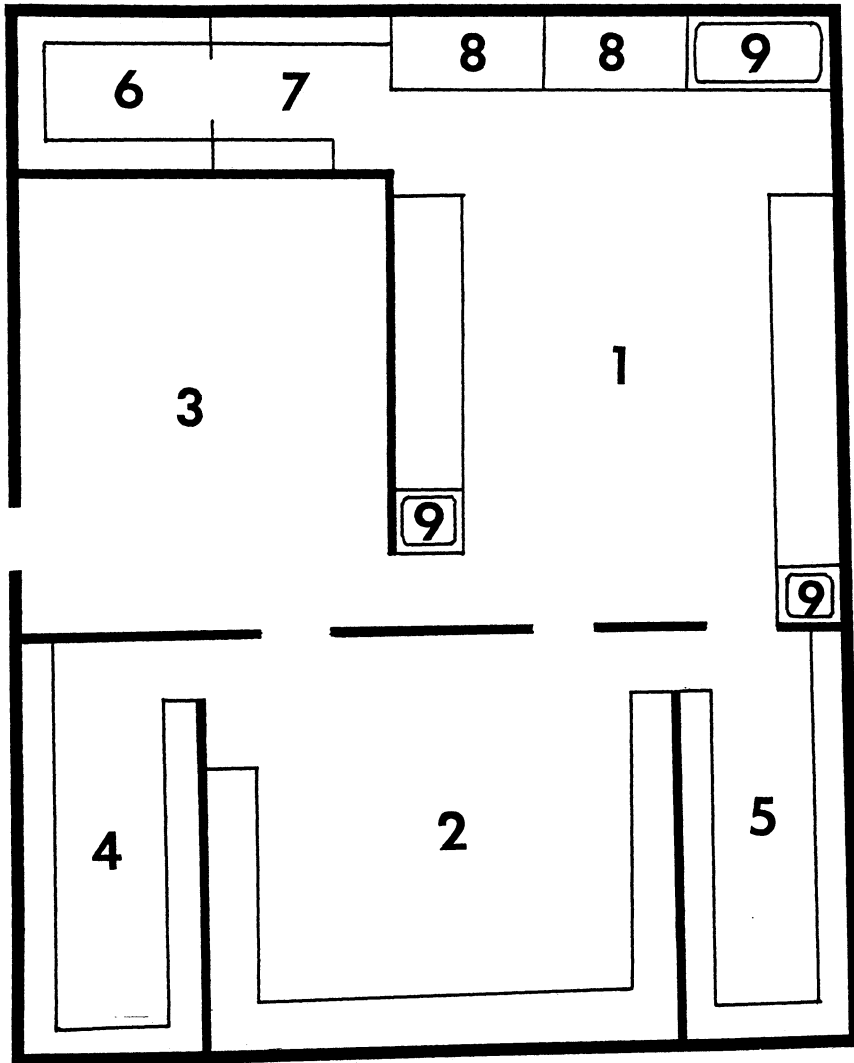
LAYOUT B



- 1. LABORATORY AREA
- 2. INSTRUMENTAL AREA
- 3. BUSINESS OFFICE
- 4. BALANCE ROOM

- 5. STRONG ROOM
- 6. GENERAL STORAGE ROOM
- 7. SOLVENT STORAGE ROOM
- 8. FUME CUPBOARDS
- 9. SINK

LAYOUT A



- 1. LABORATORY AREA
- 2. INSTRUMENTAL AREA
- 3. BUSINESS OFFICE
- 4. BALANCE ROOM

- 5. STRONG ROOM
- 6. GENERAL STORAGE ROOM
- 7. SOLVENT STORAGE ROOM
- 8. FUME CUPBOARDS
- 9. SINK



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The United Nations and Drug Control

Available in Arabic, English, French, German and Spanish. 68 pages; 1982.

Catalogue of the Film Library of the Division of Narcotic Drugs

Trilingual: English, French and Spanish. 35 pages; 1982.

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Available in English, French and Spanish. 21 pages; 1982.

Resource Book on Measures to Reduce Illicit Demand for Drugs

Available in Arabic, English, French and Spanish. 108 pages; revised 1982.

Manual on Drug Abuse Assessment

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Available in English, French and Spanish. Part one, 41 pages; part two, 56 pages; 1980.

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English only. 93 pages; 1979.

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