TEST PROCEDURE - PHYSICAL MEASUREMENTS

A Disassemble one sample firearm, and visually examine all major components (e.g., trigger mechanism, locking system) for conformance with drawing specifications and design drawings. Record any deviations from specifications. This means not only dimensional checks but heat treat and material inspection as well. This may be done by the design team, in cooperation with the test lab, before turning over the test firearms for testing. Force-displacement curves for all springs, are to be checked for conformance, within the designed operating ranges. Mark all critical components.

B. Photograph the firearm in various stages of disassembly.

C. Conduct a magnetic particle inspection of components to be subjected to stress during firing (e.g., bolt, locking lugs, barrel, etc.). Criteria is to be pass/fail.

D. Record the following for the test firearm and its ancillary equipment, as applicable:

(1) Test item nomenclature, serial number(s), and manufacturer's name

(2) Type of packaging and preservatives

(3) Non-conforming parts (ascertain with firearm disassembled, repair or replace, and record)

(4) Number and names (established by design team) for all parts

(5) Firearm physical characteristics (to be obtained on all samples)

- Weight of:
  - a. Gun empty and without accessories
  - b. Gun accessories (muzzle brake, sling, etc.)
  - c. Magazine(if applicable)
  - d. Loaded magazine (if applicable)
  - e. With loaded magazine and accessories (sum of a, b, d)
  - f. Individual subassemblies (if asked for by the design team)
- Dimensions of:
  - a. Gun
    Test item length, width, and height, with and without accessories
  - b. Drop at the heel
  - c. Drop at the comb
  - d. Length of pull
  - e. Stock pitch and cast (if applicable)
- Sight characteristics and effectiveness:
  - a. Sight radius
  - b. Height of sight line above bore line
  - c. Distance of rear sight to line of rear face of stock
- Firing pin protrusion (maximum protrusion of the point of the firing pin to the bolt face)
- Firing pin energy (copper crusher indent - SAAMI method)
- Locktime

- Trigger pull (force and displacement required to manually operate the trigger) Trigger pull is to be performed to the SAAMI standard; horizontal pull at the center of the finger radius of the trigger using the apparatus designed for taking this measurement.
- Headspace
- Barrel length (from start of chamber to end of muzzle)
- Direction and twist of rifling (for rifles - i.e. right hand, 1 turn in 10 inches)
- Number of lands and grooves (for rifles)
- Diameter across lands and grooves (for rifles)
- Bore Diameter (for shotguns)
- Choke constrictions in the barrel or choke tubes supplied (for shotguns)
- Chamber dimensions (via chamber cast)
- Bolt cocking force (hammer down and hammer cocked)
- Action spring dimensions and load characteristics
- Magazine release force
- Safety on/off force (1 lbs. min. = SAAMI recommendation)
- Sear Lift (if applicable)
- Sear engagement
- Primary mass/secondary mass (action bar/bolt masses)

(6) Type of operation (blowback, short recoil, inertia, etc.)
(7) Type of fire (semiautomatic, pump, etc.)
(8) Type of bolt locking mechanism (rotary, locking block, etc.)
(9) Type of feed (box, staggered column, tube, etc.)
(10) Type of ejection (fixed on the receiver, etc.)
(11) Type of extraction (claw, blowback, etc.)

Data Required:

- Prepare a characteristics data sheet, suitable for the formal report and other purposes, consisting of a general view photograph of the firearm, along with a listing of all principal physical and performance characteristics.
- Note firing pin indent below the SAAMI minimum.
- Note headspace above Remington inspection maximum
- Note headspace below Remington inspection minimum.
- Record chamber dimensions out of Remington specification on Remington firearms.
- Record chamber dimensions out of SAAMI specification.
- Record any firing of the firearm without the trigger being pulled.

TEST PROCEDURE - PROOF TESTING

Proofing of a firearm is the intentional stressing of the firearm components which contain the cartridge by firing cartridges which develop pressures substantially exceeding those of normal service loads. The components being proofed or stressed are those in direct contact with, and/or which contain the primary firing pressures. Proofing is accomplished by firing definitive proof cartridges.

Headspace, bore and chamber dimensions and cartridge case support are of major importance in assuring that specified pressure is obtained from the cartridge and that the firearm-ammunition system is structurally sound. Control of these characteristics is necessary to prevent cartridge case or firearm failure. Fired proof cartridges should be destroyed or rendered unusable. They should never be discarded or mixed with other scrap brass cartridges.

Method:

1. Before proof testing the firearm should be inspected for:
   - Barrel obstructions
   - Bore and chamber free of oil or grease
   - Any inspection identification indicating that all inspection and testing normally performed before proof firing have been completed (magnaflux, etc.).

2. Proof test procedure:

   A. Assembled Firearms

      I. One definitive proof cartridge should be fired in each chamber or barrel of each firearm.

      II. Definitive proof ammunition is tested in accordance with the "Handling of Ammunition" procedure defined in the SAAMI Technical Committee Manual, Volume III, Section II, Page 2410. The procedures for testing were developed in order to consistently position the propellant.

      III. Failure to follow this procedure during the definitive proof testing of each chamber of the firearm could result in pressure levels significantly below the minimum proof pressure specification as determined for the cartridge.

   B. Altered Components

      I. Firearms and/or components which were previously subjected to proof testing and, which subsequently have any proof stressed components changed, altered, or substituted, should be reproofed.

3. Because of the pressures involved in shooting proof cartridges, adequate precautions, both mechanical and procedural, should be taken to protect personnel performing the firearms proof testing. To this end, the firearm should be securely mounted, completely shielded from the operator and firing accomplished by a remote control method.

4. Record headspace before and after proof testing.

5. A firearm is properly proofed when the cartridge has been fired without evidence of significant gas leakage. Significant gas leakage occurs when a case separation or split allows gas to escape. In the event that significant gas leakage occurs, the firearm should be inspected for damage and reproofed.

6. Firearms following proof, should be submitted to sufficient visual, mechanical, and functional inspection to assure that both the firearm and the fired proof cartridge have satisfactorily withstood the test. This inspection includes:

A. Visual for damage, i.e., damaged receiver or bolt, bulged or otherwise damaged barrel, broken stock, or any part subjected to the proofing stress which can be visually examined for damage.

B. The fired proof cartridge should be examined to determine that no firearm fault has introduced cartridge failure, such as:

I. Expanded cartridge head

II. Excessive roughness, rings, or bulging, which would affect extraction.

III. Incipient separation or stretch ahead of the case head indicating excessive in headspace or excessive pressure as stated above.

IV. Any cartridge case failure indicating a firearm fault.

7. Function by subsequent firing or other functional tests to assure that no damage has occurred in the proof firing.

8. Mechanically gage the firearm's headspace to assure that excessive setback of stressed components has not occurred in proof firing.

9. After proof firing and inspection, the Proof Stamp should be applied at or near the breach area. Do not stamp if beyond Remington maximum.

Data Required:

- Record and note any headspace growth and round level.
- Record significant gas leakage and/or firearm damage.
- Record any firing of the firearm without the trigger being pulled.

TEST PROCEDURE - REGAIN TEST

This test is conducted to evaluate whether the trigger mechanism will reset to full engagement when the trigger is partially pulled by the customer and then released with the safety in the "Fire" or "Off" position.

Method:

A. Remove all lubricant from the firecontrol using Rem-Clean solvent.

B. Insert the firearm to be tested in the trigger pull apparatus for this test and measure the engagement between the sear and trigger (or striker).

C. Apply enough pressure on the trigger to bring it to approximately 25% of its design full engagement (75% fired).

D. Release the trigger pressure gradually and record the engagement when fully released.

E. Apply enough pressure on the trigger to bring it to approximately 50% of its design full engagement.

F. Release the trigger pressure gradually and record the engagement when fully released.

G. Repeat A through F but with the firecontrol lubricated per the design team's specifications or owner's manual.

Data Required:

- Record engagement before and after test.
- Record if mechanism did not return to full engagement.
- Record trigger pull vs. distance
- Record any firing of the firearm without the trigger being pulled.
- Record trigger pre-play before and after test (if applicable).

TEST PROCEDURE - SAFETY PULL TEST

This test is conducted to determine if the safety mechanism will release the trigger mechanism and cause the firearm to fire if the trigger is pulled intentionally by the customer with the safety on.

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Method:

A. Inspect and verify the firearm is not loaded.

B. Close the firearm as if to fire it and put the safety to the "Safe" or "On" position.

C. Pull the trigger with a load of 40 lbs.

Data Required:

- Record any firing of the firearm.
- Record any part breakage's.
- Record sear engagement before and after test.
- Record sear lift before and after test (if applicable).
- Record trigger pre-play before and after test (if applicable).
- Record any firing of the firearm without the trigger being pulled.

TEST PROCEDURE - SAFETY FUNCTION TEST

This test is conducted to determine if the safety mechanism will release the trigger mechanism and cause the firearm to fire if the trigger is pulled intentionally by the customer with the safety on and then moved to the fire condition. This test also determines if the safety will release the trigger mechanism and cause the firearm to fire if the trigger is pulled intentionally by the customer with the safety in a "null" or half way to fire condition.

Method:

A. Inspect and verify the firearm is not loaded.
B. Close the firearm as if to fire it and put the safety to the "Safe" or "On" position.
C. Pull the trigger firmly (10 lbs. maximum) - firearm must not fire.
D. With the finger off the trigger, move the safety to the "Fire" or "Off" position - firearm must not fire.
E. Open and close the guns action.
F. Move the safety to full "Safe" or "On" and then manually position the safety half way to the half way to the "Fire" or "Off" position where the safety is placed in the "Null" position. Pull the trigger - firearm must not fire and the safety must not move to the full "Fire" or "Off" position.
G. With the finger off the trigger, push the safety to the full "Fire" or "Off" position - firearm must not fire.
H. Perform steps B through G three times per firearm.

Data Required:

- Record any firing of the firearm.
- Record any part breakage's.
- Record sear engagement before and after test.
- Record sear lift before and after test (if applicable).
- Record trigger pre-play before and after test (if applicable).

TEST PROCEDURE - ACCURACY

Accuracy testing is conducted to determine the ability of the firearm to shoot within performance specifications using a wide spectrum of ammunition bullet and powder weights, using different manufacturer's ammunition.

Method:

(1) Certify the ammunition selected for muzzle velocity and pressure.

(2) For center fire rifles, fire three 5 shot groups at 100 yards, using a 20 power scope, for each ammunition type selected. Prior to beginning of the test, shoot 5 "fouling" shots to seat in the rifle. Clean the bore between each ammunition type used for test and repeat the 5 fouling shots. Lastly, sight in the firearm using iron sights. After shooting accuracy, obtain the total adjustment range and increment of adjustment.

For shotguns, shoot 5 patterns for each choke at 40 yards for hunting shotguns, 5 patterns at 25 yards for skeet shotguns, using the Remington sight picture. Fouling shots are not required. For slug shotguns, shoot three 5 shot groups using a 7 power scope (minimum). at 50 and 100 yds. Prior to beginning of the test, shoot 5 "fouling" shots to seat in the gun. Clean the bore between each ammunition type used for test and repeat the 5 fouling shots. Lastly, sight in the firearm using iron sights. After shooting accuracy, obtain the total adjustment range and increment of adjustment.

Rimfire accuracy is shot at 25 yards (100 yds. optional). Fire three 5 shot groups, using a 10 power scope, for each ammunition type selected (2 recommended). Prior to beginning of the test, shoot 5 "fouling" shots to seat in the rifle. Clean the bore between each ammunition type used for test and repeat the 5 fouling shots. Lastly, sight in the firearm using iron sights. After shooting accuracy, obtain the total adjustment range and increment of adjustment.

(3) Cycle the safety from fire to safe every 5 rounds.

(4) Accuracy and pattern work is to be shot from a recoiling Frankford rest.
Shoulder shooting is acceptable but not the preferred way of testing.

(5) Set the iron sights and lock the movable elevation scale (if provided) at the 100 yard position and the windage scale (if provided) at the zero position. Both scales are kept locked in these positions for the remainder of all other tests. Note the position and record.

Data Required:

- Measure group sizes center to center for rifles/point of impact and pattern density (30" circle) for shotguns.
- Record takedown screw torque (if applicable), bore and groove dimensions, bedding point location.
- Record maximum range setting (for the ammunition of the gun)
- Record Increment of adjustment, range and windage.
- Record total adjustment range, and total windage adjustment
- Record any firing of the firearm without the trigger being pulled.

TEST PROCEDURE - ENDURANCE TESTING

Endurance testing is conducted to evaluate the functioning life of the firearm. Record all instances of malfunctions and failures, and replace parts when they become unserviceable. When a specific part is being studied, continue the test only long enough to determine its useful life. Table 4 lists suggested test plans.

TABLE 4
AMMUNITION REQUIREMENTS

Firearm type	Ammunition Description	Number of Rounds Min.
Centerfire rifles	Various bullet weights and geometry	3000
Rimfire rifles	Various bullet weights and geometry	10,000
Target shotguns	50% light target loads 50% heavy target loads	25,000
Field Grade shotguns	50% 2 3/4" magnums 50% 3" magnums	5,000
Slug shotguns	50% 2 3/4" slugs 50% 3" slugs	3,000

Method:

A. Disassemble, thoroughly clean, lubricate per the design team's instructions, and reassemble at least five test guns. Record headspace and barrel bore and groove measurements for each.

B. Fire each test gun, and record bolt velocity, bullet velocity and accuracy. Shoot heavy loads in the heavy jack and light loads in the light jack for bolt velocities. The range distances for determining velocity and accuracy are usually established in the requirements; when they are not specified, refer to test reports on similar items.)

C. Fire each test weapon in accordance with the firing procedure (number of rounds, firing cycle) specified by engineering. If a firing procedure is not specified, use the following:

(1) Before commencing design acceptance testing, calibrate, adjust, or re- build the shooting jacks.

(2) Allow the firearm to completely recover in the shooting jack between each shot and do not lean or "stiff arm" the firearm while shooting the gun.

(3) Allow the weapon to cool between cycles; 100 rds for shotguns and rimfire, 20 rounds for centerfire. The use of forced air to accelerate cooling of the barrels between firing trials is permitted. The air should be directed from the chamber toward the muzzle to prevent it from washing the lubricant from the firearm's action. The firearm can be cooled by forced air by inserting a curved tube (copper suggested) into the chamber toward the muzzle. Operate and check safety after every cooling cycle.

(4) Cycle the safety from fire to safe every 5 rounds.

(5) Conduct selected firing cycles, using the firing attitudes of Table 3 at the end of the test.

(6) After every 1,000 rounds, disassemble, inspect, clean and lubricate the entire mechanism, unless otherwise specified, fire 20 rounds for velocity and accuracy at the ranges previously established.

D. After the specified number of rounds have been fired, disassemble, inspect, clean and lubricate the entire mechanism, and fire the gun again for velocity and accuracy, and record bore and headspace measurements.

Data Required:

Record the following:

- Muzzle velocity
- Any sights that come loose before 500 rounds.
- Bolt velocity at every 1000 round interval.
- Group size or Pattern location at every 1000 round interval.
- Headspace every 1000 round interval.
- Trigger Pull every 1000 round interval
- Ambient temperature
- Malfunctions per ammo type, breakage, and replacement parts used.
- Any failure that requires the gun to be removed from testing completely.
- Any firing of the firearm without the trigger being pulled.

TEST PROCEDURE - INTENTIONAL ABUSE

This test is conducted to evaluate the ultimate strength of the firearm. This is one of the last tests to be done since it renders the firearm unusable for any subsequent testing.

Method:

A. Disassemble, thoroughly clean, lubricate, and reassemble the subject test guns. Record headspace. Magnaflux all locking system and barrel components. Strain gage the middle of the chamber of the barrel. Only use firearms with headspace from +.004 to the SAAMI minimum headspace for testing. Verify barrel concentricity (or wall thickness around barrel), and test nominal as well as worst case.

B. Fire a specially prepared intentional abuse round with the firearm in a room specially prepared for testing. Witness paper is to be hung around the firearm at the rear, top, bottom, and sides. The paper at the rear should simulate the outline of the shooter and the witness paper at the sides and top should be placed to cover the length of the firearm at a distance 3 feet away. Fire the gun with a lanyard. No personnel are to be in the room when the test is performed. Video tape through a lexan shield and through the witness paper on the ejection port side of the firearm. Photograph the firearm and witness paper after the test is completed.

C. Centerfire and rimfire rifles are shot with a bore obstruction (usually 5 bullets forced into the bore just ahead of the chamber and mud at the muzzle).

D. 12 ga. shotguns are tested with the following high pressure loads.

TABLE 5
Shotgun High Pressure Loads

Winchester AA Case (once fired), Federal 209 Primer, 492 grains #7 1/2 shot, 6% Antimony 700-X Powder using the grain values below, Kistler Transducer Model 6231A2 #306582

Powder Weight (grains)	Wad	Average Pressure (psi)	Standard Deviation (psi)	-3 Sigma (psi)	+3 Sigma (psi)
30.0	RXP-12	26,000	500	24,500	27,500
34.0	RXP-12	31,000	500	29,500	32,500
37.3	RXP-12	35,600	600	33,800	37,400
41.1	RXP-12	40,600	900	37,900	43,300
43.0	RP-12	42,300	750	40,050	44,550
45.5	RP-12	45,750	800	43,350	48,150
53.0	RP-12	53,800	1,700	48,700	58,900
60.0	RP-12	61,200	1,100	57,900	64,500
70.0	.3H	67,700	1,850	62,150	73,250

No data is given for shooting high pressure rounds in centerfire rifles or for different gauge shotguns other than 12. These must be developed by the test lab at the time of the testing.

1. Make ten rounds to verify the pressure level of the load in a pressure barrel. Test a minimum of 3 guns at each pressure level.

2. A bore obstruction of the gauge next lowest for the gauge to be tested

(e.g. a 12/20 burst test). Glue a ball bearing (.125 dia.) to the primer of the small round to aid its ignition as well.

3. Wet compressed sand forced into the muzzle end back to the end of the choke or choke tube. In rifles, fill the first 3 inches of barrel.

4. A bore obstruction comprising a 3/8" felt wad ahead and behind a shotgun slug of the gauge to be tested placed at the end of the choke or choke tube and just before the gas cylinder area (approximately 13" down bore).

E. Re-magnaflux all locking system and barrel components after firing.

Test Precautions:

(1) Loading of high pressure rounds:
- Only load a round into the action when ready to shoot.
- Check pressures to verify load - 10 samples minimum.
- Do not store high pressure rounds - cut down those not to be shot!
- Follow all safety procedures when taking pressures.

(2) Doing the actual testing:
- Two people are required to do the testing.
- The rounds are **NOT** to be loaded into the chamber, action closed, or the gun shot by hand. All of this must be done remotely via ropes, cams, or electrical actuators.
- Unloading of a high pressure round from the firearm also must be done remotely.

(3) No more than one high pressure round is to be fired per firearm.

Data Required:

- Record headspace before and after test (if measurable).
- Take photos of the firearm before and after test.
- Record pressure level of the test as recorded by strain gauge.
- Save witness papers and note any penetration of the witness paper to the rear of the firearm by any fragment.
- Measure concentricity (or wall thickness around barrel), barrel hardness, and barrel diameters at every inch.

TEST PROCEDURE - HOT AND COLD

Functioning tests are conducted in climatic chambers to evaluate the effects of extreme high and low temperatures on firearm performance.

TEST TEMPERATURES, EXTREME CONDITIONS

Condition	Temperature
	F degrees
Hot	120
Cold	-20

For all tests and because of safety precautions, condition the firearms "half loaded", i.e., with the bolt in the battery position and the chamber empty, so that one complete cycle of the operating handle loads the firearm. Ammunition is conditioned at the same time as the rifle, but separately. If test results indicate a high number of first round failures, it may be necessary to manually operate the firing mechanism several times to restore proper operation of the firearm. When this action is performed, it will be so noted.

Specified lubricants to be used in each environmental test are determined by reference to the appropriate owner's manuals or design teams recommendation. In addition to observations of general gun performance, also report requirements for additional lubrication and cleaning. Do not clean or re-lubricate test weapons unless required for completion of the test.

High Temperature Test This subtest evaluates the effect of extreme high temperatures on the functioning performance of weapons.

Method:

(1) Certify, by shooting a minimum of 30 rounds, in a pressure barrel, the muzzle velocity and pressures of the rounds chosen to be the high bolt velocity and low bolt velocity samples for autoloading firearms.

(2) Condition at least three test firearms and the ammunition in a climatic chamber for at least 6 hours at a temperature of 120 degrees F.

TABLE 6
Ammunition Requirements (MINIMUM)

Type of Firearm	# of Rounds/Firearm	
	Low Temp	High Temp
All	100 Low Bolt Vel. 100 High Bolt Vel.	100 Low Bolt Vel. 100 High Bolt Vel.

(3) Test each firearm within the chamber as follows:

a. Fire 25 low velocity rounds and shoot 25 high velocity rounds, wait 2 hours, and repeat. This applies to shotguns and rimfire rifles. For centerfire fires shoot 25 rounds wait 2 hours and repeat.

b. Do not perform maintenance during the 200 round cycle unless otherwise specified

c. Cycle the safety from fire to safe every 5 rounds.

d. At every 50 round interval verify the firearm is not loaded. Close the firearm as if to fire it and put the safety to the "Safe" or "On" position.

Pull the trigger firmly (10 lbs. maximum) - firearm must not fire.

With the finger off the trigger, move the safety to the "Fire" or "Off" position - firearm must not fire.

e. After 200 rounds have been fired through each firearm, remove the firearms from the conditioning chamber, and disassemble, thoroughly inspect, clean and oil each one.

Low Temperature Test This subtest evaluates the effect of extreme low temperatures on the functioning performance of the firearms.

Method:

(1) Certify, by shooting a minimum of 30 rounds, in a pressure barrel, the muzzle velocity and pressures of the rounds chosen to be the high bolt velocity and low bolt velocity samples for autoloading firearms.

(2) Condition at least three test weapons and the ammunition in a climatic chamber for at least 6 hours at a temperature of -20 degrees F.

(3) Test each firearm within the chamber as follows:

a. Fire 50 rounds (25 high vel., 25 low vel.) at 2 hour intervals.

b. Do not perform maintenance during the 200 round cycle unless otherwise specified.

c. Cycle the safety from fire to safe every 5 rounds.

d. At every 50 round interval verify the firearm is not loaded. Close the firearm as if to fire it and put the safety to the "Safe" or "On" position. Pull the trigger firmly (10 lbs. maximum) - firearm must not fire. With the finger off the trigger, move the safety to the "Fire" or "Off" position - firearm must not fire.

e. After 200 rounds have been fired through each firearm, remove the firearm from the conditioning chamber, and disassemble, thoroughly inspect, clean and oil each one.

Data Required:

- Record temperature and exposure times
- Record all malfunctions.
- Record damage noted during inspection
- Record all maintenance actions performed
- Record ammunition velocity and pressures
- Record any firing of the firearm without the trigger being pulled.

TEST PROCEDURE - FIELD DEBRIS TESTING

This test determines the effect of field debris on firearm performance, where the firing is conducted after the firearm has field debris directly placed in the action. Use the field debris mixture listed in Table 7.

Method:

(1) Clean and lubricate test gun to the procedure supplied by the design team.

(2) Open the bolt on autoloaders, remove the bolt on bolt action designs. Set the safety on "safe." Check that the firearm is unloaded.

(3) Record the weight of one level tablespoon of debris mixture.

(4) Expose the firearm as follows:
Place the firearm in a shooting jack, turn bottom side up, and apply a tablespoon of debris in the firecontrol mechanism from the bottom. Tap the firearm three times, in the middle of the receiver, to jar the rifle and aid field debris getting into the mechanism.

(5) Turn the firearm to its normal upright horizontal position and apply a tablespoon of field debris to the top of the firecontrol mechanism from the top. Tap the firearm three times, in the middle of the receiver, to jar the rifle and aid the debris getting into the mechanism.

(6) Wipe away any debris that prevents the bolt from closing. Clean parts as much as possible by blowing sharply or wiping.

(7) Fire a full magazine from the firearm. If repeated malfunctions make this impossible, attempt to fire with another magazine. If firing is still unsatisfactory, attempt to fire with a clean magazine, container, etc., loaded with clean ammunition. If repeated malfunctions make it impractical to fire the remaining ammunition, stop the test.
For shotguns or other tube fed designs, shoot a fully loaded tube of ammunition.

(8) Cycle the safety from fire to safe every 5 rounds.

(9) At every 5 round interval verify the firearm is not loaded.
Close the firearm as if to fire it and put the safety to the "Safe" or "On" position.
Pull the trigger firmly (10 lbs. maximum) - firearm must not fire.
With the finger off the trigger, move the safety to the "Fire" or "Off" position - firearm must not fire.

(10) Fire 20 rounds; 10 high bolt velocity and 10 low bolt velocity rounds. (if bolt velocity applicable)

(11) Disassemble the firearm over white paper and weigh or measure the amount of debris present in the main mechanism area. Debris should be removed from the parts for weighing. Photograph the disassembly (or video) at each major step.

Data Required: Field Debris

- Record malfunctions.
- Record number of rounds fired.
- Record weight of debris in the gun at the conclusion of the test.
- Record any firing of the firearm without the trigger being pulled.
- Record any hang fires.

TABLE 7

FIELD DEBRIS MIXTURE (BY VOLUME)

Dried Grass Clippings	2 parts	
Bird Seed		1 part
Toothpicks (round, .25" long max.) to represent twigs	1 part	
Table Salt		1 part
Small Stones (.015 dia. to .125 dia.)		1 part
Crushed Dry Leaves		2 parts
Pine Needles		1 part
Hair Samples (no longer than 2 inches)	1 part	

TEST PROCEDURE - STATIC SAND AND DUST TEST

This test is one of two that evaluates the effect of sand and dust on firearm performance, where the test firing is conducted after the firearm has sand and dust directly placed in the action. Thus, an exposure box is not required. Use the sand and dust mixture listed in Table 8. This test is normally done before all other sand and dust tests.

Method:

(1) Clean and lubricate test gun to the procedure supplied by the design team.

(2) Open the bolt on autoloaders, remove the bolt on bolt action designs. Set the safety on "safe." Check that the firearm is unloaded.

(3) Record the weight of one level tablespoon of debris mixture.

(4) Expose the firearm as follows:
Place the firearm in a shooting jack and apply a tablespoon of sand in the firecontrol mechanism from the bottom. Tap the firearm three times, in the middle of the receiver, to jar the rifle and to assist sand getting into the mechanism.

(5) Turn the firearm to its normal upright horizontal position and apply a tablespoon of sand and dust to the top of the firecontrol mechanism from the top. Tap the firearm three times, in the middle of the receiver, to jar the rifle and aid sand getting into the mechanism.

(6) Wipe away any sand that prevents the bolt from closing. Clean parts as much as possible by blowing sharply or wiping.

(7) Fire a full magazine from the firearm. If there are repeated malfunctions, attempt to fire with another magazine. If firing is still unsatisfactory, attempt to fire with a clean magazine, container, etc., loaded with clean ammunition. If repeated malfunctions make it impractical to fire the remaining ammunition, stop the test. For shotguns or other tube feed designs, shoot a fully loaded tube of ammunition. Cycle the safety from fire to safe every 5 rounds.

(8) At every 5 round interval verify the firearm is not loaded.
Close the firearm as if to fire it and put the safety to the "Safe" or "On" position.
Pull the trigger firmly (10 lbs. maximum) - firearm must not fire.
With the finger off the trigger, move the safety to the "Fire" or "Off" position - firearm must not fire.

(9) Fire 20 rounds; 10 high bolt velocity and 10 low bolt velocity rounds. (if bolt velocity sensitive)

(10) Disassemble the firearm over white paper and weigh the amount of debris that finds its way into the main mechanism area. Photograph the disassembly (or video) at each major step.

Data Required: Static Sand and Dust Test

- Record malfunctions.
- Record number of rounds fired.
- Record weight of debris found in the gun.
- Record any firing of the firearm without the trigger being pulled.
- Record any hang fires.

TEST PROCEDURE - DYNAMIC SAND AND DUST TEST

This subtest is also conducted to evaluate the effects of blowing sand and dust on gun performance. Firing is conducted in one of the sand and dust facilities described:

A variable speed blower with volumetric dry feeder attached is mounted outside the test chamber. The feeder must deliver a constant but adjustable flow of dust mixture to the air-delivery pipe of the blower. The blower-feeder combination must be capable of dispensing sand and dust so that the mixture falls evenly on the area concerned at a rate of 100 ±25 grams per minute per square meter.
Two types of chambers may be used for the sand and dust test, as follows:

Type A This type is used for the standard sand and dust test. The test chamber is a box made of 25mm (1 inch) plywood 0.9m (3 feet) wide, 1.2m (4 feet) high, and 1.8m (4.5 feet) long, with transparent sides and an interior gun cradle. A 7.6cm (3 inch) vent hole aligned with the blower is in the end of the box opposite the blower. A pair of rubber gauntlet groves for the test personnel, is attached over hand openings on each side of the box. The gloves provide dust-sealed access to the gun and permit full control of the gun, including installing magazines and firing.

Type B This type of chamber is used for larger firearms or when it is not convenient to use type A. This chamber consists of a box of any size that allows free circulation of the sand- and dust-laden atmosphere around the firearm. The chamber is provided with vents to relieve any buildup of air pressure, and aid in circulating the dust. It may be bottomless so that it can be placed over the weapon. Access doors and ports are provided as needed but must fit closely enough to contain the circulating atmosphere. NOTE: The dust-laden atmosphere should not be breathed by personnel. Do not allow anyone to enter the chamber without approved breathing protection or unless the chamber is first purged of any visible dust.

Method:

(1) Prepare a sand and dust mixture of angular structure, with particle size distribution determined by weight, using the US standard sieve series. The composition may be obtained by mixing 42 percent "No. 1 dry" sand, 8 percent "No. 3 Q-Rok" sand, and 50 percent 140-mesh silica flour, which will provide the blend shown in Table 8.

TABLE 8
COMPOSITION OF SAND AND DUST MIXTURE
(by percent particles, by weight, retained in sieves)

Sieve Size (US gage sieve no.)	Percent of weight retained	Particle Size (microns)
20	3	842 to 1000
30	5	595 to 841
45	17	355 to 595

60	14	251 to 354
100	10	150 to 250
(pass 100)	<1	------
140-mesh silica flour		
140	1	105 to 149
200	4	74 to 105
325	7.5	44 to 74
(pass 325)	37.5	less than 44

Calibrate the sand and dust feeder of the facility to dispense the mixture at a rate of 100 ±25 grams per minute per square meter over the area concerned.

(2) Clean and lubricate test firearm. Place firearm and its ammunition in the test chamber. The firearm should be in the horizontal position in which it would normally be fired. The ammunition complement will be 10 rds. low bolt velocity, 10 rounds high bolt vel. (if bolt velocity applicable) Fully load the test firearm and place any safety switch in the "safe" position. Engineering judgment is necessary to determine the protection given the ammunition. Remaining magazines are normally covered with plastic bags.

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(3) Cycle the safety from fire to safe every 5 rounds.

(4) At every 5 round interval verify the firearm is not loaded.
Close the firearm as if to fire it and put the safety to the "Safe" or "On" position.
Pull the trigger firmly (10 lbs. maximum) - firearm must not fire.
With the finger off the trigger, move the safety to the "Fire" or "Off" position - firearm must not fire.

(5) Turn on the dust dispenser and allow to operate for one minute before firing. The firing schedule for magazine-fed weapons is one magazine every 60 seconds.

(6) Use a clock continuously throughout each test so that a chronological record of total test time is made. The total time that the bolt remains open (to clear stoppages, to change magazines, etc.) is a critical measurement in this test.

(7) If the firings are performed without any malfunction that cannot be readily cleared by immediate action, i.e., one requiring the use of tools or weapon disassembly, continue the test until such a malfunction occurs or until all of the ammunition is fired.

(8) Disassemble the firearm over a white paper and weigh the amount of debris that is present in the main mechanism area. Photograph the disassembly (or video) at each major step.

Data Required: Dynamic Sand and Dust Test

- Record malfunctions.
- Record number of rounds fired.
- Record weight of debris found in the gun.
- Record sand and dust dispensing rate
- Record the time the gun is open to sand.
- Record any firing of the firearm without the trigger being pulled.
- Record any hang fires.

TEST PROCEDURE - SALT WATER IMMERSION TEST (10-DAY)

This subtest evaluates the effects of salt water on firearm performance.

Method:

A. Prepare a salt water solution of 5% sodium chloride and 95% water by weight. The sodium chloride must not contain more than 0.1% sodium iodide and 0.2% other impurities.

B. Prepare three test firearms in accordance with the owners manual. The guns will not be over-lubricated to discourage corrosive buildup.

C. Temperature-stabilize the weapons, ammunition sufficient to fire at least four reloadings on each of 5 days, and the salt water solution to within 20 degrees C of each other before immersing.

D. Fully close an unloaded firearm and place its safety "on". Immerse the firearm and all of its ammunition (magazines, chargers, or clips) separately in the salt water solution for one minute. The solution must cover the test items completely.

E. Remove the test item, and drain all salt water from the bore by lowering the firearms muzzle and slightly retracting the bolt to allow the salt water to drain from it. Fire the firearm 20 rounds, 10 high bolt velocity and 10 low bolt vel.
(if bolt velocity sensitive). Cycle the safety from fire to safe every 5 rounds.

F. At every 20 round interval verify the firearm is not loaded.
Close the firearm as if to fire it and put the safety to the "Safe" or "On" position.
Pull the trigger firmly (10 lbs. maximum) - firearm must not fire.
With the finger off the trigger, move the safety to the "Fire" or "Off" position - firearm must not fire.

G. Repeat D through F with the other two guns.

H. Repeat firing with all three guns on days 3, 5, 8, 10. If conditioned ammunition and/or magazines, etc., prevent firearm functioning, substitute clean ammunition and/or magazines from that point on in the 10-day test. No cleaning, wiping, or maintenance of the firearm is permitted until after the test has been completed or until such time as they are rendered inoperable. Should this occur before 10 days, perform the minimum restorative maintenance necessary to return each gun to operating condition, and continue testing to its normal conclusion. Store the guns and ammunition in a high humidity environment (at least 90% RH) when not being fired or immersed.

I. Photograph the test item as necessary.

Data Required:

- Record number of rounds fired
- Record test temperatures and firearm exposure times
- Record malfunctions
- Record any firing of the firearm without the trigger being pulled.
- Record any hang fires.

TEST PROCEDURE - SOLVENT TEST

This test evaluates if any of the synthetic or non-steel components in a firearm are degraded (in terms of their properties) by various chemicals.

Method:

A. Obtain the following chemicals:

- Shooter Choice Bore Cleaner
- Mineral Spirits
- Rem Oil
- Accubore
- Rem Bore Cleaner
- Break Free
- Birchwood-Casey Gun Scrubber
- Rem Action Cleaner
- CRC 556
- Hoppes Lubricating Oil
- WD-40 Oil
- Hoppes #9
- LP-1 lubricant

B. Weigh and obtain hardness readings on the test specimens.

C. Place the specimens in a container so that they are completely covered by the solvent. Leave at rest in the container for 24 hours.

D. Remove and wipe the specimens until they are dry. Weigh and obtain hardness readings on the test specimens.

E. Leave the specimens to air dry an additional 24 hours. Weigh and obtain hardness readings on the test specimens.

Data Required:

- Record part weights.
- Record part hardness.