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Technology Assessment Program

38/357 Caliber Revolvers

NIJ Standard-0109.00

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Technology Assessment Program

NIJ Standard for 38/357 Caliber Revolvers

NIJ Standard-0109.00

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U.S. DEPARTMENT OF JUSTICE
National Institute of Justice

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This standard was formulated by the Law Enforcement Standards Laboratory of the National Bureau of Standards under the direction of Lawrence K. Eliason, Chief of LESL, and Daniel E. Frank, Manager, Protective Equipment Program. Technical research was performed by Nicholas J. Calvano of the NBS Automated Production Technology Division and Stanley K. Wakamiya of the NBS Industrial Systems Division. The standard has been reviewed and approved by the Technology Assessment Program Advisory Council (TAPAC) and adopted by the International Association of Chiefs of Police (IACP) as an IACP standard.

NIJ STANDARD
FOR
38/357 CALIBER REVOLVERS

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FOREWORD

This document, NIJ Standard-0109.00, Standard for 38/357 Caliber Revolvers, is an equipment standard developed by the Law Enforcement Standards Laboratory of the National Bureau of Standards. It is produced as part of the Technology Assessment Program of the National Institute of Justice. A brief description of the program appears on the inside front cover.

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

Because this NIJ standard is designed as a procurement aid, it is necessarily highly technical. For those who seek general guidance concerning the selection and application of law enforcement equipment, user guides have also been published. The guides explain in nontechnical language how to select equipment capable of the performance required by an agency.

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

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

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

NIJ STANDARD FOR 38/357 CALIBER REVOLVERS

1. PURPOSE AND SCOPE

This standard establishes performance requirements and test methods for revolvers to be used by law enforcement officers. It addresses only 38 caliber double action revolvers, including those known as 357 magnum. It also provides guidelines for assessing the acceptability of new or reissue revolvers. This standard does not address revolver sights (see appendix A for a discussion of revolver sight considerations).

2. CLASSIFICATION

The revolvers covered by this standard are considered to be a single classification.

3. DEFINITIONS

3.1 Barrel/Cylinder Gap

The space between the front surface of the cylinder and the rear surface of the barrel.

3.2 Barrel Bore

The diameter of the inscribed circle formed by the tops of the lands.

3.3 Double Action

A mode of operation that permits the trigger to rotate the revolver's cylinder, cock the hammer, and fire the revolver (see also single action).

3.4 Hammer Spur

Extension of the hammer used to cock the hammer manually.

3.5 Headspace

The space between the breach face and the surface of the cylinder on which the cartridge rim seats.

3.6 Headspace Gage

A device used to facilitate measurement of headspace. See figure 1.

3.7 Ranging Rod

A rod, closely toleranced to the barrel bore diameter, which is used to check the alignment of barrel and cylinder cartridge holes. See figure 2.

3.8 Single Action

A mode of operation that uses the trigger only to fire the revolver. Rotation of the cylinder is accomplished when the hammer is separately cocked. The hammer remains cocked until the trigger is actuated (see also double action).

3.9 Trigger Pull

The force that must be applied to the trigger to fire the revolver.

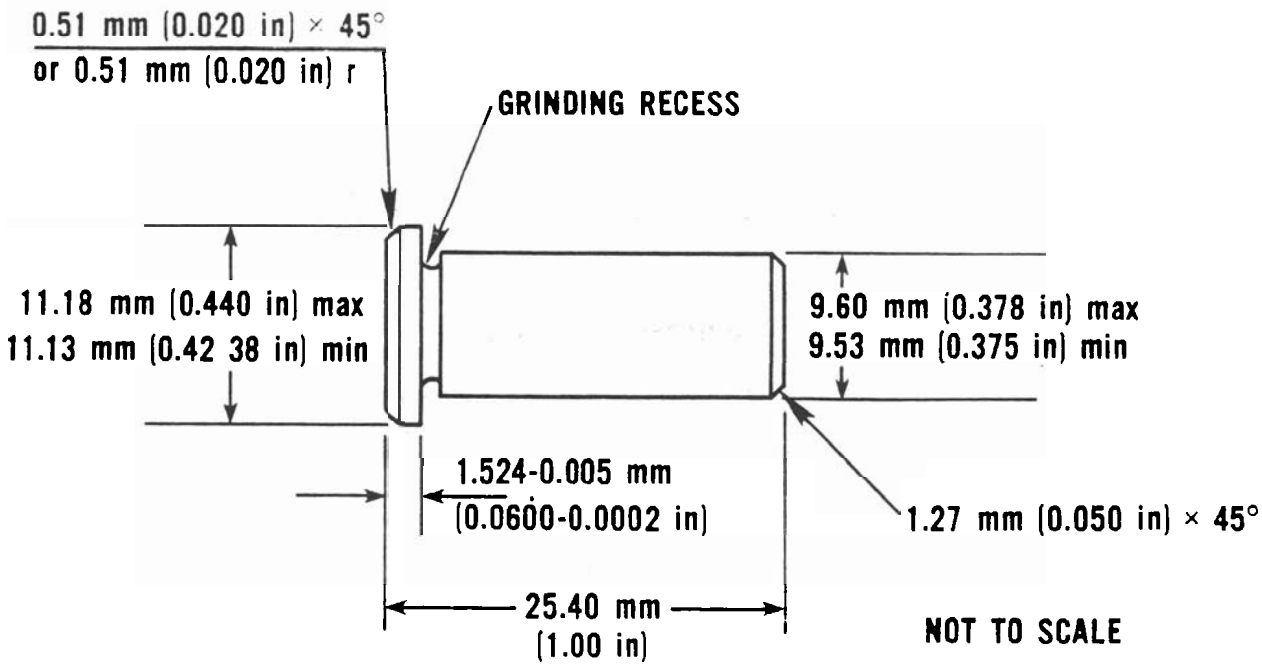
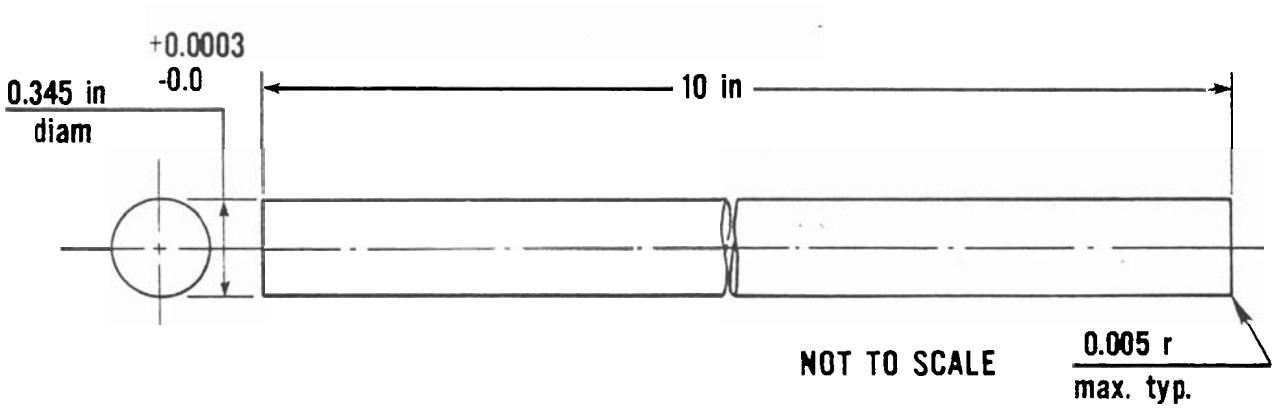


FIGURE 1. *Headspace gage (caliber 38).*



Rod must be straight within 0.001 total indicated reading for its length
Rod must be round within 0.0003 total indicated reading for its length

FIGURE 2. *Ranging rod.*

4. REQUIREMENTS

4.1 Acceptance Criteria

A 38 caliber revolver model satisfies the requirements of this standard if both sample items (see sec. 5.1) meet the dimensional, functional, and firing requirements, the drop safety requirement is passed by one of the revolvers, and the hammer safety requirement is passed by the other revolver.

To be suitable for reissue, a revolver model that has previously met the requirements of this standard must meet all of the dimensional requirements (entire sec. 4.3) and functional requirements (entire sec. 4.4) required by this standard.

Double action only revolvers must not be capable of single action operation and must meet the requirements of this standard with the exception of sections 4.4la, 4.4.3a, 4.4.3e, 4.4.7a, and 4.4.8b.

4.2 User Information

The following information items shall be among those supplied to the user with each revolver by the manufacturer or distributor.

a) Field disassembly and assembly instructions.
b) A statement as to the acceptability of using PLUS-P ammunition in the revolver.
c) A parts list.
d) Ordering instructions for spare or replacement parts.
e) Cleaning instructions.
f) Certification of compliance with this standard.

4.3 Dimensional Requirements

4.3.1 Barrel/Cylinder Gap

The barrel gap shall be not less than .004 in (.102 mm) nor more than .008 in (.203 mm) when measured in accordance with section 5.3.1.

4.3.2 Barrel Bore Diameter

The barrel bore diameter shall be not less than .346 in (8.79 mm) nor more than .350 in (8.89 mm) when measured at the muzzle end of the barrel in accordance with section 5.3.2.

4.3.3 Headspace

The headspace shall be not less than .060 in (1.52 mm) nor more than .074 in (1.88 mm) when measured in accordance with section 5.3.3.

4.4 Functional Requirements

4.4.1 Action

The action shall operate smoothly without binding or sticking when tested in accordance with the appropriate section:

a) Single action (sec. 5.4.1a).
b) Double action (sec. 5.4.1b).
c) Double action only revolvers shall not remain cocked when the hammer is pulled fully to the rear and released (sec. 5.4.1c).

4.4.2 Barrel and Cylinder Alignment

The cylinder and barrel shall be in alignment when the hammer is in the fired position and with the trigger held fully to the rear. When tested in accordance with section 5.4.2 the ranging rod shall pass through the barrel and cylinder to the breach face without binding and there shall be no perceptible clicking sound as the rod passes through the barrel/cylinder gap.

4.4.3 Cylinder Assembly

a) The cylinder shall lock in alignment with the barrel when the hammer is cocked single action.
b) With the trigger held fully to the rear, the barrel cylinder gap shall meet the dimensional requirements at each extreme of the longitudinal travel of the cylinder.
c) The cylinder shall rotate freely in the frame without binding.
d) The cylinder shall open and close without binding.
e) It shall not be possible to open the cylinder when the hammer is in the cocked position single action.
f) The cylinder rotation mechanism shall operate smoothly.

4.4.4 Ejection

The mechanism used to eject cartridges from the cylinder shall eject all cartridges without hesitation when tested in accordance with section 5.4.4.

4.4.5 Cylinder Support

The mechanism used to support the cylinder in the frame shall be tightly assembled.

Any movable parts shall slide freely throughout their length of travel within the cylinder and support mechanism.

4.4.6 Hammer

The hammer shall operate smoothly on the hammer pivot. If the single action mode is present, the hammer once cocked shall support a 45±1 N (10.23±0.23 lb) force when tested in accordance with section 5.4.6.

4.4.7 Trigger

a) The single action trigger pull force shall be not less than 15 N (3.4 lb) nor more than 22 N (5 lb) when tested in accordance with section 5.4.7.
b) The double action trigger pull force shall be not more than 58 N (13.2 lbs) when tested in accordance with section 5.4.7.
c) The trigger must return completely to the forward position with no binding or sticking when the trigger is pulled fully to the rear and then released.

4.4.8 Visual Inspection

a) Hammer—There shall be no binding or interference between the hammer, the firing pin, and the frame as appropriate.
b) Hammer Clearance—If the single action mode is present, the hammer shall have sufiicient overtravel to guarantee the achievement of the full cocked position.
c) Mainspring—The mainspring shall be uniform and free of kinks.
d) Particles—There shall be no loose shavings of any kind in the revolver.
e) Screws—The revolver shall be free of missing or deformed screws.
f) Surface—The revolver shall be free of rust spots and burrs.

4.4.9 Safety Features

The revolver shall incorporate one or more design features to prevent the inadvertent discharge of the revolver unless actuated through the proper firing sequence, i.e., trigger pulled fully to the rear. The parts to implement the safety feature(s) shall be present and shall function in their intended manner.

4.5 Firing Requirement

The revolver shall fire 100 rounds of ammunition single action and 500 rounds of ammunition double action with no structural or mechanical failures and no more than one misfire not traceable to poor ammunition when tested in accordance with section 5.5. The revolver shall be judged a failure if any two of the following four parameters measured during the firing test fall outside the specified range: headspace, barrel/cylinder gap, trigger pull (double and single action), and barrel/cylinder alignment.

A double action only revolver shall meet this requirement for 600 rounds of ammunition fired double action.

4.6 Drop Requirement

The revolver shall not fire and the primer shall be free of any indentation after having been subjected to the drop test described in section 5.6.

4.7 Hammer Safety Requirement

The revolver shall not fire and the primer shall be free of any indentation when subjected to the hammer safety test described in section 5.7.

5. TEST METHODS

5.1 Sampling

Two representative samples of each revolver model to be tested are required. The samples can be selected at random from the current purchase lot for acceptance testing, recognizing that the two tested revolvers probably will

not be suitable for field issue after testing. Alternately, two test revolvers can be supplied by the manufacturer for qualification compliance testing separately from the purchase lot, in which case they shall be selected randomly from the current production.

5.2 Special Test Equipment

5.2.1 Hammer Impactor

The impactor is constructed of steel and has a cylindrical shape. Dimensions are shown in figure 3. This impactor is hollow and open on one end so that its mass, which varies with the weapon being tested, can be adjusted to equal the mass of the fully loaded weapon. The impacting end must be at least 6-mm (1/4 in) thick and the wall thickness must be at least 3-mm (1/8 in) thick.

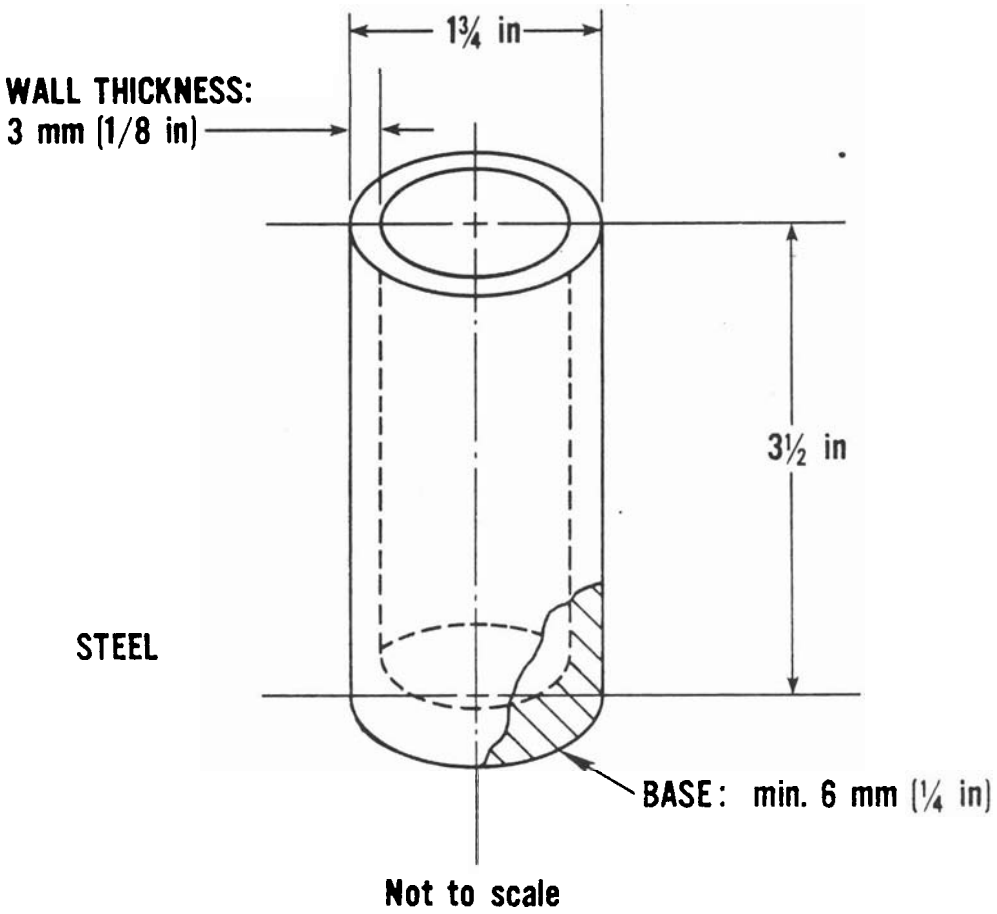


FIGURE 3. *Impactor.*

5.2.2 Headspace Gage

The headspace gage is a hardened steel rod, precision ground to the dimensions shown in figure 1.

5.2.3 Ranging Rod

The ranging rod is a hardened steel rod 10-in long, precision ground to the dimensions shown in figure 2.

5.3 Dimensional Tests

5.3.1 Barrel/Cylinder Gap Measurement

Measure the barrel/cylinder gap from each side of the frame using standard flat feeler gages. Insert the feeler gage halfway into the gap.

5.3.2 Barrel Bore Diameter Measurement

Measure the bore diameter of the largest circle that could be inscribed in the bore of the barrel at the muzzle, using any method capable of measuring the limit of the bore size as required by section 4.3.2. Possible methods of measurement include an air gage, caliber/micrometer, etc ; no one method is necessarily applicable to all bores.

5.3.3 Headspace Measurement

Insert a headspace gage into a chamber and align it with the barrel. Measure the distance between the breach face and the headspace gage. The headspace is the sum of the measured distance and the previously measured thickness of the gage rim. Repeat for each chamber.

5.4 Functional Tests

5.4.1 Action

a) Operate the revolver in the single action mode.
b) Operate the revolver in the double action mode.
c) Verify that double action only revolvers do not remain cocked when the hammer is pulled fully to the rear and released.

In each case note any grittiness, hesitation, or nonuniformity of pressure required to operate the action.

5.4.2 Barrel and Cylinder Alignment

Operate the revolver in the double action mode once, insert the ranging rod into the barrel and push until it completely enters the cylinder. Repeat for each chamber.

5.4.3 Cylinder Assembly

a) With the hammer cocked, attempt to rotate the cylinder and then perform the barrel and cylinder alignment test (sec. 5.4.2) but in the single action mode at each extreme of cylinder rotation.
b) With the cylinder closed, pull the trigger fully to rear; with the trigger held fully to the rear perform the barrel/cylinder gap measurement (sec. 5.3.1), first with the cylinder pushed as far forward as possible and then with the cylinder pushed as far rearward as possible.
c) Rotate the cylinder. Note any binding.
d) Open the cylinder to the charging position then close the cylinder to the firing position. Note any binding.
e) Cock the hammer. Attempt to place the cylinder in the loading position (open).
f) Operate the cylinder rotation mechanism and note whether the cylinder rotates smoothly, and without binding.

5.4.4 Ejection Test

Fire six rounds (five with five-shot revolvers) of the ammunition required for use in the firing test (sec. 5.5) into a bullet trap or other suitable device, and then point the muzzle of the revolver upward, open the cylinder, and eject the spent cartridges. Note any hesitation in the ejection action.

5.4.5 Cylinder Support Test

Examine the cylinder support mechanism, including the ejector mechanism. Operate the ejector mechanism with the cylinder empty. Note any binding. Load the cylinder with dummy ammunition. Operate the ejector mechansim. Note any binding. Rotate the cylinder on the support system. **Note any binding.**

5.4.6 Hammer Test

Operate the hammer and check for smoothness of operation. With the hammer fully cocked and without touching the trigger, attempt to make the hammer fall by applying a force of 45 ± 1 N (10.23 ± 0.23 lb) to the hammer tangential to the arc the hammer makes when it falls.

5.4.7 Trigger Pull Test

Firmly mount the revolver so that motion is restricted in every direction. The load shall be applied to the rearmost part of the front surface of the trigger and parallel to the barrel to within $\pm 5^\circ$

a) Single action—Cock the revolver. Apply a 13-N (2.95 lb) load to the trigger and increase the load continuously or in 2-N (0.45 lb) increments until a load of 23 N (5.17 lb) has been applied or until the hammer releases.

b) Double action—With the hammer at the "at rest" down position, apply a 13-N (2.95 lb) load to the trigger and increase the load continuously or in 2-N (0.45 lb) increments until a load of 59 N (13.4 lb) has been applied or until the hammer cocks and releases.

In performing these tests, the load must be applied to the trigger slowly. Impulsive loading of the trigger must be avoided.

5.4.8 Visual Inspection

Visually inspect and check the following items for conformance with the requirements of section 4.4.8: hammer, firing pin, mainspring, entire revolver (for chips, screws, and surface finish).

5.4.9 Safety Features Test

Obtain from the manufacturer a description of the design feature(s) included in the revolver to insure that the revolver will discharge only through the proper operation of the trigger mechanism, the list of parts that implement the design feature(s), and the manner in which the safety feature(s) operate. Verify that all of the safety parts are present, that they operate in the manufacturer's intended manner, and that the feature(s) perform their intended function.

5.5 Firing Test

Fire a total of 600 rounds, 100 rounds single action and 500 rounds double action. For double action only revolvers fire 600 rounds of ammunition double action. Table 1 gives the characteristics of the commercial, factory loaded ammunition to be used. Plus-P ammunition is to be used with 38 caliber revolvers unless the revolver manufacturer's instructions specifically caution against using such ammunition. Normal load ammunition is to be used in revolvers that have been declared unsuitable for Plus-P ammunition by the manufacturer. Revolvers designated as 357 magnum are to be tested with 357 magnum ammunition.

TABLE 1. *Ammunition description*

Cartridge	Bullet type[1]	Bullet weight (grains)	Nominal velocity barrel length 4 in (fps)	(mps)
38 Special	LRN	158	700	213
Plus-P 38 Special	JHP	110	1300	396
357 magnum	JHP	125	1300	396

[1] LRN = Lead Round Nose and JHP = Jacketed Hollow Point.

Before firing, examine the revolver for defects such as loose screws, cracks, etc. Tighten any loose screws and perform the following measurements before firing and after every 100 rounds: Headspace (sec. 5.3.3), barrel/cylinder gap (sec. 5.3.1), trigger pull (sec. 5.4.7), and barrel/cylinder alignment (sec. 5.4.2). Also reexamine the revolver for damage and loose parts after every 100 rounds. Mount the revolver on a bench rest with the barrel aimed into a bullet trap or other suitable device. Load the revolver with 357 magnum, Plus-P, or normal load 38 caliber ammunition as required.

Fire six rounds (five with five-shot revolvers) and eject the cartridges. During ejection, check to be sure that the ejection mechanism operates smoothly and that cartridges are ejected without hesitation. Reload and repeat. After each series of 50 rounds has been fired, pause for 5 to 10 min to allow the revolver to cool. Clean the cylinder and barrel of the revolver in accordance with the manufacturer's instructions after every 100 rounds.

In the event that the revolver produces two or more misfires during the 600 round test sequence, examine the primers in the misfired cartridges. If it is obvious that the misfires are the fault of the revolver (e.g., very shallow or

no indentation of the primer), the revolver has failed to meet the requirements of the standard. If it is not obvious that the misfires are the fault of the revolver, repeat the entire firing test as stated above, except that the dimensional measurements (headspace, barrel/cylinder gap, trigger pull, and barrel/cylinder alignment) do not have to be made. If the revolver passes the second 600 round test, it meets the requirements. If two or more misfires occur during the second 600 rounds, and again it is not clearly the fault of the revolver, assistance can be obtained from the ammunition manufacturer to determine the condition of the ammunition.

5.6 Drop Safety Test

Load the revolver with cases containing primers only and drop from a height of 1 m + 1 cm - 0 (39.37 in + 0.394 in - 0) onto a solid steel plate having minimum dimensions 2.54-cm thick × 15 cm × 15 cm (1 in × 6 in × 6 in). The drop distance is measured from the lowermost portion of the revolver to the top surface of the steel plate.

The following six drops are required:

1) Normal firing position; barrel horizontal
2) Upside down; barrel horizontal
3) On grip; barrel vertical
4) On muzzle; barrel vertical
5) On side; barrel horizontal
6) On opposite side; barrel horizontal

Examine the primer for firing pin indentations after each drop.

5.7 Hammer Safety Test

To determine the weight of the fully loaded revolver, weigh together the revolver and the appropriate live ammunition (see table 1) to the nearest 10 g. Note: For safety, do not put the live ammunition in the revolver. Load the revolver with cases having primers only. Then mount the revolver with the barrel vertical and pointing down and

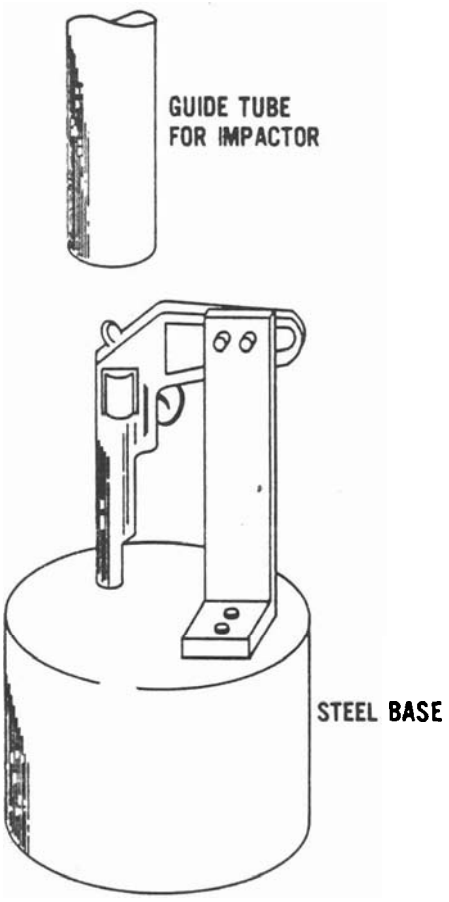


FIGURE 4. *Hammer safety test arrangement.*

the hammer in the double action at rest position, trigger forward. The barrel rests on a steel base with provisions for venting at the muzzle should the revolver discharge. The mounting system must prevent revolver motion during the test. Figure 4 shows an acceptable setup.

Adjust the mass of the impactor by adding any high density material to the internal cavity so that it matches the mass of the fully loaded revolver as determined above. Position the impactor above the hammer of the revolver so that the impactor base strikes only the hammer. The distance between the striking face of the impactor and the hammer shall be 1.0 m + 1.0 cm - 0 (39.37 in + 0.394 in - 0).

Release the impactor allowing it to fall freely through a guide tube so that it strikes the hammer (see fig. 4). If the revolver does not discharge, examine the cartridge for firing pin indentation. Rotate the cylinder to the next chamber and repeat until failure occurs or until all chambers have been tested.

APPENDIX A. SIGHT CONSIDERATIONS

The exact trajectory of a bullet fired from a revolver is determined by the characteristics of the ammunition, the handgun, and the individual that fires the revolver. Sights, fixed or adjustable, are provided to enable an individual to aim the revolver, i.e., predetermine the desired point of impact of the bullet. For practical purposes, no two individuals aim a revolver by aligning the sights with the desired point of impact in exactly the same manner. As a consequence, no revolver that meets the performance requirements of the standard should be used in service until the individual to whom it has been issued "sights-it-in" using the intended service ammunition. The process of "sighting a revolver in" will often identify problems with the sights on the revolver that must be corrected to insure suitability for service use.

The most commonly used revolver sight is the Patridge type. It consists of a rectangular notch on the rear of the revolver and a post or ramp-type blade attached to the muzzle end of the barrel. There are several special sighting systems and modifications to the Patridge sight to facilitate aiming the revolver, each of which has its own inaccuracies and potential problems.

Common problems with Patridge type sights that affect the aiming of the revolver are as follows:

(1) The front sight may be too high, low, thick, or thin; not securely attached; or not attached in line with the frame and barrel.
(2) The notch in the rear sight may be too wide, narrow, shallow, or deep.
(3) The rear sight may be too high or low, not attached securely, or not attached in line with the frame and barrel.
(4) Adjustable sights may not have sufficient adjustment in elevation or azimuth to accommodate all user and ammunition variables.

The above problems are sometimes simple to correct. Front sights that are too high or thick may be filed in place for adjustment. However, when a front sight is too thin, short, or improperly attached, the service of the factory or trained gunsmith (armorer) is required to correct the problem. When the notch of a rear sight is too high, narrow, or not securely attached, correction is generally a simple matter. However, rear sights that are already too low, wide, or not in line with the axis of the revolver should be corrected by trained personnel. Problems with adjustable rear sights that are not due to the adjusting mechanism (i.e., rear sight will move but not enough) are usually corrected by adjusting the front (fixed) sight to accommodate the useful adjustment range of the rear sight. Some manufacturers, recognizing the difficulties associated with adding metal to a sight that is too small, have designed replaceable front sights. However, care must now be taken to assure that the front sight is solidly attached to the revolver.

Clearly for special sighting systems, the manufacturer of the system must be consulted for assistance when the person issued the revolver cannot "sight-it-in."

Finally, it should be recognized that the revolver, ammunition, shooter, and the sights comprise a system, some parts of which are fully capable of compensating for deficiencies in other parts of the system. However, the characteristics of any part of the system can change with time, for example:

(1) The shooter
    (a) physical strength changes
    (b) eyesight changes
(2) The service ammunition changes
(3) The revolver changes
    (a) dropped but still serviceable
    (b) normal wear and tear
    (c) any repair work has been done.

The revolver should be sighted-in by the user before it is considered ready for service (at the time of original issue and any time that the characteristics of the ammunition, revolver, or individual issued the weapon change). The user should pay particular attention to any problems in aiming the revolver when "sighting-it-in" prior to proficiency requalification to detect any subtle changes in revolver or personal characteristics that may have occurred since the last time that it was fired for accuracy.