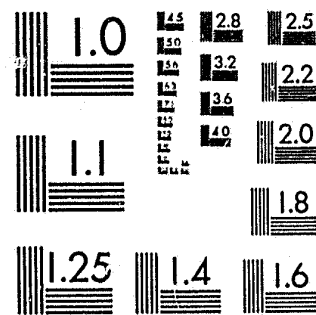


National Criminal Justice Reference Service



This microfiche was produced from documents received for inclusion in the NCJRS data base. Since NCJRS cannot exercise control over the physical condition of the documents submitted, the individual frame quality will vary. The resolution chart on this frame may be used to evaluate the document quality.



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

Microfilming procedures used to create this fiche comply with the standards set forth in 41CFR 101-11.504.

Points of view or opinions stated in this document are those of the author(s) and do not represent the official position or policies of the U. S. Department of Justice.

National Institute of Justice
United States Department of Justice
Washington, D. C. 20531

2/3/84

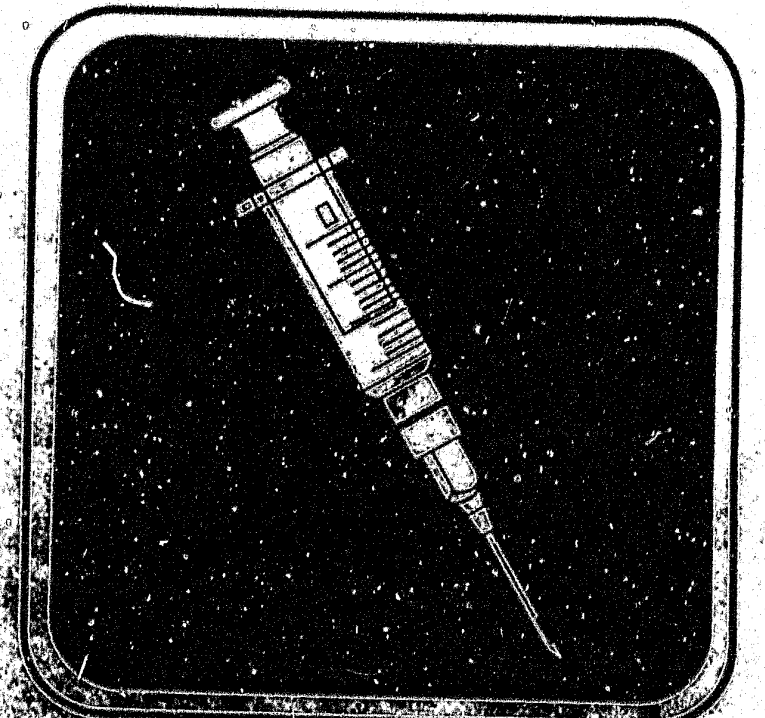


U.S. Department of Justice
National Institute of Justice

Technology Assessment Program

INFORMATION CENTER

Assessment of Color Test Reagents/ Kits for Preliminary Identification of Drugs of Abuse



A Program of the National Institute of Justice
Conducted by the
INTERNATIONAL ASSOCIATION of CHIEFS of POLICE
AUGUST 1983

90356

National Institute of Justice

James K. Stewart
Director

**National Institute of Justice
Advisory Board**

Dean Wm. Roach, Chairman
Commissioner
Pennsylvania
Crime Commission
St. Davids, Pa.

Frank Carrington, Vice Chairman
Executive Director
Victims' Assistance
Legal Organization
Virginia Beach, Va.

Donald Baldwin
Executive Director
National Law Enforcement
Council
Washington, D.C.

Pierce R. Brooks
Retired Chief of Police
Eugene, Oreg.

Leo F. Callahan
President
International Association
of Chiefs of Police
Fort Lauderdale, Fla.

James Duke Cameron
Justice
Arizona Supreme Court
Phoenix, Ariz.

Donald L. Collins
Attorney
Collins and Alexander
Birmingham, Ala.

Harold Daltch
Attorney, partner
Leon, Weill and Mahony
New York City

Gavin de Becker
Public Figure Protection
Consultant
Los Angeles, Calif.

John Duffy
Sheriff
San Diego, Calif.

George D. Haimbaugh, Jr.
Robinson Professor of Law
University of South Carolina
Law School
Columbia, S.C.

Richard L. Jorandby
Public Defender
Fifteenth Judicial Circuit
of Florida
West Palm Beach, Fla.

Kenneth L. Khachigian
Public Affairs Consultant
formerly Special Consultant
to the President
San Clemente, Calif.

Mitch McConnell
County Judge/Executive
Jefferson County
Louisville, Ky.

Guadalupe Quintanilla
Assistant Provost
University of Houston
Houston, Texas

Frank K. Richardson
Associate Justice
California Supreme Court
San Francisco, Calif.

Bishop L. Robinson
Deputy Commissioner
Baltimore Police Department
Baltimore, Md.

James B. Roche
Massachusetts State
Police Force
Boston, Mass.

H. Robert Wientzen
Manager
Field Advertising Department
Procter and Gamble
Cincinnati, Ohio

Assessment of Color Test Reagents/Kits for Preliminary Identification of Drugs of Abuse

Prepared by the
**TECHNOLOGY ASSESSMENT PROGRAM INFORMATION CENTER
RESEARCH AND DEVELOPMENT DIVISION
INTERNATIONAL ASSOCIATION OF CHIEFS OF POLICE
Gaithersburg, Maryland 20878**

under

**Supporting Grant Number
811J-CX-0071**

**AWARDED BY THE
U.S. Department of Justice
National Institute of Justice
Office of Development, Testing, and Dissemination**

**U.S. Department of Justice
National Institute of Justice**

90356

This document has been reproduced exactly as received from the person or organization originating it. Points of view or opinions stated in this document are those of the authors and do not necessarily represent the official position or policies of the National Institute of Justice.

Permission to reproduce this copyrighted material has been granted by
Public Domain/LEAA/NIJ

U.S. Department of Justice
to the National Criminal Justice Reference Service (NCJRS).

Further reproduction outside of the NCJRS system requires permission of the copyright owner.

Test results and analyses herein do not represent product approval or endorsement by the National Institute of Justice, the U.S. Department of Justice; the National Bureau of Standards, the U.S. Department of Commerce; the IACP; or the laboratories which conducted the equipment testing.

ABOUT THE TECHNOLOGY ASSESSMENT PROGRAM

The Technology Assessment Program is sponsored by the Office of Development, Testing, and Dissemination of the National Institute of Justice (NIJ), U.S. Department of Justice. The program responds to the mandate of the Justice System Improvement Act of 1979, which created NIJ and directed it to encourage research and development to improve the criminal justice system and to disseminate the results to federal, state, and local agencies.

The Technology Assessment Program is an applied research effort that determines the technological needs of justice system agencies, sets minimum performance standards for specific devices, tests commercially available equipment against those standards, and disseminates the standards and the test results to criminal justice agencies nationwide and internationally.

The program operates through:

The **Technology Assessment Program Advisory Council (TAPAC)** consisting of nationally recognized criminal justice practitioners from federal, state, and local agencies, which assesses technological needs and sets priorities for research programs and items to be evaluated and tested.

The **Law Enforcement Standards Laboratory (LESL)** at the National Bureau of Standards, which develops voluntary national performance standards for compliance testing to ensure that individual items of equipment are suitable for use by criminal justice agencies. The standards are based upon laboratory testing and evaluation of representative samples of each item of equipment to determine the key attributes, develop test methods, and establish minimum performance requirements for each essential attribute. In addition to the highly technical standards, LESL also produces user guides that explain in non-technical terms the capabilities of available equipment.

The **Technology Assessment Program Information Center (TAPIC)** operated by the International Association of Chiefs of Police (IACP), which supervises a national compliance testing program conducted by independent agencies. The standards developed by LESL serve as performance bench marks against which commercial equipment is measured. The facilities, personnel, and testing capabilities of the independent laboratories are evaluated by LESL prior to testing each item of equipment, and LESL helps the Information Center staff review and analyze data. Test results are published in Consumer Product Reports designed to help justice system procurement officials make informed purchasing decisions.

All publications issued by the National Institute of Justice, including those of the Technology Assessment Program, are available from the National Criminal Justice Reference Service (NCJRS), which serves as a central information and reference source for the nation's criminal justice community. For further information, or to register with NCJRS, write to the National Institute of Justice, National Criminal Justice Reference Service, Washington, DC 20531.

James K. Stewart, Director
National Institute of Justice

CONTENTS

	Page
Executive Summary	i
• Table 1 - Summary of Test Results	ii
Introduction	1
Chemical Tests for the Preliminary Identification of Drugs	2
The Standard	5
Models and Manufacturers of Color Test Reagents/Kits Tested	7
The Testing Laboratories	8
The Test Results	9
Tabulations of Test Results	11
• Faurot Narcotic Kit	12
• Ferguson Kit	13
• Mikrotest Kit	14
• Narcoban Test Kit	15
• Narcoban-Jr Kit	16
• Nark Kit	17
• NIK Narcotics Identification System	18
• ODV Narcotic Disposakit	19
• Quantkit	20
• Sirchie Drug Identification Kit MZ001	21
• Sirchie Drug Identification Kit MZ002	22
• Valtox Kit	23
Reagent/Drug Combinations Tested	25
• Faurot Narcotic Kit	26
• Ferguson Kit	26
• Mikrotest Kit	26
• Narcoban Test Kit	27
• Narcoban-Jr Kit	27
• Nark Kit	28
• NIK Narcotics Identification System	28
• ODV Narcotic Disposakit	29
• Quantkit	29
• Sirchie Drug Identification Kit MZ001	30
• Sirchie Drug Identification Kit MZ002	31
• Valtox Kit	31
Bibliography	32
Appendix - NIJ Standard 0605.00	33

EXECUTIVE SUMMARY

Color tests are the most common laboratory procedures used by chemists for making preliminary examinations of suspected drugs. The tests, because of their convenience and simplicity, are also widely used in the field by law enforcement investigators to make preliminary identifications of controlled substances. It is important to emphasize that the tests have an inherent problem—they indicate only the *possible* presence or absence of a drug. Nonetheless, and with this caveat firmly in mind, color test kits are a valuable tool for the preliminary identification of drugs of abuse.

The Testing Program for Color Test Reagents/Kits for Preliminary Identification of Drugs of Abuse was conducted by the Technology Assessment Program Information Center (TAPIC) of the IACP under a grant from the National Institute of Justice (NIJ). The program is an applied research effort operated under the auspices of NIJ's Office of Development, Testing and Dissemination. It is part of a larger law enforcement equipment program involving NIJ, IACP and the Law Enforcement Standards Laboratory (LESL) of the National Bureau of Standards (NBS). The program is a broadly based mutual effort in which the TAPIC supervises independent testing of police equipment, using NIJ standards developed by LESL under Institute guidance.

Five major categories of equipment are included in the Technology Assessment Program (TAP):

- Communications and Electronics
- Forensic Science
- Security Systems
- Transportation
- Weapons and Protective Equipment

The law enforcement community is another partner involved in the TAP with major representation on the Technology Assessment Program Advisory Council (TAPAC). The TAPAC has a dual role functioning as an integral part of TAP and as an advocate for the needs of the law enforcement community. Test results in the program are published in reports similar to this document to help police administrators and other officials in the criminal justice system make informed decisions when purchasing law enforcement equipment.

In this phase of the program the TAPIC tested a wide assortment of chemical spot test kits that have been developed commercially for making field tests of drugs. NIJ Standard 0605.00, "Color Test Reagents/Kits for Preliminary Identification of Drugs of Abuse" was used as the reference standard for examining the 12 kits identified by TAPIC in its extensive survey of the police equipment market. The standard establishes minimum requirements for color test reagents/kits and provides test methods to determine compliance with these requirements. It is adapted from a standard published earlier, NILECJ Standard 0604.00, "Chemical Spot Test Kits for Preliminary Identifications of Drugs of Abuse."

The examinations of the kits were conducted by two independent laboratories selected in open competition after announcement of the program in the *Commerce Business Daily*. Final selection of the testing laboratories was based on objective scoring of their competence to perform the tests, and on-site inspections by the Office of Testing Laboratories Evaluation Technology of NBS, LESL, and IACP.

Every kit examined in this program was tested against each requirement of the standard. The results of the tests are summarized in Table 1, which follows. A detailed tabulation of the test results for each kit is provided in the body of this report. The same convention is used in all tabulations of this report; "P" means the requirement of the standard was met, "X" means the requirement of the standard was not met.

TABLE 1
SUMMARY OF TEST RESULTS

NIJ Standard - 0605.00			FAUROT NARCOTIC KIT	FERGUSON KIT	MIKROTEST KIT	SIRCHIE NARPK KIT	NARCOBAN-JR KIT	NARCOBAN TEST KIT	NIK	ODV	QUANT KIT	SIRCHIE KIT M2001	SIRCHIE KIT M2002	VALTOX KIT
Paragraph	Sub-paragraph	Performance Requirement	Compliance	Compliance	Compliance	Compliance	Compliance	Compliance	Compliance	Compliance	Compliance	Compliance	Compliance	Compliance
4.1		User Information												
4.1.1		Drugs Detected	P	P	P	P	P	P	P	P	P	P	P	P
4.1.2		Instructions												
		Clarity	P	P	X	P	P	P	P	P	P	P	P	P
		Time	X	P	P	P	P	P	P	P	P	X	X	P
		Final Color	P	P	P	P	P	P	P	P	P	P	P	P
4.1.3		Safety Precautions												
	a	Hazards Warning	X	P	P	P	P	P	P	X	P	P	P	X
	b	Antidotes	X	X	X	P	P	X	P	X	P	X	P	X
	c	Discard Procedures	X	P	X	P	P	P	P	P	X	X	P	X
4.1.4		General												
	a	Presumptive Tests	X	P	P	P	P	X	P	X	P	P	P	P
	b	Training	X	P	P	P	X	X	X	X	X	X	X	X
	c	Contamination	X	P	X	P	P	X	P	X	P	X	X	X
4.2		Labeling												
	a	Reagent Identification	P	X	P	P	P	P	P	P	X	P	P	P
	b	Drug(s) Detected	P	P	P	P	P	P	P	P	P	P	P	P
	c	Danger Markings	X	P	X	P	P	X	P	P	X	P	P	X
	d	Discard Date	X	X	X	X	X	X	X	X	X	X	X	P
4.3		Workmanship	P	P	P	P	P	P	P	P	P	X	P	P
4.4		Safe Disposal Materials	X	X	X	P	X	P	P	P	X	X	P	X
4.5		Color Samples	X	X	P	P	P	X	P	P	P	X	X	P
4.6		Test Color & Sensitivity	P ¹	P ¹	X ¹	P ¹	P ¹	P ¹	P ¹	P ¹	X ¹	X ¹	X ¹	P ¹
4.7		Drug Detection Limit	P	P	P	P	P	P	P	P	P	P	P	P

¹See "Tabulation of Test Results" for this manufacturer's kit listing compliance or noncompliance for all reagent/drug combinations tested.

Note: P = Requirement of the standard was met.
X = Requirement of the standard was not met.



INTRODUCTION

Color test reagents/kits for the presumptive identification of marijuana, narcotics and other drugs of abuse are a relatively small but extremely important segment of the police equipment market. The reagents/kits are used by law enforcement officers to make chemical tests of drugs in the field or under other circumstances where there is an urgent need for preliminary identification of a substance suspected to be an illegal drug. Reagents are any chemical or solution used to produce a desired chemical reaction. They are provided with drug test kits to examine suspected substances for the presence of drugs. Since the reagents are intended to produce one or more colors when they react with a particular substance, they are usually called color test reagents.

Early in the Technology Assessment Program the Technology Assessment Program Advisory Council (TAPAC) identified color test reagents/kits and the need for more comprehensive information about them as top priority items. As with other critical items of police equipment tested in the program, the TAPAC recommended:

- developing a performance standard for color test reagents/kits,
- obtaining comparative performance data by testing the kits against the standard, and
- producing a consumer-type report from the performance data as a guideline for users of the kits.

The matter presented in this document is a report and discussion of the testing program conducted by the Technology Assessment Program Information Center (TAPIC) of the IACP on the color test reagents/kits marketed by various manufacturers of this equipment for law enforcement officers and other users in the criminal justice system. The tests were conducted using National Institute of Justice Standard 0605.00 "Color Test Reagents/Kits for Preliminary Identification of Drugs of Abuse." Twelve kits were tested according to the detailed test procedures of the standard and the test results were compared to the minimum performance requirements specified by the standard to determine whether or not the reagents/kits complied with each of those requirements.

A very large volume of data was compiled in the tests performed on the reagents/kits, and has been summarized for this report which includes a tabulation of the test results obtained for each of the twelve kits tested. These tabulations show whether the individual kits and their component reagents did or did not meet the minimum performance requirements specified in the several sections of the standard.

The test results published by the TAPIC in this and other reports on law enforcement equipment are intended to help law enforcement officers make informed decisions when selecting technical equipment for purchase. With the detailed information furnished in this document the user can select from the various kits tested the particular kit and combination of reagents that will best suit his needs in enforcing the drug laws.

CHEMICAL TESTS FOR THE PRELIMINARY IDENTIFICATION OF DRUGS

All of the common chemical tests used in drug test kits are relatively simple procedures, and many of the tests involve using only a single reagent. In the simplest tests a preliminary identification of the suspected drug is made by mixing it with a chemical reagent that produces a color characteristic of the particular drug/reagent combination. Other tests use two or more reagents, each reagent being added to the drug in a given sequence and at short time intervals, to produce the characteristic color(s) needed for an identification. In some tests the reagents produce a succession of several colors as an identification of a suspected drug.

There are many variations of the reagent/drug combinations that can be used as tests for illegal drugs. Color tests and the variations of these tests called "spot tests" represent a surprisingly large number of chemical reagents employed by chemists to identify many substances that happen to include drugs of abuse. In fact, the field tests commonly used by law enforcement officers are only a relatively small number of the color tests used by chemists to identify drugs in making laboratory examinations of controlled substances. It would simplify drug testing greatly if each drug could be identified by a reagent that produces a unique result such as an unmistakable interference-free color change when it reacts with the drug being tested. This, however, is not the situation. Even in the hands of professional chemists the use of color test reagents for specific identification of unknown drugs becomes a complex, time-consuming procedure requiring experience with the test methods and in observing the test results. Single test results particularly, must be interpreted with caution by law enforcement officers. Experienced drug chemists follow the widely accepted principle that *a single chemical test producing a color reaction seldom makes a specific identification of a drug to the exclusion of all other drug substances*, i.e. the result of a lone positive color test is nothing more than a presumptive identification.

Limitations of Color Tests for Drugs

The limitations of color test reagents for making preliminary identifications of drugs in the field cannot be emphasized too strongly.

Field tests are basically simple to perform but the results of the tests may be misleading to the users who are not familiar with their limitations. The correct interpretation of a single positive color test is that it establishes only a possibility that the suspected drug is present. Paragraph 4.1.4(a) of NIJ Standard 0605.00 stresses the limitation of color test reagents/kits for preliminary identification of drugs of abuse. This paragraph requires the manufacturer to make "a statement that the reagents in the kit are intended to be used for presumptive tests only, and that all substances tested with the kit should be subjected to more definitive examination by qualified scientists in a crime laboratory."

Paragraph 4.1.4 also contains several other provisions that are related to the limitations of color tests for drugs to place additional emphasis on these limitations. These provisions require manufacturers to notify users of the kit that they should:

- receive appropriate training,
- be taught that the reagents can give false positive as well as false negative results, and
- be informed of the possibility of reagent and/or sample contamination and consequent misleading results.

All of the above instructions are essential for users to avoid invalid test results. The various provisions of paragraph 4.1.4 are in a true sense corollaries that follow from the initial statement in subparagraph (a). They were included in the standard to emphasize the presumptive character of color tests and the need for users to recognize the limitations of the tests.

In the study of every science, beginners must learn a new vocabulary and that words used in the science often have a more limited or different meaning than in ordinary usage. Almost always this is the case when chemists refer to an identification. This word has different shades of meaning when used in different chemical contexts, particularly in connection with color tests to identify suspected drugs of abuse. The title of NIJ Standard 0605.00 "Color Test Reagents/Kits for Preliminary Identification of Drugs of Abuse" pointedly qualifies *identification* with *preliminary* to emphasize that the reagents are only exploratory or presumptive tests for these drugs, and that color test reagents, when used singly to identify drugs, make only tentative identifications of the drugs under examination. Chemists writing for other chemists stress this characteristic of color tests and spot tests. It is all the more important then for nonchemist users of color tests to understand this limitation of color test reagents.

Feigl's *Spot Tests in Organic Analysis*,¹ the definitive text book on spot tests in chemical analysis, stresses in the opening paragraphs that specific tests for organic compounds (which include drugs of abuse) are rare and that reliable identifications of individual compounds by purely chemical means are infrequent. Feigl explains that in spite of this limitation chemical tests do have a very practical use in determining whether a given substance may be present. This distinction defines very precisely the value of color test reagents for preliminary identification of drugs of abuse. The reagents/kits should be used in field test situations, only to find out whether a particular drug may or may not be present. Parenthetically, this also is the principal reason why paragraph 4.1.4(a) of the standard provides that all substances tested with color test reagents in the field should be subjected to more definitive examination by qualified scientists in a crime laboratory.

The identification of an unknown drug or other compound by chemical analysis is a systematic process, and as mentioned earlier is seldom accomplished by a single chemical test. The systematic approach described by Umberger in *Legal Medicine Pathology and Toxicology*² is a classic in the use of color tests for identifying drugs. It should be required study for every chemist performing drug analyses.

Umberger places special emphasis on the fallibility of any single chemical test for identifying a particular drug. Although he was concerned with the problems of toxicologists in identifying drugs extracted from tissue samples (human organs) and body fluids, the difficulties met in those analyses closely parallel the problems encountered in making field tests for drugs. Umberger particularly stresses that "*Because of uncontrollable variables in the analysis of organic substances (drugs) isolated from tissue, an infallible interpretation cannot be made from any single chemical test.*"

In the same way, the presence of interfering substances such as diluents in street drugs and drug dosage forms, adulterations, impurities, and other drugs affect both the sensitivity and specificity of the tests by altering the reaction(s) of the reagent with the drug(s) present in a mixture. Continuing his discussion of the identification process, Umberger then observes: (emphasis ours) "*The term specific test is inappropriate in organic toxicologic analysis, in fact in any testing procedure, it is the entire process including separation and purification as well as the reaction itself which makes a specific test.*"

The limitations of single chemical tests in toxicology examinations apply in all respects to color test reagents used under similar conditions as field tests for drugs.

In this connection the test methods described in paragraph 5 and the drug detection limits listed in Tables 1 and 2 of NIJ Standard 0605.00 are based on the in-depth studies conducted by Velapoldi and Wicks in *The Use of Chemical Spot Tests Kits for the Presumptive Identification of Narcotics and Drugs of Abuse*³. Their investigations covered the reactions of selected pure drugs with typical chemical reagents found in narcotic chemical spot tests kits. In summarizing their results, these authors conclude: (emphasis ours) "*Most importantly, however, it must be emphasized that these kits are useful in obtaining preliminary and presumptive evidence only and should not be used as sole evidence for the identification of a narcotic or drug of abuse.*"

References

¹Feigl, et al, "Spot Tests in Organic Analysis," Elsevier Publishing Company, New York, 1966.

²Umberger, et al, "Legal Medicine, Pathology and Toxicology," Appleton-Century-Crofts, Incorporated, New York, 1954.

³Velapoldi, R.A., and Wicks, S.A., "The Use of Chemical Spot Tests Kits for the Presumptive Identification of Narcotics and Drugs of Abuse," *Journal of Forensic Sciences*, Vol. 19, No. 3, 1974.

THE STANDARD

The IACP testing program for color test reagents/kits was conducted using NIJ Standard 0605.00, "Color Test Reagents/Kits for Preliminary Identification of Drugs of Abuse." NIJ Standard 0605.00 applies to kits containing chemical reagents used in the field to make color tests for the preliminary identification of drugs of abuse, referred to in the discussion which follows simply as drugs. The standard establishes the minimum requirements for color test reagents/kits employed in identifying these drugs and the methods to be used in testing the reagents to determine whether the reagents comply with the requirements of the standard. It was developed by the Law Enforcement Standards Laboratory (LESL) of the National Bureau of Standards (NBS) and the Technology Assessment Program Advisory Council (TAPAC) of the International Association of Chiefs of Police, and has been promulgated as a voluntary national standard by the National Institute of Justice (NIJ), formerly the National Institute of Law Enforcement and Criminal Justice (NILECJ).

NIJ Standard 0605.00 is an adaptation of NILECJ Standard 0604.00 for "Chemical Spot Test Kits for Preliminary Identification of Drugs of Abuse." The kits addressed in the early standard (NILECJ Standard 0604.00) are designed to identify drugs with some degree of specificity. These kits prescribe a systematic approach in which the drug tests are made with several different chemical reagents in a specific sequence. In general, sequential testing of drug substances is a more reliable and sophisticated method of identification than by testing with a single reagent or a combination of reagents. Systematic testing is basically the method followed by professional chemists in identifying unknown drugs, drug mixtures, and many other substances. In contrast, NIJ Standard 0605.00 is concerned with single reagents (or reagent combinations) that are used to give a *preliminary confirmation* of the identity of a suspected drug or class of drugs.

Neither NIJ Standard 0605.00 nor NILECJ Standard 0604.00 from which it was adapted, applies to kits which use thin layer chromatography as the identification procedure or to kits for identifying drugs in body fluids. Usually NIJ Standard 0605.00 will be referred to in this report simply as the standard.

The principal requirements of the standard are described in paragraphs 4.1 through 4.7, and the methods of testing in paragraphs 5.1 through 5.3. The requirements specify performance characteristics and information to ensure that the reagents and kits meet user needs. The paragraphs include the following provisions:

- 4.1.1 Names of the drugs tentatively identified by each reagent in the kit.
- 4.1.2 Clear instructions for making the tests.
- 4.1.3 Safety precautions to be observed in using the kits.
- 4.1.4 Instructions concerning the need for training and the basic limitations of the reagents.
- 4.2 Labelling of the reagents.
- 4.3 Inspection of workmanship.
- 4.4 Materials for safe disposal of used reagents.
- 4.5 Color samples for matching test results.
- 4.6 Colors specified by the manufacturer for each reagent when it is tested according to paragraph 5 following.
- 4.7 Specification of drug detection limits.

Paragraph 5 specifies the conditions to be observed and the procedures to be used in testing kits to verify conformance to the requirements of paragraphs 4.6 and 4.7.

The standard does not mandate the identities of reagents to be included in a test kit; however, 11 reagents are listed for information purposes in the appendix of the standard since they are among the reagents currently in common use. A kit may contain any reagent or group of reagents that meets the requirements of the standard.

The complete text of the standard is included in the appendix of this report.

MODELS AND MANUFACTURERS OF COLOR TEST REAGENTS/KITS TESTED

The TAPAC program to test color test reagents/kits for preliminary identification of drugs of abuse began with an extensive survey by the IACP to identify all makes of this type equipment currently available for use in law enforcement operations. Twelve different models and nine manufacturers of drug test kits were identified in the survey, as listed below:

Faurot Narcotic Kit	NIK, Narcotics Identification System
Faurot, Incorporated	Becton, Dickinson and Company
Elmsford, New York	Arlington, Texas
Ferguson Test Kit	ODV, Narcotic Disposakit
Ferguson Test Kits and Instruments,	ODV, Incorporated
Incorporated	South Paris, Maine
Baltimore, Maryland	Quantkit
Mikro-Test Kits	Quantkit Company
Parish Chemical Company	Stockton, California
Orem, Utah	Sirchie Drug Identification Kit MZ001
Narcoban Test Kit	Sirchie Fingerprint Laboratories
PM Labs of Nevada, Incorporated	Raleigh, North Carolina
Tarzana, California	Sirchie Drug Identification Kit MZ002
Narcoban-Jr. Kit	Sirchie Fingerprint Laboratories
PM Labs of Nevada, Incorporated	Raleigh, North Carolina
Tarzana, California	Valtox Kit
Nark Kit	Valley Toxicology Laboratory, Incorporated
Sirchie Fingerprint Laboratories	Davis, California
Raleigh, North Carolina	

A specimen of each model was purchased by IACP for examination in the testing program, either from open stock of the manufacturers or from vendors of police equipment.

THE TESTING LABORATORIES

Extensive inquiries were conducted by the IACP in identifying laboratories with the expertise needed to perform the color tests called for by NIJ Standard 0605.00. The testing program was announced to interested laboratories by publication of a notice in the *Commerce Business Daily*, and by mailing nationwide to nearly 70 laboratories a Request for Proposal (RFP) to test the kits. The RFP contained:

- a description of the laboratory work required to perform the compliance tests, and
- a questionnaire to determine the competence of the laboratories to conduct these tests.

One group of laboratories was specifically excluded from participating in the testing program. Laboratories affiliated with manufacturers of color test reagents/kits were disqualified from submitting a proposal to test the kits in order to eliminate a possible conflict of interest on this basis.

Evaluation and approval of the testing laboratories were performed by LESL with the assistance of another NBS group, the Office of Testing Laboratory Evaluation Technology (OTLET). OTLET is the NBS office assigned the responsibility of assessing the competence of testing laboratories qualified to perform tests required by LESL standards, and of accrediting the laboratories qualified to conduct specific tests using specific test methods.

Final selection of the laboratories was based on:

- an objective scoring of the information furnished by the laboratories in their replies to the questionnaire, and
- on-site inspections of the top candidate laboratories by IACP, LESL, and OTLET.

Although IACP's proposal did not require previous experience in a crime laboratory, both laboratories selected to test the kits employed chemists with extensive forensic experience in drug identification. These chemists were assigned the responsibility for supervising the testing procedures in their laboratories. Also, in both laboratories the drug chemists' color vision was measured for accuracy by an OTLET scientist using the Farnsworth Munsell Color Hue Eye Test.

Contracts to conduct the tests were awarded to two laboratories:

- United States Testing Company, Inc., Hoboken, New Jersey; and
- Hauser Laboratories, Boulder, Colorado.

THE TEST RESULTS

Almost without exception, commercial color test kits differ greatly, although they do correspond closely in two respects: the chemical reagents used for making preliminary tests of specific drug substances, and the containers provided by the manufacturers for dispensing the reagents in the kits. For example, the modified Duquenois test for marijuana and the Dille-Koppanyi reagent for the barbiturates are commonly used in the kits as presumptive tests for these drug substances. The reagent containers, regardless of who manufactures the kit are basically two types: bottles supplied with droppers for measuring drops of the reagents, and small sealed ampules or vials containing measured amounts of the reagents. Otherwise test kits can be and are manufactured in widely differing configurations that make it possible to use quite different techniques for testing suspected drug substances. Despite their many differences, it is possible to make valid comparisons of the kits by testing them against a performance standard such as NIJ Standard 0605.00 as the reference.

The tabulations that follow summarize the large volume of data that was obtained and reported by the two testing laboratories in their examinations of commercial color test reagents/kits for preliminary identification of drugs of abuse. Each of the testing laboratories used different formats to report the results of its tests. The test results for all the drug test kits are reported here in a concise, uniform format that includes all the specifications of the standard. The report format was designed to accommodate all the data for the different types of kits tested in this program.

Two separate sets of tables are used for each kit. The first table in a set reports conformance or non-conformance of a kit with all test requirements of the standard except those for paragraph 4.6, "Test Color and Sensitivity of the Reagents." These tables are captioned "Tabulation of Test Results" and list the requirements of the standard; arranged in sequence, identified by their respective paragraph numbers, or where applicable as subparagraphs. Compliance or noncompliance with the standard, as the case may be, is noted with a "P" or an "X" in the appropriate column. The letter "P" in a column or line of a table is used to indicate that the test kit complies with the particular performance requirement of the standard listed. Conversely the letter "X" indicates noncompliance with the designated provision of the standard. If a provision of the standard is marked with the letter "X" in the compliance column, any remarks made by the testing laboratory in evaluating the performance of the test kit are included in the comment column.

The tabulation of test results for each kit is followed by a second set of tables captioned "Reagent/Drug Combinations Tested," that report the test results found in accordance with paragraph 4.6 of the standard for the various reagent/drug combinations specified by the manufacturer. The tests of the reagent/drug combinations were conducted by the methods described in paragraph 5 of the standard with some changes in the test protocols ordered by the IACP. The changes made in the test methods were requested pursuant to paragraphs 4.6 and 4.7 of the standard. Briefly, paragraph 4.6 avoids needless replication of tests made with reagents that produce the same color or sequence of colors with certain classes of drugs, such as the amphetamines with Marquis reagent and the barbiturates with Dille-Koppanyi reagent. Thus, if a reagent produces the same color(s) with more than one drug, this test need be performed for only one of the applicable reagent/drug combinations.

Paragraph 4.7 provides that: The manufacturer shall specify the drug detection limit, determined in accordance with paragraph 5.3, for each drug/reagent combination listed on a reagent container label, other than those listed in Table 1 (of the standard). For any drug listed in Table 2 (of the standard), the numerical value of the limit shall not exceed that listed in Table 2.

Since most of the manufacturers do not:

- specify the drug detection limits for the reagent/drug combinations listed for their reagents, or
- identify their test reagents, as required by paragraph 4.7, by the names and/or compositions given in Appendix A of the standard,

the testing laboratories were instructed to use the maximum acceptable drug detection limits given in Table 2 of NIJ Standard 0605.00, instead of the lower values in Table 1. This change in the test protocol was decidedly advantageous to the manufacturers inasmuch as the maximum acceptable drug detection limits given in Table 2 are with only two exceptions at least ten times greater than the drug detection limits in Table 1. Consequently, Table 2 requires much less sensitive reagents than Table 1.

Every kit examined in this program was tested for compliance with all requirements of the standard. In evaluating the results of the tests it is clear that while all performance requirements are important, some should be considered more important than others, particularly those concerned with the essential functions of the kits.

The tests made of the color reactions and sensitivity of the reagents pursuant to the requirements of paragraph 4.6 obviously have major importance. The reagents are the basic components of the kits. If the reagents don't perform as required in field tests of drugs, the kits have failed in their most important function. The reagents in all the kits tested complied substantially with the requirements of paragraph 4.6 for test color and sensitivity although in a relatively small number of instances an individual reagent contained in a kit did not produce the color(s) specified by the manufacturer for the particular reagent/drug combination tested.

As shown in the Summary of Test Results, Table 1 of the Executive Summary, no kit complied with every requirement of the standard. This table provides a complete summary of the test results for all kits examined pursuant to paragraphs 4.1 through 4.7 of the standard, except the tests provided by paragraph 4.6 for individual reagent/drug combinations. In Table 1 the tests of the reagent/drug combinations that were made pursuant to paragraph 4.6 are reported in toto with a single notation of "P" or "X". This convention is required because the table summarizes the results of all tests in the line opposite a given paragraph. Thus, for paragraph 4.6 the reader must refer to the table of Reagent/Drug Combinations Tested to determine individual test results of interest to him; for example, to identify the specific reagent/drug tests that did not comply with the requirements of the standard.

The information provided in this report and summarized in its tables, should help users of color test reagents/kits make an informed choice in their purchases of this equipment. They have a wide range of products from which to select the reagents/kits suited to their needs.

TABULATIONS OF TEST RESULTS

Faurot Narcotic Kit
Ferguson Kit
Mikrotest Kit
Narcoban Test Kit
Narcoban-Jr Kit
Nark Kit
NIK Narcotics Identification System
ODV Narcotic Disposakit
Quantkit
Sirchie Drug Identification Kit MZ001
Sirchie Drug Identification Kit MZ002
Valtox Kit

TABULATION OF TEST RESULTS
FAUROT NARCOTIC KIT
FAUROT, INC.

NIJ Standard - 0605.00				
Paragraph	Sub-paragraph	Performance Requirement	Compliance	Comment
4.1		User Information		
4.1.1		Drugs Detected	P	
4.1.2		Instructions		
4.1.3		Clarity	P	
		Time	X	Times for final colors not specified.
		Safety Precautions		
	a	Hazards Warning	X	Inadequate warnings. No precautions are given.
	b	Antidotes	X	Insufficient instructions for emergency care and treatment.
	c	Discard Procedures	X	No instructions given.
4.1.4		General		
	a	Presumptive Tests	X	No statement made concerning need for examination by a qualified laboratory.
	b	Training	X	Requirement for appropriate training not mentioned.
	c	Contamination	X	No discussion of misleading results from reagent/sample contamination.
4.2		Labeling		
	a	Reagent Identification	P	
	b	Drug(s) Detected	P	
	c	Danger Markings	X	Inadequate warnings on some reagents.
	d	Discard Date	X	Discard dates not given.
4.3		Workmanship	P	
4.4		Safe Disposal Materials	X	No instructions or containers for disposal are provided.
4.5		Color Samples	X	Color samples not included.
4.6		Test Color & Sensitivity	*	
4.7		Drug Detection Limit	P	

*See REAGENT/DRUG COMBINATIONS TESTED. Compliance or noncompliance of each reagent/drug combination tested in accordance with Paragraph 4.6 of the standard, Test Color and Sensitivity, is listed separately.

Note: P = Requirement of the standard was met.
X = Requirement of the standard was not met.

TABULATION OF TEST RESULTS
FERGUSON KIT
FERGUSON TEST KITS & INSTRUMENTS, INC.

NIJ Standard - 0605.00				
Paragraph	Sub-paragraph	Performance Requirement	Compliance	Comment
4.1		User Information		
4.1.1		Drugs Detected	P	
4.1.2		Instructions		
4.1.3		Clarity	P	
		Time	P	
		Safety Precautions		
	a	Hazards Warning	P	
	b	Antidotes	X	Antidotes and emergency treatment not described.
	c	Discard Procedures	P	
4.1.4		General		
	a	Presumptive Tests	P	
	b	Training	P	
	c	Contamination	P	
4.2		Labeling		
	a	Reagent Identification	X	Packages are labelled, but individual ampules are not.
	b	Drug(s) Detected	P	
	c	Danger Markings	P	
	d	Discard Date	X	Discard dates not given.
4.3		Workmanship	P	
4.4		Safe Disposal Materials	X	Not included in kits.
4.5		Color Samples	X	Colors are described, but sample colors are not provided.
4.6		Test Color & Sensitivity	*	
4.7		Drug Detection Limit	P	

*See REAGENT/DRUG COMBINATIONS TESTED. Compliance or noncompliance of each reagent/drug combination tested in accordance with Paragraph 4.6 of the standard, Test Color and Sensitivity, is listed separately.

Note: P = Requirement of the standard was met.
X = Requirement of the standard was not met.

TABULATION OF TEST RESULTS
MIKROTEST KIT
PARISH CHEMICAL CO.

NIJ Standard - 0605.00

Paragraph	Sub-paragraph	Performance Requirement	Compliance	Comment
4.1		User Information		
4.1.1		Drugs Detected	P	
4.1.2		Instructions		
4.1.3		Clarity	X	Instructions for barbiturates and marijuana reagents are not clear.
		Time	P	
		Safety Precautions		
	a	Hazards Warning	P	
	b	Antidotes	X	Antidotes and emergency treatment not described.
	c	Discard Procedures	X	No discard procedures given.
4.1.4		General		
	a	Presumptive Tests	P	
	b	Training	P	
	c	Contamination	X	No mention of possible reagent contamination.
4.2		Labeling		
	a	Reagent Identification	P	
	b	Drug(s) Detected	P	
	c	Danger Markings	X	No danger markings on reagents.
	d	Discard Date	X	Shelf life is mentioned but expiration dates are not listed.
4.3		Workmanship	P	
4.4		Safe Disposal Materials	X	Neutralization reagents are not provided.
4.5		Color Samples	P	
4.6		Test Color & Sensitivity	*	
4.7		Drug Detection Limit	P	

*See REAGENT/DRUG COMBINATIONS TESTED. Compliance or noncompliance of each reagent/drug combination tested in accordance with Paragraph 4.6 of the standard, Test Color and Sensitivity, is listed separately.

Note: P = Requirement of the standard was met.
X = Requirement of the standard was not met.

TABULATION OF TEST RESULTS
NARCOBAN TEST KIT
PM LABS OF NEVADA, INC.

NIJ Standard - 0605.00

Paragraph	Sub-paragraph	Performance Requirement	Compliance	Comment
4.1		User Information		
4.1.1		Drugs Detected	P	
4.1.2		Instructions		
4.1.3		Clarity	P	
		Time	P	
		Safety Precautions		
	a	Hazards Warning	P	
	b	Antidotes	X	No instructions, antidotes or precautions are given for ingestion.
	c	Discard Procedures	P	
4.1.4		General		
	a	Presumptive Tests	X	Tests are described as conclusive in most cases.
	b	Training	X	Requirement for appropriate training is not stated.
	c	Contamination	X	No discussion of sample contamination and possibility of misleading test results.
4.2		Labeling		
	a	Reagent Identification	P	
	b	Drug(s) Detected	P	
	c	Danger Markings	X	Barbiturate reagents are not labelled flammable.
	d	Discard Date	X	No discard dates are present.
4.3		Workmanship	P	
4.4		Safe Disposal Materials	P	
4.5		Color Samples	X	No color sample for morphine and codeine tests with heroin reagent.
4.6		Test Color & Sensitivity	*	
4.7		Drug Detection Limit	P	

*See REAGENT/DRUG COMBINATIONS TESTED. Compliance or noncompliance of each reagent/drug combination tested in accordance with Paragraph 4.6 of the standard, Test Color and Sensitivity, is listed separately.

Note: P = Requirement of the standard was met.
X = Requirement of the standard was not met.

TABULATION OF TEST RESULTS
NARCOBAN-JR KIT
PM LABS OF NEVADA, INC.

NIJ Standard - 0605.00

Paragraph	Sub-paragraph	Performance Requirement	Compliance	Comment
4.1		User Information		
4.1.1		Drugs Detected	P	
4.1.2		Instructions		
4.1.3		Clarity	P	
		Time	P	
		Safety Precautions		
	a	Hazards Warning	P	
	b	Antidotes	P	
	c	Discard Procedures	P	
4.1.4		General		
	a	Presumptive Tests	P	
	b	Training	X	Need for appropriate training is not mentioned.
	c	Contamination	P	
4.2		Labeling		
	a	Reagent Identification	P	
	b	Drug(s) Detected	P	
	c	Danger Markings	P	
	d	Discard Date	X	No expiration dates are given.
4.3		Workmanship	P	
4.4		Safe Disposal Materials	X	Reagents for neutralization are not included.
4.5		Color Samples	P	
4.6		Test Color & Sensitivity	*	
4.7		Drug Detection Limit	P	

*See REAGENT/DRUG COMBINATIONS TESTED. Compliance or noncompliance of each reagent/drug combination tested in accordance with Paragraph 4.6 of the standard, Test Color and Sensitivity, is listed separately.

Note: P = Requirement of the standard was met.
X = Requirement of the standard was not met.

TABULATION OF TEST RESULTS
NARK KIT
SIRCHIE FINGER PRINT LABORATORIES

NIJ Standard - 0605.00

Paragraph	Sub-paragraph	Performance Requirement	Compliance	Comment
4.1		User Information		
4.1.1		Drugs Detected	P	
4.1.2		Instructions		
4.1.3		Clarity	P	
		Time	P	
		Safety Precautions		
	a	Hazards Warning	P	
	b	Antidotes	P	
	c	Discard Procedures	P	
4.1.4		General		
	a	Presumptive Tests	P	
	b	Training	P	
	c	Contamination	P	
4.2		Labeling		
	a	Reagent Identification	P	
	b	Drug(s) Detected	P	
	c	Danger Markings	P	
	d	Discard Date	X	No expiration dates are given.
4.3		Workmanship	P	
4.4		Safe Disposal Materials	P	
4.5		Color Samples	P	
4.6		Test Color & Sensitivity	*	
4.7		Drug Detection Limit	P	

*See REAGENT/DRUG COMBINATIONS TESTED. Compliance or noncompliance of each reagent/drug combination tested in accordance with Paragraph 4.6 of the standard, Test Color and Sensitivity, is listed separately.

Note: P = Requirement of the standard was met.
X = Requirement of the standard was not met.

TABULATION OF TEST RESULTS
 NIK
 NARCOTICS IDENTIFICATION SYSTEM
 BECTON, DICKINSON AND COMPANY

NIJ Standard - 0605.00				
Paragraph	Sub-paragraph	Performance Requirement	Compliance	Comment
4.1		User Information		
4.1.1		Drugs Detected	P	
4.1.2		Instructions		
4.1.3		Clarity	P	
		Time	P	
		Safety Precautions		
4.1.3	a	Hazards Warning	P	
	b	Antidotes	P	
	c	Discard Procedures	P	
4.1.4		General		
4.1.4	a	Presumptive Tests	P	
	b	Training	X	Need for training prior to using the kit is not mentioned.
	c	Contamination	P	
4.2		Labeling		
4.2	a	Reagent Identification	P	
	b	Drug(s) Detected	P	
	c	Danger Markings	P	
	d	Discard Date	X	Expiration dates are not given.
4.3		Workmanship	P	
4.4		Safe Disposal Materials	P	
4.5		Color Samples	P	
4.6		Test Color & Sensitivity	*	
4.7		Drug Detection Limit	P	

*See REAGENT/DRUG COMBINATIONS TESTED. Compliance or noncompliance of each reagent/drug combination tested in accordance with Paragraph 4.6 of the standard, Test Color and Sensitivity, is listed separately.

Note: P = Requirement of the standard was met.
 X = Requirement of the standard was not met.

TABULATION OF TEST RESULTS
 ODV NARCOTIC DISPOSKIT
 ODV, INCORPORATED

NIJ Standard - 0605.00				
Paragraph	Sub-paragraph	Performance Requirement	Compliance	Comment
4.1		User Information		
4.1.1		Drugs Detected	P	
4.1.2		Instructions		
4.1.3		Clarity	P	
		Time	P	
		Safety Precautions		
4.1.3	a	Hazards Warning	X	Boxes are labelled "Caution" but no statements as to corrosive or flammable nature of some reagents are present.
	b	Antidotes	X	No instructions for skin or eye contact. Antidote for sodium hydroxide is incorrect. No instructions to seek medical help if appropriate.
	c	Discard Procedures	P	
4.1.4		General		
4.1.4	a	Presumptive Tests	X	Statement of presumptive identification is present but instructions state "results will be conclusive" if full testing sequence is followed.
	b	Training	X	Instructions state "little or no special training is required" and "false positives are eliminated."
	c	Contamination	X	Instructions warn against contaminating the sample but do not discuss the possibility of misleading results.
4.2		Labeling		
4.2	a	Reagent Identification	P	
	b	Drug(s) Detected	P	
	c	Danger Markings	P	
	d	Discard Date	X	No discard dates are given.
4.3		Workmanship	P	
4.4		Safe Disposal Materials	P	
4.5		Color Samples	P	
4.6		Test Color & Sensitivity	*	
4.7		Drug Detection Limit	P	

*See REAGENT/DRUG COMBINATIONS TESTED. Compliance or noncompliance of each reagent/drug combination tested in accordance with Paragraph 4.6 of the standard, Test Color and Sensitivity, is listed separately.

Note: P = Requirement of the standard was met.
 X = Requirement of the standard was not met.

TABULATION OF TEST RESULTS
QUANTKIT
QUANTKIT COMPANY

NIJ Standard - 0605.00

Paragraph	Sub-paragraph	Performance Requirement	Compliance	Comment
4.1		User Information		
4.1.1		Drugs Detected	P	
4.1.2		Instructions		
4.1.3		Clarity	P	
		Time	P	
		Safety Precautions		
	a	Hazards Warning	P	
	b	Antidotes	P	
	c	Discard Procedures	X	Procedures for discarding reagents are not included.
4.1.4		General		
	a	Presumptive Tests	P	
	b	Training	X	The requirement for appropriate training is not mentioned.
	c	Contamination	P	
4.2		Labeling		
	a	Reagent Identification	X	Packages are labelled, but individual vials are not.
	b	Drug(s) Detected	P	
	c	Danger Markings	X	No danger markings on vials.
	d	Discard Date	X	No expiration dates are listed.
4.3		Workmanship	P	
4.4		Safe Disposal Materials	X	No reagents for neutralization and safe disposal materials included in kits.
4.5		Color Samples	P	
4.6		Test Color & Sensitivity	*	
4.7		Drug Detection Limit	P	

*See REAGENT/DRUG COMBINATIONS TESTED. Compliance or noncompliance of each reagent/drug combination tested in accordance with Paragraph 4.6 of the standard, Test Color and Sensitivity, is listed separately.

Note: P = Requirement of the standard was met.
X = Requirement of the standard was not met.

TABULATION OF TEST RESULTS
SIRCHIE DRUG IDENTIFICATION KIT MZ001
SIRCHIE FINGER PRINT LABORATORIES

NIJ Standard - 0605.00

Paragraph	Sub-paragraph	Performance Requirement	Compliance	Comment
4.1		User Information		
4.1.1		Drugs Detected	P	
4.1.2		Instructions		
		Clarity	P	
		Time	X	No times are specified for many of the tests.
		Safety Precautions		
4.1.3	a	Hazards Warning	P	
	b	Antidotes	X	No instructions for neutralizing acid burns, especially eye contact.
	c	Discard Procedures	X	No instructions for neutralizing acids prior to discarding.
4.1.4		General		
	a	Presumptive Tests	P	
	b	Training	X	Need for appropriate training not mentioned.
	c	Contamination	X	No statement concerning misleading results from sample contamination.
4.2		Labeling		
	a	Reagent Identification	P	
	b	Drug(s) Detected	P	
	c	Danger Markings	P	
	d	Discard Date	X	No discard dates are present.
4.3		Workmanship	X	Kit contained a leaking reagent bottle with instructions on label dissolved. Chloroform bottle showed evaporation loss.
4.4		Safe Disposal Materials	X	No instructions for neutralizing acids prior to disposal. No containers supplied for disposal of chemicals.
4.5		Color Samples	X	No color samples included.
4.6		Test Color & Sensitivity	*	
4.7		Drug Detection Limit	P	

*See REAGENT/DRUG COMBINATIONS TESTED. Compliance or noncompliance of each reagent/drug combination tested in accordance with Paragraph 4.6 of the standard, Test Color and Sensitivity, is listed separately.

Note: P = Requirement of the standard was met.
X = Requirement of the standard was not met.

TABULATION OF TEST RESULTS
SIRCHIE DRUG IDENTIFICATION KIT MZ002
SIRCHIE FINGER PRINT LABORATORIES

NIJ Standard - 0605.00

Paragraph	Sub-paragraph	Performance Requirement	Compliance	Comment
4.1		User Information		
4.1.1		Drugs Detected	P	
4.1.2		Instructions		
4.1.3		Clarity	X	Instructions generally are clear with exception of morphine test with reagent #3 and demerol-opiates reagent.
		Time	X	No times specified for most reagent/drug combinations.
		Safety Precautions		
	a	Hazards Warning	P	
	b	Antidotes	X	Antidote and treatment for cocaine reagent are not included.
	c	Discard Procedures	P	
4.1.4		General		
	a	Presumptive Tests	P	
	b	Training	X	No discussion of requirement for appropriate training and false positives/negatives.
	c	Contamination	X	No discussion of misleading results from reagent and/or sample contamination.
4.2		Labeling		
	a	Reagent Identification	P	
	b	Drug(s) Detected	P	
	c	Danger Markings	P	
	d	Discard Date	X	Expiration dates not listed.
4.3		Workmanship	P	
4.4		Safe Disposal Materials	X	Reagents for neutralizing are included but their use is not explained.
4.5		Color Samples	X	No color samples included.
4.6		Test Color & Sensitivity	*	
4.7		Drug Detection Limit	P	

*See REAGENT/DRUG COMBINATIONS TESTED. Compliance or noncompliance of each reagent/drug combination tested in accordance with Paragraph 4.6 of the standard, Test Color and Sensitivity, is listed separately.

Note: P = Requirement of the standard was met.
X = Requirement of the standard was not met.

TABULATION OF TEST RESULTS
VALTOX KIT
VALTOX LABORATORIES, INC.

NIJ Standard - 0605.00

Paragraph	Sub-paragraph	Performance Requirement	Compliance	Comment
4.1		User Information		
4.1.1		Drugs Detected	P	
4.1.2		Instructions		
4.1.3		Clarity	P	
		Time	P	
		Safety Precautions		
	a	Hazards Warning	X	Inadequate warnings and instructions are given for flammable and corrosive chemicals.
	b	Antidotes	X	Insufficient safety instructions in case of eye or skin contact.
	c	Discard Procedures	X	No solution or instructions for neutralizing potassium hydroxide reagent.
4.1.4		General		
	a	Presumptive Tests	P	
	b	Training	X	No statement regarding need for training of kit users. No discussion of false negative results.
	c	Contamination	X	No discussion concerning possibility of reagent/sample contamination.
4.2		Labeling		
	a	Reagent Identification	P	
	b	Drug(s) Detected	P	
	c	Danger Markings	X	Reagent bottles other than acids have no warning labels.
	d	Discard Date	P	
4.3		Workmanship	P	
4.4		Safe Disposal Materials	X	Refer to 4.1.3c above. Same comment.
4.5		Color Samples	P	
4.6		Test Color & Sensitivity	*	
4.7		Drug Detection Limit	P	

*See REAGENT/DRUG COMBINATIONS TESTED. Compliance or noncompliance of each reagent/drug combination tested in accordance with Paragraph 4.6 of the standard, Test Color and Sensitivity, is listed separately.

Note: P = Requirement of the standard was met.
X = Requirement of the standard was not met.

REAGENT/DRUG COMBINATIONS TESTED

Faurot Narcotic Kit
Ferguson Kit
Mikrotest Kit
Narcoban Test Kit
Narcoban-Jr Kit
Nark Kit
NIK Narcotics Identification System
ODV Narcotic Disposakit
Quantkit
Sirchie Drug Identification Kit MZ001
Sirchie Drug Identification Kit MZ002
Valtox Kit

REAGENT/DRUG COMBINATIONS TESTED

Requirements Specified in Paragraph 4.6, Test Color and Sensitivity, NIJ Standard - 0605.00

**FAUROT NARCOTIC KIT
FAUROT, INC.**

	Solution E and Solution A with Morphine	Solution E and Solution B with Cocaine	Solution C and Solution F with THC		
Compliance	P	P	P		

**FERGUSON KIT
FERGUSON TEST KITS & INSTRUMENTS INC.**

	Marquis Reagent with Mescaline	Marquis Reagent with Codeine	Marquis Reagent with Amphetamine	Marquis Reagent with Morphine	Marquis Reagent with Heroin
Compliance	P	P	P	P	P
	Cocaine Reagent with Cocaine	Marijuana Reagents with THC			
Compliance	P	P			

**MIKROTEST KIT
PARISH CHEMICAL CO.**

	Heroin, Codeine, Amphetamines Reagent with Amphetamine	Cocaine Reagent with Cocaine	Barbiturates Reagent with Phenobarbital	Marijuana Reagent with THC	Heroin, Codeine, Amphetamines Reagent with Mescaline
Compliance	P	P	X*	P	P
	Heroin, Codeine, Amphetamines Reagent with Heroin	Heroin, Codeine, Amphetamines Reagent with Codeine			
Compliance	P	P			

*Color change did not develop.

NOTE: P = Requirement of the standard was met.
X = Requirement of the standard was not met.

**NARCOBAN TEST KIT
PM LABS OF NEVADA, INC.**

	Amphetamine Reagent with Amphetamine	Alkaloids, Opiates Reagent with Morphine	Barbiturate Reagents A and B with Secobarbital	Cocaine, Methadone, Demerol Reagents A and B with Cocaine	Cocaine, Methadone, Demerol Reagents A and B with Methadone
Compliance	P	P	P	P	P
	Heroin Reagent with Heroin	Heroin Reagent with Morphine	LSD Reagents A and B with LSD	Marijuana Reagents A and B with THC	
Compliance	P	P	P	P	

**NARCOBAN-JR KITS
PM LABS OF NEVADA, INC.**

	Amphetamine Reagent with Amphetamine	Amphetamine Backup Reagent with Amphetamine	Marijuana Reagent with THC	Morphine Alkaloids, Opiates Reagent with Morphine	LSD Reagent with LSD
Compliance	P	P	P	P	P
	Barbiturates Reagent with Phenobarbital	Mescaline Reagent with Mescaline	Heroin Reagent with Heroin	Cocaine Reagent with Cocaine	Methadone Reagent with Methadone
Compliance	P	P	P	P	P

NOTE: P = Requirement of the standard was met.
X = Requirement of the standard was not met.

NARK KIT SIRCHIE FINGER PRINT LABORATORIES					
	Fast Blue B with THC	Mandelin Reagent with Amphetamine	Nitric Acid with Heroin	Marquis Reagent with Morphine	Mayer Reagent with Amphetamine
Compliance	P	P	P	P	P
	Marquis Reagent with Amphetamine	Nitric Acid with Morphine	Cobalt Thiocyanate Reagent with Cocaine	Dille-Koppanyi Reagent with Phenobarbital	Erllich Reagent with LSD
Compliance	P	P	P	P	P
	Duquenois Reagent with THC				
Compliance	P				

NIK NARCOTICS IDENTIFICATION SYSTEM BECTON, DICKINSON AND COMPANY					
	Duquenois Reagent with THC	Methadone Reagent with Methadone	Marquis Reagent with Morphine	Nitric Acid with Morphine	Opiates Reagent with Morphine
Compliance	P	P	P	P	P
	Koppanyi Reagent with Phenobarbital	Scott Reagent with Cocaine	Marquis Reagent with Codeine	Nitric Acid with Codeine	Opiates Reagent with Codeine
Compliance	P	P	P	P	P
	Nitric Acid with Heroin	Opiates Reagent with Heroin	Brown Heroin Reagent with Heroin	Marquis Reagent with Heroin	Marquis Reagent with LSD
Compliance	P	P	P	P	P
	LSD Reagent with LSD	Nitric Acid with LSD	Nitric Acid with Mescaline	Opiates Reagent with Mescaline	Marquis Reagent with Mescaline
Compliance	P	P	P	P	P
	Marquis Reagent with Amphetamine				
Compliance	P				

NOTE: P = Requirement of the standard was met.
X = Requirement of the standard was not met.

ODV NARCOTIC DISPOSAKIT ODV INCORPORATED					
	Reagent One (Mayer's Reagent) with Morphine	Reagent Two (Marquis Reagent) with Morphine	Reagent Two (Marquis Reagent) with Amphetamine	Reagent Two (Marquis Reagent) with Mescaline	Reagent Three (Nitric Acid) with Heroin
Compliance	P	P	P	P	P
	Reagent Three (Nitric Acid) with Morphine	Reagent Four (Cobalt Thiocyanate Reagent) with Cocaine	Reagent Four (Cobalt Thiocyanate Reagent) with Methadone	Reagent Five (Dille-Koppanyi Reagent) with Pentobarbital	Reagent Six (Mandelin Reagent) with Amphetamine
Compliance	P	P	P	P	P
	Reagent Six (Mandelin Reagent) with Methamphetamine	Reagent Six (Mandelin Reagent) with Morphine	Reagent Seven (Modified Ehrlich's Reagent) with LSD	Reagent Eight (Duquenois Reagent) with THC	Reagent Nine (KN Reagent, Fast Blue B Salt) with THC
Compliance	P	P	P	P	P
	Reagent Three (Nitric Acid) with Mescaline	Reagent Six (Mandelin Reagent) with Mescaline	Reagent Three (Nitric Acid) with Codeine	Reagent Six (Mandelin Reagent) with Codeine	Reagent Four (Cobalt Thiocyanate Reagent) with Codeine
Compliance	P	P	P	P	P
	Reagent Two (Marquis Reagent) with LSD	Reagent Two (Marquis Reagent) with Methadone	Reagent Six (Mandelin Reagent) with LSD	Reagent Six (Mandelin Reagent) with Methadone	
Compliance	P	P	P	P	

QUANTKIT QUANTKIT COMPANY					
	Stimulant Reagent with Amphetamine	Heroin Reagent with Heroin	THC, Hashish, Marijuana Reagent with THC	Cocaine Reagent with Cocaine	Barbiturate Reagent with Phenobarbital
Compliance	P	X*	P	P	P

*Test with heroin did not give predicted color. Reaction aqua blue instead of green.

NOTE: P = Requirement of the standard was met.
X = Requirement of the standard was not met.

SIRCHIE DRUG IDENTIFICATION KIT MZ001 SIRCHIE FINGER PRINT LABORATORIES					
	Demerol Opiates Reagent with Morphine	Morphine, Codeine, Heroin Reagent Number One with Morphine	Morphine, Codeine, Heroin Reagent Number Two with Morphine	Morphine, Codeine, Heroin Reagent Number Three with Morphine	Morphine, Codeine, Heroin Reagent Number Four with Morphine
Compliance	P	P	P	P	P
	Morphine, Codeine, Heroin Reagent Number One with Heroin	Morphine, Codeine, Heroin Reagent Number Two with Heroin	Morphine, Codeine, Heroin Reagent Number Three with Heroin	Morphine, Codeine, Heroin Reagent Number One with Codeine	Morphine, Codeine, Heroin Reagent Number Two with Codeine
Compliance	P	P	P	P	P
	Morphine, Codeine, Heroin Reagent Number Three with Codeine	Cocaine Reagent with Cocaine	Demerol, Opiates Reagent with Amphetamine	Demerol, Opiates Reagent with Mescaline	Amphetamine Reagent One and Amphetamine Reagent Two with Methamphetamine
Compliance	X	P	P	P	P
	Barbiturate Reagent Numbers One, Two, and Three with Phenobarbital	Methadone Reagent with Methadone	Methadone Reagent and Morphine, Codeine, Heroin Reagent with Methadone	LSD Reagents One, Two, and Three with LSD	Modified Duquenois Reagent with THC
Compliance	X	X	X	P	P

NOTE: P = Requirement of the standard was met.
X = Requirement of the standard was not met.

SIRCHIE DRUG IDENTIFICATION KIT MZ002 SIRCHIE FINGER PRINT LABORATORIES					
	Cocaine Reagent with Cocaine	Reagent Number Three with Heroin	Reagent Number Three with Codeine	Marijuana Reagents Numbers One and Two with THC	Demerol, Opiates Reagent with Amphetamine
Compliance	P	P	P	P	P
	Demerol, Opiates Reagent with Mescaline	Amphetamine Reagents Numbers One and Two with Methamphetamine	Barbiturates Reagents Numbers One, Two, and Three with Phenobarbital	Reagent Number Three with Morphine	Demerol, Opiates Reagent with Morphine
Compliance	P	P	X*	P	P
	Demerol, Opiates Reagent with Heroin	Methadone Reagent with Methadone	LSD Reagent with LSD		
Compliance	P	**	**		

*Color did not deepen with reagent three.

**Tests not performed. Kit was missing the reagents required to make the tests.

VALTOX KIT VALTOX LABORATORIES, INC.					
	Marquis Reagent with Amphetamine	Marquis Reagent with Methedrine (Methamphetamine)	Marquis Reagent with Heroin	Dille-Koppanyi Reagent with Phenobarbital	Cobalt Thiocyanate Reagent with Cocaine
Compliance	P	P	P	P	P
	Scott Reagent with Cocaine	LSD (Van Urk) Reagent with LSD	Modified Duquenois Reagent with THC	Methedrine Reagent with Amphetamine	STP and Opiates Reagent with Codeine
Compliance	P	P	P	P	P

NOTE: P = Requirement of the standard was met.
X = Requirement of the standard was not met.

BIBLIOGRAPHY

¹Spot Tests in Organic Analysis, by Fritz Feigl, Eng., D. Sc. and Dr. Vinzenz Anger. Translated by Ralph E. Oesper, Ph.D., 7th English Edition, 1966, Elsevier Publishing Company, Amsterdam, London, New York.

²Legal Medicine Pathology and Toxicology, by Thomas A. Gonzales, M.D., Morgan Vance, M.D., Milton Helpert, M.D., and Charles J. Umberger, Ph.D., 2nd Edition, 1954, Appleton-Century-Crofts, Incorporated, New York.

³Velapoldi, R.A., and Wicks, S.A., "The Use of Chemical Spot Tests Kits for the Presumptive Identification of Narcotics and Drugs of Abuse," Journal of Forensic Sciences, Vol. 19, No. 3, 1974.

APPENDIX

NIJ Standard 0605.00

Color Test Reagents/Kits for Preliminary
Identification of Drugs of Abuse

**NIJ STANDARD
FOR
COLOR TEST REAGENTS/KITS FOR PRELIMINARY
IDENTIFICATION OF DRUGS OF ABUSE**

CONTENTS

	Page
Foreword	v
1. Purpose	1
2. Scope	1
3. Definitions	1
4. Requirements	1
4.1 User Information	1
4.2 Labeling	2
4.3 Workmanship	2
4.4 Safe-Disposal Materials	2
4.5 Color Samples	2
4.6 Test Color and Sensitivity	2
4.7 Drug Detection Limit	2
5. Test Methods	4
5.1 General Test Conditions	4
5.2 Test Color and Sensitivity Determination	4
5.3 Drug Detection Limit Determination	4
Appendix A	5

FOREWORD

This document, NIJ Standard-0605.00, Color Test Reagents/Kits for Preliminary Identification of Drugs of Abuse, is an equipment standard developed by the Law Enforcement Standards Laboratory of the National Bureau of Standards. It is produced as part of the Technology Assessment Program of the National Institute of Justice. A brief description of the program appears on the inside front cover.

This standard is a technical document that specifies performance and other requirements equipment must meet to conform to the needs of criminal justice agencies for high quality service. Purchasers can use the test methods described in this report to determine firsthand whether a particular piece of equipment meets the standards, or they may have the tests conducted on their behalf by a qualified testing laboratory. Procurement officials may also refer to this standard in their purchasing documents and require that equipment offered for purchase meet the requirements, with compliance guaranteed by the vendor or attested to by an independent laboratory.

Because this NIJ standard is designed as a procurement aid, it is necessarily highly technical. For those who seek general guidance about the capabilities of color test reagents/kits for preliminary identification of drugs of abuse, user guides also are published. The guides explain in non-technical language how to select equipment capable of the performance required by an agency.

NIJ standards are subjected to continuing review. Technical comments and recommended revisions are welcome. Please send suggestions to the Program Manager for Standards, National Institute of Justice, U.S. Department of Justice, Washington, DC 20531.

Before citing this or any other NIJ standard in a contract document, users should verify that the most recent edition of the standard is used. Write to: Chief, Law Enforcement Standards Laboratory, National Bureau of Standards, Washington, DC 20234.

Lester D. Shubin
Program Manager for Standards
National Institute of Justice

**NIJ STANDARD
FOR
COLOR TEST REAGENTS/KITS FOR PRELIMINARY
IDENTIFICATION OF DRUGS OF ABUSE**

1. PURPOSE

The purpose of this standard is to establish minimum requirements for color test reagents/kits for drugs of abuse and methods of testing the reagents to determine compliance with those requirements.

2. SCOPE

This standard applies to field testing kits which consist of color test reagents for the preliminary identification of drugs of abuse (hereinafter referred to simply as drugs). It does not apply to kits which use thin layer chromatography as the identification procedure nor to kits which identify drugs in body fluids.

This standard is an adaptation of NILECJ standard 0604.00 for "Chemical Spot Test Kits for Preliminary Identification of Drugs of Abuse." The kits addressed in that standard are designed to identify drugs with a substantial degree of specificity by means of (in general) sequential tests with several chemical reagents in accordance with an objective test protocol. In contrast, this standard is concerned with single reagents (or reagent combinations) that are used to give a preliminary confirmation of the identity of a suspected drug or class of drugs.

Note that this standard does not mandate the identities of the reagents to be included in a test kit. The eleven reagents listed in appendix A are included for informational purposes only, since they are among the reagents currently in common use. A kit may contain any reagent or group of reagents that meet the requirements of this standard.

3. DEFINITIONS

3.1 Centroid Color Charts

A collection of charts, published by the Inter-Society Color Council and the National Bureau of Standards, which logically group and illustrate the colors. There is a chart for each color hue. On each chart, color saturation increases from left to right and color lightness increases from bottom to top. The charts are identified as NBS Standard Reference Material 2106 and are described in NBS Circular 553. The charts may be purchased from the Office of Standard Reference Materials, and the circular may be obtained from the Office of Technical Publications, both at the National Bureau of Standards, Washington, D.C. 20234.

3.2 Final Color

The color, generally formed within one or two minutes, that remains after any intermediate colors, produced by the addition of a reagent to a drug or other substance, have disappeared.

4. REQUIREMENTS

4.1 User Information

The kit shall include the following information.

4.1.1 Drugs Detected

The identity of the drug or drugs for which each reagent in the kit can be used to make a tentative identification.

4.1.2 Instructions

Clear instructions for performing each chemical test and for interpreting the results, including the time required for the final color to appear.

4.1.3 Safety Precautions

- Warning of the hazards of the flammable and corrosive chemicals contained in the kit.
- Steps to follow and antidotes to use if hazardous reagents are taken internally or come in contact with parts of the body or clothes.
- Procedures for safely discarding used reagents and containers.

4.1.4 General

- A statement that the reagents in the kit are intended to be used for presumptive purposes only, and that all substances tested should be subjected to more definitive examination by qualified scientists in a crime laboratory.
- A statement that users of the kit should receive appropriate training in its use, and should be taught that the reagents can give false positive as well as false negative results.
- A discussion of the possibility of reagent and/or sample contamination and consequent misleading results.

4.2 Labeling

Each reagent container shall have a label which either directly or by reference:

- Identifies the reagent.
- Identifies the drug or drugs which it can detect.
- Is prominently marked "Danger," where appropriate.
- Gives a discard date, where appropriate.

4.3 Workmanship

Visual inspection of the kit shall show no broken or inoperative catches, hinges or containers. There shall be no evidence of reagent leakage.

4.4 Safe-Disposal Materials

The kit shall contain chemicals for neutralizing strongly acidic and basic reagents and/or acid/base-resistant containers into which used reagents and containers can be deposited and safely disposed of at a later time in accordance with 4.1.3.c.

4.5 Color Samples

The kit shall include a sample or reproduction of the color or colors produced by each reagent in the kit when reacted with each drug listed on the reagent container label.

4.6 Test Color and Sensitivity

Each reagent in the kit shall produce the color or colors that are specified by the manufacturer in the form of color samples (par. 4.5), or have the same color hue and color saturation as those colors, for each of five replicate tests, performed in accordance with paragraph 5.2 at the drug detection limit listed in table 1 or specified by the manufacturer in accordance with paragraph 4.7. If a reagent produces the same color with more than one drug, this test need be performed for only one of those reagent/drug combinations.

4.7 Drug Detection Limit

The manufacturer shall specify the drug detection limit, determined in accordance with paragraph 5.3, for each drug/reagent combination listed on a reagent container label, other than those listed in table 1. For any drug listed in table 2, the numerical value of the limit shall not exceed that listed in table 2.

TABLE 1. Drug detection limits and drug solvents

Reagent	Drug	Drug detection limit, μg	Solvent
A.1	Cocaine-HCl	60.0	CHCl_3
A.1	Methadon-HCl	15.0	CHCl_3
A.2	Amobarbital	100.0	CHCl_3
A.2	Pentobarbital	100.0	CHCl_3
A.2	Phenobarbital	100.0	CHCl_3
A.2	Secobarbital	100.0	CHCl_3
A.3	Marijuana	350.0 ¹	—
A.3	Tetrahydrocannabinol (THC)	2.0	CHCl_3
A.4	Codeine Sulfate	5.0	H_2O
A.4	D-Amphetamine-HCl	10.0	CHCl_3
A.4	Heroin-HCl	20.0	CHCl_3
A.4	D-Methamphetamine-HCl	150.0	CHCl_3
A.4	Morphine	5.0	CHCl_3
A.5	Codeine Sulfate	1.0	H_2O
A.5	D-Amphetamine-HCl	10.0	CHCl_3
A.5	Heroin-HCl	10.0	CHCl_3
A.5	LSD Tartrate	5.0	H_2O
A.5	Mescaline Sulfate	1.0	H_2O
A.5	Methadon-HCl	1.0	CHCl_3
A.5	d-Methamphetamine-HCl	5.0	CHCl_3
A.5	Morphine	5.0	CHCl_3
A.6	Mescaline Sulfate	1.0	H_2O
A.7	LSD Tartrate	5.0	H_2O

¹This quantity of marijuana assumes 0.5 percent active ingredients.

TABLE 2. Maximum acceptable drug detection limits for reagents other than A.1 through A.7 (see appendix A)

Drug	μg
Cocaine-HCl	600
Codeine Sulfate	50
D-Amphetamine-HCl	100
Heroin-HCl	200
LSD Tartrate	50
Marijuana	1000 ¹
Tetrahydrocannabinol (THC)	6 ²
Mescaline Sulfate	10
Methadon-HCl	150
d-Methamphetamine-HCl	500
Morphine	50
Phenobarbital	1000

¹This quantity of marijuana assumes 0.5 percent active ingredients.

²This quantity of THC assumes 100 percent active ingredients.

5. TEST METHODS

5.1 General Test Conditions

At the time of the tests, the ambient temperature shall be between 10 °C and 40 °C (50 °F and 104 °F); the relative humidity shall be between 10 and 90 percent.

5.2 Test Color and Sensitivity Determination

5.2.1 Marijuana Preparation

For marijuana, transfer a quantity equal to the drug detection limit into each of five test containers and proceed in accordance with paragraph 5.2.3. If Tetrahydrocannabinol (THC) is used for testing purposes, prepare it in accordance with paragraph 5.2.2.

5.2.2 Other Drug Preparation

For all other drugs, prepare a 1.0 µg/µL solution of the drug in a reagent grade solvent. Chloroform and distilled water are convenient solvents for the drugs listed in table 1, as indicated.

Transfer by micropipette into each of five test containers the volume of drug solution, in µL, numerically equal to the drug detection limit, in µg, listed in table 1 or specified by the manufacturer in accordance with paragraph 4.7.

Evaporate the solvent by infrared heating and/or by gently blowing a stream of gas such as oil-free air, nitrogen, helium, etc., over the surface of the solution. Keep heating time to a minimum by heating only until the solvent is evaporated, to avoid the possibility of drug decomposition. The temperature of the solution should not exceed 40 °C (104 °F) during solvent evaporation.

5.2.3 Procedure

If the kit is packaged with the reagents in sealed glass tubes for single test field purposes, break the reagent tubes in suitable individual containers such as small beakers or test tubes. Use a disposable pasteur-type pipette (Kimble No. 72060, or equivalent) to transfer one drop (approximately 0.1 mL) of each reagent being tested, in the sequence specified by the manufacturer if appropriate, to each of the five drug test specimens prepared in paragraph 5.2.1 and/or 5.2.2 above.* Allow the drop of reagent to run down the side of the container onto the drug. Compare the color or colors produced within the specified time limits, to those provided by the manufacturer in accordance with paragraph 4.5, and determine whether the colors are essentially the same.

5.3 Drug Detection Limit Determination

Prepare a solution, using a suitable reagent grade solvent, having a drug concentration of 1.0 µg/µL, or lower if necessary. Using a micropipette, transfer five samples of a convenient volume of this solution to test containers. Evaporate the solvent and add reagent, as described in paragraph 5.2. Change the quantity of drug transferred to the test containers by varying either the solution concentration or the volume transferred, and repeat the test until the smallest mass of transferred drug is determined, to one significant figure, for which five out of five color changes are observed. As a safety factor, multiply this quantity by ten, and use the product as the operational drug detection limit.

*When two or more reagents are used sequentially, transfer the minimum number of drops of each reagent that is equivalent to the ratio specified by the manufacturer (i.e., three drops to one, three drops to two, etc.).

APPENDIX A—REAGENTS

Use reagent grade chemicals.

A.1 Cobalt(II) Thiocyanate

Dissolve 2.0 grams (g) of cobalt (II) thiocyanate in 100 milliliters (mL) of distilled water.

A.2 Dille-Koppanyi Reagent, Modified

Solution A. Dissolve 0.1 g of cobalt (II) acetate dihydrate in 100 mL of methanol. Add 0.2 mL of glacial acetic acid and mix.

Solution B. Add 5 mL of isopropylamine to 95 mL of methanol.

Procedure. Add 2 volumes of solution A to the drug, followed by 1 volume of solution B.

A.3 Duquenois-Levine Reagent, Modified

Solution A. Add 2.5 mL of acetaldehyde and 2.0 g of vanillin to 100 mL of 95 percent ethanol.

Solution B. Concentrated Hydrochloric Acid.

Solution C. Chloroform.

Procedure. Add 1 volume of solution A to the drug and shake for 1 minute. Then add solution B. Agitate gently, and determine the color produced. Add 3 volumes of solution C and agitate. If the designated color is extracted into solution C, the test is positive.

A.4 Mandelin Reagent

Dissolve 1.0 g of ammonium vanadate in 100 mL of concentrated sulfuric acid.

A.5 Marquis Reagent

Carefully add 100 mL of concentrated sulfuric acid to 5 mL of 40 percent formaldehyde (v.v, formaldehyde:water).

A.6 Nitric Acid

Concentrated.

A.7 Para-Dimethylaminobenzaldehyde (p-DMAB)

Add 2.0 g of p-DMAB to 50 mL of 95 percent ethanol and 50 mL of concentrated hydrochloric acid.

A.8 Ferric Chloride

Dissolve 2.0 g of anhydrous ferric chloride or 3.3 g of ferric chloride hexahydrate in 100 mL of distilled water.

A.9 Froehde Reagent

Dissolve 0.5 g of molybdic acid or sodium molybdate in 100 mL of hot concentrated sulfuric acid.

A.10 Mecke Reagent

Dissolve 1.0 g of selenious acid in 100 mL of concentrated sulfuric acid.

A.11 Zwikker Reagent

Solution A. Dissolve 0.5 g of copper (II) sulfate pentahydrate in 100 mL of distilled water.

Solution B. Add 5 mL of pyridine to 95 mL of chloroform.

Procedure. Add 1 volume of solution A to the drug, followed by 1 volume of solution B.

TABLE A-1. Final colors produced by reagents A.1 through A.11 with various drugs and other substances

Material	Reagent	Final Color (ISCC-NBS)
Benzphetamine	A.1	169. s. g B
Brompheniramine	A.1	168. brill. g B + 177 brill. B
Chlorpromazine-HCl	A.1	168. brill. g B
Cocaine-HCl	A.1*	169. s. g B + 178. s. B
Darvon (propoxyphene-HCl)	A.1	169. s. g B
Demerol-HCl	A.1	169. s. g B
Doxepin-HCl	A.1	169. s. g B
Heroin-HCl	A.1	169. s. g B
Librium	A.1	181. l. B
Marezine (cyclizine-HCl)	A.1	171. v. l. g B
Methadon-HCl	A.1*	181. l. B
Methapyrilene-HCl	A.1	169. s. g B
Opium	A.1	146. d. G
Phencyclidine	A.1	168. brill. g B
Procaine-HCl	A.1*	169. s. g B + 178. s. B
Quinine, Quinine Salts	A.1	178. s. B
Ritalin	A.1	168. brill. g B
Contac	A.2	31. p. y Pk
Pentobarbital	A.2*	218. s. P
Phenobarbital	A.2*	218. s. P
Secobarbital	A.2*	218. s. P
Tea	A.2	29. m. y Pk
Mace	A.3	237. s. r P ² 237. s. r P ³ 221. v. l. P ⁴
Marijuana	A.3*	197. deep p B ² 186. gy. B ³ 220. v. deep P ⁴
Nutmeg	A.3	244. p. r P ² 244. p. r P ³ 226. v. p. P ⁴
Tea	A.3	243. v. d. r P ⁵
Aspirin	A.4	113. Ol Gy
Benzphetamine	A.4*	119. l. Y G
Brompheniramine	A.4	50. brill. O
Chlorpromazine-HCl	A.4	107. m. Ol + 13. deep R
Cocaine-HCl	A.4*	51. deep O
Codeine Sulfate	A.4*	107. m. Ol
Contac	A.4	84. s. Y
D-Amphetamine-HCl	A.4*	164. m. b G
D-Methamphetamine-HCl	A.4*	186. m. y G
Darvon (propoxyphene-HCl)	A.4	44. d. r Br
Doxepin-HCl	A.4	21. blackish R
Dristan	A.4	127. gy. Ol G

Excedrin	A.4	108. d. Ol
Heroin-HCl	A.4*	43. m. r Br
L-Isomethadon-HCl	A.4	243. v. d. r P
Mace	A.4	46. gy. r Br
MDA-SO ₄ (3,4-methylene-dioxyamphetamine)	A.4	235. p Black
Mescaline Sulfate	A.4*	65. br Black
Methadon-HCl	A.4	183. d. B
Methapyrilene-HCl	A.4	243. v. d. r P + 260. v. d. p R
Methaqualone	A.4	35. s. r O
Methyprylon	A.4	184. v. p. B
Morphine	A.4*	47. d. gy. r Br
Opium	A.4*	94. l. Ol Br
Oxycodone-HCl	A.4	68. s. O Y
Procaine-HCl	A.4	51. deep O
Quinine	A.4	108. d. Ol
Ritalin	A.4	68. s. O Y
Salt, iodized	A.4	51. deep O
STP-HCl (2,5-dimethoxy-4-methylamphetamine)	A.4*	117. s. Y G
TMA-HCl (trimethoxy-amphetamine)	A.4*	94. l. Ol Br
Aspirin	A.5	12. s. R
Benzphetamine	A.5*	41. deep r Br
Chlorpromazine-HCl	A.5	260. v. d. p R
Codeine Sulfate	A.5*	212. d. V
D-Amphetamine	A.5*	44. d. r Br + 34. v. r O
D-Methamphetamine-HCl	A.5*	44. d. r Br + 34. v. r O
Darvon (propoxyphene-HCl)	A.5	230. blackish P
Demerol-HCl	A.5	56. deep Br
Doxepin-HCl	A.5	21. blackish R
Dristan	A.5	241. m. r P
Excedrin	A.5	15. m. R
Heroin-HCl	A.5*	239. v. deep r P
LSD Tartrate	A.5	235. p Black
Mace	A.5	244. p. r P
Marezine (cyclizine-HCl)	A.5	98. brill. g Y
MDA-SO ₄ (3,4-methylene-dioxyamphetamine)	A.5*	267. Black
Mescaline Sulfate	A.5*	36. deep r O
Methadon-HCl	A.5	28. l. y Pk
Methapyrilene-HCl	A.5	260. v. d. p R ⁶
Morphine	A.5*	243. v. d. r P
Opium	A.5*	44. d. r Br
Oxycodone-HCl	A.5*	201. d. p Br
Pentobarbital	A.5	78. d. y Br
Phencyclidine	A.5	7. p. Pk
Phenobarbital	A.5	78. d. y Br
Ritalin	A.5	71. m. O Y
Secobarbital	A.5	78. d. y Br

STP-HCl (2,5-dimethoxy-4-methylamphetamine)	A.5*	101. l. g Y
Sugar	A.5	46. gy. r Br
TMA-HCl (trimethoxy-amphetamine)	A.5*	36. deep r O
Chlorpromazine-HCl	A.6	101. l. g Y
Codeine Sulfate	A.6*	101. l. g Y
Doxepin-HCl	A.6	84. s. Y
Excedrin	A.6	68. s. O Y
Heroin-HCl	A.6*	89. p. Y
LSD Tartrate	A.6	54. br O
Mace	A.6	40. s. r Br
MDA-SO ₄ (3,4-methylene-dioxyamphetamine)	A.6	101. l. g Y
Mescaline Sulfate	A.6*	41. deep r Br
Methapyrilene-HCl	A.6	44. d. r Br
Morphine	A.6*	67. brill. O Y
Opium	A.6*	101. l. g Y
Oxycodone-HCl	A.6	86. l. Y
STP-HCl (2,5-dimethoxy-4-methylamphetamine)	A.6	89. p. Y
TMA-HCl (trimethoxyamphetamine)	A.6	14. v. deep R
LSD Tartrate	A.7*	219. deep P
Baking Soda	A.8	43. m. r Br
Excedrin	A.8	260. v. d. p R
Morphine	A.8*	67. brill. O Y
Aspirin	A.9	228. gy. P
Chlorpromazine-HCl	A.9	21. blackish R
Codeine Sulfate	A.9*	147. v. d. G
Darvon (propoxyphene-HCl)	A.9	230. blackish P
Doxepin-HCl	A.9	41. deep r Br
Dristan	A.9	163. l. b G
Excedrin	A.9	148. v. p G
Heroin-HCl	A.9*	256. deep p R
LSD Tartrate	A.9	138. v. d. y G
Mace	A.9	257. v. deep p R
Marezine (cyclizine-HCl)	A.9	101. l. g Y
MDA-SO ₄ (3,4-methylene-dioxyamphetamine)	A.9*	157. g Black
Mescaline Sulfate	A.9*	84. s. Y
Methapyrilene-HCl	A.9	65. br Black
Morphine	A.9*	67. brill. O Y
Opium	A.9*	96. d. Ol Br
Oxycodone-HCl	A.9	84. s. Y
Phencyclidine	A.9	7. p. Pk
STP-HCl (2,5-dimethoxy-4-methylamphetamine)	A.9*	117. s. Y G
TMA-HCl (trimethoxy-amphetamine)	A.9*	183. d. Blue
Benzphetamine	A.10*	101. l. g Y
Chlorpromazine-HCl	A.10	111. d. gy. Ol + 108. d. Ol
Codeine Sulfate	A.10*	175. v. d. g B

Darvon (propoxyphene-HCl)	A.10	41. deep r Br
Doxepin-HCl	A.10	21. blackish R
Dristan	A.10	94. l. Ol Br
Excedrin	A.10	93. y Gy
Heroin-HCl	A.10*	161. deep b G
LSD Tartrate	A.10	152. blackish G
L-Isomethadon-HCl	A.10	7. p. Pk
Mace	A.10	111. d. gy. Ol
Marezine (cyclizine-HCl)	A.10	98. brill. g Y
MDA-SO ₄ (3,4-methylene-dioxyamphetamine)	A.10*	183. d. B
Mescaline Sulfate	A.10*	114. Ol Black
Methapyrilene-HCl	A.10	230. blackish P
Morphine	A.10*	166. v. d. b G
Nutmeg	A.10	65. br Black
Opium	A.10*	114. Ol Black
Oxycodone-HCl	A.10	107. m. Ol
Phencyclidine	A.10	7. p. Pk
STP-HCl (2,5-dimethoxy-4-methylamphetamine)	A.10*	118. deep Y G
TMA-HCl (trimethoxy-amphetamine)	A.10*	75. deep y Br
Baking Soda	A.11	181. l. B
Excedrin	A.11	144. l. G
Mace	A.11	120. m. Y G
Pentobarbital	A.11*	222. l. P
Phenobarbital	A.11*	222. l. P
Secobarbital	A.11*	222. l. P
Tea	A.11	120. m. Y G
Tobacco	A.11	136. m. y G

(+) means "and/or."

(*) means common reagent for that drug.

¹ Color abbreviations used:

B = blue
b = bluish
Br = brown
br = brownish
brill. = brilliant
d. = dark
G = green
g = greenish
Gy = gray

gy. = grayish
l. = light
m. = moderate
med. = medium
O = orange
Ol = olive
P = purple
p = purplish
p. = pale
Pk = pink

pk = pinkish
R = red
r = reddish
s. = strong
V = violet
v. = very or vivid
Y = yellow
y = yellowish

² Aqueous phase.

³ Aqueous phase after chloroform extraction.

⁴ Chloroform phase (marijuana extraction usually rapid compared to other materials).

⁵ Not extracted into chloroform.

⁶ Precipitate.

END