# Acceptance Test Plan for Sight Assembly With Radioactive Source

# ATP902964
# Rev: A
# Rev Date: 31-Mar-08

(SPECTER OS P/N 902964-001)

## List of Latest Approvals

| Project Authority | ELCAN Distribution for Electronic Approval |
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## Document Revision History

| Date | Rev. | Revised By: | Change |
|---|---|---|---|
| 31-Mar-08 | A | G. Gervais | Initial release |
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## Overview

This plan contains inspection procedures and acceptance inspection equipment required to verify and validate the performance of Sight Assembly and quality assurance requirements regarding durability of tritium vile within the telescope.

Unless otherwise stated, testing shall be in standard ambient conditions:

| | |
|---|---|
| Temperature: | 23 ± 10℃ |
| Relative Humidity: | 50% ± 30% |
| Atmospheric Pressure: | 650 to 775 mm Hg |

The Quality System under which ELCAN is operating during manufacture of these assemblies has been registered as compliance to ISO 9001:2000.

## 1. Applicable Documents

### *Specifications*

| | |
|---|---|
| MIL-F-13926 | Fire Control, Material, General Specification Governing the Manufacture and inspection of . |
| NUREG-SR1556 Vol. 8, Appendix O | Consolidated Guidance about materials Licenses: Program Specific Guidance about Exempt Distribution Licenses. |

### *Standards*

| | |
|---|---|
| ISO 9001:2000 | International Standard for Quality Systems Model for Quality Assurance in Design/Development, Production, Installation and Servicing. |
| MIL-STD-1913 | Military Standard – Dimensioning of Accessory Mounting Rail for Small Arms Weapons. |
| MIL-PRF-13830 | Optical Components for Fire Control Instruments General Specification Governing the Manufacture, Assembly, and Inspection of. |

## 2. Testing Summary

| Section | Characteristic | Sample | Minimum Time |
|---|---|---|---|
| 5.1 | Chemical | | |
| | Gun Oil | 5 Units | 2 Days |
| | Tricholoromethane | 5 Units | 2 Days |
| | Cleaning Compound | 5 Units | 2 Days |
| 5.2 | Temperature | | |
| | High Temperature | 5 Units | 1 Days |
| | Low Temperature | 5 Units | 2 Days |
| | Humidity | 5 Units | 2 Days |
| 5.3 | Temperature Shock | 5 Units | 1 Days |
| 5.4 | Vibration | 5 Units | 2 Days |
| 5.5 | Pressure | 5 Units | 1 Days |
| 5.6 | Penetration | 5 Units | 1 Days |
| 5.7 | Mechanical Shock | 5 Units | 1 Days |
| 5.8 | Firing | 1 Units | 1 Days |
| 5.9 | Evaluation | 5 Units after each section | 1 Days |
| **Minimum Total Estimated Time** | | | 26 days |

# 3. Requirements

### *Organizational*

At least five gunsights of each model are to be subject to each of the tests described below.

The same gunsight(s) are to be used for each test.

Order of the testing is not significant.

Between each test the gunsights are to be visually inspected to ensure there have been no detrimental effects of the tritium illumination vile within the telescope.

The gunsights must not become loosened or detached from the gun (test Mechanical Shock and Firing (Original document 3.2.7 & 3.2.8) and the light sources must not become loosened or detached from the gunsights as a result of any tests.

Once all tests are completed, the gunsight are to be subject to the evaluation in section 5.9 Evaluation ( original Document 3.2.9).

### *Control Plan*

Inspect both unit under test and assure that it is not damaged beyond technical data package intent prior to conducting acceptance testing.

A failure shall be defined as any failure of the unit under test to meet any of the requirements of this procedure with respect to section **5.9 Evaluation**.

Each failure should be analyzed as to its cause and remedial action necessary to document the issue.

# 5. Characteristic

## 5.1 *Chemical*

Requirement: The gunsight is to be immersed for 48 hours at room temperature in each of the following:
**Gun Oil**
**Tricholoromethane**
**Cleaning Compound according to MIL-C-372B**

Reference: NUREG-SR1556, Vol. 8, Appendix O

Equipment Used: Appropriate Container

Inspection Method: Between each test the gunsights are to be visually inspected to ensure there have been no detrimental effects of the tritium illumination vile within the telescope. The sights must also be tested per section 5.9 of this document.

Sample Size 5 units

Acceptance Criteria Between each test the gunsights are to be visually inspected to ensure there have been no detrimental effects of the tritium illumination vile within the telescope. The sights must also be tested per section 5.9 of this document.

## 5.2 *Temperature*

Requirement: **High Temperature**: The temperature of the gunsight is to be raised from ambient to 120°C and held at this temperature for one hour.
**Low Temperature**: The temperature of the gunsight is to be lowered from ambient to -46°C and held at this temperature for 48 hours
**Relative Humidity**: The gunsight is to be placed in an environment of 100% relative humidity and a temperature of 42°C and held in this environment for 48 hours.

Reference: NUREG-SR1556, Vol. 8, Appendix O

Equipment Used: Thermal / humidity chamber

Test/Inspection Method: Between each test the gunsights are to be visually inspected to ensure there have been no detrimental effects of the tritium illumination vile within the telescope. The sights must also be tested per section 5.9 of this document.

**High Temperature**: The temperature of the gunsight is to be raised from ambient to 120°C and held at this temperature for one hour.
**Low Temperature**: The temperature of the gunsight is to be lowered from ambient to -46°C and held at this temperature for 48 hours
**Relative Humidity**: The gunsight is to be placed in an environment of 100% relative humidity and a temperature of 42°C and held in this environment for 48 hours.

Sample Size 5 units

Acceptance Criteria Between each test the gunsights are to be visually inspected to ensure there have been no detrimental effects of the tritium illumination vile within the telescope. The sights must also be tested per section 5.9 of this document

## 5.3 *Temperature Shock*

Requirement: The gunsight is to be heated to 80°C and held at this temperature for 15 minutes. The gunsight is to be transferred, within 15 seconds, to a cold chamber having a temperature of -46°C and held in this chamber for 15 minutes.

Reference: NUREG-SR1556, Vol. 8, Appendix O

Equipment Used: Two thermal chambers

Test/Inspection Method: Between each test the gunsights are to be visually inspected to ensure there have been no detrimental effects of the tritium illumination vile within the telescope. The sights must also be tested per section 5.9 of this document.

The gunsight is to be heated to 80°C and held at this temperature for 15 minutes. The gunsight is to be transferred, within 15 seconds, to a cold chamber having a temperature of -46°C and held in this chamber for 15 minutes.

Sample Size 5 units

Acceptance Criteria Between each test the gunsights are to be visually inspected to ensure there have been no detrimental effects of the tritium illumination vile within the telescope. The sights must also be tested per section 5.9 of this document.

## 5.4 *Vibration*

Requirement: The gunsight is to be subject to simple harmonic motion having an amplitude of 0.075cm. The vibration cycle is to go from 10Hz to 50Hz and back again in approximately 1 minute. This is to be carried out for 10 cycles. Afterwards, the gunsight is to be subject to 30 minutes of vibration at resonance frequency. This test is to be carried out in each of the three principal axes of the gunsight.

Reference: NUREG-SR1556, Vol. 8, Appendix O

Equipment Used: Vibration table setup
Vibration fixturing

Test/Inspection Method: Between each test the gunsights are to be visually inspected to ensure there have been no detrimental effects of the tritium illumination vile within the telescope. The sights must also be tested per section 5.9 of this document.

The gunsight is to be subject to simple harmonic motion having an amplitude of 0.075cm. The vibration cycle is to go from 10Hz to 50Hz and back again in approximately 1 minute. This is to be carried out for 10 cycles. Afterwards, the gunsight is to be subject to 30 minutes of vibration at resonance frequency. This test is to be carried out in each of the three principal axes of the gunsight.

Sample Size 5 units

| | |
|---|---|
| Acceptance Criteria | Between each test the gunsights are to be visually inspected to ensure there have been no detrimental effects of the tritium illumination vile within the telescope. The sights must also be tested per section 5.9 of this document. |

## 5.5 *Pressure*

| | |
|---|---|
| Requirement: | The gunsight is to be placed in a test chamber and exposed to 0.25 and 2.0 bar of 4 periods of 15 minutes each, the pressure being returned to atmospheric between each period. |
| Reference: | NUREG-SR1556, Vol. 8, Appendix O |
| Equipment Used: | Thermal Chamber / Pressure settings |
| Test/Inspection Method: | Between each test the gunsights are to be visually inspected to ensure there have been no detrimental effects of the tritium illumination vile within the telescope. The sights must also be tested per section 5.9 of this document.<br><br>The gunsight is to be placed in a test chamber and exposed to 0.25 and 2.0 bar of 4 periods of 15 minutes each, the pressure being returned to atmospheric between each period. |
| Sample Size | 5 units |
| Acceptance Criteria | Between each test the gunsights are to be visually inspected to ensure there have been no detrimental effects of the tritium illumination vile within the telescope. The sights must also be tested per section 5.9 of this document. |

## 5.6 *Penetration*

| | |
|---|---|
| Requirement: | A hammer with a small point of weighing 10g is to be dropped from a height of 1 meter onto the exposed surface of the light source. |
| Reference: | NUREG-SR1556, Vol. 8, Appendix O |
| Equipment Used: | A 10g Ball bearing |
| Test/Inspection Method: | Between each test the gunsights are to be visually inspected to ensure there have been no detrimental effects of the tritium illumination vile within the telescope. The sights must also be tested per section 5.9 of this document.<br><br>A hammer with a small point of weighing 10g is to be dropped from a height of 1 meter onto the exposed surface of the light source. |
| Sample Size | 5 units |

Acceptance Criteria: Between each test the gunsights are to be visually inspected to ensure there have been no detrimental effects of the tritium illumination vile within the telescope. The sights must also be tested per section 5.9 of this document.

## 5.7 *Mechanical Shock*

Requirement: This test is to be performed with the gunsight attached to the gun which would have the most detrimental effect to the gunsight.

The gun is to be dropped from 2m onto a hard surface (at least 1" thick durometer rubber backed by concrete). The gun is to be dropped 60 times in such a manner that it strikes the surface ten times in each of the following attitudes:
Barrel vertical, muzzle down
Barrel vertical, muzzle up
Barrel horizontal, bottom up
Barrel horizontal, bottom down
Barrel horizontal, left side up
Barrel horizontal, right side up

Reference: NUREG-SR1556, Vol. 8, Appendix O

Equipment Used: 1 rifle
1 mat, 85 durometer, 1" thick

Test/Inspection Method: Between each test the gunsights are to be visually inspected to ensure there have been no detrimental effects of the tritium illumination vile within the telescope. The sights must also be tested per section 5.9 of this document.

This test is to be performed with the gunsight attached to the gun which would have the most detrimental effect to the gunsight.

The gun is to be dropped from 2m onto a hard surface (at least 1" thick durometer rubber backed by concrete). The gun is to be dropped 60 times in such a manner that it strikes the surface ten times in each of the following attitudes:
Barrel vertical, muzzle down
Barrel vertical, muzzle up
Barrel horizontal, bottom up
Barrel horizontal, bottom down
Barrel horizontal, left side up
Barrel horizontal, right side up

Sample Size: 5 units

Acceptance Criteria: Between each test the gunsights are to be visually inspected to ensure there have been no detrimental effects of the tritium illumination vile within the telescope. The sights must also be tested per section 5.9 of this document.

## 5.8 *Firing*

Requirement: This test is to be performed with the gunsight attached to the gun which would have the most detrimental effect on the gunsight. The gun is to sequentially fire 5000 rounds of ammunition with lapses only sufficient to allow reloading (only one sight of each model needs to be subjected to the firing test).

Reference: NUREG-SR1556, Vol. 8, Appendix O

Equipment Used: 1 rifle

Test/Inspection Method: Between each test the gunsights are to be visually inspected to ensure there have been no detrimental effects of the tritium illumination vile within the telescope. The sights must also be tested per section 5.9 of this document.

This test is to be performed with the gunsight attached to the gun which would have the most detrimental effect on the gunsight. The gun is to sequentially fire 5000 rounds of ammunition with lapses only sufficient to allow reloading (only one sight of each model needs to be subjected to the firing test).

Sample Size: 5 units

Acceptance Criteria: Between each test the gunsights are to be visually inspected to ensure there have been no detrimental effects of the tritium illumination vile within the telescope. The sights must also be tested per section 5.9 of this document.

## 5.9 *Evaluation*

Requirement: After each test, the gunsight is to be immersed in water for 24 hours at ambient temperature. The volume of the water is to be about equal to 10 times that of the volume of the gunsight. After the gunsight is removed, the activity of the solution is to be measured. The activity of the solution is to be ≤ 50 nanocurries.

Reference: NUREG-SR1556, Vol. 8, Appendix O

Equipment Used: 5 beakers

Test/Inspection Method: After each test, the gunsight is to be immersed in water for 24 hours at ambient temperature. The volume of the water is to be about equal to 10 times (2500mL) that of the volume of the gunsight.

After the gunsight is removed, the activity of the solution is to be measured. This activity is measured by evaluating a 2mL sample. This sample shall have an activity of no greater than 88.8 DPM (Disintegrations for minutes).

Sample Size: 5 units

Acceptance Criteria: Between each test the gunsights are to be visually inspected to ensure there have been no detrimental effects of the tritium illumination vile within the telescope.

The activity of the immersion water shall not exceed 50 nanocuries (88.8 DPM for the 2mL sample).

## 6.0 Testing Summary

All five sights were subject to testing as described in ATP 902964. Tested sight serial numbers are as follows.

The part number tested is 902964-001 that is used for configuration identification, control, and status accounting of all hardware and documentation.

| Sight Serial Number |
|---|
| 902964-07-00101 |
| 902964-07-00103 |
| 902964-07-00107 |
| 902964-07-00109 |
| 902964-07-00110 |

The following testing result summary of the sights is the final testing of activity of the immersion water that shall not exceed 50 nanocuries (88.8 DPM for the 2mL sample).

## Results summary

| Sight # | Sight Serial Number | Acceptance Criteria | Actual Value | Pass / Fail |
|---|---|---|---|---|
| 1 | 902964-07-00101 | ≤ 88.8 DPM | 31.67 DPM | Pass |
| 2 | 902964-07-00103 | ≤ 88.8 DPM | 47.22 DPM | Pass |
| 3 | 902964-07-00107 | ≤ 88.8 DPM | 0.00 DPM | Pass |
| 4 | 902964-07-00109 | ≤ 88.8 DPM | 15.85 DPM | Pass |
| 5 | 902964-07-00110 | ≤ 88.8 DPM | 79.22 DPM | Pass |

In addition to the testing for activity of immersion water, the Beta-lights were removed from the sights and verified operational integrity is still present.

| Sight # | Sight Serial Number | Acceptance Criteria | Pass / Fail |
|---|---|---|---|
| 1 | 902964-07-00101 | Beta-Light still illuminates with no fractures to glass housing. | Pass |
| 2 | 902964-07-00103 | Beta-Light still illuminates with no fractures to glass housing. | Pass |
| 3 | 902964-07-00107 | Beta-Light still illuminates with no fractures to glass housing. | Pass |
| 4 | 902964-07-00109 | Beta-Light still illuminates with no fractures to glass housing. | Pass |
| 5 | 902964-07-00110 | Beta-Light still illuminates with no fractures to glass housing. | Pass |

IN CONCLUSION THE TESTING PERFORMED ON ALL SIGHTS DID NOT AFFECT THE OPERATIONAL PERFORANCE OF THE ILLUMINATION BETA-LIGHT WITHIN THE SIGHT.