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DEPARTMENT OF DEFENSE

SMALL CALIBER AMMUNITION TEST PROCEDURES

9MM CARTRIDGES

FSC 1305

DEPARTMENT OF DEFENSE
Washington, DC 20301

Small Caliber Ammunition Test Procedures, 9mm Cartridges
MIL-STD-1468 (AR)

1. This Military Standard is approved for use by the US Army Armament Research, Development and Engineering Center and is available for use by all Departments and Agencies of the Department of Defense.

2. Recommended changes should be addressed to:

US Army Armament Research, Development
and Engineering Center
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FOREWORD

PURPOSE

The purpose of this publication is to prescribe uniform proof and inspection procedures to be used by all proof-testing facilities for acceptance inspection of 9mm ammunition. Adherence to these procedures, and equipment listed in the Inspection Equipment List, is considered necessary to assure uniformity of test results; however, if conflicts are encountered between the provisions of this pamphlet and the item specification, the latter will apply.

NUMBERING SYSTEM

Each section carries its own independent sequence of page and paragraph numbers. Pages are numbered as follows: The figure preceding the dash represents the number of the section and the number following the dash denotes the page within the section. Thus, 2-4 means section 2, page 4.

INSPECTION EQUIPMENT LISTS

Inspection Equipment Lists contain a complete list of the equipment, together with the drawing numbers of the equipment, that shall be used for the individual tests. Each specification identifies the appropriate Inspection Equipment List.

RECORDING OF DATA

The suggested format contained at the end of each test procedure may be used for recording test data. The data recorded shall be as prescribed by the various sections of this pamphlet and as prescribed by the item specification.

SAFETY

It must be recognized and emphasized that all proof-testing is hazardous. During the conduct of any test or operation described in this regulation, all local installation safety precautions and rules shall be observed.

CONTENTS

SECTION 1

WEAPON UNIT GUIDE

1. PURPOSE

The inspection, maintenance and cleaning of ballistic equipment is an important part of proof technique. Weapons used for official acceptance tests shall be inspected, maintained and cleaned in accordance with the practices outlined herein. Complete records of the wear history of weapons should be maintained for reference as a possible aid in the interpretation of ballistic results. All weapons shall be controlled by regular inspection and maintenance.

2. EQUIPMENT

Equipment listed in the applicable Inspection Equipment List shall be used.

3. FIRING-PIN MEASUREMENTS

3.1 Before comparability in test conditions can be established between stations, it is necessary that attention be paid to firing-pin diameter and contour, firing-pin protrusion and firing-pin indent of the test weapons and test actions. These measurements shall be made before a weapon or test action is placed in service, after misfires, pierced primers or flowbacks; or whenever a part replacement has been made in the bolt assembly.

3.1.1 Firing-pin diameter shall be checked with a micrometer, however, when difficulty is experienced with an unusual series of primer defects, the contour of the firing-pin point should be checked with a template or visual comparator. The diameter of the firing-pin hole in the faceplate should be checked concurrently. A loose fit between firing-pin and firing-pin hole, due to improper diameter of either or both, may cause punch outs of the primer and loss of sensitivity due to eccentric blow.

3.1.2 Firing-pin protrusion must be checked frequently to insure against pierced primers or misfires. Pin protrusion is measured with a dial gage of such construction as to be suitable for the particular weapon or action involved.

3.1.3 Firing-pin indent shall be measured by placing a copper pressure cylinder in a fixture (drawings of cylinder and fixture are referenced in the applicable Inspection Equipment List), the fixture is then inserted in the chamber of the weapon, the bolt is closed and the firing-pin released. The cylinder is then removed and the distance from the bottom of the indent to the undeformed surface of the cylinder is measured using a dial gage. A point micrometer graduated to .001", may also be used. This measurement is subtracted from the original measurement, the difference shall be the primer indent measurement.

(NOTE: Firing-pin indent and firing-pin protrusion shall be as shown in the detailed sections of this regulation.)

4. MEASUREMENT OF GUN CHARACTERISTICS

4.1 Headspace. The headspace of all test and service weapons shall be measured the first time they are put in use, during any shift or when fitting new barrels to fixed receivers. All test and service weapons shall conform to the headspace tolerance specified in the detailed sections of this regulation.

4.2 The headspace measurement for weapons containing the M1903 receiver is made as follows:

4.2.1 The bolt is stripped so that the operator will not be deceived by the drag caused by the extractor or other parts. A headspace gage is then selected by trial and error, which, when inserted into the chamber like a cartridge, will just allow the bolt to close when moderate pressure is applied. The dimension of this gage is the value of the headspace of the weapon. This measurement is checked by removing this headspace gage from the chamber, and inserting the next larger gage (plus .001") which should stop the bolt before it is completely closed.

4.2.2 Corrections to headspace shall be made by the gunsmith only.

5. CARE AND MAINTENANCE OF WEAPONS

Proper cleaning and lubricating of all ballistic equipment is essential for accurate reproducible proof results.

5.1 The bore of the weapon is cleaned as follows:

5.1.1 A soft bristle brush is saturated with cleaner and worked through the barrel with a vigorous scrubbing action. A brass brush is then run completely through the barrel in one long continuous stroke. When the brush emerges from the opposite end of the barrel the stroke is reversed and the brush is withdrawn through the barrel.

5.1.2 The bore is again swabbed with a soft bristle brush soaked in solvent. A cloth 'patch soaked in solvent is run through the bore several times. The chamber is carefully wiped with a similar patch.

5.1.3 A succession of clean cloth patches is then run through the bore until it is completely dry and clean. If barrel is not to be used in the immediate future, a clean patch is immersed in oil and run through the barrel so that a light film covers the chamber and bore.

5.1.4 Whenever the construction of the gun permits it, the bore is cleaned from the breech. When it is necessary to clean from the muzzle, special care is necessary in cleaning the chamber in order to remove the dirt, lint and bristles deposited therein during cleaning of the bore.

5.2 Small metal parts are cleaned by immersing in a bath of solvent or cleaner and scrubbing vigorously with a brass brush. Large metal parts are cleaned by wiping with a cloth soaked in solvent, cleaner or light oil.

5.3 Frequency of lubricating and cleaning.

5.3.1 Special test weapons (Receivers, Pressure Gages, etc.).

5.3.1.1 The bore and chamber are cleaned and lightly oiled at the close of each shift in which the weapon is used. All exposed parts of the receiver are wiped with an oily cloth.

5.3.1.2 Once each week, each test action in current use is completely dismantled, inspected, cleaned and lubricated.

5.3.1.3 Metal fouling is removed when it becomes too thick. The time for removal of such fouling is left to the judgment of the gunsmith, but the barrel is never allowed to foul to the point where the fouling begins to scale off.

5.3.2 Service weapons.

5.3.2.1 The chamber and bore are cleaned at the close of firing on each shift in which the weapon is used.

5.3.2.2 The receiver and bolt groups of each weapon are completely disassembled and cleaned at the close of firing on each shift or after 500 cartridges have been fired, if more than 500 cartridges be fired per shift. The hammer and trigger groups of automatic weapons are completely disassembled and cleaned as needed. Complete disassembly of the trigger and hammer groups each day is unnecessary.

5.3.2.3 The weapon is lubricated after each cleaning. Lubrication is applied to all moving parts and to the bore.

5.4 Inspection of weapons.

5.4.1 All of the items listed are checked in the initial inspection of the weapon; items marked (*) are checked daily; and items marked (**) are checked weekly when a weapon is used frequently or continuously.

a. Universal Receivers and assemblies containing the M1903 Receiver.

(1) Unpack, remove rust preventive

* (2) Disassemble, clean and lubricate

* (3) Inspect chamber and bore

(4) Check headspace

(5) Check bullet seat (breechbore gage)

(6) Examine camming and locking mechanisms

(7) Examine striker and bolt

** (8) Check firing-pin protrusion

** (9) Check firing-pin indent

* (10) Hand function, to check smoothness of feeding and ejection

b. Sub-machine guns

(1) Unpack, remove rust preventive

* (2) Disassemble, clean and lubricate

* (3) Inspect chamber and bore

* (4) Examine firing-pin and bolt

* (5) Check firing-pin protrusion

* (6) Check headspace

** (7) Check firing-pin indent (where applicable)

* (8) Assemble and function with dummy ammunition

c. Pistols

(1) Unpack, remove rust preventive

* (2) Disassemble, clean and lubricate

* (3) Inspect chamber and bore

* (4) Examine receiver and slide

* (5) Test action with dummy ammunition

6. REMOVAL OF METAL FOULING

6.1 The solution used for the removal of metal fouling consists of the following:

Ammonium per sulphate, USP . . . . 1 oz.
Ammonium carbonate, USP . . . . 0.5 oz.
Ammonia water (28% NH3 oz. vol.)
Spec. O-A-451, Class B . . . . 6 oz.
Water . . . . 4 oz.

It is recommended that this solution be prepared as required.

NOTE: This solution is very corrosive when allowed to dry on a metal surface or if brought in contact with a hot surface of a barrel. Great care should be exercised to see that it does not come in contact with blued metal or with gun actions.

6.2 To remove metal fouling, the barrel should be thoroughly cleaned. To remove the last traces of oil, a single cartridge should fired through it just before introduction of the fouling solution.

6.3 A tight fitting stopper is inserted into the bullet seat, and the fouling solution poured into the barrel until it is filled completely up to the muzzle.

6.4 If the solution does not completely fill the barrel, a line of corrosion will be formed. Some method must therefore be used to assure the barrel remains completely full. (A rubber tube slipped over the muzzle, a crater of grease built up around the muzzle, or the constant observation and addition of solution as it evaporates.,) 6.5 After one-half hour, the solution is poured out and the color noted. If the color is a deep blue, the treatment must be repeated. Between each application and after the final one (when the solution shows only a light trace of blue) the barrel is washed out with hot water, then cleaned with a wire brush and dried with cloth patches.

SECTION 2

REFERENCE CARTRIDGES

1. PURPOSE

1.1 The reference cartridges shall be used to establish the ballistic and equipment corrections for: Qualification Approval, Production Acceptance, and Surveillance Tests. In addition, the cartridges may be used to determine barrel serviceability or to check on other equipment or ballistic measurements. The reference lot will meet all the requirements of this manual and STANAG 4090.

1.2 NATO requirements. The Regional Test Center will maintain and supply Cartridge, Reference, NATO. The Test Center will fire an assessment and publish the following values for the reference cartridge:

a. Ballistic Data (EPVAT):

Average Velocity Results at 16 meters

Extreme Variation

Standard Deviation

Average Casemouth Pressure Results

Extreme Variation

Standard Deviation

Average Action Time Results at 21 degrees C

b. Assessment values:

Velocity at 16 meters

Case Mouth Pressure

Action Time at 21 degrees C

1.3 Review of assessed values. The superintendents of the Regional Test Centers will monitor the assessed values of the reference lot in the following manner:

a. The data from all firings of the reference cartridges conducted at the Regional Test Centers during a calendar year will be maintained.

b. Charts will be prepared showing the average values obtained at each of the Regional Test Centers and the combined averages. These will be plotted against the assessed values and the difference obtained. Significant differences will be statistically determined by using an "f" or "t" test.

2. EQUIPMENT

2.1 Required equipment is listed.

a. Reference cartridges

b. EPVAT barrels

c. Piezoelectric gages (Kistler Model 6215)

d. Associated recording instrumentation

3. PREPARATION

3.1 Cartridge storage area. Upon receipt of reference cartridges, the cartridges shall be placed in a dry storage area. Extreme variations in temperature within the storage area shall be held to a minimum.

3.2 Cartridge conditioning. Upon removal from the storage area, reference cartridges shall be conditioned at a constant temperature of approximately 21 degrees C for a minimum of 24 hours prior to being placed in the constant temperature controlled box for 2 hours at 21 degrees C, + 2 degrees C.

3.3 Master assessment barrels. The five EPVAT barrels used for the official assessment of the reference lot shall be defined as the "master assessment" barrels and shall be retained for use in assessing a new reference lot or reassessing the original lot if its values are significantly changing.

4. CONDUCTING THE TEST

4.1 Conducting assessment. The manner and sequence for conducting the assessment shall be the same as described in the EPVAT Test, SECTION 4, using EPVAT test barrels previously fired approximately 500 times. Twenty cartridges shall be fired in each of five EPVAT barrel pressure gage assemblies. The average velocity at 16 meters, case mouth pressures, and action item with the five EPVAT barrel pressure gage assemblies for the first day shall be obtained. If the average velocity of any barrel assembly deviates from the average of the five barrels by more than 6 meters per second or if the standard deviation for any individual barrel exceeds 10 meters per second, that barrel shall be replaced with another barrel and the firing for that barrel repeated and new averages calculated. An additional 20 cartridges shall be fired in the same manner in the same five EPVAT test barrels and with the same pressure gages on each of the 2 succeeding days. The velocity difference between the highest and lowest daily averages should not exceed 4 meters per second.

4.2 Simulated assessment. A simulated assessment test will be conducted at the discretion of the National Test Agencies or at the request of the Regional Test Centers. The purpose of a simulated assessment test is to provide a comparison between the various test centers for verification/correlation of test procedures, equipment used, and data obtained.

4.2.1 Procedure for conducting simulated assessment. The procedures are the same as previously described; however, the test barrels used will not be the "master assessed" barrels but a group of five barrels selected by the National Test Center or the Regional Test Center. The 500-round "life" for these barrels can be obtained by firing NATO qualified cartridges of the same type as the reference lot. The simulated assessment will first be conducted at the National Test Center and the results reported to the Regional Test Center. If the results are significantly different from the official assessed values for the reference lot, the barrels will be supplied to the Regional Test Center which will repeat the simulated assessment test.

5. RECORDING OF RESULTS

5.1 Upon completion of the tests, the average velocity, case mouth pressure and action time, for the entire series shall be computed.

5.2 Sentencing.

5.2.1 Official assessed values. The Regional Test Center superintendent will publish, as a NATO document, the official assessed values for the reference lot.

SECTION 3

ACCURACY TEST PROCEDURE

1. PURPOSE

1.1 The Accuracy Test is fired under controlled conditions at a target located at a specified distance from the weapon to determine the uniformity and dispersion of bullets. In order to minimize weapon inaccuracies, the test shall be fired in a rigidly mounted test weapon.

2. EQUIPMENT

2.1 Equipment listed in the Accuracy Section of the appropriate Inspection Equipment List shall be used.

2.2 The target size for Accuracy Tests shall not be less than 600mm x 600mm. A windup motor operated by remote control may be used for changing to a new target.

2.3 The pier or mount, on which the test assembly is mounted, shall be of solid construction.

3. PREPARATION

3.1 The flight of the bullet is affected to a degree by the direction and velocity of the wind over the outdoor range. Therefore, accuracy tests should not be fired when the velocity of the transverse wind is greater than 16km per hour (10 mph), or varying by more than 8km per hour (5 mph).

3.2 The following measurements shall be made before a test weapon is placed in service, after misfires, pierced primers or flowbacks; or whenever a part replacement has been made in the assembly:

	Limits
Firing-pin protrusion	1.52 - 1.73mm
Firing-pin indent	0.28 - 0.38mm
Headspace	19.15 - 19.23mm

3.3 The accuracy test weapon is assembled and clamped in position on the mount and boresighted into position. It is of prime importance that the assembly be mounted properly so that the weapon maintains its original position from shot to shot.

3.4 The test cartridges shall be placed at a point convenient to the technician. It is not necessary to condition the ammunition at a specified temperature, prior to firing. However, it is necessary that all cartridges be uniform with respect to temperature.

3.5 Two weapons shall be used. The number of targets to be fired shall be divided equally among the number of weapons to be used.

4. CONDUCTING THE TEST

4.1 A sufficient number of unrecorded cartridges of the type of ammunition under test shall be fired to assure that the test weapon is correctly sighted on the target, but in any event a minimum of three cartridges shall be fired to warm and foul the weapon when it is first put into service and after it has been cleaned or cooled. The approximate location of the shots fired is reported to the technician in order that alignment of the weapon may be adjusted, if necessary.

4.2 After the warming (fouling) cartridges have been fired, the target shall be changed so as to present a fresh surface for the succeeding target. Thereafter, the target shall be changed after each target of 10 cartridges has been fired.

4.3 Consideration is not given to the position of the propellant in the cartridge case, except that the manner of handling the ammunition from cartridge to cartridge is reasonably uniform. Ten cartridges shall then be fired in even sequence at a rhythmic uniform rate, as rapidly as service of the weapon permits.

4.4 The approximate location of the center of impact and the estimated size (Extreme Vertical and Extreme Horizontal) of the target first fired shall be reported to the technician by the observer in the target area, in order that alignment of the weapon may be adjusted if necessary.

4.5 The procedure shall be repeated until the specified number of targets has been fired in the first weapon, or when the exposed metal surface of the test barrel becomes too hot to grasp with the bare hand (approximately 60°C), at which time the barrel shall be cooled to ambient temperature before the next target is fired.

4.6 After the required number of targets has been fired with the first weapon, that weapon shall be removed from the mount and cooled to ambient temperature.

4.7 The second test weapon shall then be assembled on the mount and the procedure prescribed in 4.1 through 4.5 is repeated.

4.8 If it is necessary to use a weapon after it has been cooled with water, the chamber and bore of the weapon shall be wiped dry before any additional firing, and three warming (fouling) cartridges shall be fired.

5. MEASUREMENT OF TARGET

5.1 Explanation of terms.

5.1.1 Extreme Vertical (Ex. Ver.). Vertical distance between the center of the hole made by the uppermost shot and the center of the hole made by the lowermost shot.

5.1.2 Extreme Horizontal (Ex. Hor.). Horizontal distance between the center of the hole made by the shot farthest to the right and the center of the hole made by the shot farthest to the left.

5.1.3 Extreme Spread (Ex. Spr.). Distance between centers of the shot holes farthest apart.

5.1.4 Mean Radius (M.R.). Arithmetic mean of the distances between the center of all shot holes and a point of the target called the Center of Impact.

5.1.5 Center of Impact (C.I.). Defined as the point at which the algebraic sums of the vertical and horizontal components respectively of the distances to the center of each shot hole are zero.

5.2 Targets shall be measured and Mean Radius of each target determined in the manner indicated and illustrated on Drawings I and II at the end of this section.

5.3 Draw a horizontal line, PA through the center of the lowest shot hole on the target and extend it horizontally in both directions until its length is equal to or greater than the width of the group of shots comprising the target.

5.4 Draw a vertical line, PB through the center of the shot hole on the extreme left of the target perpendicular to the meeting line PA at P. Extend line PB above PA until the length of PB is equal to or greater than the height of the group of shots comprising the target.

5.5 Measure (by means of the scale or opisometer) the perpendicular distance Y from the center of each shot hole on the target to line PA. Add the distance so obtained and divide by the number of shots. The result of this calculation is the average vertical distance of the shot holes above the baseline PA, and is designated by Y. Similarly, measure (by means of the scale or opisometer) the perpendicular distance X from the center of each shot hole to line PB, add the distances so obtained and divide by the number of shots. The result is the average horizontal distance of the shot holes from the vertical ordinate PB, and is designated X.

5.6 Location of Center of Impact. From P, measure along PB a distance, PD, equal to Y, and along PA measure a distance, PE, equal to X. At points E and D erect the respective perpendiculars EC and DC to lines PA and PB. The intersection of these perpendiculars is the Center of Impact of the target, C. See Drawing I at the end of this section.

5.7 Mean Radius (M.R.). From the Center of Impact, measure the distance to the center of each shot hole of the target. Add these distances and divide by the number of shot holes. The result is the M.R. Drawing II at the end of this section illustrates the procedures.

5.8 If one or more shots miss the target in any 10 shot series, the entire accuracy test shall be considered invalid and refired at a larger target, as necessary to insure hits.

6. RECORDING OF RESULTS

6.1 All dimensions of the group shall be recorded to the nearest millimeter. Test sheets shall show the following:

a. Mean Radius

b. Extreme Horizontal

c. Extreme Vertical

d. Extreme Spread

e. Velocity and direction of wind (outdoor range)

f. Number and type of case casualties

g. Misfires

The following test weapon data shall be recorded on the test sheet:

a. Receiver number

b. Barrel number

c. Total number of cartridges fired in barrel (prior to test)

d. Headspace measurement

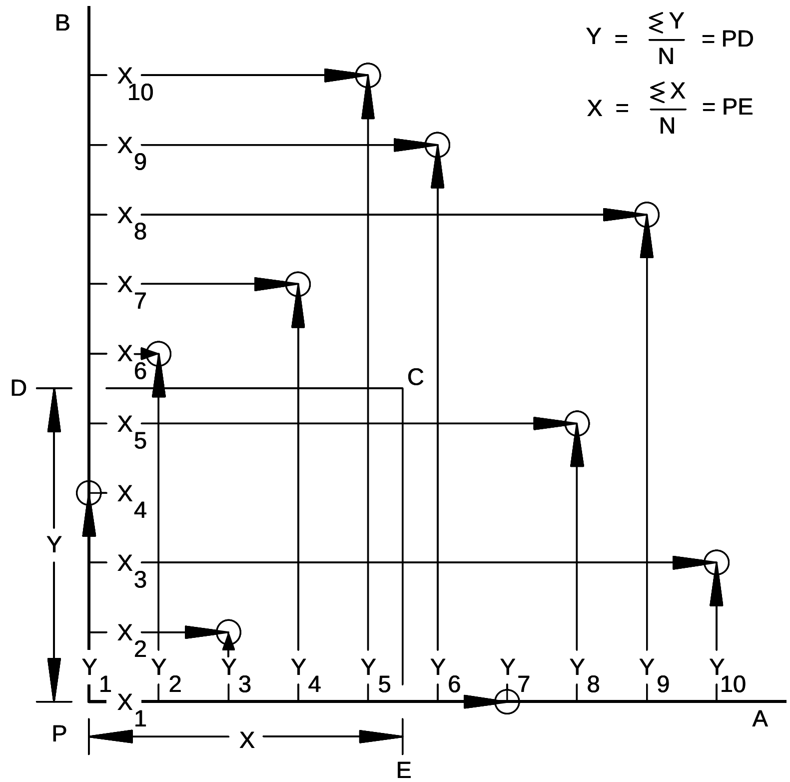
7. FACTORS AFFECTING ACCURACY TESTS

7.1 The external factors should be controlled as closely as possible in order to obtain results that are representative of the inherent accuracy of the ammunition.

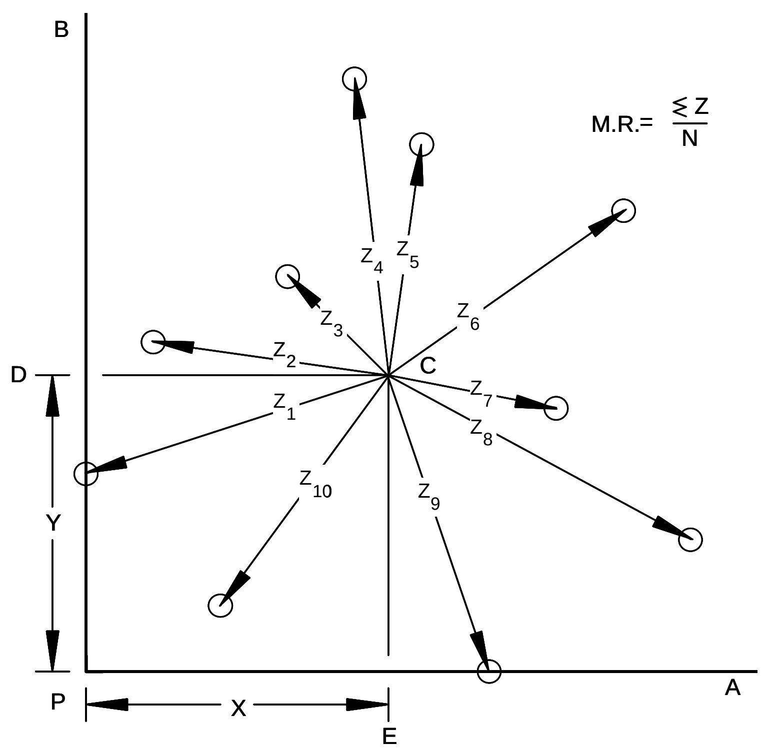
7.2 The dimensions and condition of accuracy weapons, as well as the manner of placing the weapon in the rest, are of prime Importance.

7.3 The technique of test can affect accuracy results. if uniformity in the manner in which the cartridges are handled, chambered and fired be poor, a larger Mean Radius is obtained than if the cartridges be tested in a uniform manner.

7.4 The temperature of the test barrel should be controlled so that the exposed metal surface of the barrel does not become too hot to grasp with the bare hands (approximately 60°C), at which time the weapon shall be cooled to ambient temperature before the next target is fired.



DRAWING I



DRAWING II

Propellant:	**Engineering Proof Testing Record Accuracy Test at _______Yds**	Ammunition:
Type		Lot
Army Lot		Type
Charge		Caliber
Case		Bullet
Primer		Wt.

Gun	Receiver	Barrel	Times Fired	Headspace	Pin Protrusion	Avg. MR	Wind	
							MPH	Dir.

Gun No.	Target No.		Ex. Ver.	Ex. Hor.	Ex. Spread		

Remarks:

Proof Technician(s)
Date Fired

SECTION 4

ELECTRONIC PRESSURE, VELOCITY AND ACTION TIME (EPVAT) TEST PROCEDURE

1. PURPOSE

1.1 The testing of ammunition for velocity, action time, and peak pressure at the case mouth shall be done simultaneously using a piezoelectric pressure transducer and associated equipment to measure the case mouth pressure. The purpose of testing for these attributes is as follows:

a. Velocity: The velocity test is a precisely controlled test to ascertain the velocity uniformity and level of the ammunition lot under test and to determine if the average velocity and uniformity obtained complies with the requirements of the applicable specification.

b. Action time: Action time is the overall ignition, propellant burning and barrel time of a bullet. The test serves to establish the performance level of the ammunition by recording the individual performance of each cartridge with respect to each other, as well as with respect to the entire group.

c. Case mouth pressure: The case mouth pressure test determines the pressure exerted, expressed in megapascals (MPa) in the chamber of the gun. The test is performed as a safety measure to insure that the pressure developed by the ammunition is safe for firing in the weapon(s) for which it is intended.

2. EQUIPMENT

2.1 Equipment listed in the Electronic Pressure Velocity, and Action Time (EPVAT) section of the appropriate Inspection Equipment List shall be used.

2.2 The firing mechanism shall be fitted with a device which reliably transmits an electrical signal to initiate timing on a chronograph at the instant of contact between firing pin and primer. The assembly shall also include a separate device (such as electrostatic collector at the muzzle) which transmits an electrical signal at the instant of bullet exit from the muzzle to terminate timing on the chronograph.

3. USE OF REFERENCE CARTRIDGES

3.1 Reference cartridges shall be used to establish range and equipment corrections prior to firing any ammunition lot for acceptance.

3.2 After twenty (20) reference cartridges have been fired in the weapon to be used for the test, the observed mean case mouth pressure and observed mean velocity of the reference cartridges shall be compared with the assessed values. If the assessed value is higher, the difference is a plus correction and shall be added to the mean case mouth pressure or mean velocity of the test cartridges. If the assessed value is lower, the difference is a minus correction and shall be subtracted from the mean case mouth pressure or mean velocity of the test cartridges. If both values are identical, no correction is applied.

3.3 Charts shall be maintained of the results obtained with each barrel using reference cartridges.

3.4 The EPVAT barrel assembly shall be withdrawn from service when either of the following performance variations from the assessed value of the reference cartridge is exceeded:

Mean peak case mouth pressure	± 25 MPa
Mean velocity	± 15 meters/sec

3.5 It is to be noted that barrels shall be retested several times before being finally rejected as out of tolerance.

4. OPERATING PROCEDURE FOR THE BALLISTIC PRESSURE TRANSDUCER

4.1 The case mouth pressure shall be determined by using accepted pressure transducers of the type(s) specified in Appendix A and qualified for use as per Appendices B and C.

4.2 The sensitivity constant for the transducer shall be determined prior to the test and as a minimum, after each successive 140 ± 10 cartridges fired on the transducer.

4.3 The transducer shall have its sensitivity determined at the pressure level of 250 MPa. The pressure units of the hydraulic calibration system, megapascals or pounds per square inch, may determine which nominal pressure level shall be used, i.e., 250 MPa or 36,000 psi. The method for determining the transducer sensitivity is detailed in Appendix B.

4.4 After having determined the sensitivity value for the transducer, the value shall be compared to the sensitivity previously obtained from the very last sensitivity determination.

The last sensitivity having been determined 140 ± 10 rounds previous in the life of the transducer, or for a new transducer, the value shall be that obtained from the initial Linearity Test (refer to Appendix B). If the change in sensitivity is greater than ± 2% from the previous value, or more than ± 10% from the original value, the transducer shall be disqualified for further testing.

4.5 The transducer sensitivity value to be used for instrumentation scaling shall be the value determined at 250 MPa for the case mouth transducer.

4.6 A record shall be maintained of the sensitivities obtained as a function of the number of cartridges fired on each transducer.

5. PREPARATION

5.1 The required number of reference cartridges (20) and test cartridges (30) shall be placed in a vertical position, primer end down, in separate recessed holding blocks. Each sample, properly identified, shall be placed in a constant temperature box or room, and shall be conditioned for a minimum of two hours.

5.2 Each barrel shall be borescoped to assess its general condition and to assure that the gas hole is not obstructed. The EPVAT barrel assembly shall be in accordance with the applicable drawings and the following measurements shall be made before it is placed in service, after misfires, pierced primers, blowback, or whenever a part replacement has been made in the bolt assembly.

	Limits
Firing pin protrusion	1.52 - 1.73mm
Firing pin indent	0.28 - 0.38mm
Headspace	19.15 - 19.23mm

5.3 The firing range shall be set up as shown on Drawing I. Velocity Screens shall be checked for position. The instrumental point (mid-point between screens) shall be 16 meters from the muzzle.

5.4 The chamber and bore of the barrel shall be wiped dry and the barrel bore sighted into position.

5.5 The transducer mounting holes shall contain no particles of foreign material on the sealing surface. To insure this condition, the following procedure shall be strictly adhered to prior to installing a transducer.

a. Any burrs, combustion particle, residue, corrosion, or other anomaly shall be removed by touching up the sealing surface with a flat end reamer.

b. Clean cavity and transducer thoroughly, use clean, lint-free industrial paper wipers and Freon TF degreaser spray.

5.6 The transducer shall be installed with the EPVAT barrel as per the instructions contained in Appendix A. The signal connector on the transducer and interconnecting line shall be wiped clean with lint-free industrial paper.

5.7 Electronic instrumentation requirements are outlined in Appendix A and calibration procedures are listed in Appendix B.

6. CONDUCTING THE TEST

6.1 Five fouling shots shall be fired. The pressure, velocity, and action time readings shall be recorded to assure that the measuring equipment is functioning properly. After the fifth fouling shot, the pressure transducer shall be retightened to the appropriate torque level specified in Appendix A. The transducer signal line shall be reconnected and securely tightened finger tight.

6.2 When firing EPVAT at 21°C, the recessed holding blocks containing the reference and test cartridges shall be removed from the controlled-temperature room or box and placed at a point convenient to the technician, provided the temperature of the firing room is approximately 21°C. If the firing room is not at approximately 21°C, or if EPVAT is to be fired for High or Low Temperature testing, the cartridges shall be placed in an insulated box (five cartridges at a time) which has been conditioned at the required temperature and the box placed at a point convenient to the technician. The cartridges shall then be removed singly from the insulated box immediately before firing. If an insulated box is not available, the cartridges shall be removed singly from the temperature controlled room or box immediately before firing.

6.3 In order that the propellant shall be uniformly positioned from shot to shot, attention to detail is necessary in handling and chambering the cartridge. The cartridge shall first be held vertically, bullet upward. It shall then be rotated slowly in a vertical plane, stopping the rotation momentarily after 180° of rotation when the bullet is downward, and then continuing through the remainder of 360°, stopping with the cartridge again bullet end upward. The bullet end of the cartridge shall now be lowered slowly to a position slightly above horizontal.

6.4 The cartridge shall be chambered very carefully, taking care that the primer end of the case is not elevated above the bullet end of the case. (The object is to have the propellant in a loose condition at the primer end of the case, and with such airspace as is present, at the bullet end of the case).

6.5 The breech block shall be closed gently and the trip lever, to which the lanyard is attached, shall be carefully engaged to the hammer. If the technician encounters any difficulty closing the breech block or engaging the trip level, the test shall be discontinued until such difficulty is corrected. If any delay occurs after the cartridge is placed in the chamber, and duration of the delay is such that the temperature of the cartridge has changed significantly, the cartridge shall be extracted and another inserted in its place.

6.6 The technician retires to a safe position and pulls the lanyard with a smooth, firm motion. The velocity, action time, and peak case mouth pressure of the shot shall be recorded. The breech block shall be opened, the fired case extracted and visually examined for case casualties.

6.7 The procedure prescribed in 6.3 through 6.6 is repeated until the required number of reference cartridges have been fired.

6.8 The pressure correction and velocity correction shall then be obtained as prescribed in paragraph 3.2

6.9 Provided the requirements of paragraph 3.4 are met, the procedure in paragraph 6.3 through 6.6 is repeated with test cartridges until the required number have been fired.

6.10 At not more than every 140 $\pm$ 10 rounds fired, the following steps shall be taken:

a. Remove the signal lines from the transducer.

b. Remove the transducer and inspect all components for excessive combustion particle residue; be careful to distinguish between normal combustion residue and metallic particles removed from the bullet jacket. Also inspect the transducer threads for combustion residue.

c. Clean the transducer and cavity thoroughly using lint-free industrial paper wipers and Freon TF degreaser spray.

Once cleaned, inspect the sealing surface of the transducer and the cavity for signs of gas flow past the annular Vee ring.

6.11 Upon completion of the above steps, the following procedure shall be followed to restart the test:

a. If the transducer and barrel cavity appear normal, the barrel shall remain qualified for the next 140 rounds of test.

b. If the transducer threads show signs of combustion residue or if any other evidence of gas flow through the sealing surfaces is noticed, the sealing surface of the barrel shall be examined to assure that a 32 microinch finish exists (or better). If the surface finish is poor, the surface shall be machine refinished with a flat end chucking reamer before attempting to use the barrel. The transducer or components at fault shall be replaced so that no gas leakage is experienced. All testing since the last examination shall be refired to assure that the condition did not influence the test results.

c. If the excessive residue and/or bullet jacket particle accumulation is noticed, the EPVAT barrel shall be removed from test and a retest fired in a replacement barrel to assure that residue fouling did not influence the test results.

7. RECORDING THE RESULTS

7.1 Results of both reference and test cartridges should be recorded directly on the test sheet form. Average velocity shall be recorded to the nearest m/sec., average case mouth pressure shall be recorded to the nearest 1.0 MPa. Individual action time measurements shall be recorded to the nearest .01 millisecond.

7.2 All groups of data will be tabulated to show means, extreme variations and standard deviation of each group, and the number and type of case casualties.

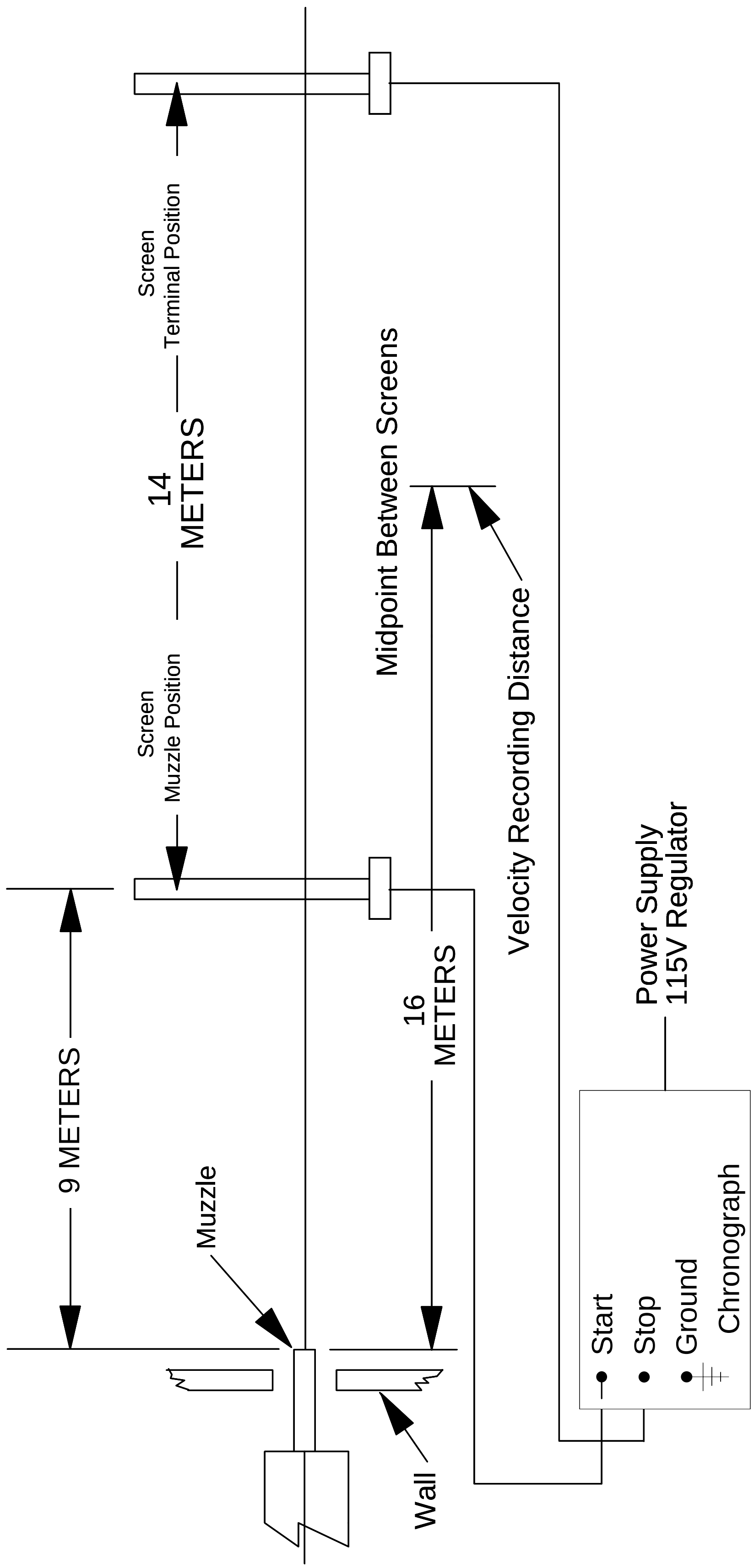
The following test weapon data shall be recorded on the test sheet:

a. Receiver number

b. Barrel number

c. Transducers serial number

d. Total number of cartridges fired in barrel (prior to test).


Screen
Terminal Position
14
METERS
Screen
Muzzle Position
Midpoint Between Screens
Velocity Recording Distance
9 METERS
16
METERS
Muzzle
Wall
Power Supply
115V Regulator
Start
Stop
Ground
Chronograph

DRAWING I

SECTION 5

BULLET EXTRACTION TEST PROCEDURE

1. PURPOSE

1.1 The Bullet Extraction Test determines the force required to pull a bullet from its cartridge case. It is used as a measure of the uniformity and efficiency in which the bullets are secured in the cartridge case.

2. EQUIPMENT

2.1 Equipment listed in the Bullet Extraction section of the appropriate Inspection Equipment List shall be used.

3. PREPARATION

3.1 The testing machine should be calibrated either weekly or prior to each occasion of use, whichever is less frequent. Calibration points shall include at least 30 pounds, 60 pounds, 100 pounds, 150 pounds and 250 pounds. If calibration errors exceed 3 pounds at scale readings below 200 pounds, or 6 pounds at scale readings above 200 pounds, then the necessary corrective action shall be taken to reduce the errors below these limits before the bullet extraction test is conducted. The method of calibration shall be by calibrated proof rings or calibrated spring balances which shall yield values within ± 1% of true values over calibrating range.

3.2 The number of cartridges as prescribed by the applicable specification are placed in a recessed holding block which shall be placed at a point convenient to the technician.

4. CONDUCTING THE TEST

4.1 The cartridge shall be inserted into the case holding block on the pulling head and aligned with the jaws on the pulling head. The jaws shall then be secured to the bullet just above the neck of the case.

4.2 The load shall be applied.

4.3 When the bullet has been extracted from the cartridge case, the machine shall be stopped. The force required to extract the bullet, indicated by the tensile indicator, shall be recorded.

4.4 The case and bullet shall then be removed from the holding block and jaws.

4.5 The case, with the propellant, should be placed upright in a recessed holding block and the extracted bullet placed point down in the mouth of the case.

5. RECORDING OF RESULTS

5.1 The following data shall be recorded.

a. Force required to extract each bullet

b. Average of the individual values

c. Minimum value

d. Maximum value

e. Testing machine data

Propellant	Engineering Proof Testing Record Bullet Extraction Test	Ammunition:
Type		Lot
Army Lot		Type
Charge		Caliper
Case		Bullet
Primer	Spec/Auth	Wt. Grs

Type of Machine
Rate of Loading – Lbs/min:
Rate of Travel of Pulling Head – Inches/min:

Calibration Points	30	60	100	150	250
Calibration Error					

Round No.	Extraction weight in lbs.		
Average			
Max			
Min			

Remarks :

Proof Technician(s)
Date of Test

SECTION 6

FUNCTION AND CASUALTY TEST PROCEDURE

1. PURPOSE

1.1 To insure that the ammunition can be expected to perform satisfactorily in the service weapons for which it has been designed. Ammunition may be ballistically satisfactory, i.e., it may comply with individual specification requirements such as velocity, pressure, trace, etc., yet be unserviceable for use in the field because of undesirable characteristics which jeopardize the safety of user personnel.

1.2 A malfunction is a faulty condition of the ammunition, weapon or its support equipment. A faulty or poorly adjusted weapon can cause casualties in normal ammunition, but if the weapon is in proper condition when casualties are encountered, then the fault is charged to the ammunition. It is important that the weapon be in correct adjustment and in proper condition so that results will not be misleading and any casualties encountered can be attributed to the proper cause.

2. EQUIPMENT

2.1 Equipment listed in the Function and Casualty section of the appropriate inspection equipment list shall be used.

2.2 Function and casualty weapons required by the item specification together with proper tools for assembly and suitable inspection gages for checking the weapons.

2.3 Firing pin indent of each test weapon shall be measured as follows:

2.4 Firing pin indent shall be measured by placing a copper pressure cylinder, which has been measured for length, in a holding fixture (drawings of copper cylinder, holding fixture and dial gage are referenced in the applicable inspection equipment list). Prior to inserting the copper cylinder in the holding fixture, a zero indicator reading shall be obtained, on the dial gage, on the height of the copper cylinder. The copper cylinder is then placed in the holding fixture. The weapon shall be held in a vertical position, muzzle end down. The bolt or slide shall be retracted to the rearward position and held open. The holding fixture containing the copper cylinder shall then be inserted into the barrel chamber, making certain the copper cylinder retains its original fully seated position in the holding fixture. The bolt or slide shall be manually returned to the battery position and the firing pin released. The bolt or slide shall be retracted very carefully and the holding fixture containing the copper cylinder removed from the chamber. The copper cylinder shall be removed from the holding fixture and the depth of the indent determined by measuring the distance from the original zero indicator reading to the bottom of the firing pin impression. The firing pin indent shall not be off-center more than one half the diameter of the indent.

2.5 Cyclic rate timer. Suitable recording instrument that will permit measurements within ± 2% of the true rate of fire. Cyclic rate shall be recorded to the nearest cycle per minute.

3. PREPARATION

3.1 Weapons shall be of the latest design or most recent issue. Receivers for weapons will be considered serviceable until such time as replacement is determined necessary by the gunsmith and verified by the Quality Assurance Representative. Receivers containing metal defects, excessive wear, excessive loosening of component parts, etc., to prevent proper functioning, shall be replaced immediately regardless of accumulated rounds. All barrels shall be inspected dimensionally and visually before use and rejected if any defect is discovered, regardless of accumulated rounds. Barrels for weapons will be considered serviceable until such time as replacement is determined necessary by the gunsmith and verified by the Quality Assurance Representative. Each weapon and/or barrel considered unserviceable, due to the above, shall be returned to the Quality Assurance Representative with a written report containing reason for turn-in.

3.2 The test cartridges to be loaded into the applicable magazines shall be examined for obvious defects. If visual defects are found, the defective cartridge(s) shall be replaced and the defects shall be noted on the test sheet form.

3.3 Cartridges to be temperature conditioned (high and low temperature) shall be at ambient temperature (16°C to 27°C) prior to temperature conditioning and shall be loaded into the applicable magazines and conditioned for no less than one hour.

3.4 For horizontal firings the weapon shall be assembled on the mount and sighted into position. For 80° depression firings the weapon shall be assembled on a suitable mount. Weapons shall be at room temperature at the start of the test.

3.5 Prior to the horizontal firing, a screen at least 760 x 760mm in size shall be erected at a distance of approximately 15 meters from the gun so that the bullets will pass through the screen near its center. This screen shall be examined, after each weapon is fired, for evidence of stripped bullet jackets. It shall be recovered or replaced as necessary to facilitate observation of the pattern of shots.

4. CONDUCTING THE TEST

4.1 The number of cartridges per burst and the cooling cycle shall be as shown below. Barrels shall be cooled by air or water to ambient temperature.

4.1.1 Horizontal firings:

Weapon	Magazine Capacity	No. of Magazines	Magazines Before Cooling
Pistol	15	3	3
SMG	30	3	3

4.1.2 80° Depression firings:

Weapon	Magazine Capacity	No. of Magazines	Magazines Before Cooling
Pistol	15	3	3
SMG	30	3	3

4.2 The procedure for firing each of the weapons specified shall be the same insofar as possible. For the horizontal firings the magazine shall be inserted into the weapon and the cartridges fired full automatic where possible (otherwise semi-automatic) and the magazine removed. A time interval of not more than one half minute shall be allowed between magazines. The next magazine of cartridges shall be inserted and fired semi-automatic. This procedure of alternating automatic and semi-automatic shall be followed (in weapons which permit automatic fire) until the test has been fired. The weapon shall then be cooled to ambient temperature before any further firings take place. For 80° depression firings the initial magazine shall be fired semi-automatic followed by automatic (in weapons which permit automatic fire). This procedure of alternating the method of firing shall be followed until the test has been fired. The weapon shall then be cooled to ambient temperature before any further firings take place.

4.3 At all times, cleaning, lubrication and maintenance of each weapon shall conform insofar as possible to the technical instructions provided by the country that provided the weapon. In the absence of specific instructions, cleaning, lubrication and maintenance shall be consistent with good practice for small arms, taking account of any special conditions associated with peculiarities of the weapon, the test, and the type of ammunition. In general, the weapons should be examined frequently for accumulation of brass chips around the extractor, combustion residue in the gas system or other mechanism, excessive fouling in the barrel, and broken or excessively worn parts.

4.4 In the event any stoppage occurs during firing of the test, a detailed check shall be made to determine whether the ammunition or the equipment is at fault. If the stoppage was caused by a misfire, the check of the weapon shall include measurement of the firing pin protrusion and firing pin indent. To assist in determining whether ammunition or equipment is responsible for a stoppage, it is good practice to test the weapon in question using ammunition of known characteristics, and to test the ammunition in question by firing in another weapon of the same type. If it is established that some faulty condition of the weapon is responsible for stoppage, then the test shall be disregarded, the weapon shall be corrected or replaced, and the tests previously conducted with that weapon shall be refired.

4.5 Upon completion of firing, all cartridge cases from the test ammunition shall be carefully examined for firing defects in accordance with the applicable cartridge specification. If any defect is found, a detailed check of the equipment shall be made to determine whether the ammunition or equipment is at fault. If it is established that a fault weapon is responsible for the firing defect, then the test shall be disregarded, the weapon shall be corrected or replaced and tests with that type of weapon shall be refired. If it cannot be established that the weapon or other equipment is at fault, then the firing defect shall be charged against the ammunition.

5. RECORDING OF RESULTS

5.1 Casualties shall be reported in accordance with terminology specified in paragraph 6. Those casualties not listed in the item specification shall be recorded on the test report form for information only.

5.2 Misfires shall be recorded and the cause described.

5.3 The function and casualty test requires careful attention and alertness, and any unusual occurrence in gun function or appearance of fired cases shall be noted.

5.4 Failures of gun parts shall be shown on the ammunition report.

5.5 The following test weapon data shall be recorded on the test report:

a. Receiver number

b. Barrel number

c. Total number of cartridges fired in receiver and barrel, respectively, prior to test.

d. Headspace measurement

e. Firing pin protrusion

f. Firing pin indent

g. Temperature at which cartridges were stored and fired.

6. DEFINITIONS

6.1 Misfire. Failure of a round of ammunition to fire after the initiating impulse has been applied to the primer. There are two general categories of misfires:

a. The primer fails to fire when struck by the firing pin.

b. The propellant does not ignite when the primer fires normally.

6.2 Perforated primer. One in which the primer cup is completely perforated by the firing pin. It can be identified by a visible hole through the primer, or if the perforation be minute, by discoloration of the firing pin indent caused by burning gas.

6.3 Primer leak. Discoloration caused by gas leakage around junction between primer cup and the primer pocket wall.

6.4 Loose primer. Looseness, but not so as to permit the fired primer to fall from the primer pocket, after the cartridge is fired.

6.5 Blown primer. A primer which, when the cartridge is fired is separated completely from the head of the cartridge case and both the head of the case and the primer pocket are enlarged and deformed.

6.6 Dropped primer. A primer which, when the cartridge is fired, falls from the primer pocket during or after extraction.

Although it is in the same category as a blown primer, deformation to the head of the case and the primer pocket is less obvious.

6.7 Hangfire. Any delay in the functioning of a cartridge after initiating action is taken. Usually refers to delay in ignition of primer and/or propellant.

6.8 Flow-back. A flow-back may be described as the forcing of the dome of the primer cup into the space between the firing-pin and the firing-pin hole.

6.9 Punch-out. A punch-out is the removal of metal in the dome of the primer by the firing pin. Although similar to a perforated primer, a punch-out results in the formation of a round disk of metal that may or may not remain attached to the pierced primer cup.

6.10 Primer setback. The backward movement of a primer cup in a cartridge case which occurs when the base of the cup is not properly supported by the bolt face or breechblock and protrudes above the head of the cartridge case.

6.11 Ruptured case. A circumferential separation of the case wall produced by firing. Ruptures are divided into two categories, partial and complete. A partial rupture is one which extends less than 360 degrees around the case; a complete rupture is one which extends entirely around the case, separating the **case** into two parts. Ruptures are designated according to position, as indicated on Drawing C7643674.

6.12 Split case. A longitudinal separation of the metal in the case wall produced by firing. Splits shall be classified as prescribed by the cartridge specification and Drawing C7643674.

6.13 Stretched case. A longitudinal elongation of the metal of the case wall which can be recognized by a change in sheen of the case within a partial or complete circumferential ring or band.

6.14 Rim shear. A case which exhibits complete removal of any portion of the extractor rim during normal gun functioning, usually resulting in failure to extract.

6.15 Failure to extract. The fired case is not removed from the weapon chamber by normal gun action.

6.16 Stripped jacket. The jacket of the bullet separates from the core after it has left the muzzle of the weapon or separates in the bore.

6.17 Bullet-in-bore. A bullet remaining in the bore of the barrel.

6.18 Muzzle burst. Explosion of a projectile at the muzzle of the weapon, or up to a distance of approximately fifteen (15) feet from the muzzle.

6.19 Muzzle flash. Flash that appears at the muzzle of the weapon when a projectile leaves the barrel.

6.20 Breech flash. Gas flash occurring at breech of weapon.

6.21 Breech flame. Flame occurring at breech of weapon.

6.22 Fouling. Deposit that accumulates in receiver of rifle or bore of barrel during firing.

6.23 Double tap. The inadvertent firing of two or more rounds of ammunition with a single trigger pull in semi-automatic firing mode.

Propellant:	**Engineering Proof Testing Record** **Function and Casualty Test**	Ammunition:
Type		Lot
Army Lot		Type
Charge		Caliber
Case	Spec/Auth	Bullet
Primer		Wt. Grs

Gun Type	Gun No.	Barrel No.	Times Fired	Firing Pin Indent	Firing Pin Protrusion	Headspace

	Ambient Temperature	Stored at Fired at	Stored at Fired at	Stored at Fired at	Stored at Fired at	Total All Conditions
Rounds Fired						X
Cyclic Rate						
Defect Type*						

*For legend, see Item Specification; no entry indicates “No Defect”.

Remarks:

Proof Technician(s)
Date Fired

SECTION 7

MERCUROUS NITRATE TEST PROCEDURE

1. PURPOSE

Mercurous nitrate testing is a visual means of determining if stresses exist in brass cartridge cases that may cause the cases to crack or split under conditions of storage or during service usage.

2. EQUIPMENT

Equipment listed in Mercurous Nitrate section of the appropriate Inspection Equipment List shall be used.

3. MANDATORY SAFETY REQUIREMENTS

3.1 Food shall not be stored or eaten in the vicinity in which these tests are conducted.

3.2 Acid resistant apron and gloves or the equivalent shall be worn by each test technician.

3.3 Face shield shall be worn at all times during the pouring or mixing of acids and water. Safety glasses shall be worn during other phases of this test.

3.4 Asbestos or heat insulating gloves shall be worn during the heat volatilization phase of the test to facilitate handling.

3.5 During the entire period of volatilization the oven door shall be closed.

3.6 Extreme care shall be exercised in the mixing of acid with water; this shall be accomplished by pouring the acid into the water.

3.7 Test shall be conducted under a canopy or hood having a forced draft ventilation system to remove noxious fumes. The disposition of tested components shall be governed by local regulations.

4. PREPARATION

4.1 Nitric-acid solution. Four hundred milliliters of nitric acid (of specific gravity 1.42) are dissolved in 500 milliliters of distilled water at room temperature. To this solution, distilled water is added to bring the volume of the resulting solution to one liter. (The resultant specific gravity will be 1.25).

4.2 Mercurous nitrate solution. Ten grams of mercurous nitrate and 10 milliliters of nitric acid (of specific gravity 1.42) are dissolved in 400 milliliters of distilled water at room temperature. To this solution, distilled water is added to bring the volume of the resulting solution to one liter.

4.2 Test of Cartridges.

4.2.1 The cartridges are positioned in both nitric acid and mercurous nitrate solutions in a vertical position, with the head of the case down. The depth of each solution is adjusted until it completely covers the mouth of the case.

4.2.2 One-half of the number of cartridges prescribed in the applicable specification for the mercurous nitrate test is submerged in the nitric acid solution. After 30 seconds the cartridges are withdrawn, rinsed in water and the excess water removed. The cartridges are then submerged for 15 minutes in the mercurous nitrate solution. Upon removal, the surface of the cartridge case is examined under a magnification (10 to 15 diameters) for splits and cracks. All splits and cracks found are reported.

4.3 Test of cartridge case.

4.3.1 The cases for this test are obtained by disassembly of cartridges. The primers must be fired prior to using the cases. Cases shall be inspected prior to the test.

4.3.2 The cases are positioned in both nitric acid and mercurous nitrate solutions in a vertical position, with the head of the case down. The depth of each solution is adjusted until it completely covers the mouth of the case but does not rise more than one-half inch above the mouth of the case.

4.3.3 Cases from the remaining half of the number of cartridges prescribed in the applicable specification for the mercurous nitrate test (after the bullet and propellant have been removed and the primer fired) are submerged in nitric acid solution. After 30 seconds the cases are withdrawn, rinsed in water and the excess water removed. The cases are then submerged for 15 minutes in the mercurous nitrate solution. Upon removal, the mercury on the surface of the case is volatilized by the application of heat and the surface then examined under magnification (10 to 15 diameters) for splits and cracks. All splits and cracks found are reported.

NOTE A split is defined as a separation of the metal entirely through the wall of the case. A crack is a surface condition and represents a separation of the metal partially through the wall. Cracks are not considered to be splits.

A suggested method for determining cracks and splits follows:

Splits in the cartridge case, after the mercury cracking test, are defined by filling the case with water (water temperature 70°F to 100°F) to the mouth until a convex meniscus condition exists and placing the thumb over the mouth of the case. If the case is split, this exerts sufficient pressure to force the water through the opening.

Splits in the assembled cartridge are not so easily detected unless the split is at the mouth of the case and the bullet metal is seen through the split. If the split is in the body, the only way to determine whether it is a split or crack is to disassemble and follow the procedure used for the case check.

5. RECORDING OF RESULTS

5.1 Results of the test shall be recorded directly on the test sheet form.

5.2 All splits and cracks and their location shall be reported.

Propellant:	**Engineering Proof Testing Record** **<u>Mercurous Nitrate Test</u>**	Ammunition:
Type		Lot
Army Lot		Type
Charge		Caliber
Case	Spec/Auth	Bullet
Primer		Wt. Grs

Complete Ctgs Tested	Cracks	Location	Splits	Location
Complete Ctgs Tested	Cracks	Location	Splits	Location

Remarks:

Proof Technician (s)
Date of Test

SECTION 8
WATERPROOF TEST PROCEDURE

1. PURPOSE

To determine the watertightness of cartridges.

2. EQUIPMENT

Equipment listed in the Waterproof section of the appropriate Inspection Equipment List shall be used.

3. PROCEDURE I (FIRING TEST)

3.1 Preparation

a. The Type I Waterproof Test requires a pressure tight vessel, large enough to hold a minimum of 30 9mm, cartridges under at least two inches of water, at a constant 25 psi for a period of at least 30 minutes. The pressure vessel shall include a gage that accurately displays the internal pressure, with one psi graduations, and a tray or rack used for lowering the cartridges into and out of the vessel.

b. In addition to the pressure vessel cited above, an EPVAT barrel, set up in accordance with Section 4.0 is required; but only velocity data will be collected in the firing portion of the test.

3.2 Conducting the test.

a. The sample cartridges shall be placed in a tray or rack and lowered into the pressure vessel, taking care to insure that all test cartridges are at least two inches under water.

b. The pressure vessel is then closed, and air pressure applied. The air pressure is adjusted to 25 ± 2 psi and maintained at that level for at least 30 minutes.

c. After 30 minutes, the pressure is removed from the pressure vessel, the sample cartridges removed from the water and dried with a clean cloth.

d. After being dried, the sample cartridges are placed base down in a recessed holding block and transported to the range for the firing portion of the test.

e. The maximum time interval between removal from the water until firing for velocity, shall be not longer than three hours. If the firing phase of this procedure can not be conducted within the allotted time, the test shall be declared invalid and another test sample required.

f. Firing the test - Firing of the sample cartridges shall be in accordance with paragraph 4.6, of Section 4, EPVAT Test Procedure, except that only velocity data shall be recorded. Caution shall be exercised during this portion of the test to assure, in the case of a low report or squib, that the bullet has not become lodged in the barrel. After the firing of any suspect rounds, the technician shall verify that the bullet has cleared the bore.

g. Recording of data - The following, data shall be reported on the test form:

(1) Velocity of each round

(2) Mean velocity of the sample

(3) Occurrences of any misfires, squibs, and bullet in bore

4. PROCEDURE II (VACUUM TEST)

4.1 Preparation for test.

a. The Glass Test Chamber should be at least of sufficient diameter to accommodate five cartridges lying horizontally on a perforated rack or tray, and of sufficient depth to allow a 2 to 2 1/2 inch head of water above the cartridges for the test. The volume of the reservoir should be about 5 to 15 times the volume of air remaining in the Glass Test Chamber when the Glass Test Chamber contains sufficient water for conducting the test.

b. The Glass Test Chamber shall contain a sufficient amount of freshly boiled water cooled to room temperature to allow a 2 to 2 1/2 inch head of water above the cartridges. A perforated metal tray shall be placed across the narrow part of the body. The ground glass surfaces on the lid and body and on the glass tap shall be smeared with vasoline or vacuum grease.

4.2.2 Conducting the test.

a. With the Glass Test Chamber closed to the vacuum reservoir and the valve open from the reservoir to the vacuum pump, the vacuum pump shall be set in operation. The pressure in the reservoir shall be reduced until the vacuum gage shows some predetermined reading greater than that specified in the specifications; this predetermined reading is the vacuum in the reservoir which will, when the reservoir is connected to the Glass Test Chamber, produced the desired vacuum in both. (The desired vacuum in the reservoir will be approximately one to 3 inches greater than that required by the specification, and should be determined by experiment with the particular apparatus to be used, and recorded for future reference). When the desired vacuum in the reservoir has been obtained, the valve from the reservoir to the pump shall be closed, and the pump operation may be stopped.

b. The ammunition to be tested (not exceeding five cartridges at a time) shall be placed horizontally on the tray in the Glass Test Chamber and the lid placed in position. The glass tap shall be turned to allow the vacuum reservoir to evacuate the Glass Test Chamber to the required pressure below atmospheric pressure and shall be held at that pressure for the specified time. The number of bubbles liberated from the mouth or primer, or both, of each cartridge shall be observed. At the end of the specified time the vacuum shall be released from the Glass Test Chamber, the lid removed and the ammunition removed.

c. The procedure prescribed in 4.2a and b shall be repeated until the required number of cartridges has been tested.

4.3 Recording of data. Results of Waterproof Test shall be reported as follows:

a. No leak

b. Slow leak - A series of two or more air bubbles appearing at the primer or mouth of the case, or both, but which are liberated at such a rate that only one bubble from either the primer or the mouth of the cartridge is in transit to the surface at any one time.

c. Fast leak - A series of air bubbles appearing at the primer or mouth of the case, or both, which are liberated at such a rate that more than one bubble from the primer or the mouth of the cartridge case is in transit to the surface at any one time.

d. Location of leak - Identify area of leak with machinist layout ink.

Propellant:	**Engineering Proof Testing Record** **<u>Mercurous Nitrate Test</u>**	Ammunition:
Type		Lot
Army Lot		Type
Charge		Caliber
Case	Spec/Auth	Bullet
Primer		Wt. Grs

Sample Size	Number of Cartridges			Percentage Waterproof
	No Leak	Slow Leak	Fast Leak	

Location of Leaks:

Remarks:

Proof Technician

Date of Test

SECTION 9

PRIMER SENSITIVITY TEST PROCEDURE

1 PURPOSE

To determine the sensitivity limits within which the primer functions in order to provide assurance that:

a. The primer will be safe to handle.

b. The primer will fire in the cartridge case and weapon(s) for which it is intended.

2 EQUIPMENT

Equipment listed in Primer Sensitivity section of the appropriate Inspection Equipment List shall be used.

3 TEST PROCEDURE (Complete Rundown Test)

3.1 Preparation for test.

3.1.1 The test shall be conducted on empty primed cases. In the event the primed cases must be obtained by disassembly of cartridges, the disassembly shall be accomplished in such a manner as to cause the least possible distortion of the cartridge case.

3.1.2 The firing-pin protrusion of the machine shall be 0.89MM minimum. This measurement shall be obtained by seating the firing pin fully against the shoulder stop in the firing-pin retainer, and measuring the resulting protrusion of the point of the firing pin from the face of the firing-pin retainer. A micrometer, dial indicator, or other suitable measuring instrument shall be used for this purpose. If the firing-pin protrusion is less than the minimum dimension, the firing pin or the firing pin retainer shall be replaced in order to achieve the required firing-pin protrusion.

3.1.3 A headspace gage having a dimension of 19.15MM shall be placed in the caseholder. The caseholder shall be lowered, if necessary, until the breechblock closes and clamps freely without interference with the headspace gage. The caseholder shall then be adjusted by raising carefully until contact is felt between the head of the gage and the firing-pin retainer when the breechblock is fully closed. To verify that contact has been established between the headspace gage and the firing-pin retainer, the retainer shall be coated thinly with some colored compound (such as 'Prussion blue" in oil) which will be transferred to the opposing surface upon contact. The breechblock shall be closed and clamped, with the headspace gage in place; the breechblock shall then be opened, and the head of the gage inspected for evidence of contact, and adjustment of the case holder refined as necessary. When the proper adjustment has been achieved, the caseholder shall be locked in position by tightening the locking collar, and the adjustment shall be verified again using the colored compound and the headspace gage to assure that the adjustment has not been disturbed by tightening the locking collar. The gage shall then be removed from the caseholder, and the face of the firing-pin retainer wiped clean.

3.1.4 A primed case shall be inserted in the caseholder and the breechblock closed and clamped. The electromagnet shall be energized and the ball attached thereto. All measurements shall be made between the top of the firing pin and the bottom of the suspended ball. The method of measurement used for indicating height of drop shall be graduated in inches with an accuracy of $\pm$ 1/64 inch. The position of the magnet and ball shall be adjusted so that the height of drop desired can be accomplished. When this adjustment has been completed, the ball shall be removed from the machine.

3.1.5 A plumb bob attached to a rod, which fits into the hollow magnetic core by a piece of mason cord, is used to determine alignment of magnetic assembly with the firing pin. Adjust any of the 3 screws in the base that will result in the desired alignment of magnet with the pin. The plumb bob shall be removed when this adjustment is completed. A piece of carbon paper shall be placed on the head of the firing pin and the ball dropped from various heights. After the ball is dropped each time, the firing-pin head shall be inspected to ascertain if the mark left by the carbon paper is in the center of head. If the ball is not hitting on the center of the pin, the cause thereof shall be determined and corrective action taken.

3.2 Conducting the test.

3.2.1 Current is applied to the magnet coil of the drop test machine and the magnet height is set so that the distance between bottom of suspended ball and the head of the firing pin, with primed case in position, is 8 inches.

3.2.1.1 Alignment of magnet with firing pin is checked as prescribed in 3.1.5.

3.2.1.2 Primed case is inserted in holder.

3.2.1.3 Breechblock is closed and locked.

3.2.1.4 Steel ball of appropriate size is suspended from the magnet.

3.2.1.5 Key is pressed to break circuit and permit ball to fall.

3.2.1.6 Performance of primer is noted; that is, whether it fires, misfires or squibs, and result is recorded. Squibs shall be counted as misfires.

3.2.1.7 Ball is removed from ball trap.

3.2.1.8 Breechblock is unlocked and opened.

3.2.1.9 Cartridge case is removed from caseholder.

3.2.2 The procedure prescribed in 3.2.1.2 through 3.2.1.9 shall be repeated until the specified number of primed cases have been tested at 8 inches. The number of primers firing and the number misfiring shall be recorded on the report form.

3.2.3 The procedure prescribed in 3.2.1 and 3.2.2 is than repeated at 9 inches, 10 inches, etc., until a height is reached at which all the primers in the sample fire. The magnet is then lowered to a height of drop of 7 inches, then 6 inches, etc., until a height is reached at which all the primers in the sample misfire. The number firing and the number misfiring at each height shall be recorded.

3.2.4. The prescribed procedure constitutes a complete rundown test.

3.3 Calculation of sensitivity characteristics.

The primer sensitivity characteristics to be calculated are "$\overline{H}$" "σ" and "a_3". These 3 statistics can be defined in terms of the data obtained in the drop test as follows:

a. $$\overline{H} = \sum P_i + (H_{100\%} + .5)$$

b. $$\sigma = \sqrt{(p_i k_i) - (\sum p_i)^2}$$

c. $$a_3 = \frac{\sum p_i s_i + 2(\sum p_i)^3 - 3\sum p_i k_i \sum p_i}{\sigma^3}$$

Where:

$\overline{H}$ = Mean critical height, or the height at which 50 percent of the primers fire and 50 percent of the primers misfire.

$\sum$ = Sum of individual values.

p_i = Decimal fraction of primers misfiring at each individual height.

$H_{100\%}$ = First height at which all primers in sample misfire.

σ = Standard deviation, or dispersion of the individual primer sensitivities about the mean.

k_i = Variance factor.

s_i = Skewness factor.

a_3 = Skewness value.

3.3.1 The data obtained in the rundown tests are tabulated in the manner illustrated on Figure I.

a. In Column I "Height of Drop", enter all the intermediate heights of drop, in consecutive order, starting with the lowest height at which some of the primers fire and some fail to fire. The height at which all the primers fire and the height at which all the primers misfire are not included.

b. In Column II "Number Fired", enter the number of primers firing at each height.

c. In Column III "Number misfired", enter the number of primers which fail to fire at each height.

d. In Column IV "Fraction Misfired", enter the decimal fraction of the primers that fail to fire at each intermediate height. This fraction is designated "p_i", and is obtained by dividing the number of primers that fail to fire by the number of primers tested. Results are recorded to the closest second decimal place.

e. Add numbers contained in Column IV and enter sum as $\sum p_i$. Directly under $\sum p_i$ enter "$H_{100\%} + .5$" (the first height at which all the primers in the sample misfired, plus .50). Add $\sum p_i$ and "$H_{100\%} + .5$". The result is $\overline{H}$ (mean critical height).

f. In Column V "Variance Factor", the odd numbers in sequence are written; i.e. 1, 3, 5, 7, 9. etc. Number 1 must be in alignment with the first entry in Column IV.

g. In Column VI, the value of the individual entries in Column IV, "p_i" are multiplied by the corresponding individual entries In Column V, "k_i", and the results "$p_i k_i$" are placed in proper alignment in Column VI. For example, if the number in Column IV Is .74 and the odd number aligned with it in Column V is 5, then place 3.70 (5 x .74) in Column VI on the same line as 5 and .74. Odd numbers remaining in Column V having no corresponding entries in Column VI are ignored.

h. Add the numbers contained in Column VI and enter the sum as $\sum p_i k_i$. Directly under $\sum p_i k_i$ enter $(\sum p_i)^2$, the square of the sum of Column IV. Write $(\sum p_i)^2$ to the nearest second decimal place. Subtract $(\sum p_i)^2$ from $\sum p_i k_i$. The result is σ^2. Extract the square root of σ^2 to obtain σ, the standard deviation.

3.3.2 $\overline{H}$ plus and minus the multiple(s) of σ, as prescribed in the applicable specification, shall be computed. The results obtained are then compared with the requirements of the specification to determine acceptability.

3.3.3 When determination of skewness is required, the following procedure shall be accomplished:

a. Follow procedures prescribed in 3.3.1a through 3.3.1h.

b. In Column VII "Skewness Factor(s)", the numbers entered are as shown in I.

c. In column VIII, numbers as shown in Column VII are multiplied by corresponding numbers in Column IV. Results are placed on same line in Column VIII "$p_i s_i$". Ignore numbers in Column VII that have no corresponding entries in Column IV.

d. Add numbers contained in Column VIII and enter sum as $\sum p_i s_i$.

e. Cube the sum of Column IV $(\sum p_i)$ and multiply by 2.

f. Multiply the sum of Column VI ($\sum p_i k_i$) by the sum of Column IV ($\sum p_i$), then multiply the product by 3.

g. Cube the standard deviation (σ) obtained in Column VI.

h. Calculate skewness value (a_3) by substitution of computed values in the following formula:

$$a_3 = \frac{\sum p_i s_i + 2(\sum p_i)^3 - 3\sum p_i k_i \sum p_i}{\sigma^3}$$

4 TEST PROCEDURE (2-Height Test)

To employ this method it must be assumed that the critical heights of the primers are normally distributed or nearly so. Therefore this method shall be used only when the criteria prescribed in the applicable specification have been satisfied.

4.1 Preparation for test.

4.1.1 Preparation for test shall be as prescribed in 3.1.

4.2 Selection of test heights.

4.2.1 Available rundown test data on the same or similar primers can be utilized to advantage in selecting the heights for a 2-height drop test. If such data are not available, the testing of small samples at several heights may be entailed in order to make the proper selection of 2 test heights. In either case the following criteria apply:

Call the lower height X_1, the upper height X_2, the fraction firing at the lower height p_1, and the fraction firing at the upper height p_2. If at least some failures and nonfailures occur at both heights (i.e., neither p_1 nor p_2 is zero (0) or one (1.0)) and if $p_2 - p_1 \geq .20$, the heights are considered satisfactory for conducting the 2-height test. If p_1 is zero (0), increase the height and test another sample. If p_2 is one (1.0), decrease the height and test another sample. If $p_2 - p_1 < .20$ increase "d", the difference between the 2 heights. In addition to the above,, It in desirable that X_1 and X_2 be selected so that $p_1 < .50$ and $p_2 > .50$.

4.3 Conducting the test.

4.3.1 Two samples are selected, each containing the number of items prescribed in the applicable specification.

4.3.2 Current is applied to the magnet coil on the drop test machine and the magnet height is set so that the distance between bottom of suspended ball and top surface of firing-pin assembly, with primed case in position, is set for the lower height.

4.3.3 The procedure prescribed in 3.2.1.1 through 3.2.1.9 is then followed until the number specified has been tested at the lower height.

4.3.4 The number of primers firing and the fraction thereof shall be recorded on the report form.

4.3.5 Following the procedure prescribed in 4.3.2 the machine is set for the upper height.

4.3.6 The test sample for the upper height is then tested following the procedure prescribed in 4.3.3 and 4.3.4.

5 CALCULATION OF 2-HEIGHT CHARACTERISTICS

The 2-height characteristics to be calculated are "$\overline{H}$" and "σ". These 2 statistics can be defined in terms of the data obtained in the 2-height drop test as follows:

a. $\overline{H} = X_1 + d(\overline{H}')$

b. $\sigma = dS'$

Where:

$\overline{H}$ = Mean critical height, or the height at which 50 percent of the primers fire and 50 percent of the primers misfire.

σ = Standard deviation of the critical heights.

X_1 = Lower height.

X_2 = Upper height.

d = Difference between the fixed heights.

p_1 = Fraction firing at lower height.

p_2 = Fraction firing at upper height.

$\overline{H}'$ and S' = Values obtained from tables at the and of this section.

5.1 The data obtained in the 2-height test are tabulated in the manner Illustrated on Figure II.

a. In Column I "Height of Drop", enter X_1 (lower height) and X_2 (upper height).

b. In Column II "Number Tested", enter the number of primers tested at each height.

c. In Column III "Number Firing", enter the number of primers firing at each height.

d. In Column IV "Fraction Firing", enter the decimal fraction of the primers that fire at each height. These fractions are designated p_1 and p_2, and are obtained by dividing the number of primers firing by the number of primers tested at each height. Results are recorded to the nearest second decimal place.

5.2 If p_1 is zero (0), the lower height is increased and another test sample selected and tested. If p_2 is one (1.0) the upper height is decreased and another test sample selected and tested. If $p_2 - p_1 < .20$ increase "d", the difference between the heights, and test another sample or samples. If $p_2 - p_1 \geq .20$, $p_1 > 0$ and $p_2 < 1.0$, proceed as instructed below.

5.3 Using the values of p_1 and p_2, refer to the tables at the end of this section in order to obtain $\overline{H}'$ and S'. The values of $\overline{H}'$ are to be taken as negative for p_1 greater than .50.

5.4 Subtract the lower height (X_1) from the upper height (X_2) to obtain the difference, "d".

5.5 Compute $\overline{H}$ and σ by substitution of the numerical values for $\overline{H}'$, S' and d in the formulas provided on the Primer Sensitivity Report, Figure II.

Example:

a. At 6 inches, 15 out of 50 fired, while at 8 inches, 37 out of 50 fired. Hence, p_1 = 15/50 or .30, p_2 = 37/50 or .74 and d = 8-6 or 2". Since the difference between p_1 and p_2 is at least .20, we can proceed to the tables.

b. Turn to the page that contains p_1 = .30. Under column headed p_2 we find .74; on the same line as .74 we find $\overline{H}'$ = .4491 and S' = .8564.

c. Substitution in the formulas provided, give the following:

$$\overline{H}' = 6 + 2(.4491) = 6.90 \text{ inches.}$$
$$\sigma = 2(.8564) = 1.71 \text{ inches.}$$

6 RECORDING RESULTS

Results shall be recorded on the report form as prescribed in 3.3.

6.1 The following data shall also be recorded:

a. Headspace.
b. Firing-pin protrusion.
c. Diameter of ball.
d. Weight of ball.
e. Number tested at each height.

Machine:	Engineering Proof Testing Record Primer Sensitivity Test	Ammunition:
Headspace		Lot No.
F.P. Protrusion		Ctg. Type
Dia. Of Ball		Caliber
	Spec./Auth.	Primer
		Mfg.

Number of primers tested at each height

I	II	III	IV	V	VI	VII	VIII
Height Of Drop "H"	Number Fired	Number Misfired	Fraction Misfired "p_i"	Variance Factor "k_i"	"$p_i k_i$"	Skewness Factor "s_i"	"$p_i s_i$"
				1		1	
				3		7	
				5		19	
				7		37	
				9		61	
				11		91	
				13		127	
				15		169	
				17		217	
				19		271	
				21		331	
				23		397	
				25		469	
				27		547	

$\sum p_i$ $H_{100\%} + .5$ $\overline{H}$	$\sum p_i k_i$ $-(\sum p_i)^2$ σ^2 σ	$\sum p_i s_i$ $2(\sum p_i)^3$ $3(\sum p_i)(\sum p_i k_i)$ a_3

$$\overline{H} = \sum P_i + (H_{100\%} + .5)$$

$$\sigma = \sqrt{(p_i k_i) - (\sum p_i)^2}$$

$$a_3 = \frac{\sum p_i s_i + 2(\sum p_i)^3 - 3\sum p_i k_i \sum p_i}{\sigma^3}$$

Operator:
Date:

FIGURE I

Machine:	Primer Sensitivity Test Two Height Test	Ammunition:
Headspace		Lot No.
F.P. Protrusion		Ctg. Type
Dia. Of Ball		Caliber
	Spec./Auth.	Primer
		Mfg.

I	II	III	IV
Height of Drop	Number Tested	Number Firing	Fraction Firing
$X_1 =$			$p_1 =$
$X_2 =$			$p_2 =$

$$\overline{H} = X_1 + d(\overline{H}')$$

$$\sigma = dS'$$

Operator:

Date:

FIGURE II

TABLE I
Estimates of the Mean and Standard Deviation
Fraction Firing at Two Heights

$p_1 = 0.01$						$p_1 = 0.02$					
p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.21	1.5306	0.6579	0.61	0.8928	0.3838	0.22	1.603	0.7803	0.62	0.871	0.4239
0.22	1.4969	0.6434	0.62	0.8839	0.3800	0.23	1.562	0.7605	0.63	0.861	0.4192
0.23	1.4654	0.6299	0.63	0.8752	0.3762	0.24	1.524	0.7421	0.64	0.851	0.4146
0.24	1.4360	0.6173	0.64	0.8665	0.3725	0.25	1.489	0.7250	0.65	0.842	0.4100
0.25	1.4083	0.6054	0.65	0.8579	0.3688	0.26	1.456	0.7090	0.66	0.833	0.4055
0.26	1.3823	0.5942	0.66	0.8494	0.3651	0.27	1.425	0.6940	0.67	0.824	0.4010
0.27	1.3576	0.5836	0.67	0.8410	0.3615	0.28	1.396	0.6799	0.68	0.815	0.3966
0.28	1.3343	0.5736	0.68	0.8326	0.3579	0.29	1.369	0.6665	0.69	0.806	0.3922
0.29	1.3121	0.5640	0.69	0.8243	0.3543	0.30	1.343	0.6539	0.70	0.797	0.3879
0.30	1.2910	0.5550	0.70	0.8160	0.3508	0.31	1.318	0.6419	0.71	0.788	0.3836
0.31	1.2709	0.5463	0.71	0.8078	0.3473	0.32	1.295	0.6305	0.72	0.779	0.3793
0.32	1.2516	0.5380	0.72	0.7997	0.3437	0.33	1.273	0.6196	0.73	0.770	0.3750
0.33	1.2332	0.5301	0.73	0.7915	0.3402	0.34	1.251	0.6093	0.74	0.761	0.3708
0.34	1.2155	0.5225	0.74	0.7834	0.3367	0.35	1.231	0.5994	0.75	0.753	0.3665
0.35	1.1985	0.5152	0.75	0.7752	0.3332	0.36	1.211	0.5899	0.76	0.744	0.3623
0.36	1.1822	0.5082	0.76	0.7671	0.3297	0.37	1.193	0.5808	0.77	0.735	0.3581
0.37	1.1664	0.5014	0.77	0.7590	0.3262	0.38	1.175	0.5720	0.78	0.727	0.3539
0.38	1.1512	0.4948	0.78	0.7508	0.3227	0.39	1.157	0.5636	0.79	0.718	0.3496
0.39	1.1365	0.4885	0.79	0.7426	0.3192	0.40	1.141	0.5554	0.80	0.709	0.3454
0.40	1.1222	0.4824	0.80	0.7343	0.3157	0.41	1.125	0.5476	0.81	0.701	0.3411
0.41	1.1084	0.4765	0.81	0.7260	0.3121	0.42	1.109	0.5400	0.82	0.692	0.3368
0.42	1.0950	0.4707	0.82	0.7176	0.3085	0.43	1.094	0.5327	0.83	0.683	0.3325
0.43	1.0820	0.4651	0.83	0.7091	0.3048	0.44	1.079	0.5255	0.84	0.674	0.3281
0.44	1.0694	0.4597	0.84	0.7005	0.3011	0.45	1.065	0.5186	0.85	0.665	0.3236
0.45	1.0571	0.4544	0.85	0.6918	0.2974	0.46	1.051	0.5120	0.86	0.655	0.3191
0.46	1.0451	0.4493	0.86	0.6829	0.2935	0.47	1.038	0.5054	0.87	0.646	0.3145
0.47	1.0334	0.4442	0.87	0.6738	0.2896	0.48	1.025	0.4991	0.88	0.636	0.3097
0.48	1.0220	0.4393	0.88	0.6644	0.2856	0.49	1.012	0.4929	0.89	0.626	0.3049
0.49	1.0109	0.4345	0.89	0.6548	0.2815	0.50	1.000	0.4869	0.90	0.616	0.2998
0.50	1.0000	0.4299	0.90	0.6448	0.2772	0.51	0.988	0.4810	0.91	0.605	0.2946
0.51	0.9893	0.4253	0.91	0.6344	0.2727	0.52	0.976	0.4753	0.92	0.594	0.2891
0.52	0.9789	0.4208	0.92	0.6234	0.2680	0.53	0.965	0.4697	0.93	0.582	0.2833
0.53	0.9687	0.4164	0.93	0.6119	0.2630	0.54	0.953	0.4642	0.94	0.569	0.2771
0.54	0.9586	0.4121	0.94	0.5994	0.2577	0.55	0.942	0.4588	0.95	0.555	0.2704
0.55	0.9488	0.4078	0.95	0.5858	0.2518	0.56	0.932	0.4536	0.96	0.540	0.2629
0.56	0.9391	0.4037	0.96	0.5706	0.2453	0.57	0.921	0.4484	0.97	0.522	0.2542
0.57	0.9295	0.3996	0.97	0.5530	0.2377	0.58	0.910	0.4433	0.98	0.500	0.2435
0.58	0.9201	0.3955	0.98	0.5311	0.2283	0.59	0.900	0.4383	0.99	0.469	0.2283
0.59	0.9109	0.3916	0.99	0.5000	0.2149	0.60	0.890	0.4334			
0.60	0.9018	0.3876				0.61	0.880	0.4286			

TABLE I (continued)

p_1 = 0.03						p_1 = 0.04					
p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.23	1.6470	0.8757	0.63	0.8500	0.4519	0.24	1.6763	0.9575	0.64	0.8300	0.4741
0.24	1.6014	0.8514	0.64	0.8399	0.4466	0.25	1.6267	0.9292	0.65	0.8300	0.4413
0.25	1.5591	0.8290	0.65	0.8300	0.4413	0.26	1.5810	0.9031	0.66	0.8201	0.4361
0.26	1.5199	0.8081	0.66	0.8201	0.4361	0.27	1.5386	0.8788	0.67	0.8104	0.4309
0.27	1.4833	0.7887	0.67	0.8104	0.4309	0.28	1.4991	0.8563	0.68	0.8009	0.4258
0.28	1.4490	0.7704	0.68	0.8009	0.4258	0.29	1.4622	0.8352	0.69	0.7914	0.4208
0.29	1.4169	0.7533	0.69	0.7914	0.4208	0.30	1.4276	0.8155	0.70	0.7820	0.4158
0.30	1.3866	0.7373	0.70	0.7820	0.4158	0.31	1.3952	0.7969	0.71	0.7727	0.4108
0.31	1.3580	0.7221	0.71	0.7727	0.4108	0.32	1.3645	0.7794	0.72	0.7634	0.4059
0.32	1.3310	0.7077	0.72	0.7634	0.4059	0.33	1.3356	0.7629	0.73	0.7542	0.4010
0.33	1.3053	0.6940	0.73	0.7542	0.4010	0.34	1.3082	0.7473	0.74	0.7451	0.3962
0.34	1.2809	0.6810	0.74	0.7451	0.3962	0.35	1.2822	0.7324	0.75	0.7360	0.3913
0.35	1.2577	0.6687	0.75	0.7360	0.3913	0.36	1.2575	0.7183	0.76	0.7270	0.3865
0.36	1.2355	0.6569	0.76	0.7270	0.3865	0.37	1.2339	0.7048	0.77	0.7180	0.3817
0.37	1.2142	0.6456	0.77	0.7180	0.3817	0.38	1.2114	0.6919	0.78	0.7089	0.3769
0.38	1.1939	0.6348	0.78	0.7089	0.3769	0.39	1.1898	0.6796	0.79	0.6999	0.3721
0.39	1.1744	0.6244	0.79	0.6999	0.3721	0.40	1.1692	0.6679	0.80	0.6909	0.3673
0.40	1.1557	0.6145	0.80	0.6909	0.3673	0.41	1.1494	0.6565	0.81	0.6818	0.3625
0.41	1.1376	0.6049	0.81	0.6818	0.3625	0.42	1.1304	0.6457	0.82	0.6726	0.3576
0.42	1.1203	0.5956	0.82	0.6726	0.3576	0.43	1.1120	0.6352	0.83	0.6634	0.3527
0.43	1.1035	0.5867	0.83	0.6634	0.3527	0.44	1.0944	0.6251	0.84	0.6541	0.3478
0.44	1.0873	0.5781	0.84	0.6541	0.3478	0.45	1.0773	0.6154	0.85	0.6447	0.3428
0.45	1.0716	0.5698	0.85	0.6447	0.3428	0.46	1.0609	0.6060	0.86	0.6352	0.3377
0.46	1.0564	0.5617	0.86	0.6352	0.3377	0.47	1.0449	0.5969	0.87	0.6254	0.3325
0.47	1.0417	0.5539	0.87	0.6254	0.3325	0.48	1.0295	0.5881	0.88	0.6155	0.3272
0.48	1.0274	0.5463	0.88	0.6155	0.3272	0.49	1.0145	0.5795	0.89	0.6053	0.3218
0.49	1.0135	0.5389	0.89	0.6053	0.3218	0.50	1.0000	0.5712	0.90	0.5947	0.3162
0.50	1.0000	0.5317	0.90	0.5947	0.3162	0.51	0.9859	0.5631	0.91	0.5838	0.3104
0.51	0.9868	0.5247	0.91	0.5838	0.3104	0.52	0.9721	0.5553	0.92	0.5724	0.3043
0.52	0.9740	0.5179	0.92	0.5724	0.3043	0.53	0.9588	0.5477	0.93	0.5603	0.2979
0.53	0.9615	0.5112	0.93	0.5603	0.2979	0.54	0.9457	0.5402	0.94	0.5474	0.2911
0.54	0.9493	0.5047	0.94	0.5474	0.2911	0.55	0.9330	0.5330	0.95	0.5335	0.2836
0.55	0.9374	0.4984	0.95	0.5335	0.2836	0.56	0.9206	0.5259	0.96	0.5179	0.2754
0.56	0.9257	0.4922	0.96	0.5179	0.2754	0.57	0.9085	0.5189	0.97	0.5000	0.2658
0.57	0.9143	0.4861	0.97	0.5000	0.2658	0.58	0.8966	0.5121	0.98	0.4780	0.2542
0.58	0.9031	0.4801	0.98	0.4780	0.2542	0.59	0.8850	0.5055	0.99	0.4470	0.2377
0.59	0.8921	0.4743	0.99	0.4470	0.2377	0.60	0.8736	0.4990			
0.60	0.8813	0.4686				0.61	0.8624	0.4926			
0.61	0.8707	0.4629				0.62	0.8514	0.4863			
0.62	0.8603	0.4574				0.63	0.8406	0.4802			

TABLE I (continued)

$p_1 = 0.05$						$p_1 = 0.06$					
p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.25	1.6951	1.0305	0.65	0.8102	0.4926	0.26	1.7059	1.0972	0.66	0.7903	0.5083
0.26	1.6424	0.9985	0.66	0.7995	0.4861	0.27	1.6506	1.0616	0.67	0.7795	0.5013
0.27	1.5938	0.9690	0.67	0.7890	0.4797	0.28	1.5997	1.0289	0.68	0.7687	0.4944
0.28	1.5488	0.9416	0.68	0.7786	0.4734	0.29	1.5526	0.9986	0.69	0.7582	0.4877
0.29	1.5070	0.9162	0.69	0.7684	0.4671	0.30	1.5089	0.9705	0.70	0.7478	0.4810
0.30	1.4680	0.8925	0.70	0.7583	0.4610	0.31	1.4683	0.9444	0.71	0.7375	0.4743
0.31	1.4315	0.8703	0.71	0.7483	0.4549	0.32	1.4302	0.9199	0.72	0.7273	0.4678
0.32	1.3973	0.8495	0.72	0.7384	0.4489	0.33	1.3946	0.8970	0.73	0.7173	0.4613
0.33	1.3651	0.8299	0.73	0.7286	0.4429	0.34	1.3611	0.8754	0.74	0.7073	0.4549
0.34	1.3347	0.8114	0.74	0.7188	0.4370	0.35	1.3295	0.8551	0.75	0.6974	0.4486
0.35	1.3059	0.7939	0.75	0.7092	0.4312	0.36	1.2996	0.8359	0.76	0.6876	0.4423
0.36	1.2787	0.7774	0.76	0.6996	0.4253	0.37	1.2714	0.8177	0.77	0.6779	0.4360
0.37	1.2527	0.7616	0.77	0.6900	0.4195	0.38	1.2445	0.8005	0.78	0.6682	0.4297
0.38	1.2281	0.7466	0.78	0.6805	0.4137	0.39	1.2190	0.7840	0.79	0.6585	0.4235
0.39	1.2045	0.7323	0.79	0.6710	0.4080	0.40	1.1947	0.7684	0.80	0.6488	0.4173
0.40	1.1821	0.7186	0.80	0.6615	0.4022	0.41	1.1714	0.7535	0.81	0.6391	0.4111
0.41	1.1605	0.7056	0.81	0.6520	0.3964	0.42	1.1492	0.7392	0.82	0.6294	0.4048
0.42	1.1399	0.6930	0.82	0.6425	0.3906	0.43	1.1280	0.7255	0.83	0.6197	0.3986
0.43	1.1201	0.6810	0.83	0.6329	0.3848	0.44	1.1075	0.7124	0.84	0.6099	0.3923
0.44	1.1011	0.6694	0.84	0.6232	0.3789	0.45	1.0879	0.6997	0.85	0.6000	0.3859
0.45	1.0827	0.6582	0.85	0.6135	0.3730	0.46	1.0691	0.6876	0.86	0.5900	0.3795
0.46	1.0650	0.6475	0.86	0.6036	0.3669	0.47	1.0509	0.6759	0.87	0.5799	0.3730
0.47	1.0480	0.6371	0.87	0.5935	0.3608	0.48	1.0333	0.6646	0.88	0.5696	0.3663
0.48	1.0315	0.6271	0.88	0.5833	0.3546	0.49	1.0164	0.6537	0.89	0.5590	0.3595
0.49	1.0155	0.6174	0.89	0.5728	0.3483	0.50	1.0000	0.6432	0.90	0.5482	0.3526
0.50	1.0000	0.6080	0.90	0.5621	0.3417	0.51	0.9841	0.6330	0.91	0.5370	0.3454
0.51	0.9850	0.5988	0.91	0.5509	0.3349	0.52	0.9687	0.6231	0.92	0.5253	0.3379
0.52	0.9704	0.5900	0.92	0.5393	0.3279	0.53	0.9538	0.6135	0.93	0.5130	0.3300
0.53	0.9562	0.5814	0.93	0.5271	0.3204	0.54	0.9393	0.6042	0.94	0.5000	0.3216
0.54	0.9425	0.5730	0.94	0.5141	0.3125	0.55	0.9252	0.5951	0.95	0.4859	0.3125
0.55	0.9290	0.5648	0.95	0.5000	0.3040	0.56	0.9115	0.5863	0.96	0.4704	0.3025
0.56	0.9159	0.5568	0.96	0.4844	0.2945	0.57	0.8981	0.5777	0.97	0.4526	0.2911
0.57	0.9032	0.5491	0.97	0.4665	0.2836	0.58	0.8851	0.5693	0.98	0.4309	0.2771
0.58	0.8907	0.5415	0.98	0.4447	0.2704	0.59	0.8723	0.5611	0.99	0.4006	0.2577
0.59	0.8785	0.5341	0.99	0.4142	0.2518	0.60	0.8599	0.5531			
0.60	0.8665	0.5268				0.61	0.8477	0.5452			
0.61	0.8548	0.5197				0.62	0.8358	0.5376			
0.62	0.8434	0.5127				0.63	0.8241	0.5300			
0.63	0.8321	0.5059				0.64	0.8126	0.5227			
0.64	0.8211	0.4992				0.65	0.8014	0.5154			

TABLE I (continued)

p_1 = 0.07						p_1 = 0.08					
p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.27	1.7101	1.1588	0.63	0.8164	0.5532	0.28	1.7089	1.2162	0.64	0.7967	0.5670
0.28	1.6527	1.1199	0.64	0.8046	0.5452	0.29	1.6497	1.1741	0.65	0.7848	0.5585
0.29	1.5999	1.0841	0.65	0.7930	0.5373	0.30	1.5955	1.1355	0.66	0.7731	0.5502
0.30	1.5512	1.0511	0.66	0.7816	0.5296	0.31	1.5454	1.0998	0.67	0.7616	0.5420
0.31	1.5060	1.0205	0.67	0.7704	0.5220	0.32	1.4989	1.0668	0.68	0.7503	0.5340
0.32	1.4639	0.9920	0.68	0.7594	0.5145	0.33	1.4558	1.0361	0.69	0.7392	0.5261
0.33	1.4247	0.9654	0.69	0.7485	0.5072	0.34	1.4155	1.0074	0.70	0.7282	0.5183
0.34	1.3879	0.9404	0.70	0.7378	0.5000	0.35	1.3779	0.9806	0.71	0.7174	0.5106
0.35	1.3534	0.9170	0.71	0.7273	0.4928	0.36	1.3425	0.9555	0.72	0.7068	0.5030
0.36	1.3208	0.8950	0.72	0.7169	0.4858	0.37	1.3092	0.9318	0.73	0.6963	0.4956
0.37	1.2901	0.8742	0.73	0.7066	0.4788	0.38	1.2778	0.9094	0.74	0.6859	0.4882
0.38	1.2610	0.8545	0.74	0.6964	0.4719	0.39	1.2481	0.8883	0.75	0.6757	0.4809
0.39	1.2335	0.8358	0.75	0.6863	0.4651	0.40	1.2200	0.8683	0.76	0.6655	0.4736
0.40	1.2072	0.8180	0.76	0.6763	0.4583	0.41	1.1932	0.8492	0.77	0.6554	0.4664
0.41	1.1823	0.8011	0.77	0.6664	0.4515	0.42	1.1678	0.8311	0.78	0.6453	0.4593
0.42	1.1585	0.7850	0.78	0.6565	0.4448	0.43	1.1435	0.8139	0.79	0.6354	0.4522
0.43	1.1357	0.7696	0.79	0.6466	0.4382	0.44	1.1204	0.7974	0.80	0.6254	0.4451
0.44	1.1140	0.7548	0.80	0.6368	0.4315	0.45	1.0982	0.7816	0.81	0.6155	0.4380
0.45	1.0931	0.7407	0.81	0.6270	0.4249	0.46	1.0770	0.7665	0.82	0.6055	0.4310
0.46	1.0730	0.7271	0.82	0.6172	0.4182	0.47	1.0566	0.7520	0.83	0.5956	0.4239
0.47	1.0537	0.7140	0.83	0.6073	0.4115	0.48	1.0370	0.7381	0.84	0.5856	0.4167
0.48	1.0352	0.7014	0.84	0.5974	0.4048	0.49	1.0182	0.7246	0.85	0.5755	0.4096
0.49	1.0173	0.6893	0.85	0.5874	0.3981	0.50	1.0000	0.7117	0.86	0.5653	0.4024
0.50	1.0000	0.6776	0.86	0.5774	0.3912	0.51	0.9825	0.6992	0.87	0.5550	0.3950
0.51	0.9833	0.6663	0.87	0.5671	0.3843	0.52	0.9655	0.6872	0.88	0.5446	0.3876
0.52	0.9671	0.6553	0.88	0.5567	0.3772	0.53	0.9492	0.6755	0.89	0.5339	0.3800
0.53	0.9515	0.6447	0.89	0.5461	0.3701	0.54	0.9333	0.6642	0.90	0.5230	0.3722
0.54	0.9363	0.6344	0.90	0.5352	0.3627	0.55	0.9179	0.6533	0.91	0.5117	0.3642
0.55	0.9215	0.6244	0.91	0.5240	0.3550	0.56	0.9030	0.6427	0.92	0.5000	0.3559
0.56	0.9072	0.6147	0.92	0.5123	0.3471	0.57	0.8885	0.6323	0.93	0.4877	0.3471
0.57	0.8932	0.6053	0.93	0.5000	0.3388	0.58	0.8744	0.6223	0.94	0.4747	0.3379
0.58	0.8797	0.5961	0.94	0.4870	0.3300	0.59	0.8606	0.6125	0.95	0.4607	0.3279
0.59	0.8664	0.5871	0.95	0.4729	0.3204	0.60	0.8472	0.6030	0.96	0.4452	0.3169
0.60	0.8535	0.5783	0.96	0.4574	0.3099	0.61	0.8342	0.5937	0.97	0.4276	0.3043
0.61	0.8409	0.5698	0.97	0.4397	0.2979	0.62	0.8214	0.5846	0.98	0.4062	0.2891
0.62	0.8285	0.5614	0.98	0.4181	0.2833	0.63	0.8089	0.5757	0.99	0.3766	0.2680
			0.99	0.3881	0.2630						

TABLE I (continued)

$p_1 = 0.09$						$p_1 = 0.10$					
p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.29	1.7028	1.2701	0.65	0.7768	0.5793	0.30	1.6926	1.3207	0.66	0.7565	0.5903
0.30	1.6424	1.2250	0.66	0.7647	0.5704	0.31	1.6311	1.2727	0.67	0.7445	0.5809
0.31	1.5869	1.1836	0.67	0.7530	0.5616	0.32	1.5747	1.2287	0.68	0.7326	0.5717
0.32	1.5357	1.1454	0.68	0.7414	0.5530	0.33	1.5227	1.1882	0.69	0.7210	0.5626
0.33	1.4883	1.1101	0.69	0.7300	0.5445	0.34	1.4746	1.1506	0.70	0.7096	0.5537
0.34	1.4443	1.0772	0.70	0.7188	0.5361	0.35	1.4299	1.1158	0.71	0.6984	0.5450
0.35	1.4033	1.0466	0.71	0.7078	0.5279	0.36	1.3883	1.0833	0.72	0.6874	0.5364
0.36	1.3649	1.0180	0.72	0.6970	0.5199	0.37	1.3494	1.0530	0.73	0.6765	0.5279
0.37	1.3289	0.9912	0.73	0.6863	0.5119	0.38	1.3130	1.0245	0.74	0.6658	0.5195
0.38	1.2951	0.9659	0.74	0.6757	0.5040	0.39	1.2787	0.9978	0.75	0.6552	0.5112
0.39	1.2632	0.9421	0.75	0.6653	0.4962	0.40	1.2464	0.9726	0.76	0.6447	0.5031
0.40	1.2330	0.9196	0.76	0.6550	0.4885	0.41	1.2159	0.9488	0.77	0.6343	0.4950
0.41	1.2044	0.8983	0.77	0.6447	0.4809	0.42	1.1870	0.9262	0.78	0.6240	0.4869
0.42	1.1773	0.8781	0.78	0.6345	0.4733	0.43	1.1596	0.9048	0.79	0.6138	0.4789
0.43	1.1515	0.8588	0.79	0.6244	0.4657	0.44	1.1335	0.8845	0.80	0.6036	0.4710
0.44	1.1269	0.8405	0.80	0.6144	0.4582	0.45	1.1087	0.8651	0.81	0.5935	0.4631
0.45	1.1034	0.8230	0.81	0.6043	0.4507	0.46	1.0850	0.8467	0.82	0.5833	0.4552
0.46	1.0810	0.8062	0.82	0.5943	0.4432	0.47	1.0624	0.8290	0.83	0.5732	0.4473
0.47	1.0595	0.7902	0.83	0.5842	0.4357	0.48	1.0407	0.8121	0.84	0.5631	0.4394
0.48	1.0389	0.7748	0.84	0.5741	0.4282	0.49	1.0200	0.7959	0.85	0.5529	0.4314
0.49	1.0191	0.7601	0.85	0.5640	0.4207	0.50	1.0000	0.7803	0.86	0.5426	0.4234
0.50	1.0000	0.7458	0.86	0.5538	0.4130	0.51	0.9808	0.7653	0.87	0.5322	0.4153
0.51	0.9816	0.7322	0.87	0.5434	0.4053	0.52	0.9623	0.7509	0.88	0.5217	0.4071
0.52	0.9639	0.7190	0.88	0.5329	0.3975	0.53	0.9445	0.7370	0.89	0.5110	0.3987
0.53	0.9468	0.7062	0.89	0.5222	0.3895	0.54	0.9273	0.7236	0.90	0.5000	0.3902
0.54	0.9303	0.6939	0.90	0.5113	0.3813	0.55	0.9107	0.7106	0.91	0.4887	0.3813
0.55	0.9143	0.6819	0.91	0.5000	0.3729	0.56	0.8946	0.6981	0.92	0.4770	0.3722
0.56	0.8988	0.6704	0.92	0.4883	0.3642	0.57	0.8790	0.6859	0.93	0.4648	0.3627
0.57	0.8837	0.6591	0.93	0.4760	0.3550	0.58	0.8639	0.6741	0.94	0.4518	0.3526
0.58	0.8691	0.6482	0.94	0.4630	0.3454	0.59	0.8492	0.6626	0.95	0.4379	0.3417
0.59	0.8549	0.6376	0.95	0.4491	0.3349	0.60	0.8349	0.6515	0.96	0.4226	0.3298
0.60	0.8411	0.6273	0.96	0.4337	0.3235	0.61	0.8210	0.6407	0.97	0.4053	0.3162
0.61	0.8276	0.6173	0.97	0.4162	0.3104	0.62	0.8075	0.6301	0.98	0.3842	0.2998
0.62	0.8144	0.6074	0.98	0.3950	0.2946	0.63	0.7943	0.6198	0.99	0.3552	0.2772
0.63	0.8016	0.5979	0.99	0.3656	0.2727	0.64	0.7814	0.6098			
0.64	0.7890	0.5885				0.65	0.7688	0.5999			

TABLE I (continued)

$p_1 = 0.11$						$p_1 = 0.12$					
p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.31	1.6786	1.3686	0.67	0.7360	0.6001	0.32	1.6613	1.4138	0.68	0.7153	0.6088
0.32	1.6163	1.3178	0.68	0.7239	0.5902	0.33	1.5985	1.3604	0.69	0.7032	0.5985
0.33	1.5592	1.2713	0.69	0.7121	0.5806	0.34	1.5409	1.3114	0.70	0.6914	0.5884
0.34	1.5067	1.2284	0.70	0.7005	0.5711	0.35	1.4880	1.2664	0.71	0.6798	0.5786
0.35	1.4581	1.1888	0.71	0.6891	0.5618	0.36	1.4390	1.2247	0.72	0.6684	0.5689
0.36	1.4129	1.1520	0.72	0.6779	0.5527	0.37	1.3936	1.1861	0.73	0.6572	0.5593
0.37	1.3709	1.1177	0.73	0.6668	0.5437	0.38	1.3513	1.1501	0.74	0.6462	0.5500
0.38	1.3317	1.0857	0.74	0.6559	0.5348	0.39	1.3119	1.1165	0.75	0.6353	0.5407
0.39	1.2949	1.0557	0.75	0.6452	0.5260	0.40	1.2749	1.0850	0.76	0.6246	0.5316
0.40	1.2603	1.0276	0.76	0.6346	0.5174	0.41	1.2402	1.0555	0.77	0.6139	0.5225
0.41	1.2278	1.0010	0.77	0.6241	0.5088	0.42	1.2075	1.0277	0.78	0.6034	0.5136
0.42	1.1970	0.9760	0.78	0.6137	0.5003	0.43	1.1766	1.0014	0.79	0.5930	0.5047
0.43	1.1680	0.9522	0.79	0.6033	0.4919	0.44	1.1474	0.9765	0.80	0.5827	0.4959
0.44	1.1404	0.9297	0.80	0.5931	0.4835	0.45	1.1198	0.9530	0.81	0.5724	0.4871
0.45	1.1141	0.9084	0.81	0.5828	0.4752	0.46	1.0935	0.9306	0.82	0.5621	0.4784
0.46	1.0892	0.8880	0.82	0.5726	0.4669	0.47	1.0684	0.9093	0.83	0.5519	0.4697
0.47	1.0654	0.8686	0.83	0.5624	0.4586	0.48	1.0446	0.8890	0.84	0.5416	0.4609
0.48	1.0426	0.8501	0.84	0.5522	0.4503	0.49	1.0218	0.8696	0.85	0.5313	0.4522
0.49	1.0209	0.8323	0.85	0.5420	0.4419	0.50	1.0000	0.8511	0.86	0.5210	0.4434
0.50	1.0000	0.8153	0.86	0.5317	0.4335	0.51	0.9791	0.8333	0.87	0.5106	0.4345
0.51	0.9800	0.7990	0.87	0.5213	0.4250	0.52	0.9591	0.8162	0.88	0.5000	0.4255
0.52	0.9607	0.7833	0.88	0.5107	0.4164	0.53	0.9398	0.7998	0.89	0.4893	0.4164
0.53	0.9422	0.7682	0.89	0.5000	0.4077	0.54	0.9213	0.7841	0.90	0.4783	0.4071
0.54	0.9243	0.7536	0.90	0.4890	0.3987	0.55	0.9034	0.7688	0.91	0.4671	0.3975
0.55	0.9071	0.7395	0.91	0.4778	0.3895	0.56	0.8861	0.7542	0.92	0.4554	0.3876
0.56	0.8904	0.7260	0.92	0.4661	0.3800	0.57	0.8695	0.7400	0.93	0.4433	0.3772
0.57	0.8743	0.7128	0.93	0.4539	0.3701	0.58	0.8534	0.7263	0.94	0.4304	0.3663
0.58	0.8587	0.7001	0.94	0.4410	0.3595	0.59	0.8378	0.7130	0.95	0.4167	0.3546
0.59	0.8435	0.6877	0.95	0.4272	0.3483	0.60	0.8226	0.7001	0.96	0.4016	0.3418
0.60	0.8288	0.6757	0.96	0.4120	0.3359	0.61	0.8079	0.6876	0.97	0.3845	0.3272
0.61	0.8145	0.6641	0.97	0.3947	0.3218	0.62	0.7937	0.6755	0.98	0.3639	0.3097
0.62	0.8006	0.6527	0.98	0.3739	0.3049	0.63	0.7798	0.6636	0.99	0.3356	0.2856
0.63	0.7871	0.6417	0.99	0.3452	0.2815	0.64	0.7662	0.6521			
0.64	0.7738	0.6309				0.65	0.7530	0.6409			
0.65	0.7609	0.6204				0.66	0.7402	0.6299			
0.66	0.7483	0.6101				0.67	0.7276	0.6192			

TABLE I (continued)

p_1 = 0.13						p_1 = 0.14					
p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.33	1.6408	1.4567	0.69	0.6943	0.6164	0.34	1.6176	1.4973	0.70	0.6732	0.6232
0.34	1.5777	1.4007	0.70	0.6823	0.6058	0.35	1.5544	1.4389	0.71	0.6613	0.6121
0.35	1.5200	1.3494	0.71	0.6706	0.5953	0.36	1.4966	1.3853	0.72	0.6496	0.6013
0.36	1.4668	1.3022	0.72	0.6590	0.5851	0.37	1.4434	1.3361	0.73	0.6381	0.5906
0.37	1.4177	1.2586	0.73	0.6476	0.5750	0.38	1.3943	1.2906	0.74	0.6268	0.5802
0.38	1.3721	1.2182	0.74	0.6365	0.5651	0.39	1.3487	1.2484	0.75	0.6156	0.5699
0.39	1.3297	1.1805	0.75	0.6255	0.5553	0.40	1.3064	1.2092	0.76	0.6047	0.5597
0.40	1.2902	1.1454	0.76	0.6146	0.5456	0.41	1.2668	1.1726	0.77	0.5939	0.5497
0.41	1.2532	1.1125	0.77	0.6039	0.5361	0.42	1.2298	1.1384	0.78	0.5832	0.5398
0.42	1.2184	1.0817	0.78	0.5933	0.5267	0.43	1.1951	1.1063	0.79	0.5726	0.5300
0.43	1.1857	1.0526	0.79	0.5828	0.5174	0.44	1.1624	1.0760	0.80	0.5621	0.5203
0.44	1.1548	1.0252	0.80	0.5723	0.5081	0.45	1.1316	1.0475	0.81	0.5517	0.5107
0.45	1.1256	0.9993	0.81	0.5620	0.4989	0.46	1.1025	1.0205	0.82	0.5413	0.5011
0.46	1.0979	0.9747	0.82	0.5517	0.4898	0.47	1.0749	0.9950	0.83	0.5310	0.4915
0.47	1.0716	0.9514	0.83	0.5414	0.4806	0.48	1.0487	0.9707	0.84	0.5207	0.4820
0.48	1.0466	0.9292	0.84	0.5311	0.4715	0.49	1.0238	0.9476	0.85	0.5104	0.4724
0.49	1.0228	0.9080	0.85	0.5208	0.4624	0.50	1.0000	0.9257	0.86	0.5000	0.4628
0.50	1.0000	0.8878	0.86	0.5104	0.4532	0.51	0.9773	0.9047	0.87	0.4896	0.4532
0.51	0.9782	0.8685	0.87	0.5000	0.4439	0.52	0.9556	0.8846	0.88	0.4790	0.4434
0.52	0.9574	0.8499	0.88	0.4894	0.4345	0.53	0.9349	0.8654	0.89	0.4683	0.4335
0.53	0.9374	0.8322	0.89	0.4787	0.4250	0.54	0.9149	0.8469	0.90	0.4574	0.4234
0.54	0.9181	0.8151	0.90	0.4678	0.4153	0.55	0.8958	0.8292	0.91	0.4462	0.4130
0.55	0.8996	0.7987	0.91	0.4566	0.4053	0.56	0.8774	0.8122	0.92	0.4347	0.4024
0.56	0.8818	0.7829	0.92	0.4450	0.3950	0.57	0.8597	0.7957	0.93	0.4226	0.3912
0.57	0.8646	0.7676	0.93	0.4329	0.3843	0.58	0.8425	0.7799	0.94	0.4100	0.3795
0.58	0.8480	0.7529	0.94	0.4201	0.3730	0.59	0.8260	0.7646	0.95	0.3964	0.3669
0.59	0.8319	0.7386	0.95	0.4065	0.3608	0.60	0.8100	0.7498	0.96	0.3816	0.3532
0.60	0.8164	0.7248	0.96	0.3915	0.3476	0.61	0.7946	0.7355	0.97	0.3648	0.3377
0.61	0.8013	0.7114	0.97	0.3746	0.3325	0.62	0.7796	0.7216	0.98	0.3447	0.3191
0.62	0.7867	0.6984	0.98	0.3542	0.3145	0.63	0.7650	0.7081	0.99	0.3171	0.2935
0.63	0.7724	0.6858	0.99	0.3262	0.2896	0.64	0.7509	0.6950			
0.64	0.7586	0.6735				0.65	0.7371	0.6823			
0.65	0.7451	0.6615				0.66	0.7237	0.6699			
0.66	0.7320	0.6498				0.67	0.7106	0.6578			
0.67	0.7191	0.6384				0.68	0.6979	0.6460			
0.68	0.7066	0.6273				0.69	0.6854	0.6344			

TABLE I (continued)

$p_1 = 0.15$						$p_1 = 0.16$					
p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.35	1.5918	1.5358	0.67	0.7020	0.6773	0.36	1.5636	1.5723	0.68	0.6801	0.6839
0.36	1.5287	1.4750	0.68	0.6891	0.6648	0.37	1.5008	1.5092	0.69	0.6673	0.6710
0.37	1.4710	1.4193	0.69	0.6764	0.6526	0.38	1.4434	1.4514	0.70	0.6547	0.6584
0.38	1.4179	1.3681	0.70	0.6640	0.6407	0.39	1.3906	1.3983	0.71	0.6425	0.6461
0.39	1.3689	1.3208	0.71	0.6519	0.6290	0.40	1.3418	1.3493	0.72	0.6305	0.6340
0.40	1.3235	1.2770	0.72	0.6401	0.6176	0.41	1.2967	1.3039	0.73	0.6187	0.6222
0.41	1.2813	1.2363	0.73	0.6284	0.6063	0.42	1.2547	1.2617	0.74	0.6072	0.6106
0.42	1.2419	1.1983	0.74	0.6170	0.5953	0.43	1.2156	1.2224	0.75	0.5959	0.5992
0.43	1.2051	1.1627	0.75	0.6058	0.5845	0.44	1.1790	1.1856	0.76	0.5847	0.5880
0.44	1.1705	1.1294	0.76	0.5947	0.5738	0.45	1.1446	1.1510	0.77	0.5737	0.5769
0.45	1.1380	1.0980	0.77	0.5838	0.5633	0.46	1.1123	1.1185	0.78	0.5629	0.5660
0.46	1.1073	1.0684	0.78	0.5730	0.5529	0.47	1.0819	1.0879	0.79	0.5522	0.5553
0.47	1.0783	1.0404	0.79	0.5624	0.5426	0.48	1.0531	1.0590	0.80	0.5416	0.5446
0.48	1.0509	1.0139	0.80	0.5519	0.5325	0.49	1.0259	1.0316	0.81	0.5311	0.5341
0.49	1.0248	0.9888	0.81	0.5414	0.5224	0.50	1.0000	1.0056	0.82	0.5207	0.5236
0.50	1.0000	0.9648	0.82	0.5310	0.5123	0.51	0.9754	0.9808	0.83	0.5103	0.5132
0.51	0.9764	0.9421	0.83	0.5207	0.5024	0.52	0.9520	0.9573	0.84	0.5000	0.5028
0.52	0.9538	0.9203	0.84	0.5103	0.4924	0.53	0.9296	0.9348	0.85	0.4897	0.4924
0.53	0.9323	0.8995	0.85	0.5000	0.4824	0.54	0.9083	0.9133	0.86	0.4793	0.4820
0.54	0.9117	0.8796	0.86	0.4896	0.4724	0.55	0.8878	0.8928	0.87	0.4689	0.4715
0.55	0.8919	0.8605	0.87	0.4792	0.4624	0.56	0.8682	0.8730	0.88	0.4584	0.4609
0.56	0.8729	0.8422	0.88	0.4687	0.4522	0.57	0.8494	0.8541	0.89	0.4478	0.4503
0.57	0.8546	0.8245	0.89	0.4580	0.4419	0.58	0.8312	0.8359	0.90	0.4369	0.4394
0.58	0.8370	0.8075	0.90	0.4471	0.4314	0.59	0.8138	0.8183	0.91	0.4259	0.4282
0.59	0.8200	0.7912	0.91	0.4360	0.4207	0.60	0.7970	0.8014	0.92	0.4144	0.4167
0.60	0.8036	0.7753	0.92	0.4245	0.4096	0.61	0.7807	0.7851	0.93	0.4026	0.4048
0.61	0.7877	0.7600	0.93	0.4126	0.3981	0.62	0.7650	0.7693	0.94	0.3901	0.3923
0.62	0.7724	0.7452	0.94	0.4000	0.3859	0.63	0.7498	0.7540	0.95	0.3768	0.3789
0.63	0.7575	0.7308	0.95	0.3865	0.3730	0.64	0.7350	0.7391	0.96	0.3623	0.3643
0.64	0.7430	0.7169	0.96	0.3719	0.3588	0.65	0.7207	0.7248	0.97	0.3459	0.3478
0.65	0.7290	0.7034	0.97	0.3553	0.3428	0.66	0.7068	0.7108	0.98	0.3262	0.3281
0.66	0.7153	0.6902	0.98	0.3354	0.3236	0.67	0.6933	0.6972	0.99	0.2995	0.3011
			0.99	0.3082	0.2974						

TABLE I (continued)

$p_1 = 0.17$						$p_1 = 0.18$					
p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.37	1.5333	1.6069	0.69	0.6580	0.6896	0.38	1.5009	1.6397	0.70	0.6358	0.6946
0.38	1.4709	1.5416	0.70	0.6453	0.6763	0.39	1.4391	1.5722	0.71	0.6232	0.6809
0.39	1.4139	1.4818	0.71	0.6329	0.6633	0.40	1.3827	1.5105	0.72	0.6110	0.6675
0.40	1.3615	1.4269	0.72	0.6208	0.6506	0.41	1.3308	1.4539	0.73	0.5990	0.6544
0.41	1.3132	1.3762	0.73	0.6089	0.6382	0.42	1.2830	1.4016	0.74	0.5873	0.6416
0.42	1.2684	1.3293	0.74	0.5973	0.6260	0.43	1.2387	1.3532	0.75	0.5758	0.6290
0.43	1.2268	1.2857	0.75	0.5859	0.6140	0.44	1.1975	1.3082	0.76	0.5645	0.6166
0.44	1.1880	1.2450	0.76	0.5746	0.6022	0.45	1.1591	1.2663	0.77	0.5534	0.6045
0.45	1.1517	1.2070	0.77	0.5636	0.5907	0.46	1.1232	1.2271	0.78	0.5424	0.5926
0.46	1.1176	1.1713	0.78	0.5527	0.5793	0.47	1.0896	1.1903	0.79	0.5316	0.5808
0.47	1.0856	1.1378	0.79	0.5420	0.5680	0.48	1.0580	1.1558	0.80	0.5210	0.5692
0.48	1.0555	1.1062	0.80	0.5313	0.5569	0.49	1.0282	1.1232	0.81	0.5104	0.5576
0.49	1.0270	1.0763	0.81	0.5208	0.5458	0.50	1.0000	1.0925	0.82	0.5000	0.5462
0.50	1.0000	1.0480	0.82	0.5104	0.5349	0.51	0.9733	1.0633	0.83	0.4896	0.5349
0.51	0.9744	1.0212	0.83	0.5000	0.5240	0.52	0.9481	1.0357	0.84	0.4793	0.5236
0.52	0.9501	0.9957	0.84	0.4897	0.5132	0.53	0.9240	1.0095	0.85	0.4690	0.5123
0.53	0.9269	0.9714	0.85	0.4793	0.5024	0.54	0.9011	0.9844	0.86	0.4587	0.5011
0.54	0.9048	0.9482	0.86	0.4690	0.4915	0.55	0.8793	0.9606	0.87	0.4483	0.4898
0.55	0.8836	0.9261	0.87	0.4586	0.4806	0.56	0.8584	0.9378	0.88	0.4379	0.4784
0.56	0.8634	0.9049	0.88	0.4481	0.4697	0.57	0.8384	0.9160	0.89	0.4274	0.4669
0.57	0.8440	0.8845	0.89	0.4376	0.4586	0.58	0.8193	0.8950	0.90	0.4167	0.4552
0.58	0.8254	0.8650	0.90	0.4268	0.4473	0.59	0.8009	0.8750	0.91	0.4057	0.4432
0.59	0.8074	0.8462	0.91	0.4158	0.4357	0.60	0.7832	0.8556	0.92	0.3945	0.4310
0.60	0.7902	0.8281	0.92	0.4044	0.4239	0.61	0.7662	0.8370	0.93	0.3828	0.4182
0.61	0.7736	0.8107	0.93	0.3927	0.4115	0.62	0.7498	0.8191	0.94	0.3706	0.4048
0.62	0.7575	0.7939	0.94	0.3803	0.3986	0.63	0.7339	0.8018	0.95	0.3575	0.3906
0.63	0.7420	0.7776	0.95	0.3671	0.3848	0.64	0.7186	0.7850	0.96	0.3433	0.3751
0.64	0.7269	0.7618	0.96	0.3528	0.3697	0.65	0.7038	0.7688	0.97	0.3274	0.3576
0.65	0.7123	0.7466	0.97	0.3366	0.3527	0.66	0.6894	0.7531	0.98	0.3083	0.3368
0.66	0.6982	0.7317	0.98	0.3172	0.3325	0.67	0.6754	0.7379	0.99	0.2824	0.3085
0.67	0.6844	0.7173	0.99	0.2909	0.3048	0.68	0.6618	0.7230			
0.68	0.6711	0.7033				0.69	0.6486	0.7086			

TABLE I (continued)

***p*₁ = 0.19**						***p*₁ = 0.20**					
p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.39	1.4666	1.6706	0.71	0.6134	0.6987	0.40	1.4307	1.6999	0.72	0.5908	0.7020
0.40	1.4056	1.6012	0.72	0.6010	0.6846	0.41	1.3705	1.6285	0.73	0.5787	0.6876
0.41	1.3499	1.5376	0.73	0.5889	0.6708	0.42	1.3156	1.5632	0.74	0.5668	0.6734
0.42	1.2987	1.4793	0.74	0.5771	0.6574	0.43	1.2651	1.5032	0.75	0.5551	0.6596
0.43	1.2514	1.4255	0.75	0.5655	0.6442	0.44	1.2186	1.4479	0.76	0.5437	0.6460
0.44	1.2077	1.3757	0.76	0.5542	0.6312	0.45	1.1755	1.3967	0.77	0.5325	0.6327
0.45	1.1671	1.3294	0.77	0.5430	0.6185	0.46	1.1355	1.3492	0.78	0.5215	0.6197
0.46	1.1292	1.2862	0.78	0.5320	0.6060	0.47	1.0982	1.3049	0.79	0.5107	0.6068
0.47	1.0938	1.2459	0.79	0.5212	0.5937	0.48	1.0634	1.2635	0.80	0.5000	0.5941
0.48	1.0606	1.2081	0.80	0.5105	0.5816	0.49	1.0307	1.2247	0.81	0.4895	0.5816
0.49	1.0294	1.1726	0.81	0.5000	0.5695	0.50	1.0000	1.1882	0.82	0.4790	0.5692
0.50	1.0000	1.1391	0.82	0.4896	0.5576	0.51	0.9711	1.1538	0.83	0.4687	0.5569
0.51	0.9722	1.1075	0.83	0.4792	0.5458	0.52	0.9438	1.1214	0.84	0.4584	0.5446
0.52	0.9460	1.0775	0.84	0.4689	0.5341	0.53	0.9179	1.0906	0.85	0.4481	0.5325
0.53	0.9210	1.0491	0.85	0.4586	0.5224	0.54	0.8934	1.0615	0.86	0.4379	0.5203
0.54	0.8973	1.0222	0.86	0.4483	0.5107	0.55	0.8701	1.0338	0.87	0.4277	0.5081
0.55	0.8748	0.9965	0.87	0.4380	0.4989	0.56	0.8479	1.0075	0.88	0.4173	0.4959
0.56	0.8533	0.9719	0.88	0.4276	0.4871	0.57	0.8267	0.9823	0.89	0.4069	0.4835
0.57	0.8327	0.9485	0.89	0.4172	0.4752	0.58	0.8065	0.9583	0.90	0.3964	0.4710
0.58	0.8130	0.9261	0.90	0.4065	0.4631	0.59	0.7872	0.9353	0.91	0.3856	0.4582
0.59	0.7942	0.9046	0.91	0.3957	0.4507	0.60	0.7686	0.9133	0.92	0.3746	0.4451
0.60	0.7760	0.8840	0.92	0.3845	0.4380	0.61	0.7508	0.8921	0.93	0.3632	0.4315
0.61	0.7586	0.8641	0.93	0.3730	0.4249	0.62	0.7337	0.8718	0.94	0.3512	0.4173
0.62	0.7419	0.8450	0.94	0.3609	0.4111	0.63	0.7172	0.8522	0.95	0.3385	0.4022
0.63	0.7257	0.8266	0.95	0.3480	0.3964	0.64	0.7013	0.8333	0.96	0.3247	0.3858
0.64	0.7101	0.8088	0.96	0.3340	0.3804	0.65	0.6860	0.8150	0.97	0.3091	0.3673
0.65	0.6950	0.7916	0.97	0.3182	0.3625	0.66	0.6711	0.7974	0.98	0.2907	0.3454
0.66	0.6804	0.7750	0.98	0.2995	0.3411	0.67	0.6567	0.7803	0.99	0.2657	0.3157
0.67	0.6662	0.7588	0.99	0.2740	0.3121	0.68	0.6428	0.7638			
0.68	0.6524	0.7432				0.69	0.6293	0.7477			
0.69	0.6391	0.7279				0.70	0.6161	0.7321			
0.70	0.6260	0.7131				0.71	0.6033	0.7168			

TABLE I (continued)

$p_1 = 0.21$						$p_1 = 0.22$					
p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.41	1.3931	1.7275	0.73	0.5682	0.7046	0.42	1.3540	1.7535	0.74	0.5455	0.7064
0.42	1.3340	1.6542	0.74	0.5562	0.6898	0.43	1.2960	1.6784	0.75	0.5338	0.6912
0.43	1.2799	1.5872	0.75	0.5445	0.6753	0.44	1.2430	1.6097	0.76	0.5223	0.6764
0.44	1.2303	1.5257	0.76	0.5331	0.6611	0.45	1.1944	1.5467	0.77	0.5110	0.6618
0.45	1.1846	1.4689	0.77	0.5219	0.6471	0.46	1.1495	1.4886	0.78	0.5000	0.6475
0.46	1.1423	1.4165	0.78	0.5108	0.6335	0.47	1.1080	1.4349	0.79	0.4892	0.6335
0.47	1.1029	1.3677	0.79	0.5000	0.6200	0.48	1.0695	1.3850	0.80	0.4785	0.6197
0.48	1.0663	1.3223	0.80	0.4893	0.6068	0.49	1.0336	1.3385	0.81	0.4680	0.6060
0.49	1.0321	1.2798	0.81	0.4788	0.5937	0.50	1.0000	1.2950	0.82	0.4576	0.5926
0.50	1.0000	1.2400	0.82	0.4684	0.5808	0.51	0.9686	1.2543	0.83	0.4473	0.5793
0.51	0.9699	1.2027	0.83	0.4580	0.5680	0.52	0.9390	1.2160	0.84	0.4371	0.5660
0.52	0.9414	1.1674	0.84	0.4478	0.5553	0.53	0.9112	1.1800	0.85	0.4270	0.5529
0.53	0.9146	1.1342	0.85	0.4376	0.5426	0.54	0.8849	1.1460	0.86	0.4168	0.5398
0.54	0.8893	1.1027	0.86	0.4274	0.5300	0.55	0.8600	1.1138	0.87	0.4067	0.5267
0.55	0.8652	1.0729	0.87	0.4172	0.5174	0.56	0.8365	1.0832	0.88	0.3966	0.5136
0.56	0.8423	1.0445	0.88	0.4070	0.5047	0.57	0.8141	1.0542	0.89	0.3863	0.5003
0.57	0.8205	1.0175	0.89	0.3967	0.4919	0.58	0.7927	1.0266	0.90	0.3760	0.4869
0.58	0.7998	0.9918	0.90	0.3862	0.4789	0.59	0.7724	1.0003	0.91	0.3655	0.4733
0.59	0.7799	0.9671	0.91	0.3756	0.4657	0.60	0.7530	0.9751	0.92	0.3547	0.4593
0.60	0.7609	0.9436	0.92	0.3646	0.4522	0.61	0.7344	0.9510	0.93	0.3435	0.4448
0.61	0.7427	0.9210	0.93	0.3534	0.4382	0.62	0.7165	0.9279	0.94	0.3318	0.4297
0.62	0.7253	0.8994	0.94	0.3415	0.4235	0.63	0.6994	0.9058	0.95	0.3195	0.4137
0.63	0.7085	0.8785	0.95	0.3290	0.4080	0.64	0.6830	0.8844	0.96	0.3061	0.3964
0.64	0.6923	0.8585	0.96	0.3154	0.3911	0.65	0.6671	0.8639	0.97	0.2911	0.3769
0.65	0.6767	0.8391	0.97	0.3001	0.3721	0.66	0.6518	0.8441	0.98	0.2733	0.3539
0.66	0.6616	0.8204	0.98	0.2819	0.3496	0.67	0.6371	0.8250	0.99	0.2492	0.3227
0.67	0.6470	0.8024	0.99	0.2574	0.3192	0.68	0.6228	0.8065			
0.68	0.6329	0.7849				0.69	0.6090	0.7886			
0.69	0.6192	0.7679				0.70	0.5956	0.7713			
0.70	0.6060	0.7514				0.71	0.5825	0.7544			
0.71	0.5930	0.7354				0.72	0.5699	0.7380			
0.72	0.5805	0.7198				0.73	0.5575	0.7220			

TABLE I (continued)

$p_1 = 0.23$						$p_1 = 0.24$					
p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.43	1.3136	1.7779	0.71	0.5718	0.7739	0.44	1.2719	1.8007	0.72	0.5479	0.7757
0.44	1.2568	1.7010	0.72	0.5590	0.7566	0.45	1.2164	1.7222	0.73	0.5354	0.7581
0.45	1.2049	1.6308	0.73	0.5466	0.7398	0.46	1.1658	1.6505	0.74	0.5233	0.7409
0.46	1.1573	1.5664	0.74	0.5345	0.7235	0.47	1.1193	1.5847	0.75	0.5115	0.7242
0.47	1.1134	1.5070	0.75	0.5228	0.7075	0.48	1.0764	1.5240	0.76	0.5000	0.7079
0.48	1.0728	1.4520	0.76	0.5113	0.6920	0.49	1.0368	1.4679	0.77	0.4887	0.6920
0.49	1.0351	1.4010	0.77	0.5000	0.6767	0.50	1.0000	1.4158	0.78	0.4777	0.6764
0.50	1.0000	1.3535	0.78	0.4890	0.6618	0.51	0.9657	1.3673	0.79	0.4669	0.6611
0.51	0.9672	1.3090	0.79	0.4781	0.6471	0.52	0.9337	1.3220	0.80	0.4563	0.6460
0.52	0.9364	1.2674	0.80	0.4675	0.6327	0.53	0.9037	1.2795	0.81	0.4458	0.6312
0.53	0.9075	1.2283	0.81	0.4570	0.6185	0.54	0.8755	1.2396	0.82	0.4355	0.6166
0.54	0.8803	1.1915	0.82	0.4466	0.6045	0.55	0.8490	1.2020	0.83	0.4254	0.6022
0.55	0.8546	1.1567	0.83	0.4364	0.5907	0.56	0.8239	1.1665	0.84	0.4153	0.5880
0.56	0.8303	1.1238	0.84	0.4263	0.5769	0.57	0.8002	1.1329	0.85	0.4053	0.5738
0.57	0.8073	1.0926	0.85	0.4162	0.5633	0.58	0.7777	1.1011	0.86	0.3953	0.5597
0.58	0.7854	1.0630	0.86	0.4061	0.5497	0.59	0.7563	1.0708	0.87	0.3854	0.5456
0.59	0.7645	1.0348	0.87	0.3961	0.5361	0.60	0.7360	1.0420	0.88	0.3754	0.5316
0.60	0.7447	1.0079	0.88	0.3861	0.5225	0.61	0.7166	1.0146	0.89	0.3654	0.5174
0.61	0.7257	0.9822	0.89	0.3759	0.5088	0.62	0.6981	0.9884	0.90	0.3553	0.5031
0.62	0.7075	0.9576	0.90	0.3657	0.4950	0.63	0.6803	0.9632	0.91	0.3450	0.4885
0.63	0.6901	0.9340	0.91	0.3553	0.4809	0.64	0.6633	0.9392	0.92	0.3345	0.4736
0.64	0.6733	0.9113	0.92	0.3446	0.4664	0.65	0.6470	0.9161	0.93	0.3237	0.4583
0.65	0.6572	0.8895	0.93	0.3336	0.4515	0.66	0.6313	0.8938	0.94	0.3124	0.4423
0.66	0.6417	0.8686	0.94	0.3221	0.4360	0.67	0.6162	0.8724	0.95	0.3004	0.4253
0.67	0.6268	0.8483	0.95	0.3100	0.4195	0.68	0.6016	0.8518	0.96	0.2875	0.4070
0.68	0.6124	0.8288	0.96	0.2968	0.4017	0.69	0.5875	0.8318	0.97	0.2730	0.3865
0.69	0.5984	0.8099	0.97	0.2820	0.3817	0.70	0.5739	0.8125	0.98	0.2559	0.3623
0.70	0.5849	0.7916	0.98	0.2646	0.3581	0.71	0.5607	0.7938	0.99	0.2329	0.3297
			0.99	0.2410	0.3262						

TABLE I (continued)

$p_1 = 0.25$						$p_1 = 0.26$					
p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.45	1.2290	1.8221	0.73	0.5240	0.7768	0.46	1.1850	1.8419	0.74	0.5000	0.7772
0.46	1.1750	1.7420	0.74	0.5118	0.7588	0.47	1.1325	1.7603	0.75	0.4882	0.7588
0.47	1.1256	1.6688	0.75	0.5000	0.7413	0.48	1.0845	1.6858	0.76	0.4767	0.7409
0.48	1.0803	1.6017	0.76	0.4885	0.7242	0.49	1.0405	1.6174	0.77	0.4655	0.7235
0.49	1.0386	1.5398	0.77	0.4772	0.7075	0.50	1.0000	1.5544	0.78	0.4545	0.7064
0.50	1.0000	1.4826	0.78	0.4662	0.6912	0.51	0.9625	1.4961	0.79	0.4438	0.6898
0.51	0.9642	1.4295	0.79	0.4555	0.6753	0.52	0.9277	1.4420	0.80	0.4332	0.6734
0.52	0.9308	1.3800	0.80	0.4449	0.6596	0.53	0.8953	1.3916	0.81	0.4229	0.6574
0.53	0.8996	1.3338	0.81	0.4345	0.6442	0.54	0.8650	1.3445	0.82	0.4127	0.6416
0.54	0.8704	1.2904	0.82	0.4242	0.6290	0.55	0.8366	1.3004	0.83	0.4027	0.6260
0.55	0.8430	1.2498	0.83	0.4141	0.6140	0.56	0.8099	1.2589	0.84	0.3928	0.6106
0.56	0.8171	1.2114	0.84	0.4041	0.5992	0.57	0.7848	1.2199	0.85	0.3830	0.5953
0.57	0.7927	1.1753	0.85	0.3942	0.5845	0.58	0.7611	1.1831	0.86	0.3732	0.5802
0.58	0.7696	1.1411	0.86	0.3844	0.5699	0.59	0.7387	1.1483	0.87	0.3635	0.5651
0.59	0.7477	1.1086	0.87	0.3745	0.5553	0.60	0.7175	1.1152	0.88	0.3538	0.5500
0.60	0.7269	1.0778	0.88	0.3647	0.5407	0.61	0.6973	1.0838	0.89	0.3441	0.5348
0.61	0.7072	1.0484	0.89	0.3548	0.5260	0.62	0.6780	1.0539	0.90	0.3342	0.5195
0.62	0.6883	1.0204	0.90	0.3448	0.5112	0.63	0.6597	1.0254	0.91	0.3243	0.5040
0.63	0.6702	0.9937	0.91	0.3347	0.4962	0.64	0.6422	0.9982	0.92	0.3141	0.4882
0.64	0.6530	0.9681	0.92	0.3243	0.4809	0.65	0.6254	0.9721	0.93	0.3036	0.4719
0.65	0.6364	0.9436	0.93	0.3137	0.4651	0.66	0.6093	0.9471	0.94	0.2927	0.4549
0.66	0.6205	0.9200	0.94	0.3026	0.4486	0.67	0.5939	0.9231	0.95	0.2812	0.4370
0.67	0.6052	0.8973	0.95	0.2908	0.4312	0.68	0.5790	0.9001	0.96	0.2687	0.4177
0.68	0.5905	0.8755	0.96	0.2781	0.4123	0.69	0.5647	0.8778	0.97	0.2549	0.3962
0.69	0.5763	0.8545	0.97	0.2640	0.3913	0.70	0.5509	0.8564	0.98	0.2385	0.3708
0.70	0.5626	0.8341	0.98	0.2472	0.3665	0.71	0.5376	0.8356	0.99	0.2166	0.3367
0.71	0.5493	0.8144	0.99	0.2248	0.3332	0.72	0.5247	0.8155			
0.72	0.5364	0.7953				0.73	0.5122	0.7961			

TABLE I (continued)

p_1 = 0.27						p_1 = 0.28					
p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.47	1.1400	1.8603	0.75	0.4760	0.7768	0.48	1.0942	1.8773	0.76	0.4521	0.7757
0.48	1.0891	1.7773	0.76	0.4646	0.7581	0.49	1.0449	1.7928	0.77	0.4410	0.7566
0.49	1.0427	1.7014	0.77	0.4534	0.7398	0.50	1.0000	1.7157	0.78	0.4301	0.7380
0.50	1.0000	1.6318	0.78	0.4425	0.7220	0.51	0.9588	1.6450	0.79	0.4195	0.7198
0.51	0.9607	1.5677	0.79	0.4318	0.7046	0.52	0.9208	1.5798	0.80	0.4092	0.7020
0.52	0.9243	1.5084	0.80	0.4213	0.6876	0.53	0.8856	1.5195	0.81	0.3990	0.6846
0.53	0.8906	1.4533	0.81	0.4111	0.6708	0.54	0.8530	1.4635	0.82	0.3890	0.6675
0.54	0.8592	1.4020	0.82	0.4010	0.6544	0.55	0.8226	1.4114	0.83	0.3792	0.6506
0.55	0.8298	1.3541	0.83	0.3911	0.6382	0.56	0.7943	1.3628	0.84	0.3695	0.6340
0.56	0.8023	1.3093	0.84	0.3813	0.6222	0.57	0.7677	1.3172	0.85	0.3599	0.6176
0.57	0.7765	1.2671	0.85	0.3716	0.6063	0.58	0.7427	1.2743	0.86	0.3504	0.6013
0.58	0.7522	1.2274	0.86	0.3619	0.5906	0.59	0.7192	1.2340	0.87	0.3410	0.5851
0.59	0.7292	1.1900	0.87	0.3524	0.5750	0.60	0.6970	1.1959	0.88	0.3316	0.5689
0.60	0.7075	1.1545	0.88	0.3428	0.5593	0.61	0.6760	1.1599	0.89	0.3221	0.5527
0.61	0.6869	1.1209	0.89	0.3332	0.5437	0.62	0.6561	1.1257	0.90	0.3126	0.5364
0.62	0.6673	1.0890	0.90	0.3235	0.5279	0.63	0.6372	1.0933	0.91	0.3030	0.5199
0.63	0.6487	1.0586	0.91	0.3137	0.5119	0.64	0.6192	1.0624	0.92	0.2932	0.5030
0.64	0.6309	1.0296	0.92	0.3037	0.4956	0.65	0.6020	1.0329	0.93	0.2831	0.4858
0.65	0.6140	1.0019	0.93	0.2934	0.4788	0.66	0.5856	1.0047	0.94	0.2727	0.4678
0.66	0.5977	0.9753	0.94	0.2827	0.4613	0.67	0.5699	0.9778	0.95	0.2616	0.4489
0.67	0.5821	0.9499	0.95	0.2714	0.4429	0.68	0.5548	0.9519	0.96	0.2498	0.4285
0.68	0.5672	0.9255	0.96	0.2593	0.4231	0.69	0.5403	0.9271	0.97	0.2366	0.4059
0.69	0.5527	0.9020	0.97	0.2458	0.4010	0.70	0.5264	0.9031	0.98	0.2211	0.3793
0.70	0.5389	0.8793	0.98	0.2298	0.3750	0.71	0.5130	0.8801	0.99	0.2003	0.3437
0.71	0.5255	0.8575	0.99	0.2085	0.3402	0.72	0.5000	0.8579			
0.72	0.5125	0.8364				0.73	0.4875	0.8364			
0.73	0.5000	0.8159				0.74	0.4753	0.8155			
0.74	0.4878	0.7961				0.75	0.4636	0.7953			

TABLE I (continued)

p_1 = 0.29

p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.49	1.0475	1.8928	0.77	0.4282	0.7739
0.50	1.0000	1.8071	0.78	0.4175	0.7544
0.51	0.9567	1.7287	0.79	0.4070	0.7354
0.52	0.9169	1.6569	0.80	0.3967	0.7168
0.53	0.8803	1.5907	0.81	0.3866	0.6987
0.54	0.8464	1.5295	0.82	0.3768	0.6809
0.55	0.8149	1.4727	0.83	0.3671	0.6633
0.56	0.7857	1.4197	0.84	0.3575	0.6461
0.57	0.7583	1.3703	0.85	0.3481	0.6290
0.58	0.7327	1.3240	0.86	0.3387	0.6121
0.59	0.7086	1.2805	0.87	0.3294	0.5953
0.60	0.6860	1.2396	0.88	0.3202	0.5786
0.61	0.6646	1.2009	0.89	0.3109	0.5618
0.62	0.6443	1.1643	0.90	0.3016	0.5450
0.63	0.6251	1.1296	0.91	0.2922	0.5279
0.64	0.6069	1.0967	0.92	0.2826	0.5106
0.65	0.5895	1.0653	0.93	0.2727	0.4928
0.66	0.5730	1.0354	0.94	0.2625	0.4743
0.67	0.5571	1.0067	0.95	0.2517	0.4549
0.68	0.5420	0.9794	0.96	0.2402	0.4340
0.69	0.5274	0.9531	0.97	0.2273	0.4108
0.70	0.5134	0.9278	0.98	0.2123	0.3836
0.71	0.5000	0.9035	0.99	0.1922	0.3473
0.72	0.4870	0.8801			
0.73	0.4745	0.8575			
0.74	0.4624	0.8356			
0.75	0.4507	0.8144			
0.76	0.4393	0.7938			

p_1 = 0.30

p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.50	1.0000	1.9069	0.78	0.4044	0.7713
0.51	0.9544	1.8199	0.79	0.3940	0.7514
0.52	0.9127	1.7405	0.80	0.3839	0.7321
0.53	0.8745	1.6676	0.81	0.3740	0.7131
0.54	0.8393	1.6004	0.82	0.3642	0.6946
0.55	0.8067	1.5383	0.83	0.3547	0.6763
0.56	0.7765	1.4807	0.84	0.3453	0.6584
0.57	0.7483	1.4270	0.85	0.3360	0.6407
0.58	0.7220	1.3769	0.86	0.3268	0.6232
0.59	0.6974	1.3299	0.87	0.3177	0.6058
0.60	0.6743	1.2858	0.88	0.3086	0.5884
0.61	0.6525	1.2442	0.89	0.2995	0.5711
0.62	0.6319	1.2050	0.90	0.2904	0.5537
0.63	0.6124	1.1679	0.91	0.2812	0.5361
0.64	0.5940	1.1327	0.92	0.2718	0.5183
0.65	0.5764	1.0992	0.93	0.2622	0.5000
0.66	0.5597	1.0674	0.94	0.2522	0.4810
0.67	0.5438	1.0370	0.95	0.2417	0.4610
0.68	0.5286	1.0080	0.96	0.2305	0.4395
0.69	0.5140	0.9802	0.97	0.2180	0.4158
0.70	0.5000	0.9535	0.98	0.2034	0.3879
0.71	0.4866	0.9278	0.99	0.1840	0.3508
0.72	0.4736	0.9031			
0.73	0.4611	0.8793			
0.74	0.4491	0.8564			
0.75	0.4374	0.8341			
0.76	0.4261	0.8125			
0.77	0.4151	0.7916			

TABLE I (continued)

p_1 = 0.31						**p_1 = 0.32**					
p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.51	0.9519	1.9197	0.75	0.4237	0.8545	0.52	0.9031	1.9311	0.76	0.3984	0.8518
0.52	0.9081	1.8315	0.76	0.4125	0.8318	0.53	0.8614	1.8417	0.77	0.3876	0.8288
0.53	0.8682	1.7509	0.77	0.4016	0.8099	0.54	0.8232	1.7602	0.78	0.3772	0.8065
0.54	0.8316	1.6771	0.78	0.3910	0.7886	0.55	0.7882	1.6853	0.79	0.3671	0.7849
0.55	0.7978	1.6090	0.79	0.3808	0.7679	0.56	0.7560	1.6164	0.80	0.3572	0.7638
0.56	0.7666	1.5460	0.80	0.3707	0.7477	0.57	0.7262	1.5526	0.81	0.3476	0.7432
0.57	0.7376	1.4876	0.81	0.3609	0.7279	0.58	0.6985	1.4934	0.82	0.3382	0.7230
0.58	0.7106	1.4332	0.82	0.3514	0.7086	0.59	0.6727	1.4383	0.83	0.3289	0.7033
0.59	0.6854	1.3824	0.83	0.3420	0.6896	0.60	0.6486	1.3869	0.84	0.3199	0.6839
0.60	0.6618	1.3348	0.84	0.3327	0.6710	0.61	0.6261	1.3387	0.85	0.3109	0.6648
0.61	0.6397	1.2900	0.85	0.3236	0.6526	0.62	0.6049	1.2934	0.86	0.3021	0.6460
0.62	0.6188	1.2479	0.86	0.3146	0.6344	0.63	0.5850	1.2507	0.87	0.2934	0.6273
0.63	0.5991	1.2082	0.87	0.3057	0.6164	0.64	0.5661	1.2104	0.88	0.2847	0.6088
0.64	0.5804	1.1705	0.88	0.2968	0.5985	0.65	0.5483	1.1723	0.89	0.2761	0.5902
0.65	0.5627	1.1349	0.89	0.2879	0.5806	0.66	0.5314	1.1362	0.90	0.2674	0.5717
0.66	0.5459	1.1009	0.90	0.2790	0.5626	0.67	0.5153	1.1018	0.91	0.2586	0.5530
0.67	0.5299	1.0686	0.91	0.2700	0.5445	0.68	0.5000	1.0691	0.92	0.2497	0.5340
0.68	0.5146	1.0378	0.92	0.2608	0.5261	0.69	0.4854	1.0378	0.93	0.2406	0.5145
0.69	0.5000	1.0084	0.93	0.2515	0.5072	0.70	0.4714	1.0080	0.94	0.2313	0.4944
0.70	0.4860	0.9802	0.94	0.2418	0.4877	0.71	0.4580	0.9794	0.95	0.2214	0.4734
0.71	0.4726	0.9531	0.95	0.2316	0.4671	0.72	0.4452	0.9519	0.96	0.2108	0.4508
0.72	0.4597	0.9271	0.96	0.2207	0.4451	0.73	0.4328	0.9255	0.97	0.1991	0.4258
0.73	0.4473	0.9020	0.97	0.2086	0.4208	0.74	0.4210	0.9001	0.98	0.1855	0.3966
0.74	0.4353	0.8778	0.98	0.1945	0.3922	0.75	0.4095	0.8755	0.99	0.1674	0.3579
			0.99	0.1757	0.3543						

TABLE I (continued)

p_1= 0.33						**p_1= 0.34**					
p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.53	0.8539	1.9411	0.77	0.3732	0.8483	0.54	0.8042	1.9497	0.78	0.3482	0.8441
0.54	0.8141	1.8507	0.78	0.3629	0.8250	0.55	0.7665	1.8583	0.79	0.3384	0.8204
0.55	0.7778	1.7681	0.79	0.3530	0.8024	0.56	0.7321	1.7748	0.80	0.3289	0.7974
0.56	0.7445	1.6924	0.80	0.3433	0.7803	0.57	0.7005	1.6983	0.81	0.3196	0.7750
0.57	0.7138	1.6226	0.81	0.3338	0.7588	0.58	0.6714	1.6277	0.82	0.3106	0.7531
0.58	0.6854	1.5581	0.82	0.3246	0.7379	0.59	0.6445	1.5625	0.83	0.3018	0.7317
0.59	0.6591	1.4982	0.83	0.3156	0.7173	0.60	0.6195	1.5019	0.84	0.2932	0.7108
0.60	0.6346	1.4425	0.84	0.3067	0.6972	0.61	0.5962	1.4455	0.85	0.2847	0.6902
0.61	0.6116	1.3904	0.85	0.2980	0.6773	0.62	0.5745	1.3929	0.86	0.2763	0.6699
0.62	0.5902	1.3416	0.86	0.2894	0.6578	0.63	0.5541	1.3435	0.87	0.2680	0.6498
0.63	0.5700	1.2957	0.87	0.2809	0.6384	0.64	0.5350	1.2971	0.88	0.2598	0.6299
0.64	0.5510	1.2525	0.88	0.2724	0.6192	0.65	0.5170	1.2535	0.89	0.2517	0.6101
0.65	0.5331	1.2118	0.89	0.2640	0.6001	0.66	0.5000	1.2122	0.90	0.2435	0.5903
0.66	0.5161	1.1732	0.90	0.2555	0.5809	0.67	0.4839	1.1732	0.91	0.2353	0.5704
0.67	0.5000	1.1366	0.91	0.2470	0.5616	0.68	0.4686	1.1362	0.92	0.2269	0.5502
0.68	0.4847	1.1018	0.92	0.2384	0.5420	0.69	0.4541	1.1009	0.93	0.2184	0.5296
0.69	0.4701	1.0686	0.93	0.2296	0.5220	0.70	0.4403	1.0674	0.94	0.2097	0.5083
0.70	0.4562	1.0370	0.94	0.2205	0.5013	0.71	0.4270	1.0354	0.95	0.2005	0.4861
0.71	0.4429	1.0067	0.95	0.2110	0.4797	0.72	0.4144	1.0047	0.96	0.1907	0.4623
0.72	0.4301	0.9778	0.96	0.2008	0.4565	0.73	0.4023	0.9753	0.97	0.1799	0.4361
0.73	0.4179	0.9499	0.97	0.1896	0.4309	0.74	0.3907	0.9471	0.98	0.1672	0.4055
0.74	0.4061	0.9231	0.98	0.1764	0.4010	0.75	0.3795	0.9200	0.99	0.1506	0.3651
0.75	0.3948	0.8973	0.99	0.1590	0.3615	0.76	0.3687	0.8938			
0.76	0.3838	0.8724				0.77	0.3583	0.8686			

TABLE I (continued)

p_1= 0.35

p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.55	0.7541	1.9570	0.79	0.3233	0.8391
0.56	0.7185	1.8647	0.80	0.3140	0.8150
0.57	0.6860	1.7803	0.81	0.3050	0.7916
0.58	0.6562	1.7030	0.82	0.2962	0.7688
0.59	0.6287	1.6317	0.83	0.2877	0.7466
0.60	0.6033	1.5658	0.84	0.2793	0.7248
0.61	0.5797	1.5046	0.85	0.2710	0.7034
0.62	0.5578	1.4476	0.86	0.2629	0.6823
0.63	0.5373	1.3944	0.87	0.2549	0.6615
0.64	0.5181	1.3445	0.88	0.2470	0.6409
0.65	0.5000	1.2976	0.89	0.2391	0.6204
0.66	0.4830	1.2535	0.90	0.2312	0.5999
0.67	0.4669	1.2118	0.91	0.2232	0.5793
0.68	0.4517	1.1723	0.92	0.2152	0.5585
0.69	0.4373	1.1349	0.93	0.2070	0.5373
0.70	0.4236	1.0992	0.94	0.1986	0.5154
0.71	0.4105	1.0653	0.95	0.1898	0.4926
0.72	0.3980	1.0329	0.96	0.1804	0.4682
0.73	0.3860	1.0019	0.97	0.1700	0.4413
0.74	0.3746	0.9721	0.98	0.1580	0.4100
0.75	0.3636	0.9436	0.99	0.1421	0.3688
0.76	0.3530	0.9161			
0.77	0.3428	0.8895			
0.78	0.3329	0.8639			

p_1= 0.36

p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.56	0.7036	1.9630	0.80	0.2987	0.8333
0.57	0.6702	1.8697	0.81	0.2899	0.8088
0.58	0.6397	1.7846	0.82	0.2814	0.7850
0.59	0.6117	1.7065	0.83	0.2731	0.7618
0.60	0.5859	1.6345	0.84	0.2650	0.7391
0.61	0.5620	1.5679	0.85	0.2570	0.7169
0.62	0.5399	1.5062	0.86	0.2491	0.6950
0.63	0.5193	1.4486	0.87	0.2414	0.6735
0.64	0.5000	1.3949	0.88	0.2338	0.6521
0.65	0.4819	1.3445	0.89	0.2262	0.6309
0.66	0.4650	1.2971	0.90	0.2186	0.6098
0.67	0.4490	1.2525	0.91	0.2110	0.5885
0.68	0.4339	1.2104	0.92	0.2033	0.5670
0.69	0.4196	1.1705	0.93	0.1954	0.5452
0.70	0.4060	1.1327	0.94	0.1874	0.5227
0.71	0.3931	1.0967	0.95	0.1789	0.4992
0.72	0.3808	1.0624	0.96	0.1700	0.4741
0.73	0.3691	1.0296	0.97	0.1601	0.4466
0.74	0.3578	0.9982	0.98	0.1486	0.4146
0.75	0.3470	0.9681	0.99	0.1335	0.3725
0.76	0.3367	0.9392			
0.77	0.3267	0.9113			
0.78	0.3170	0.8844			
0.79	0.3077	0.8585			

TABLE I (continued)

p_1= 0.37						**p_1= 0.38**					
p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.57	0.6530	1.9676	0.81	0.2743	0.8266	0.58	0.6021	1.9709	0.82	0.2502	0.8191
0.58	0.6217	1.8735	0.82	0.2661	0.8018	0.59	0.5731	1.8761	0.83	0.2425	0.7939
0.59	0.5932	1.7876	0.83	0.2580	0.7776	0.60	0.5466	1.7895	0.84	0.2350	0.7693
0.60	0.5671	1.7088	0.84	0.2502	0.7540	0.61	0.5224	1.7100	0.85	0.2276	0.7452
0.61	0.5430	1.6362	0.85	0.2425	0.7308	0.62	0.5000	1.6368	0.86	0.2204	0.7216
0.62	0.5207	1.5690	0.86	0.2350	0.7081	0.63	0.4793	1.5690	0.87	0.2133	0.6984
0.63	0.5000	1.5067	0.87	0.2276	0.6858	0.64	0.4601	1.5062	0.88	0.2063	0.6755
0.64	0.4807	1.4486	0.88	0.2202	0.6636	0.65	0.4422	1.4476	0.89	0.1994	0.6527
0.65	0.4627	1.3944	0.89	0.2129	0.6417	0.66	0.4255	1.3929	0.90	0.1925	0.6301
0.66	0.4459	1.3435	0.90	0.2057	0.6198	0.67	0.4098	1.3416	0.91	0.1856	0.6074
0.67	0.4300	1.2957	0.91	0.1984	0.5979	0.68	0.3951	1.2934	0.92	0.1786	0.5846
0.68	0.4150	1.2507	0.92	0.1911	0.5757	0.69	0.3812	1.2479	0.93	0.1715	0.5614
0.69	0.4009	1.2082	0.93	0.1836	0.5532	0.70	0.3681	1.2050	0.94	0.1642	0.5376
0.70	0.3876	1.1679	0.94	0.1759	0.5300	0.71	0.3557	1.1643	0.95	0.1566	0.5127
0.71	0.3749	1.1296	0.95	0.1679	0.5059	0.72	0.3439	1.1257	0.96	0.1486	0.4863
0.72	0.3628	1.0933	0.96	0.1594	0.4802	0.73	0.3327	1.0890	0.97	0.1397	0.4574
0.73	0.3513	1.0586	0.97	0.1500	0.4519	0.74	0.3220	1.0539	0.98	0.1295	0.4239
0.74	0.3403	1.0254	0.98	0.1391	0.4192	0.75	0.3117	1.0204	0.99	0.1161	0.3800
0.75	0.3298	0.9937	0.99	0.1248	0.3762	0.76	0.3019	0.9884			
0.76	0.3197	0.9632				0.77	0.2925	0.9576			
0.77	0.3099	0.9340				0.78	0.2835	0.9279			
0.78	0.3006	0.9058				0.79	0.2747	0.8994			
0.79	0.2915	0.8785				0.80	0.2663	0.8718			
0.80	0.2828	0.8522				0.81	0.2581	0.8450			

TABLE I (continued)

p_1= 0.39						p_1= 0.40					
p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.59	0.5511	1.9729	0.79	0.2573	0.9210	0.60	0.5000	1.9736	0.80	0.2314	0.9133
0.60	0.5244	1.8773	0.80	0.2492	0.8921	0.61	0.4756	1.8773	0.81	0.2240	0.8840
0.61	0.5000	1.7901	0.81	0.2414	0.8641	0.62	0.4534	1.7895	0.82	0.2168	0.8556
0.62	0.4776	1.7100	0.82	0.2338	0.8370	0.63	0.4329	1.7088	0.83	0.2098	0.8281
0.63	0.4570	1.6362	0.83	0.2264	0.8107	0.64	0.4141	1.6345	0.84	0.2030	0.8014
0.64	0.4380	1.5679	0.84	0.2193	0.7851	0.65	0.3967	1.5658	0.85	0.1964	0.7753
0.65	0.4203	1.5046	0.85	0.2123	0.7600	0.66	0.3805	1.5019	0.86	0.1900	0.7498
0.66	0.4038	1.4455	0.86	0.2054	0.7355	0.67	0.3654	1.4425	0.87	0.1836	0.7248
0.67	0.3884	1.3904	0.87	0.1987	0.7114	0.68	0.3514	1.3869	0.88	0.1774	0.7001
0.68	0.3739	1.3387	0.88	0.1921	0.6876	0.69	0.3382	1.3348	0.89	0.1712	0.6757
0.69	0.3603	1.2900	0.89	0.1855	0.6641	0.70	0.3257	1.2858	0.90	0.1651	0.6515
0.70	0.3475	1.2442	0.90	0.1790	0.6407	0.71	0.3140	1.2396	0.91	0.1589	0.6273
0.71	0.3354	1.2009	0.91	0.1724	0.6173	0.72	0.3030	1.1959	0.92	0.1528	0.6030
0.72	0.3240	1.1599	0.92	0.1658	0.5937	0.73	0.2925	1.1545	0.93	0.1465	0.5783
0.73	0.3131	1.1209	0.93	0.1591	0.5698	0.74	0.2825	1.1152	0.94	0.1401	0.5531
0.74	0.3027	1.0838	0.94	0.1523	0.5452	0.75	0.2731	1.0778	0.95	0.1335	0.5268
0.75	0.2928	1.0484	0.95	0.1452	0.5197	0.76	0.2640	1.0420	0.96	0.1264	0.4990
0.76	0.2834	1.0146	0.96	0.1376	0.4926	0.77	0.2553	1.0079	0.97	0.1187	0.4686
0.77	0.2743	0.9822	0.97	0.1293	0.4629	0.78	0.2470	0.9751	0.98	0.1098	0.4334
0.78	0.2656	0.9510	0.98	0.1197	0.4286	0.79	0.2391	0.9436	0.99	0.0982	0.3876
			0.99	0.1072	0.3838						

TABLE I (continued)

p_1 = 0.41						**p_1 = 0.42**					
p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.61	0.4489	1.9729	0.81	0.2058	0.9046	0.62	0.3979	1.9709	0.82	0.1807	0.8950
0.62	0.4269	1.8761	0.82	0.1991	0.8750	0.63	0.3783	1.8735	0.83	0.1746	0.8650
0.63	0.4068	1.7876	0.83	0.1926	0.8462	0.64	0.3603	1.7846	0.84	0.1688	0.8359
0.64	0.3883	1.7065	0.84	0.1862	0.8183	0.65	0.3438	1.7030	0.85	0.1630	0.8075
0.65	0.3713	1.6317	0.85	0.1800	0.7912	0.66	0.3286	1.6277	0.86	0.1575	0.7799
0.66	0.3555	1.5625	0.86	0.1740	0.7646	0.67	0.3146	1.5581	0.87	0.1520	0.7529
0.67	0.3409	1.4982	0.87	0.1681	0.7386	0.68	0.3015	1.4934	0.88	0.1466	0.7263
0.68	0.3273	1.4383	0.88	0.1622	0.7130	0.69	0.2894	1.4332	0.89	0.1413	0.7001
0.69	0.3146	1.3824	0.89	0.1565	0.6877	0.70	0.2780	1.3769	0.90	0.1361	0.6741
0.70	0.3026	1.3299	0.90	0.1508	0.6626	0.71	0.2673	1.3240	0.91	0.1309	0.6482
0.71	0.2914	1.2805	0.91	0.1451	0.6376	0.72	0.2573	1.2743	0.92	0.1256	0.6223
0.72	0.2808	1.2340	0.92	0.1394	0.6125	0.73	0.2478	1.2274	0.93	0.1203	0.5961
0.73	0.2708	1.1900	0.93	0.1336	0.5871	0.74	0.2389	1.1831	0.94	0.1149	0.5693
0.74	0.2613	1.1483	0.94	0.1277	0.5611	0.75	0.2304	1.1411	0.95	0.1093	0.5415
0.75	0.2523	1.1086	0.95	0.1215	0.5341	0.76	0.2223	1.1011	0.96	0.1034	0.5121
0.76	0.2437	1.0708	0.96	0.1150	0.5055	0.77	0.2146	1.0630	0.97	0.0969	0.4801
0.77	0.2355	1.0348	0.97	0.1079	0.4743	0.78	0.2073	1.0266	0.98	0.0895	0.4433
0.78	0.2276	1.0003	0.98	0.0997	0.4383	0.79	0.2002	0.9918	0.99	0.0799	0.3955
0.79	0.2201	0.9671	0.99	0.0891	0.3916	0.80	0.1935	0.9583			
0.80	0.0000	1.1882				0.81	0.0000	1.1391			
p_1 = 0.43						**p_1 = 0.44**					
0.63	0.3470	1.9676	0.83	0.1560	0.8845	0.64	0.2964	1.9630	0.84	0.1318	0.8730
0.64	0.3298	1.8697	0.84	0.1506	0.8541	0.65	0.2815	1.8647	0.85	0.1271	0.8422
0.65	0.3140	1.7803	0.85	0.1454	0.8245	0.66	0.2679	1.7748	0.86	0.1226	0.8122
0.66	0.2995	1.6983	0.86	0.1403	0.7957	0.67	0.2555	1.6924	0.87	0.1182	0.7829
0.67	0.2862	1.6226	0.87	0.1354	0.7676	0.68	0.2440	1.6164	0.88	0.1139	0.7542
0.68	0.2738	1.5526	0.88	0.1305	0.7400	0.69	0.2334	1.5460	0.89	0.1096	0.7260
0.69	0.2624	1.4876	0.89	0.1257	0.7128	0.70	0.2235	1.4807	0.90	0.1054	0.6981
0.70	0.2517	1.4270	0.90	0.1210	0.6859	0.71	0.2143	1.4197	0.91	0.1012	0.6704
0.71	0.2417	1.3703	0.91	0.1163	0.6591	0.72	0.2057	1.3628	0.92	0.0970	0.6427
0.72	0.2323	1.3172	0.92	0.1115	0.6323	0.73	0.1977	1.3093	0.93	0.0928	0.6147
0.73	0.2235	1.2671	0.93	0.1068	0.6053	0.74	0.1901	1.2589	0.94	0.0885	0.5863
0.74	0.2152	1.2199	0.94	0.1019	0.5777	0.75	0.1829	1.2114	0.95	0.0841	0.5568
0.75	0.2073	1.1753	0.95	0.0968	0.5491	0.76	0.1761	1.1665	0.96	0.0794	0.5259
0.76	0.1998	1.1329	0.96	0.0915	0.5189	0.77	0.1697	1.1238	0.97	0.0743	0.4922
0.77	0.1927	1.0926	0.97	0.0857	0.4861	0.78	0.1635	1.0832	0.98	0.0685	0.4536
0.78	0.1859	1.0542	0.98	0.0791	0.4484	0.79	0.1577	1.0445	0.99	0.0609	0.4037
0.79	0.1795	1.0175	0.99	0.0705	0.3996	0.80	0.1521	1.0075			
0.80	0.1733	0.9823				0.81	0.1467	0.9719			
0.81	0.1673	0.9485				0.82	0.1416	0.9378			
0.82	0.1616	0.9160				0.83	0.1366	0.9049			

TABLE I (continued)

p_1= 0.45

p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.65	0.2459	1.9570	0.85	0.1081	0.8605
0.66	0.2335	1.8583	0.86	0.1042	0.8292
0.67	0.2222	1.7681	0.87	0.1004	0.7987
0.68	0.2118	1.6853	0.88	0.0966	0.7688
0.69	0.2022	1.6090	0.89	0.0929	0.7395
0.70	0.1933	1.5383	0.90	0.0893	0.7106
0.71	0.1851	1.4727	0.91	0.0857	0.6819
0.72	0.1774	1.4114	0.92	0.0821	0.6533
0.73	0.1702	1.3541	0.93	0.0785	0.6244
0.74	0.1634	1.3004	0.94	0.0748	0.5951
0.75	0.1570	1.2498	0.95	0.0710	0.5648
0.76	0.1510	1.2020	0.96	0.0670	0.5330
0.77	0.1454	1.1567	0.97	0.0626	0.4984
0.78	0.1400	1.1138	0.98	0.0577	0.4588
0.79	0.1348	1.0729	0.99	0.0512	0.4078
0.80	0.1299	1.0338			
0.81	0.1252	0.9965			
0.82	0.1207	0.9606			
0.83	0.1164	0.9261			
0.84	0.1122	0.8928			

p_1= 0.46

p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.66	0.1958	1.9497	0.86	0.0851	0.8469
0.67	0.1859	1.8507	0.87	0.0819	0.8151
0.68	0.1768	1.7602	0.88	0.0787	0.7841
0.69	0.1684	1.6771	0.89	0.0757	0.7536
0.70	0.1607	1.6004	0.90	0.0727	0.7236
0.71	0.1536	1.5295	0.91	0.0697	0.6939
0.72	0.1470	1.4635	0.92	0.0667	0.6642
0.73	0.1408	1.4020	0.93	0.0637	0.6344
0.74	0.1350	1.3445	0.94	0.0607	0.6042
0.75	0.1296	1.2904	0.95	0.0575	0.5730
0.76	0.1245	1.2396	0.96	0.0543	0.5402
0.77	0.1197	1.1915	0.97	0.0507	0.5047
0.78	0.1151	1.1460	0.98	0.0466	0.4642
0.79	0.1107	1.1027	0.99	0.0414	0.4121
0.80	0.1066	1.0615			
0.81	0.1027	1.0222			
0.82	0.0989	0.9844			
0.83	0.0952	0.9482			
0.84	0.0917	0.9133			
0.85	0.0883	0.8796			

p_1= 0.47

p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.67	0.1461	1.9411	0.83	0.0731	0.9714
0.68	0.1386	1.8417	0.84	0.0704	0.9348
0.69	0.1318	1.7509	0.85	0.0677	0.8995
0.70	0.1255	1.6676	0.86	0.0651	0.8654
0.71	0.1197	1.5907	0.87	0.0626	0.8322
0.72	0.1144	1.5195	0.88	0.0602	0.7998
0.73	0.1094	1.4533	0.89	0.0578	0.7682
0.74	0.1047	1.3916	0.90	0.0555	0.7370
0.75	0.1004	1.3338	0.91	0.0532	0.7062
0.76	0.0963	1.2795	0.92	0.0508	0.6755
0.77	0.0925	1.2283	0.93	0.0485	0.6447
0.78	0.0888	1.1800	0.94	0.0462	0.6135
0.79	0.0854	1.1342	0.95	0.0438	0.5814
0.80	0.0821	1.0906	0.96	0.0412	0.5477
0.81	0.0790	1.0491	0.97	0.0385	0.5112
0.82	0.0760	1.0095	0.98	0.0354	0.4697
			0.99	0.0313	0.4164

p_1= 0.48

p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.68	0.0969	1.9311	0.84	0.0480	0.9573
0.69	0.0919	1.8315	0.85	0.0462	0.9203
0.70	0.0873	1.7405	0.86	0.0444	0.8846
0.71	0.0831	1.6569	0.87	0.0426	0.8499
0.72	0.0792	1.5798	0.88	0.0409	0.8162
0.73	0.0757	1.5084	0.89	0.0393	0.7833
0.74	0.0723	1.4420	0.90	0.0377	0.7509
0.75	0.0692	1.3800	0.91	0.0361	0.7190
0.76	0.0663	1.3220	0.92	0.0345	0.6872
0.77	0.0636	1.2674	0.93	0.0329	0.6553
0.78	0.0610	1.2160	0.94	0.0313	0.6231
0.79	0.0586	1.1674	0.95	0.0296	0.5900
0.80	0.0562	1.1214	0.96	0.0279	0.5553
0.81	0.0540	1.0775	0.97	0.0260	0.5179
0.82	0.0519	1.0357	0.98	0.0238	0.4753
0.83	0.0499	0.9957	0.99	0.0211	0.4208

TABLE I (continued)

p_1 = 0.49

p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.69	0.0481	1.9197	0.85	0.0236	0.9421
0.70	0.0456	1.8199	0.86	0.0227	0.9047
0.71	0.0433	1.7287	0.87	0.0218	0.8685
0.72	0.0412	1.6450	0.88	0.0209	0.8333
0.73	0.0393	1.5677	0.89	0.0200	0.7990
0.74	0.0375	1.4961	0.90	0.0192	0.7653
0.75	0.0358	1.4295	0.91	0.0184	0.7322
0.76	0.0343	1.3673	0.92	0.0175	0.6992
0.77	0.0328	1.3090	0.93	0.0167	0.6663
0.78	0.0314	1.2543	0.94	0.0159	0.6330
0.79	0.0301	1.2027	0.95	0.0150	0.5988
0.80	0.0289	1.1538	0.96	0.0141	0.5631
0.81	0.0278	1.1075	0.97	0.0132	0.5247
0.82	0.0267	1.0633	0.98	0.0121	0.4810
0.83	0.0256	1.0212	0.99	0.0107	0.4253
0.84	0.0246	0.9808			

p_1 = 0.50

p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.70	0.0000	1.9069	0.86	0.0000	0.9257
0.71	0.0000	1.8071	0.87	0.0000	0.8878
0.72	0.0000	1.7157	0.88	0.0000	0.8511
0.73	0.0000	1.6318	0.89	0.0000	0.8153
0.74	0.0000	1.5544	0.90	0.0000	0.7803
0.75	0.0000	1.4826	0.91	0.0000	0.7458
0.76	0.0000	1.4158	0.92	0.0000	0.7117
0.77	0.0000	1.3535	0.93	0.0000	0.6776
0.78	0.0000	1.2950	0.94	0.0000	0.6432
0.79	0.0000	1.2400	0.95	0.0000	0.6080
0.80	0.0000	1.1882	0.96	0.0000	0.5712
0.81	0.0000	1.1391	0.97	0.0000	0.5317
0.82	0.0000	1.0925	0.98	0.0000	0.4869
0.83	0.0000	1.0480	0.99	0.0000	0.4299
0.84	0.0000	1.0056			
0.85	0.0000	0.9648			

p_1 = 0.51

p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.71	-0.0475	1.8928	0.87	-0.0228	0.9080
0.72	-0.0449	1.7928	0.88	-0.0218	0.8696
0.73	-0.0427	1.7014	0.89	-0.0209	0.8323
0.74	-0.0405	1.6174	0.90	-0.0200	0.7959
0.75	-0.0386	1.5398	0.91	-0.0191	0.7601
0.76	-0.0368	1.4679	0.92	-0.0182	0.7246
0.77	-0.0351	1.4010	0.93	-0.0173	0.6893
0.78	-0.0336	1.3385	0.94	-0.0164	0.6537
0.79	-0.0321	1.2798	0.95	-0.0155	0.6174
0.80	-0.0307	1.2247	0.96	-0.0145	0.5795
0.81	-0.0294	1.1726	0.97	-0.0135	0.5389
0.82	-0.0282	1.1232	0.98	-0.0124	0.4929
0.83	-0.0270	1.0763	0.99	-0.0109	0.4345
0.84	-0.0259	1.0316			
0.85	-0.0248	0.9888			
0.86	-0.0238	0.9476			

p_1 = 0.52

p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.72	-0.0942	1.8773	0.88	-0.0446	0.8890
0.73	-0.0891	1.7773	0.89	-0.0426	0.8501
0.74	-0.0845	1.6858	0.90	-0.0407	0.8121
0.75	-0.0803	1.6017	0.91	-0.0389	0.7748
0.76	-0.0764	1.5240	0.92	-0.0370	0.7381
0.77	-0.0728	1.4520	0.93	-0.0352	0.7014
0.78	-0.0695	1.3850	0.94	-0.0333	0.6646
0.79	-0.0663	1.3223	0.95	-0.0315	0.6271
0.80	-0.0634	1.2635	0.96	-0.0295	0.5881
0.81	-0.0606	1.2081	0.97	-0.0274	0.5463
0.82	-0.0580	1.1558	0.98	-0.0250	0.4991
0.83	-0.0555	1.1062	0.99	-0.0220	0.4393
0.84	-0.0531	1.0590			
0.85	-0.0509	1.0139			
0.86	-0.0487	0.9707			
0.87	-0.0466	0.9292			

TABLE I (continued)

p_1 = 0.53

p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.73	-0.1400	1.8603	0.89	-0.0654	0.8686
0.74	-0.1325	1.7603	0.90	-0.0624	0.8290
0.75	-0.1256	1.6688	0.91	-0.0595	0.7902
0.76	-0.1193	1.5847	0.92	-0.0566	0.7520
0.77	-0.1134	1.5070	0.93	-0.0537	0.7140
0.78	-0.1080	1.4349	0.94	-0.0509	0.6759
0.79	-0.1029	1.3677	0.95	-0.0480	0.6371
0.80	-0.0982	1.3049	0.96	-0.0449	0.5969
0.81	-0.0938	1.2459	0.97	-0.0417	0.5539
0.82	-0.0896	1.1903	0.98	-0.0380	0.5054
0.83	-0.0856	1.1378	0.99	-0.0334	0.4442
0.84	-0.0819	1.0879			
0.85	-0.0783	1.0404			
0.86	-0.0749	0.9950			
0.87	-0.0716	0.9514			
0.88	-0.0684	0.9093			

p_1 = 0.54

p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.74	-0.1850	1.8419	0.90	-0.0850	0.8467
0.75	-0.1750	1.7420	0.91	-0.0810	0.8062
0.76	-0.1658	1.6505	0.92	-0.0770	0.7665
0.77	-0.1573	1.5664	0.93	-0.0730	0.7271
0.78	-0.1495	1.4886	0.94	-0.0691	0.6876
0.79	-0.1423	1.4165	0.95	-0.0650	0.6475
0.80	-0.1355	1.3492	0.96	-0.0609	0.6060
0.81	-0.1292	1.2862	0.97	-0.0564	0.5617
0.82	-0.1232	1.2271	0.98	-0.0514	0.5120
0.83	-0.1176	1.1713	0.99	-0.0451	0.4493
0.84	-0.1123	1.1185			
0.85	-0.1073	1.0684			
0.86	-0.1025	1.0205			
0.87	-0.0979	0.9747			
0.88	-0.0935	0.9306			
0.89	-0.0892	0.8880			

p_1 = 0.55

p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.75	-0.2290	1.8221	0.87	-0.1256	0.9993
0.76	-0.2164	1.7222	0.88	-0.1198	0.9530
0.77	-0.2049	1.6308	0.89	-0.1141	0.9084
0.78	-0.1944	1.5467	0.90	-0.1087	0.8651
0.79	-0.1846	1.4689	0.91	-0.1034	0.8230
0.80	-0.1755	1.3967	0.92	-0.0982	0.7816
0.81	-0.1671	1.3294	0.93	-0.0931	0.7407
0.82	-0.1591	1.2663	0.94	-0.0879	0.6997
0.83	-0.1517	1.2070	0.95	-0.0827	0.6582
0.84	-0.1446	1.1510	0.96	-0.0773	0.6154
0.85	-0.1380	1.0980	0.97	-0.0716	0.5698
0.86	-0.1316	1.0475	0.98	-0.0652	0.5186
			0.99	-0.0571	0.4544

p_1 = 0.56

p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.76	-0.2719	1.8007	0.88	-0.1474	0.9765
0.77	-0.2568	1.7010	0.89	-0.1404	0.9297
0.78	-0.2430	1.6097	0.90	-0.1335	0.8845
0.79	-0.2303	1.5257	0.91	-0.1269	0.8405
0.80	-0.2186	1.4479	0.92	-0.1204	0.7974
0.81	-0.2077	1.3757	0.93	-0.1140	0.7548
0.82	-0.1975	1.3082	0.94	-0.1075	0.7124
0.83	-0.1880	1.2450	0.95	-0.1011	0.6694
0.84	-0.1790	1.1856	0.96	-0.0944	0.6251
0.85	-0.1705	1.1294	0.97	-0.0873	0.5781
0.86	-0.1624	1.0760	0.98	-0.0793	0.5255
0.87	-0.1548	1.0252	0.99	-0.0694	0.4597

TABLE I (continued)

p_1 = 0.57

p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.77	-0.3136	1.7779	0.89	-0.1680	0.9522
0.78	-0.2960	1.6784	0.90	-0.1596	0.9048
0.79	-0.2799	1.5872	0.91	-0.1515	0.8588
0.80	-0.2651	1.5032	0.92	-0.1435	0.8139
0.81	-0.2514	1.4255	0.93	-0.1357	0.7696
0.82	-0.2387	1.3532	0.94	-0.1280	0.7255
0.83	-0.2268	1.2857	0.95	-0.1201	0.6810
0.84	-0.2156	1.2224	0.96	-0.1120	0.6352
0.85	-0.2051	1.1627	0.97	-0.1035	0.5867
0.86	-0.1951	1.1063	0.98	-0.0939	0.5327
0.87	-0.1857	1.0526	0.99	-0.0820	0.4651
0.88	-0.1766	1.0014			

p_1 = 0.58

p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.78	-0.3540	1.7535	0.90	-0.1870	0.9262
0.79	-0.3340	1.6542	0.91	-0.1773	0.8781
0.80	-0.3156	1.5632	0.92	-0.1678	0.8311
0.81	-0.2987	1.4793	0.93	-0.1585	0.7850
0.82	-0.2830	1.4016	0.94	-0.1492	0.7392
0.83	-0.2684	1.3293	0.95	-0.1399	0.6930
0.84	-0.2547	1.2617	0.96	-0.1304	0.6457
0.85	-0.2419	1.1983	0.97	-0.1203	0.5956
0.86	-0.2298	1.1384	0.98	-0.1090	0.5400
0.87	-0.2184	1.0817	0.99	-0.0950	0.4707
0.88	-0.2075	1.0277			
0.89	-0.1970	0.9760			

p_1 = 0.59

p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.79	-0.3931	1.7275	0.91	-0.2044	0.8983
0.80	-0.3705	1.6285	0.92	-0.1932	0.8492
0.81	-0.3499	1.5376	0.93	-0.1823	0.8011
0.82	-0.3308	1.4539	0.94	-0.1714	0.7535
0.83	-0.3132	1.3762	0.95	-0.1605	0.7056
0.84	-0.2967	1.3039	0.96	-0.1494	0.6565
0.85	-0.2813	1.2363	0.97	-0.1376	0.6049
0.86	-0.2668	1.1726	0.98	-0.1246	0.5476
0.87	-0.2532	1.1125	0.99	-0.1084	0.4765
0.88	-0.2402	1.0555			
0.89	-0.2278	1.0010			
0.90	-0.2159	0.9488			

p_1 = 0.60

p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.80	-0.4307	1.6999	0.92	-0.2200	0.8683
0.81	-0.4056	1.6012	0.93	-0.2072	0.8180
0.82	-0.3827	1.5105	0.94	-0.1947	0.7684
0.83	-0.3615	1.4269	0.95	-0.1821	0.7186
0.84	-0.3418	1.3493	0.96	-0.1692	0.6679
0.85	-0.3235	1.2770	0.97	-0.1557	0.6145
0.86	-0.3064	1.2092	0.98	-0.1407	0.5554
0.87	-0.2902	1.1454	0.99	-0.1222	0.4824
0.88	-0.2749	1.0850			
0.89	-0.2603	1.0276			
0.90	-0.2464	0.9726			
0.91	-0.2330	0.9196			

p_1 = 0.61

p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.81	-0.4666	1.6706	0.93	-0.2335	0.8358
0.82	-0.4391	1.5722	0.94	-0.2190	0.7840
0.83	-0.4139	1.4818	0.95	-0.2045	0.7323
0.84	-0.3906	1.3983	0.96	-0.1898	0.6796
0.85	-0.3689	1.3208	0.97	-0.1744	0.6244
0.86	-0.3487	1.2484	0.98	-0.1574	0.5636
0.87	-0.3297	1.1805	0.99	-0.1365	0.4885
0.88	-0.3119	1.1165			
0.89	-0.2949	1.0557			
0.90	-0.2787	0.9978			
0.91	-0.2632	0.9421			
0.92	-0.2481	0.8883			

p_1 = 0.62

p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.82	-0.5009	1.6397	0.94	-0.2445	0.8005
0.83	-0.4709	1.5416	0.95	-0.2281	0.7466
0.84	-0.4434	1.4514	0.96	-0.2114	0.6919
0.85	-0.4179	1.3681	0.97	-0.1939	0.6348
0.86	-0.3943	1.2906	0.98	-0.1747	0.5720
0.87	-0.3721	1.2182	0.99	-0.1512	0.4948
0.88	-0.3513	1.1501			
0.89	-0.3317	1.0857			
0.90	-0.3130	1.0245			
0.91	-0.2951	0.9659			
0.92	-0.2778	0.9094			
0.93	-0.2610	0.8545			

TABLE I (continued)

p_1 = 0.63

p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.83	-0.5333	1.6069	0.91	-0.3289	0.9912
0.84	-0.5008	1.5092	0.92	-0.3092	0.9318
0.85	-0.4710	1.4193	0.93	-0.2901	0.8742
0.86	-0.4434	1.3361	0.94	-0.2714	0.8177
0.87	-0.4177	1.2586	0.95	-0.2527	0.7616
0.88	-0.3936	1.1861	0.96	-0.2339	0.7048
0.89	-0.3709	1.1177	0.97	-0.2142	0.6456
0.90	-0.3494	1.0530	0.98	-0.1927	0.5808
			0.99	-0.1664	0.5014

p_1 = 0.64

p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.84	-0.5636	1.5723	0.92	-0.3425	0.9555
0.85	-0.5287	1.4750	0.93	-0.3208	0.8950
0.86	-0.4966	1.3853	0.94	-0.2996	0.8359
0.87	-0.4668	1.3022	0.95	-0.2787	0.7774
0.88	-0.4390	1.2247	0.96	-0.2575	0.7183
0.89	-0.4129	1.1520	0.97	-0.2355	0.6569
0.90	-0.3883	1.0833	0.98	-0.2114	0.5899
0.91	-0.3649	1.0180	0.99	-0.1822	0.5082

p_1 = 0.65

p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.85	-0.5918	1.5358	0.93	-0.3534	0.9170
0.86	-0.5544	1.4389	0.94	-0.3295	0.8551
0.87	-0.5200	1.3494	0.95	-0.3059	0.7939
0.88	-0.4880	1.2664	0.96	-0.2822	0.7324
0.89	-0.4581	1.1888	0.97	-0.2577	0.6687
0.90	-0.4299	1.1158	0.98	-0.2309	0.5994
0.91	-0.4033	1.0466	0.99	-0.1985	0.5152
0.92	-0.3779	0.9806			

p_1 = 0.66

p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.86	-0.6176	1.4973	0.94	-0.3611	0.8754
0.87	-0.5777	1.4007	0.95	-0.3347	0.8114
0.88	-0.5409	1.3114	0.96	-0.3082	0.7473
0.89	-0.5067	1.2284	0.97	-0.2809	0.6810
0.90	-0.4746	1.1506	0.98	-0.2513	0.6093
0.91	-0.4443	1.0772	0.99	-0.2155	0.5225
0.92	-0.4155	1.0074			
0.93	-0.3879	0.9404			

p_1 = 0.67

p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.87	-0.6408	1.4567	0.95	-0.3651	0.8299
0.88	-0.5985	1.3604	0.96	-0.3356	0.7629
0.89	-0.5592	1.2713	0.97	-0.3053	0.6940
0.90	-0.5227	1.1882	0.98	-0.2726	0.6196
0.91	-0.4883	1.1101	0.99	-0.2332	0.5301
0.92	-0.4558	1.0361			
0.93	-0.4247	0.9654			
0.94	-0.3946	0.8970			

p_1 = 0.68

p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.88	-0.6613	1.4138	0.96	-0.3645	0.7794
0.89	-0.6163	1.3178	0.97	-0.3310	0.7077
0.90	-0.5747	1.2287	0.98	-0.2949	0.6305
0.91	-0.5357	1.1454	0.99	-0.2516	0.5380
0.92	-0.4989	1.0668			
0.93	-0.4639	0.9920			
0.94	-0.4302	0.9199			
0.95	-0.3973	0.8495			

p_1 = 0.69

p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.89	-0.6786	1.3686	0.97	-0.3580	0.7221
0.90	-0.6311	1.2727	0.98	-0.3183	0.6419
0.91	-0.5869	1.1836	0.99	-0.2709	0.5463
0.92	-0.5454	1.0998			
0.93	-0.5060	1.0205			
0.94	-0.4683	0.9444			
0.95	-0.4315	0.8703			
0.96	-0.3952	0.7969			

p_1 = 0.70

p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.90	-0.6926	1.3207	0.98	-0.3429	0.6539
0.91	-0.6424	1.2250	0.99	-0.2910	0.5550
0.92	-0.5955	1.1355			
0.93	-0.5512	1.0511			
0.94	-0.5089	0.9705			
0.95	-0.4680	0.8925			
0.96	-0.4276	0.8155			
0.97	-0.3866	0.7373			

TABLE I (continued)

p_1 = 0.71

p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.91	-0.7028	1.2701	0.95	-0.5070	0.9162
0.92	-0.6497	1.1741	0.96	-0.4622	0.8352
0.93	-0.5999	1.0841	0.97	-0.4169	0.7533
0.94	-0.5526	0.9986	0.98	-0.3688	0.6665
			0.99	-0.3121	0.5640

p_1 = 0.72

p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.92	-0.7089	1.2162	0.96	-0.4991	0.8563
0.93	-0.6527	1.1199	0.97	-0.4490	0.7704
0.94	-0.5997	1.0289	0.98	-0.3962	0.6799
0.95	-0.5488	0.9416	0.99	-0.3343	0.5736

p_1 = 0.73

p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.93	-0.7101	1.1588	0.97	-0.4833	0.7887
0.94	-0.6506	1.0616	0.98	-0.4253	0.6940
0.95	-0.5938	0.9690	0.99	-0.3576	0.5836
0.96	-0.5386	0.8788			

p_1 = 0.74

p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.94	-0.7059	1.0972	0.98	-0.4561	0.7090
0.95	-0.6424	0.9985	0.99	-0.3823	0.5942
0.96	-0.5810	0.9031			
0.97	-0.5199	0.8081			

p_1 = 0.75

p_2	$\overline{H}'$	S'	p_2	$\overline{H}'$	S'
0.95	-0.6951	1.0305	0.99	-0.4083	0.6054
0.96	-0.6267	0.9292			
0.97	-0.5591	0.8290			
0.98	-0.4890	0.7250			

p_1 = 0.76

p_2	$\overline{H}'$	S'
0.96	-0.6763	0.9575
0.97	-0.6014	0.8514
0.98	-0.5242	0.7421
0.99	-0.4360	0.6173

p_1 = 0.77

p_2	$\overline{H}'$	S'
0.97	-0.6470	0.8757
0.98	-0.5619	0.7605
0.99	-0.4654	0.6299

p_1 = 0.78

p_2	$\overline{H}'$	S'
0.98	-0.6025	0.7803
0.99	-0.4969	0.6434

p_1 = 0.79

p_2	$\overline{H}'$	S'
0.99	-0.5306	0.6579

SECTION 10

COMPRESSIVE FORCE TEST PROCEDURE

1. PURPOSE

The compressive force test ensures that the bullets are retained by the cartridge case with sufficient strength to prevent inadvertent movement of the bullet into the case.

2. EQUIPMENT

Equipment listed in Compressive Force Section of the appropriate Inspection Equipment List shall be used.

3. TEST PROCEDURE

3.1 Each cartridge shall be numerically marked in such a manner that a positive identification of each round is assured. This may be accomplished by the use of indelible marker or adhesive stickers.

3.2 After numbering, each cartridge is measured for overall length to the nearest one thousandth of an inch.

3.3 Each cartridge is placed in the testing machine and subjected to a compressive force acting along its central axis. The force shall be exerted by two parallel plates contacting only the case head and bullet tip. The test machine shall be operated at a speed which results in a loading rate between 10 and 20 pounds per second. In no case, however, shall a loading rate be used in excess of that which will register accurately on the test recording device. Once the required force has been achieved, it shall be maintained for a minimum of three seconds.

3.4 After removal from the testing machine, the cartridge shall be again measured for overall length.

4. RECORDING OF DATA

4.1 The following data shall be recorded for each group of cartridges subjected to the compressive force test.

a. Overall length of each cartridge prior to test

b. Overall length of each cartridge after test

c. Movement of bullet into case for each cartridge (a-b).

SECTION 11

OIL RESISTANCE TEST PROCEDURE

1. PURPOSE

The oil resistance test is conducted to determine the capability of cartridge sealants to prevent performance deterioration after being submerged in oil.

2. EQUIPMENT

Equipment listed in the EPVAT Section of the appropriate Inspection Equipment List shall be used.

3. TEST PROCEDURE

3.1 The sample cartridge shall be completed immersed in lubricating oil, VV-L-800, at a temperature between 60°F and 80°F for a minimum of eight hours. No pressure shall be applied.

3.2 After a minimum of eight hours and no more than sixteen hours in the oil bath, the cartridges shall be removed from the oil and carefully dried with a clean cloth. Any oil on the exterior of the cartridge could result in elevated pressures during firing and shall be avoided.

3.3 After being dried, the sample cartridges are placed base down in a recessed holding block and transported to the range for the firing portion of the test.

3.4 Firing the test - Firing of the sample cartridges shall be in accordance with paragraph 4.6, of Section 4, EPVAT Test Procedure, except that only velocity data shall be recorded. Caution shall be exercised during this portion of the test to assure, in the case of a low report or squib, that the bullet has not become lodged in the bore. After firing of any suspect round, the technician shall verify that the bullet has cleared the bore.

4. RECORDING OF DATA

The following data shall be reported on the test form:

a. Velocity of each round

b. Mean velocity of the sample

c. Any occurrences of misfire, squibs, or low report

SECTION 12

MID-CASE CHAMBER PRESSURE TEST

1. Purpose.

1.1 The testing of ammunition for mid-case chamber pressure is conducted to accurately determine the maximum pressure exerted within the cartridge case. The test is performed as a safety measure to insure that the pressure developed by the ammunition is safe for firing in the weapon(s) for which it is intended.

2. Equipment.

2.1 Equipment listed in the mid-case chamber pressure section of the appropriate Inspection Equipment List shall be used.

2.2 The pier or mount, on which the test fixture assembly is mounted, shall be of rigid construction.

3. Use of Reference Cartridges.

3.1 Reference cartridges shall be used to establish range and equipment corrections prior to firing any ammunition lot for acceptance.

3.2 After twenty (20) reference cartridges have been fired in the weapon to be used for the test, the observed mean pressure of the reference cartridges shall be compared with the assessed values. If the assessed value is higher, the difference is a plus correction and shall be added to the mean pressure of the test cartridges. If the assessed value is lower, the difference is a minus correction and shall be subtracted from the mean pressure of the test cartridge. If both values are identical, no correction is applied.

3.3 Charts shall be maintained of the results obtained with each barrel using reference cartridges.

3.4 The mid-case chamber pressure barrel shall be withdrawn from service when the mean peak mid-case chamber pressure value varies from the assessed value of the reference cartridge by more than $\pm$ 4,000 lb/in^2. It is to be noted that barrels shall be tested several times before being finally rejected as unacceptable.

4. Operating Procedure for the Ballistic Pressure Transducer.

4.1 The mid-case pressure shall be determined by using acceptable ballistic pressure transducers of the type specified in the appropriate Inspection Equipment List.

4.2 The transducer shall have it's sensitivity determined at the pressure level of 50,000 psi, prior to initial firings and after 140 ± 10 cartridges fired. The transducer sensitivity shall be expressed in units of millivolts per psi and shall be identified as being determined at 50,000 psi. The method for determining the transducer sensitivity is detailed in Appendix E.

4.3 After having determined the sensitivity value for the transducer, the value shall be compared to the sensitivity previously obtained from the very last sensitivity determination. If the change in sensitivity is greater than ± 2% from the previous value, or more than + 10% from the original value, the transducer shall be disqualified for further testing.

4.4 The transducer sensitivity value to be used for instrumentation scaling shall be the value determined at 50,000 psi.

4.5 A record shall be maintained of the sensitivities obtained as a function of the number of cartridges fired on each transducer.

5. Test Procedures.

5.1 Pre-firing (Preparation for test)

The required number of test cartridges and reference cartridges shall be drilled in a press using a drill jig listed in the Inspection Equipment List, to assure that the hole is drilled in the specified position. A #51 Drill (.0670 in. dia.) shall be used, exercising great care to assure that the drill does not penetrate into the case far enough to remove any propellant. (Should hand-loaded reference cartridges be used, the cases may be drilled before loading and assembly.) A piece of tape (shielding, pressure sensitive) 1/2 by 1/2 inch shall be placed over the drilled hole to prevent loss of propellant during handling. As each cartridge is secured in the jig for drilling, an indentation is automatically made on the cartridge case. The identation is in the same axial plane with the drilled hole and serves as a guide when the cartridge is inserted in the test barrel.

5.2 After drilling, the test and reference cartridges shall be permitted to come to a temperature of 60°F to 80°F., prior to being placed in the temperature-controlled container or room. The recessed holding blocks containing the test and reference cartridges shall be placed in the temperature-controlled container or room in such a manner that all cartridges are subjected to a uniform temperature for a minimum of two (2) hours, prior to firing. The container or room shall be maintained at a temperature of 70°F. ± 2°F., with a relative humidity of 60 ± 5 percent, and be of sufficient capacity to allow free circulation of air.

5.3 The barrel shall be borescoped to assess its general condition and to assure that the gas hole is not obstructed. The barrel assembly shall be in accordance with the applicable drawings and the following measurements shall be made before it is placed in service, after misfires, pierced primers, blowback or whenever a part replacement has been made in the bolt assembly.

	Limits
Firing pin protrusion	.060-.068 inches
Firing pin indent	.011-.015 inches
Headspace	.754-.757 inches

5.4 The chamber and bore of the barrel shall be wiped dry and the barrel bore sighted into position.

5.5 The transducer mounting hole shall contain no particles of foreign material on the sealing surface. To insure this condition, the following procedure shall be strictly adhered to prior to installing a transducer.

a. Any burrs, combustion particle, residue, corrosion or other anomaly shall be removed by touching up the sealing surface with a flat end reamer.

b. Clean cavity and transducer thoroughly, use clean lint-free industrial paper wipers and Freon TF degreaser spray.

5.6 The transducer shall be installed as per the instructions contained in Appendix D. The signal connector on the transducer and interconnecting line shall be wiped clean with lint-free industrial paper.

5.7 Electronic instrumentation requirements are outlined in the appropriate drawings and calibration procedures are listed in Appendix E.

6. Conducting the test.

6.1 Five fouling shots shall be fired. The pressure readings shall be recorded to assure that the measuring equipment is functioning properly. After the fifth fouling shot, the pressure transducer shall be retightened to the appropriate torque level specified in Appendix D. The transducer signal line shall be reconnected and securely tightened finger tight.

6.2 When firing at 21°C, the recessed holding blocks containing the reference and test cartridges shall be removed from the controlled-temperature room or box and placed at a point convenient to the technician, provided the temperature of the firing room is approximately 21°C. If the firing room is not at 21°C, or if the test is to be fired at a temperature other than 21°C, the cartridges shall be placed in an insulated box (five cartridges at a time) which has been conditioned at the required temperature and the box placed at a point convenient to the technician. The cartridges shall then be removed singly from the insulated box immediately before firing. If an insulated box is not available, the cartridges shall be removed singly from the temperature controlled room or box immediately before firing.

6.3 In order that the propellant shall be uniformly positioned from shot to shot, attention to detail is necessary in handling and chambering the cartridge. The cartridge shall first be held vertically, bullet upward. It shall then be rotated slowly in a vertical plane, stopping the rotation momentarily after 180° of rotation when the bullet is downward, and then continuing through the remainder of 360°, stopping with the cartridge again bullet end upward. The bullet end of the cartridge shall now be lowered slowly to a position slightly above horizontal, with the drilled hole facing upward. The tape covering the drilled hole shall be removed from the case, taking care that none of the propellant adheres to the tape.

6.4 The cartridge shall be chambered very carefully, taking care that the primer end of the case in not elevated above the bullet end of the case. (The object is to have the propellant in a loose condition at the primer end to the case, and with such airspace as is present, at the bullet end of the case).

6.5 The breech block shall be closed gently and the trip lever, to which the lanyard is attached, shall be carefully engaged to the hammer. If the technician encounters any difficulty closing the breech block or engaging the trip lever, the test shall be discontinued until such difficulty is corrected. If any delay occurs after the cartridge is placed in the chamber, and duration of the delay is such that the temperature of the cartridge has changed significantly, the cartridge shall be extracted and another inserted in its place.

6.6 The technician retires to a safe position and pulls the lanyard with a smooth, firm motion. The mid case pressure of the shot-shall be recorded. The breech block shall be opened, the fired case extracted and visually examined for case casualties.

6.7 The procedure prescribed in 6.3 through 6.6 is repeated until the required number of reference cartridges have been fired.

6.8. The pressure correction shall then be obtained as prescribed in paragraph 3.2.

6.9 Provided the requirements of paragraph 3.4 are met, the procedure in paragraph 6.3 through 6.6 is repeated with test cartridges until the required number have been fired.

6.10 At not more than every 140 ± 10 rounds fired, the following steps shall be taken:

a. Remove the signal lines from the transducer.

b. Remove the transducer and inspect all components for excessive combustion-particle residue. Also inspect the transducer threads for combustion residue.

c. Clean the transducer and cavity thoroughly using lint-free industrial paper wipers and Freon TF degreaser spray. Once cleaned, inspect the sealing surface of the transducer and the cavity for signs of gas flow past the annular Vee ring.

d. Determine transducer sensitivity in accordance with Appendix E.

6.11 Upon completion of the above steps, the following procedure shall be followed to restart the test:

a. If the transducer and barrel cavity appear normal, the barrel shall remain qualified for the next 140 rounds of test.

b. If the transducer threads show signs of combustion residue or if any other evidence of gas flow through the sealing surfaces in noticed, the sealing surface of the barrel shall be examined to assure that a 32 microinch finish exists (or better). If the surface finish is poor, the surface shall be machine refinished with a flat end clucking reamer before attempting to use the barrel. The transducer or components at fault shall be replaced so that no gas leakage is experienced. All testing since the last examination shall be refired to assure that the condition did not influence the test results.

c. If the excessive residue particle accumulation is noticed, the barrel shall be removed from the test and a retest fired in a replacement barrel to assure that residue fouling did not influence the test results.

7. Recording the results.

7.1 Results of both reference and test cartridges should be recorded directly on the test sheet form. Average mid-case pressure shall be recorded to the nearest 100 psi.

7.2 All groups of data will be tabulated to show means, extreme variations and standard deviation of each group and the number and type of case casualties.

7.3 The following test weapon data shall be recorded on the test sheet:

a. Receiver number.

b. Barrel number.

c. Transducer serial number.

d. Total number of cartridges fired in barrel (prior to test).

APPENDIX A
PIEZOELECTRIC PRESSURE TRANSDUCER, ELECTRONIC INSTRUMENTATION REQUIREMENTS

A.1 PURPOSE. To insure the reliability of reported pressure measurements, the Peak Pressure Measurement System and the Transducer Sensitivity Measurement System shall conform to the standard performance specifications as detailed in this Appendix. In addition, only those transducer types, which have been officially evaluated and accepted for testing, as listed in this Appendix, shall be considered for use.

A.2 PRESSURE TRANSDUCER.

A.2.1 Performance specifications. The ballistic piezoelectric pressure transducer is a fast-response high-pressure sensor capable of enduring in excess of 2000 ballistic cycles in a production testing environment. The nominal specifications are as specified on Drawing 12990876.

A.2.2 The pressure transducer qualified for case mouth pressure testing is the Kistler Instrument Corp., Model 6215, High Pressure Quartz Transducer Assembly, figure A-1.

a. Equipment required for preparation and installation are:

(1) Flat end reamer

(2) Lint-free industrial paper wipers

(3) Degreaser spray

(4) High vacuum grease

(5) Torque wrench: 26 newton-meters capacity, 8 millimeters six-point deep socket.

b. Sealing surface preparation. The following procedure shall be followed for all transducer installations, i.e., sensitivity block, case mouth and port positions of the EPVAT barrel.

(1) Shallow annular grooves in sealing surface are normal; any burring, combustion-particle residue, corrosion, or other anomaly shall be removed by touching up the surface with a flat end reamer.

(2) Clean cavity and transducer thoroughly; use clean, lint-free industrial paper wipers and degreaser spray.

(3) Transducer threads shall be coated with a thin film of high vacuum grease prior to installation.

(4) The signal connector on the transducer and interconnecting line shall be wiped clean with lint-free industrial wipers and degreaser spray.

c. Transducer installation shall proceed as follows:

(1) The sealing ring Type 1100 shall be placed on the face of the transducer and a very small amount of silicon grease shall be placed in the vee impression of the transducer to make the ring adhere. The Diaphragm Protection Type 6567 shall then be placed over the face of the transducer and snapped evenly over this face. A second sealing ring Type 1100 shall then be placed in the vee impression on the face of the Diaphragm Protection with a very small amount of silicon grease to make the ring adhere. The assembly shall then be placed into the mounting cavity.

(2) In all installations the transducer shall be tightened with a torque wrench to 20 Newton-meters.

(3) The signal line shall be connected to the transducer and securely tightened, finger tight.

(4) For calibration of the transducer, the Diaphragm Protection Type 6567 and second sealing ring Type 1100 shall not be used.

d. Transducer storage. Transducers should be stored in a clean moist-free environment. Transducers, diaphragm protection, and cables shall be kept free from contamination and possible damage when not in use.

A.3 TRANSDUCER SENSITIVITY MEASUREMENT SYSTEM (TSMS). The TSMS consists of a hydraulic pressure source and a transducer charge output recording system.

a. Hydraulic pressure source. The hydraulic pressure source determines the sensitivity of a pressure transducer by subjecting it to a precisely known pressure level. The unit should contain an electrically and/or manually operated pressure generator, an oil reservoir, a port into which the transducer can be mounted, and a precision pressure reference standard. The unit should also contain a pressure safety monitor which gives a visual indication of system pressure at all times. The essential system specifications shall be the following:

(1) Pressure Range

Maximum	500 MPa
Increments	35 MPa, or less
Accuracy	±0.25% of reading or better

(2) Pressure Safety Monitor — A nonprecision pressure gage which monitors system pressure at all times.

b. Transducer charge output recording system. The system shall provide charge signal conditioning and amplification, scaling, and continuous amplitude measurement in units of charge. A basic system shall contain a charge amplifier, a digital voltmeter, and a standard charge calibrator. The following essential specifications are required:

(1) Charge Amplifier

Input Impedance	10^{14} ohms
Linearity (Full Scale)	±0.l%
Frequency Response (within ±5%) DC to 100 kHz DC Drift	0.05 pC/s

(2) Digital Voltmeter

Range (full scale)	±1 V, ±10 V
Full Range Display ± 1V	±10,000
Overrange	100%
Accuracy	
(a) Short Term (24 hours, 23°±1°C)	±0.01% of reading ±0.l%of full scale
(b) Long Term Stability (6 months, 23°±5°C)	±0.002% of reading
Response Time (Full Scale Step Function)	1 second to 0.001% of reading

Reading Rate	4 readings per second or better
Input Resistance	10 M ohms

(3) Charge Calibration

Full Scale Charge Ranges (picocoulombs)	10^3, 10^4, 10^5
Resolution	0.1% of full scale
Load Impedance	3000 ohms minimum 0.1 uF maximum
Accuracy	±0.5% error of reading from 0.1 full scale to full scale
Linearity	0.1% deviation from full scale

A.4 PEAK PRESSURE MEASUREMENT SYSTEM. The piezoelectric transducer peak pressure system shall measure, record, and display the peak amplitude of two simultaneously occurring transient signals. For each of two input channels, the system shall provide: transducer charge signal conditioning and amplification, scaling, and peak amplitude measurement in units of pressure. Whatever the complexity of the system, it must meet the following minimal but essential specifications:

a. Charge amplifier minimal specifications

Input Impedence	10^{14} ohms
Linearity (full scale)	±0.1%
Frequency Response	DC to 100 kHz
DC Drift	0.05 pC/s

b. 20 kHz Low-Pass Filter. When matched to output impedence of Charge Amplifier (item a) and input of Peak Meter (item c) the low-pass filter performs as a second order low-pass filter which attenuates a 12 dB/octave above the specified cutoff of 20 kHz, ±2%: overshoot for a square-wave input must be 0.5%.

c. Peak amplitude detector system. This system may vary from a relatively low cost, analog peak detecting system with discrete numeric display or printout to a complete computer-controlled, ballistic measurement and data processing system. The essential characteristics of this system shall be the following:

(1)	Accuracy	±1% of peak amplitude (2 microsecond rise time to full scale)
(2)	Frequency Response (without Low-Pass Filter)	DC to 100 kHz

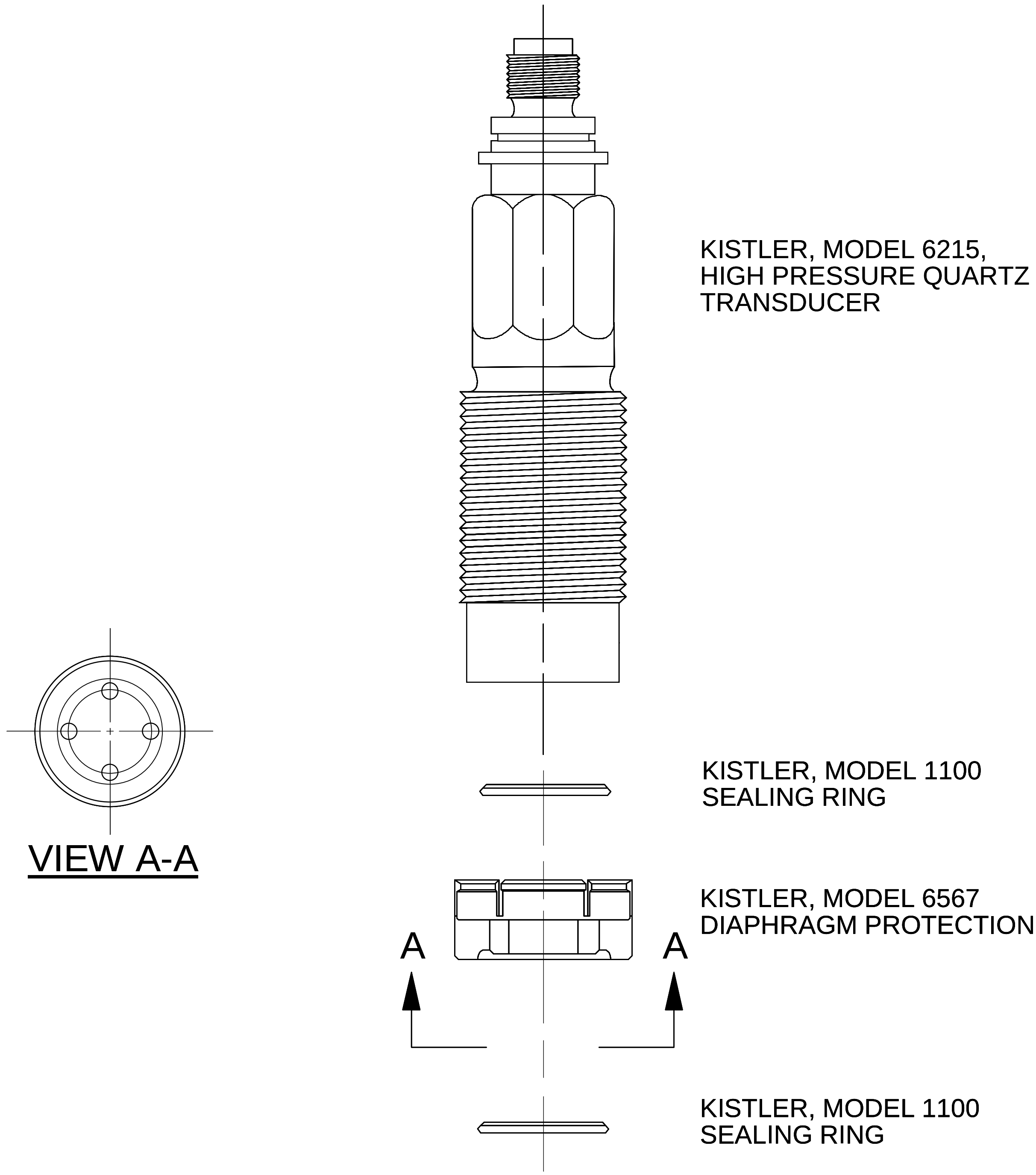


FIGURE A-1. Kistler, Model 6215 high pressure quartz transducer assembly

APPENDIX B
PIEZOELECTRIC PRESSURE TRANSDUCER, ELECTRONIC INSTRUMENTATION CALIBRATION PROCEDURES

B.1 PURPOSE. The calibration of a transducer's sensitivity is required to establish the precise value of the pressure input to electrical output transformation. Once the sensitivity is determined, the electronic instrumentation can be calibrated and the output scaled to actual physical units of pressure.

B.2 PRESSURE TRANSDUCER

B.2.1 The hydraulic pressure source, charge calibrator, and digital voltmeter shall have been calibrated with standards traceable to the US National Bureau of Standards or equivalent. The recommended calibration interval is six months to one year.

B.2.2 Determination of transducer linearity. Transducer linearity shall be determined as follows:

a. The transducer shall be installed into the hydraulic pressure port according to the appropriate procedure specified in Appendix A.

b. The electronic instrumentation shall be adjusted so that when the system is in the "groundstate," zero charge is indicated by the recording device. Similarly, the electronic instrumentation shall be adjusted so that when a full-scale known charge is applied to the input, in place of the transducer, the digital voltmeter shall indicate the electrical equivalent of the known charge. The signal cable shall be connected from the transducer to the electronic instrumentation.

c. Zero MPa of hydraulic pressure shall be applied to the transducer and the transducer input momentarily electronically zeroed. The indicated reading from the digital voltmeter shall be zero units of charge. This reading shall remain stable to within ±2 picocoulombs for the duration of time it normally requires to reach the hydraulic pressure levels in paragraph B.2.2.d.

d. The transducer shall be hydraulically pressurized up to 410 MPa and returned to zero MPa before applying the following pressure levels for record:

Low Range	High Range
(1) 35 MPa	(5) 210 MPa
(2) 75 MPa	(6) 250 MPa
(3) 105 MPa	(7) 280 MPa
(4) 140 MPa	(8) 350 MPa
	(9) 410 MPa

Each pressure level shall be applied three times either by applying increasing pressure levels in steps 1 to 9 above each time or by applying one pressure level at a time and returning to zero pressure before repeating. Electronic system drift and stability shall dictate which method should be used.

e. As each pressure level is reached, the charge reading observed on the digital voltmeter shall be noted as the transducer charge output for that pressure level.

NOTE: A quick release pressure method may be used, in which case the transducer input should be momentarily grounded as each pressure level is reached. The indicated charge shall then be recorded as the pressure level reaches zero.

f. Record the charge readings obtained above. Using the mean of the three readings at each pressure level, the transducer linearity shall be determined by the full scale error band method used in conjunction with the zero-based best straight line. The following is a description of this method:

(1) Plot the mean charge for each pressure level as shown in Figure B-1.

(2) Consider the data points as two groups - High Pressure Group and Low Pressure Group.

(3) Fit a straight line, intercepting the origin (0,0) to the data points by equalizing the error between the points below the line and the points above the line. Two separate lines shall be fitted, one each to the two data groups.

(4) A set of ±l percent Full Scale Error Bands, as shown in Figure B-1, shall be constructed about the fitted line for each data group. The transducer shall have acceptable linearity if all data points in both groups fall within their respective error bands. If one or more points in either group falls outside its error band, the transducer shall have unacceptable linearity.

(5) Transducer having acceptable linearity shall undergo the qualification test outlined in Appendix C prior to being placed into service for testing.

B.2.3 Determination of transducer sensitivity. The following steps shall be taken for every 140 ± 10 rounds, fired on each transducer placed into service for 9mm testing:

a. The procedure described in paragraphs B.2.2 through B.2.2.c shall be followed. The procedure of Section B.2.2.d shall also be followed with the exception that only the pressure level for which the transducer will be used need be applied.

b. Record the charge readings and their means for each new interval. Be sure to record the total number of rounds fired on the transducer.

c. The sensitivity to be used for ballistic testing shall be computed by dividing the mean charge by the respective pressure level at which the charge was obtained.

B.2.4 Recommended procedures for Insuring Calibration Commonality for Transducer, Transducer Sensitivity Measurement System and Peak Pressure Measurement System.

Method A: Direct Calibration of Test Instrument Chain. Refer to Figure B-2 and proceed as described in the following steps:

Step 1. Connect the TRANSDUCER (2), CHARGE AMPLIFIER (3), and PEAK READING SYSTEM (4) together. Place the transducer in the HYDRAULIC PRESSURE SOURCE (1) in the manner specified in Appendix A. Apply the calibration pressure, nominally 350 MPa (Pc) and adjust the CHARGE AMPLIFIER (3) "gain" such that the PEAK READING SYSTEM (4)* reads the electrical equivalent of Pc. The TRANSDUCER (2) shall be repressurized two additional times to assure that the system correctly reads Pc during each calibration cycle. The instrumentation chain is now calibrated for acceptance testing.

* Use a continuous readout mode during this phase since the peak reading mode is insensitive to decreasing the pressure (i.e., fluid leakage, correction for overpressurization, etc.). The long-time constant mode of the Charge Amplifier should also be used.

Step 2. In order to calculate the actual Transducer Sensitivity (TS), the calibration system must have the capability of generating and measuring the equivalent charge Q(x) from the transducer when Pc is applied to it. This measurement shall be accomplished by connecting a STANDARD CHARGE CALIBRATOR (5), in place of the TRANSDUCER (2), to the CHARGE AMPLIFIER (3) input, and adjusting the charge until the PEAK READING SYSTEM (4) reads Pc. The charge value is most accurately obtained by measuring the value of V(x) on the STANDARD DIGITAL VOLTMETER (6), and applying the relationship:

$$Q(x) = C(ref) \times V(x)$$

The Transducer Sensitivity shall then be computed as follows:

$$TS = \frac{Q(x)}{Pc} \quad pC/MPa$$

Method B: Using a Standard Charge Calibrator. Refer to Figure B-3 and proceed as described in the following steps:

Step 1. Develop a reference charge Q(ref) with the STANDARD CHARGE CALIBRATOR (1). The nominal value of Q(ref) shall be:

$$Q(ref) = Manufacturer's\ TS \times Calibration\ \mathrm{Pr}essure$$

i.e.,

$$Q(ref) = 26\ pC/MPa \times 350\ MPa$$
$$Q(ref) = 9{,}100\ pC$$

The precise value of Q(ref) is generated by measuring V(ref) directly on the STANDARD DIGITAL VOLTMETER (5)**.

i.e.,

$$C(ref) = 1000\ pF \quad (nominal)$$
$$Q(ref) = 9100\ pC$$
$$V(ref) = \frac{9100\ pC}{1000\ pF} = 9.100\ VOLTS$$

For other values of C(ref), V(ref) may be determined from the following relationship:

$$V(ref) = \frac{Q(ref)}{C(ref)} \quad pC/pF$$

** The input impedance must be such that it does not load down the voltage source within the STANDARD CHARGE CALIBRATOR (1).

Step 2. Insert Q(ref) into the CHARGE AMPLIFIER (4) and adjust the "gain" of the CHARGE AMPLIFIER (4) for direct reading in either charge or pressure on the STANDARD DIGITAL VOLTMETER (5).

Q(ref) Generated by STANDARD CHARGE CALIBRATOR (1)	→ Adjust Gain →	DIGITAL VOLTMETER READING (5)

i.e.,

For Direct Reading in Charge:

9100 pC → 9100

For Direct Reading in Pressure:

9100 pC → 350 MPa

Step 3. Connect TRANSDUCER (3), to the CHARGE AMPLIFIER (4) and apply the calibration pressure Pc from the STANDARD HYDRAULIC PRESSURE SOURCE (2). Depending on the "gain" setting used in Step 2, the readings from the STANDARD DIGITAL VOLTMETER (5) can be used to determine the actual Transducer Sensitivity (TS) as follows:

GAIN ADJUSTED FOR CHARGE READINGS

$$TS(actual) = \frac{Standard\ Digital\ Voltmeter\ (5)\ reading}{Applied\ Hydraulic\ Pressure}$$

i.e.,

$$TS(actual) = \frac{Q(x)}{Pc} \quad pC/MPa$$

$$TS(actual) = \frac{Q(x)}{350} \quad pC/MPa$$

GAIN ADJUSTED FOR PRESSURE READINGS

$$TS(actual) = \frac{Manufacturer's\ Transducer\ Sensitivity\ (Step\ 1) \times Standard\ Digital\ Voltmeter\ (5)\ reading}{Applied\ Hydraulic\ Pressure}$$

i.e.,

$$TS(actual) = \frac{26\ Pc/MPa \times P(x)\ MPa}{Pc\ MPa}$$

$$TS(actual) = \frac{26 \times P(x)}{350} \quad pC/MPa$$

Step 4. In order to calibrate a remote instrumentation chain for an acceptance test, a TRANSFER CHARGE CALIBRATOR (6)*** shall be adjusted to generate the charge Q'(x) equivalent to the desired calibration pressure for the transducer to be used. If no TRANSFER CHARGE CALIBRATOR (6) is available, the STANDARD CHARGE CALIBRATOR (1) may be used for this purpose. The calibration pressure shall be Pc. The internal potentiometer which determines V(x), within the TRANSFER CHARGE CALIBRATOR (6), shall be adjusted until the STANDARD DIGITAL VOLTMETER (5) reads the electrical equivalent of either:

a. $Standard\ Digital\ Voltmeter\,(5)\ reading = TS(actual) \times Calibration\ Pressure$

Use this equation if the "gain" in Step 2 was adjusted to indicate the electrical equivalent of charge.

i.e.,

$$Q'(x)\ pC = TS(actual)\ pC/MPa \times 350\ MPa$$

*** If no TRANSFER CHARGE CALIBRATOR (6) is available, the STANDARD CHARGE CALIBRATOR (1) may be used for this purpose.

OR

b. $Standard\ Digital\ Voltmeter\,(5)\ reading = \dfrac{TS(actual) \times Calibration\ Pressure}{\underset{(Step 1)}{Manufacturer's\ Transducer\ Sensitivity}}$

Use this equation if the "gain" in Step 2 was adjusted to indicate the electrical equivalent of pressure.

i.e.,

$$P'(x)\ MPa = \frac{TS(actual)\ Pc/MPa \times 350\ MPa}{26\ Pc/MPa}$$

With the potential locked in position to provide the proper charge a determined above, the TRANSFER CHARGE CALIBRATOR (6) can now be used to calibrate a remote instrumentation chain. The TRANSFER CHARGE CALIBRATOR (6), when used as an input to an instrumentation chain, is set to generate the charge equivalent to the calibration pressure (350 MPa). The "gain" within the charge amplifier of the instrumentation chain shall be adjusted to indicate this pressure on the peak reading system.

Step 5. If an accurate digital voltmeter, equivalent to the STANDARD DIGITAL VOLTMETER (5) is available at the remote test site, it would be advantageous to measure and record the value of V(x). In the event that the potentiometer dial becomes dislodged or the supply voltage V within the TRANSFER CHARGE CALIBRATOR (6) changes value, V(x) can be reset at the test site prior to calibrating the instrumentation chain.

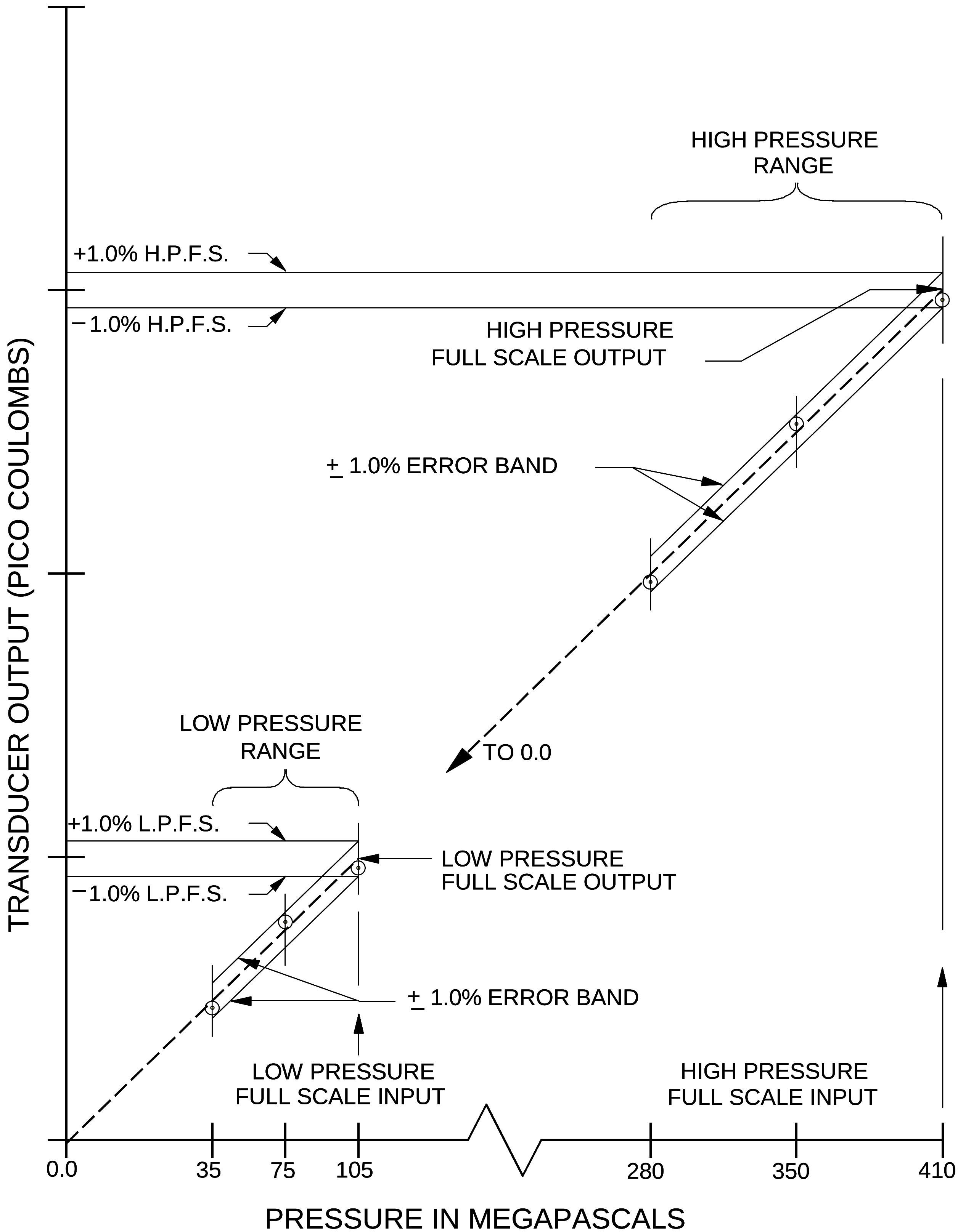


FIGURE B-1. Linearity Determination

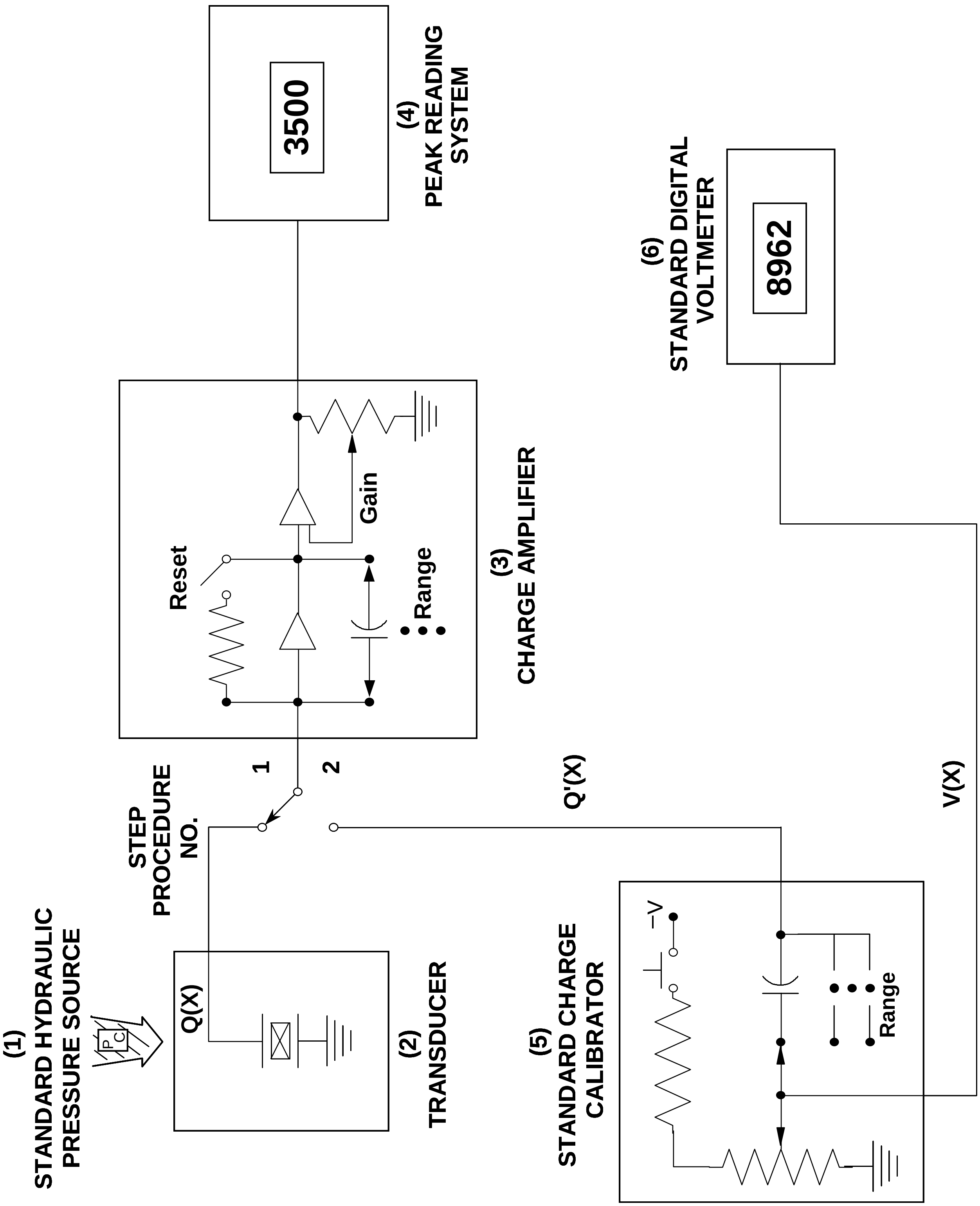


FIGURE B-2. Calibration Method A

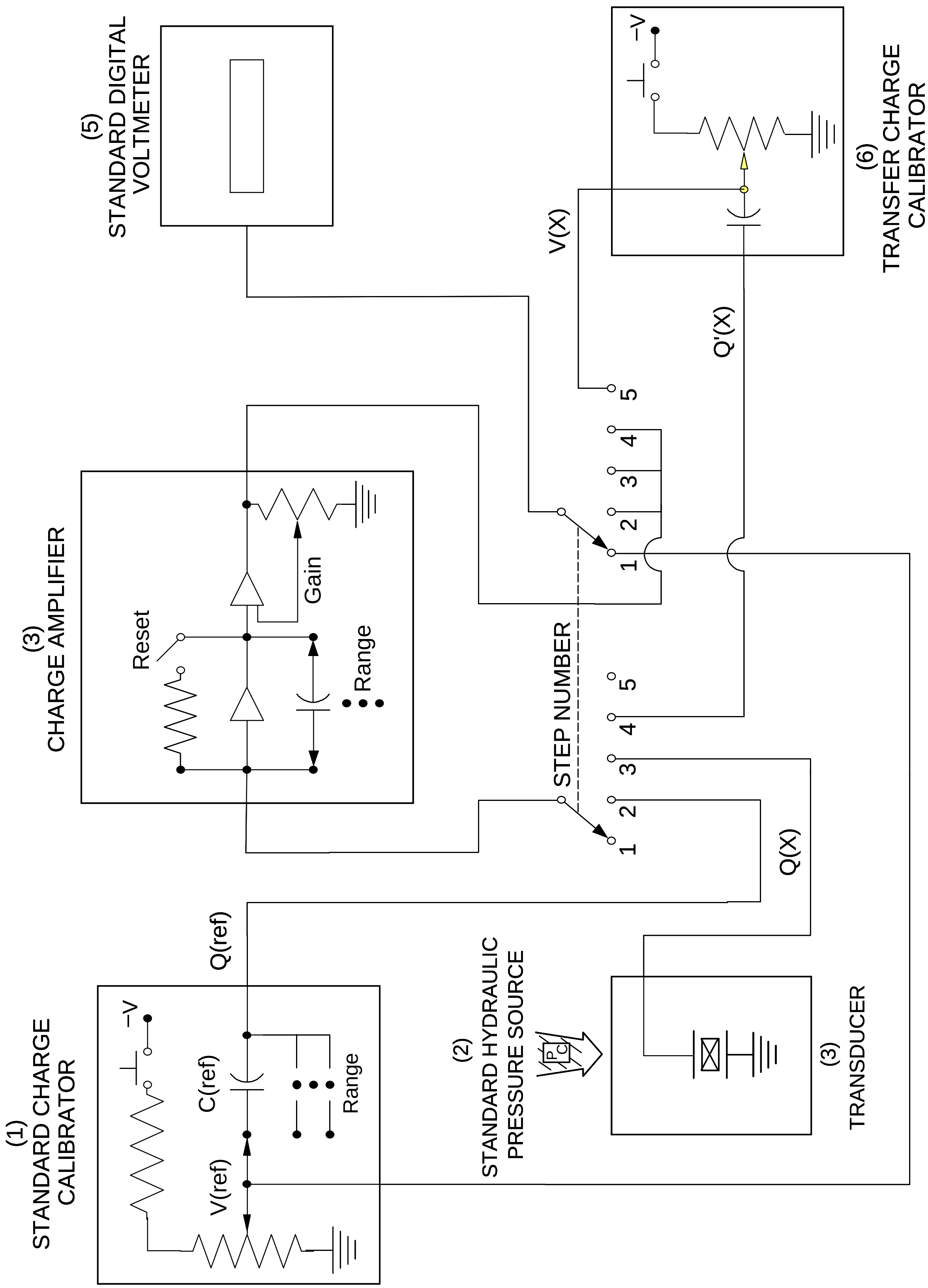


FIGURE B-3. Calibration Method B

APPENDIX C

PRESSURE TRANSDUCER QUALIFICATION TEST

C.1 PURPOSE

The Transducer Qualification Test is conducted to insure the continuity of pressure measurements when new pressure transducers are to be placed into service.

The procedure specified in this Appendix are based on the 7.62mm test procedures. For a transducer type which has been accepted for 9mm testing, e.g., the KIAG Model 6203, the Qualification Test may be conducted using the 7.62mm equipment and procedures. if the transducer qualifies under this criteria, then it is considered qualified for 9mm.

C.2 EQUIPMENT. Require equipment is listed.

a. Master Barrel as shown on Drawing No. 306, 7.62mm Manual of Proof.

b. Universal Receiver as shown on Drawing No. 301, 7.62mm Manual of Proof.

c. Test Fixture as shown on Drawing No. 305, 7.62mm Manual of Proof.

d. Port Plug with Sealing Ring as shown on Drawing No. 303, 7.62mm Manual of Proof.

e. Pressure Transducer Electronic Instrumentation as specified in Appendix A.

f. Velocity screens and suitable chronograph capable of maintaining measurement errors of less the +-l meter per second.

g. Constant temperature-controlled container capable of maintaining temperature limits at a tolerance of +-I degree C.

C.3 METHOD OF CONDUCTING TEST

C.3.1 Test preparation. Preparation shall be as follows:

a. The master barrel assembly shall be of known characteristics and in accordance with the applicable drawings and be within the measurements specified in the 7.62mm Manual of Proof.

b. Charts shall be maintained of the mean velocity results obtained with each barrel.

c. The transducer mounting holes positioned at both the case mouth and port locations shall contain no particle of foreign material on the sealing surface. To insure this condition, the following procedure shall be strictly adhered to prior to installing a transducer:

(1) Any burrs, combustion-particle residue, corrosion, or other anomaly shall be removed by touching up the sealing surface with a flat end reamer.

(2) Clean cavity and transducer thoroughly; use clean, lint-free industrial paper wipers and Freon TF degreaser spray.

C.3.2 Use of pressure transducer.

a. The new transducer to be qualified shall be installed in the master barrel, as per instructions in Appendix A, as the case mouth position, 180 degrees to ad directly opposite from a previously qualified transducer. The new transducer shall first have been determined to have acceptable linearity as per Appendix B.

b. The unused transducer mounting holes shall be securely sealed. The face of each sealing plug shall contain no particle of foreign material on the sealing surface.

c. Each transducer shall have its sensitivity determined at the two pressure levels of 75 MPa and 350 MPa. The method for determining the transducer sensitivity is detailed in Appendix B. After having determined the two sensitivities for each transducer, these values shall be compared to the respective values of the sensitivities obtained for each transducer from the very last sensitivity calibration. The last sensitivity having been determined 140 rounds, ±10 rounds, previous in the life of each transducer, or for new transducers, these values shall be those obtained from the initial Linearity Test (refer to Appendix B). If the change in sensitivity at either of the two pressure levels is greater than ±2 percent from the previous calibration, or more than ±10 percent from the original calibration, the transducer shall be disqualified and unacceptable for further testing.

d. The transducer sensitivity to be used for the instrumentation scaling shall be as follows:

Transducer Position	Sensitivity Determined At
Case Mouth	250 MPa

e. A record shall be maintained of the sensitivities obtained as a function of the number of cartridges fired on each transducer.

f. Electronic instrumentation requirements are detailed in Appendix A.

C.3.3 Firing the test. The procedure for firing EPVAT outlined in Section 4 shall be followed for a total of 20 reference rounds with the transducer positioned at the case mouth location.

C.3.4 Determination of the pressure transducer qualification for 9mm, testing shall be as follows:

a. If the pressure difference computed above for the case mouth is less than ±10 MPa, the new transducer shall be qualified for 9mm testing.

b. If the pressure difference at case mouth position exceeds ±10 MPa, the new transducer shall not be qualified for 9mm testing.

APPENDIX D

BALLISTIC TRANSDUCER INSTALLATION AND OPERATION PROCEDURE

D.1 PURPOSE

The ballistic pressure transducer must be seated properly in the test barrel or sensitivity block with sufficient and proper torque to insure accurate and reliable operation.

D.2 EQUIPMENT

Equipment listed in the appropriate Inspection Equipment List shall be used in addition to the following:

a. lint-free industrial paper wipers.'
b. Degreaser spray: Freon TF or equivalent.
c. High vacuum grease: Heat Stable Silicone Type.

D.3 SEALING SURFACE PREPARATION

The following procedure shall be followed for all transducer installations i.e., sensitivity block and chamber positions of the test barrel.

a. Shallow annular grooves (0.001 or 0.002 inches in depth) in sealing surface are normal; any burring combustion-particle residue, corrosion, or other anomaly shall be removed by touching up the surface with a flat-end reamer.

b. Clean cavity and transducer thoroughly; use clean, lint-free industrial paper wipers and degreaser spray.

c. Transducer threads shall be coated with a thin film of high vacuum grease prior to installation.

d. The signal connector on the transducer and interconnecting line shall be wiped clean with lint-free industrial wipers.

D.4 TRANSDUCER INSTALLATION

a. The transducer shall be installed into its mounting cavity (pressure test barrel or sensitivity block). The thermal protector (thermal disk) shall be used only with the installation of the transducer at the chamber position of the barrel and shall be inserted with angular "V" sealing ring towards barrel seat. It shall not be used with the transducer installation in the sensitivity block.

b. In all installations the transducer shall be tightened with torque wrench to 180 in-lbs (15 ft-lbs).

c. The signal line shall be connected to the transducer and tightened finger tight.

D.5 TRANSDUCER STORAGE

Keep transducers, thermal protectors, and cable free from contamination and possible damage when not in use.

APPENDIX E

BALLISTIC PRESSURE TRANSDUCER SENSITIVITY DETERMINATION

E.1 PURPOSE

The determination of a transducer's sensitivity is required to establish the precise value of the pressure input to electrical output transformation; once determined, the sensitivity will enable the electronic instrumentation to convert the transducer output to actual physical units of pressure.

E.2 PRESSURE TRANSDUCER

The pressure transducer type (Kistler Model 217C) used for 9mm mid-case pressure testing is the same as that used for 5.56mm pressure testing. Sensitivity determination shall be conducted using 5.56mm equipment in accordance with the procedures specified in Appendix A of SCATP-5.56, Ammunition Ballistic Accept Test Methods, Test Procedures for 5.56mm cartridges.