REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. REPORT DATE *(DD-MM-YYYY)*	2. REPORT TYPE	3. DATES COVERED *(From - To)*
06-04-2022	Final	

4. TITLE AND SUBTITLE
Test Operations Procedure (TOP)
02-2-712A Automotive Winches

5a. CONTRACT NUMBER

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER

6. AUTHORS

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
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8. PERFORMING ORGANIZATION REPORT NUMBER
TOP 02-2-712A

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
Policy and Standardization Division (CSTE-TM)
U.S. Army Test and Evaluation Command
2202 Aberdeen Boulevard
Aberdeen Proving Ground, MD 21005-5001

10. SPONSOR/MONITOR'S ACRONYM(S)

11. SPONSOR/MONITOR'S REPORT NUMBER(S)
Same as item 8

12. DISTRIBUTION/AVAILABILITY STATEMENT

Distribution Statement A. Approved for public release; distribution is unlimited.

13. SUPPLEMENTARY NOTES
Defense Technical Information Center (DTIC), AD No.:

This TOP supersedes TOP 02-2-712 Automotive Winches, dated 20 January 1987.

Marginal notations are not used in this revision to identify changes, with respect to the previous issue, due to the extent of the changes.

14. ABSTRACT
This Test Operations Procedure (TOP) describes methods used to assess the performance and endurance of automotive winches, equipped with either steel cable or synthetic rope, that are accessory items on military wheeled and tracked vehicles.

15. SUBJECT TERMS
winch; steel cable; synthetic rope; snatch block; shackle; sheaves; winch drum;

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	B. ABSTRACT	C. THIS PAGE			19b. TELEPHONE NUMBER *(include area code)*
Unclassified	Unclassified	Unclassified	SAR	25	

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U.S. ARMY TEST AND EVALUATION COMMAND
TEST OPERATIONS PROCEDURE

*Test Operations Procedure 02-2-712A 6 April 2022
DTIC AD No.

AUTOMOTIVE WINCHES

*This TOP supersedes TOP 02-2-712 Automotive Winches, dated 20 January 1987.

1. SCOPE.

This Test Operations Procedure (TOP) describes methods used to assess the performance and endurance of automotive winches, equipped with either steel cable or synthetic rope, that are accessory items on military wheeled and tracked vehicles.

2. FACILITIES AND INSTRUMENTATION.

2.1 Facilities.

Item	Requirement
Dynamometer (or other suitable loading device)	Capable of resistive loading up to the maximum winch capacity.
Soft soil	Soil type and condition described in the test plan.
Longitudinal grades	Grades as described in TOP 01-1-011[1**].
Anchor point (dead man)	Suitable anchor point to prevent vehicle movement during test.

2.2 Instrumentation.

Devices for Measuring	Permissible Measurement Uncertainty(see NOTE 1)
Line speed (e.g., stopwatch or video, preferably time-synced with data acquisition)	± 0.1 second
Winch pull (e.g., strain-gauged load cell)	± 1%
Oil pressure (e.g., gauge transducer)	± 2% of full scale
Petroleum, oil, lubricant, motor temperatures (e.g., thermocouples)	± 1 °Celsius (°C)
Motor current	± 5%

** Superscript numbers correspond to Appendix C, References.

Devices for Measuring	Permissible Measurement Uncertainty(see NOTE 1)
Motor voltage	± 2%
Physical dimensions	± 0.2%

NOTE 1: The permissible measurement uncertainty is the two-standard deviation value for normally distributed instrumentation calibration data. Thus 95 percent of all instrumentation calibration data readings will fall within two standard deviations from the known calibration value.

2.3 Specialized Equipment.

a. High-speed cameras may be used to record areas of interest such as the winch drum during winch pulls to assist in any potential failure analysis.

b. Three dimensional scanning technology may be used before and after winch pulls to determine if and where any plastic deformation has occurred on the winch or its mounting provisions on the vehicle.

3. REQUIRED TEST CONDITIONS.

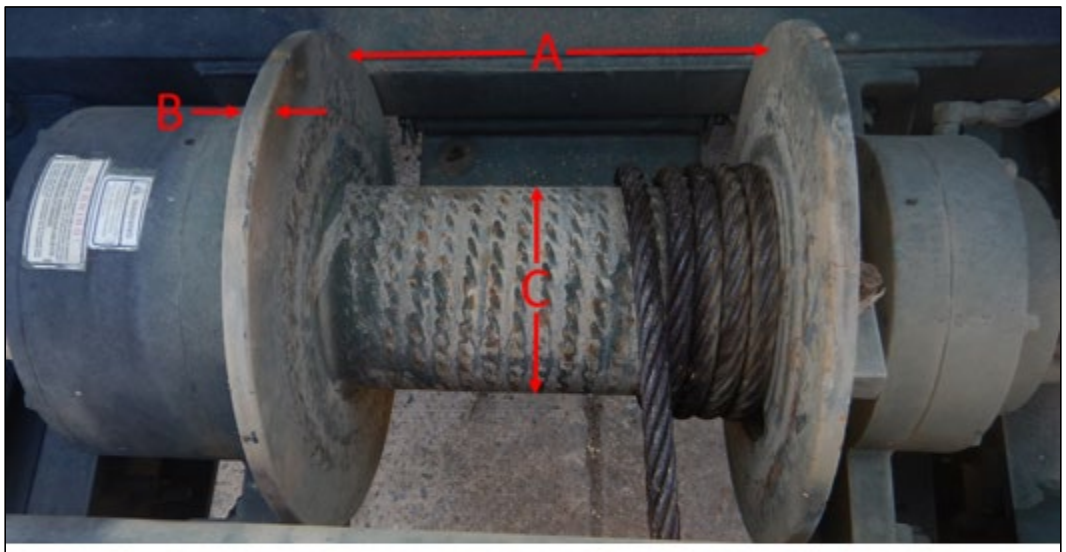
3.1 Preliminary Activities.

a. Inspect the winch, winch cable/rope, and all winching components/rigging gear (i.e., winch hook, snatch block, shackle, etc.) to ensure they are in a suitable operating condition. Record the manufacturer load ratings for each component. Nominal (design) breaking strengths for various types, classes, and sizes of wire rope are specified in Federal Specification RR-W-410[2], Wire Rope and Strand. Compare rated load of the winch to the winch line and all winch components. The ratio by which the rated breaking strength of the cable/rope should exceed the capacity of the winch is the safety factor. This safety factor should be compared to the prescribed safety factor before any loads are applied to the cable/rope. In lieu of guidance, the cable/rope should have a minimum safety factor of 2:1, however a 3.5:1 safety factor is preferred (Ente Nazionale Italiano di Unificazione (UNI EN) 14492-1[3], Power Driven Winches and Hoists and American Society of Mechanical Engineers (ASME) B30.7-2011[4], Winches). The maximum load applied to shackles, winch hooks, snatch blocks, and cable/rope thimbles should not exceed the corresponding working load limit (WLL) of each item (ASME B30.26-2015[5], Shackles - Selection, Use, and Maintenance, ASME B30.10-2019[6], Hooks: Selection, Use, and Maintenance, ASME B30.26-2015, Rigging Blocks - Selection, Use, and Maintenance, and Cordage Institute 2001-04[7], Fiber Rope Inspection and Retirement Criteria). Note that the maximum load applied to snatch blocks and components used to connect snatch blocks (i.e., shackles) could potentially be twice the rated load of the winch. In addition, synthetic rope

thimbles shall have a minimum diameter at the bearing surface of at least 2 times the rope diameter (ASME B30.30-2019[8], Ropes).

b. Determine if the winch is properly sized for the specific application or intended use. To determine the appropriate sizing of the winch for specific vehicle applications, compare winch rated capacity to applicable resistance (mire levels, overturning, etc.) calculations in Field Manual (FM) 4-30.31[9], Recovery and Battle Damage Assessment and Repair.

c. Measure and record drum diameter, cable/rope usable length and diameter, distance between drum flanges, drum flange thickness, and total number of cable/rope layers. The usable cable/rope length is determined with the manufacturer recommended minimum number of wraps on the first layer. The distance between drum flanges and drum diameter should be measured at multiple locations. These measurements should be repeated after completion of winch testing to determine if deformation occurred throughout testing. A photograph that details winch measurement locations and the recommended minimum number of measurements is provided in Figure 1.



A – Distance between drum flanges – At minimum, measurements should be completed in 90-degree increments around the inner and outer drum flange circumference, for a total of eight measurements.

B – Drum flange thickness

C – Drum diameter – At minimum, three measurements should be completed (left side, center, right side).

Figure 1. Winch measurement locations and recommended minimum number of measurements.

d. Measure and record, if applicable, the increase in vehicle length and the decrease in angle of approach or departure (as appropriate to winch location). Additionally, measure and record the weight distribution of the vehicle with the winch installed. Information will be used to determine changes due to the addition of the winch to the vehicle.

e. Determine if the winch is equipped with an overload protection device, and record details of such device. Typically, if equipped with overload protection, hydraulic winches will be regulated by hydraulic pressure supplied to the winch and electric winches will be regulated via control logic monitoring the current supplied to the winch. It may be required to contact the vehicle manufacturer to obtain specific details of the overload protection device.

f. Examine sheaves and drums to be sure that they are correct for the designated cable type and size. The recommended size of sheaves and drums is dependent on many factors such as line speed, frequency of use, and cable/rope properties. The winch manufacturer should be consulted to ensure the proper sizing of items is being used. In the absence of specific guidance, recommended minimum diameters from several sources is provided in Table 1.

TABLE 1. RECOMMENDED MINIMUM DIAMETERS (ABSENCE OF SPECIFIC APPLICATION GUIDANCE)

COMPONENT	RECOMMENDATION	SOURCE
Winch Drum (Vehicle recovery, intermittent pulls)	8 times the maximum recommended wire rope diameter	Society of Automotive Engineers (SAE) J706[10], Rating of Winches
Winch Drum (Industrial, construction, maritime, etc)	First layer pitch diameter of not less than 15 times the nominal diameter of the rope.	ASME B30.7-2011, Winches
Boom-hoisting sheaves	Pitch diameter of not less than 15 times the nominal diameter of the rope used	ASME B30.5-2007[11], Mobile and Locomotive Cranes
Load-hoisting sheaves	Pitch diameter of not less than 18 times the nominal diameter of the rope used	ASME B30.5-2007, Mobile and Locomotive Cranes
Load block (lower)	Pitch diameter not less than 16 times the nominal diameter of the rope used	ASME B30.5-2007, Mobile and Locomotive Cranes

g. Record method and location of attachment of winch cable/rope to winch drum. Record if the drum is over-wound or under-wound. For cable winch line, determine if the cable is left lay or right lay, and determine if the proper cable lay is being used for the specific cable anchor point and drum rotation. Guidance for determining proper drum attachment for specific cable lay is provided in Figure 2, as reproduced from Technical Manual (TM) 3-34.86[12], Rigging Techniques, Procedures, and Applications.

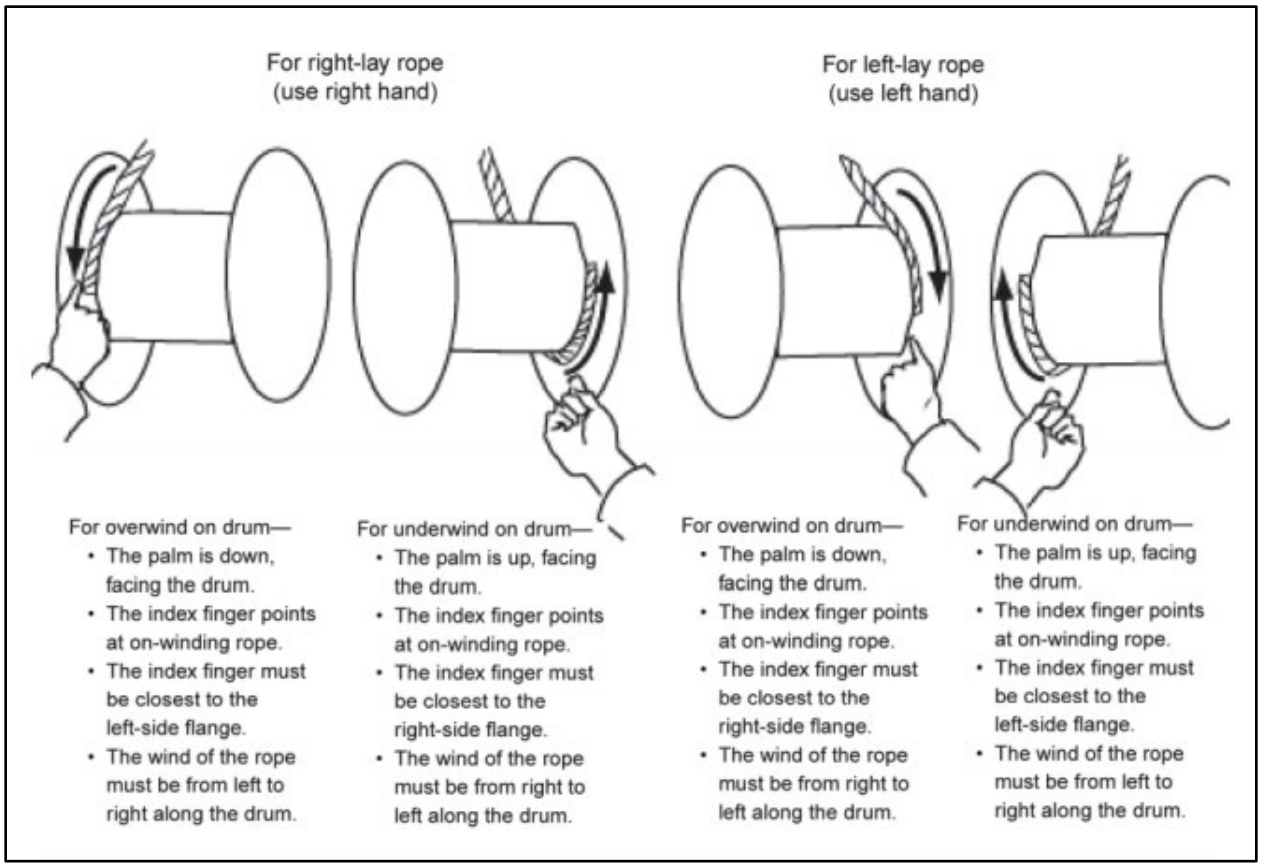


Figure 2. Determining starting flange of wire cable, reproduced from TM 3-34.86, Rigging Techniques, Procedures, and Applications.

h. Determine and record the manufacturer recommended duty cycle rating of the winch. Winch testing should not exceed the recommended duty cycle rating unless specified by the test plan. If guidance cannot be obtained from the manufacturer, hydraulic winches shall not be operated when the hydraulic reservoir oil exceeds the maximum operating temperature limit for the specific hydraulic oil used, typically 77 °C (170 °Fahrenheit (°F)). Electric winches should not be operated when the motor temperature (measured internally) exceeds 107 °C (225 °F). It is preferred to measure internal motor temperatures when possible.

i. Consult the vehicle Operating Manual to determine proper operating mode of the vehicle during winching operations. Typically, all winch operations are conducted with vehicle operating at high idle engine speed. Testing should be conducted with the vehicle operating as intended by manufacturer unless specifically stated in the test plan.

j. Typically, a break-in procedure is required for synthetic rope that requires a winch pull for a specified distance at a low line load. The winch manufacturer should provide information of the recommended break-in procedure. The break-in procedure should be

completed prior to any winch testing. Similarly, the cable/rope should be installed on the drum under a manufacturer-specified tension to prevent distortion and cable/rope bleed-through, and promote proper spooling. In lieu of manufacturer guidance, the installation tension should be 2.5 to 5 percent of the cable/rope's minimum breaking strength (ASME B30.30-2019, Ropes).

3.2 Test Controls.

a. During the test, maintain the engine and test components such as winches, boom, spade, traversing mechanisms, level winding devices, and winch in the proper operating condition.

b. Avoid extreme shock loads during the conduct of these tests, and disregard test results if winch failure occurs because of such loads.

c. Whenever the condition of the cable/rope precludes additional test operations, suspend testing until replacement cable/rope is installed. Wire cable and synthetic rope inspection details can be found in TOP 02-2-618[13], Towing and Recovery. Additional inspection information for synthetic rope can be found in Cordage Institute 2001-04, Fiber Rope Inspection and Retirement Criteria.

d. For hydraulic winches, the hydraulic system shall operate satisfactorily using the oils specified, and shall not be operated when the hydraulic reservoir exceeds 77 °C (170 °F) or other specified temperature. The winch shall not be operated beyond the manufacturer's rated duty cycle unless called out by the test plan.

e. For electric winches the electric motor shall not be operated beyond the manufacturer's rated duty cycle unless called out by the test plan. In lieu of, or in addition to adhering to duty cycle requirements, the temperature of the motor may be used as the test control. The winch manufacturer should provide the maximum temperature. If guidance cannot be obtained from the manufacturer, a maximum temperature of the winch motor shall be 107 °C (225 °F).

f. During the test, take all necessary safety precautions. Catastrophic failures could cause objects to be thrown great distances, or cables may fail and whip around any nearby object.

3.3 Safety Evaluation.

a. Controls for the winch must provide the operator with convenient and safe winch operation.

b. Adequate guards or shields must be provided to protect the operator should a cable fail, particularly when the controls are located near the winch.

c. The cable/rope must be of a size and type that will provide an adequate factor of safety and the maximum load applied to all winch components should not exceed the corresponding WLL (paragraph 3.1a).

d. Moving parts that may become a hazard to operating personnel should be fully enclosed or properly guarded.

4. TEST PROCEDURES.

4.1 Winch Capacity/Overload Protection and Brakes.

a. Properly anchor the vehicle and attach the cable/rope to a dynamometer or other suitable force loading device. Testing should be completed with the manufacturer specified minimum number of wraps on the first cable layer. A video recorder, focused on the winch drum and preferably synced with the data acquisition system, may be used throughout testing to assist in determining if slippage of the cable/rope occurs. The video recorder may also assist in assessing the automatic mechanical brake holding ability.

b. While winding the first cable/rope layer, increase load until the overload protection device functions, or if the winch is not equipped with such device, until the maximum rated capacity or overload value is reached. It is recommended to test winches without overload protection to 1.25 times the rated capacity, unless otherwise specified in the test plan. If a stall condition occurs on the winch throughout any portion of testing, continued testing should be completed at the corresponding line load.

c. At this time, check the automatic mechanical brake for its ability to stop and hold the load for 5 minutes after the removal of winch drive power.

d. A total of three test trials should be completed to determine if the results from testing are consistent.

e. Paragraphs 4.1a through 4.1d should be repeated on all rope/cable layers for winches equipped with overload protection to ensure the overload protection device functions properly. The rated line pull equation, as provided in paragraph 4.2.c, should be used as a guide for testing on each cable/rope layer.

4.2 Line Speed.

a. Determine winch line speeds with the cable loaded to 25-, 50-, 75-, and 100-percent of the rated winch capacity. If 100 percent of the rated winch capacity is not consistently attainable due to a winch stall condition or an overload protection device, testing can be completed at 90 percent of the rated winch capacity.

b. Line speed testing should be completed on each cable/rope layer, however at a minimum, line speed should be captured for the bare-drum and full-drum cable/rope layers.

c. The rated line pull is the line pull on any layer that results from the output torque that produces maximum rated line pull on the first layer. The rated line pull for each cable/rope layer

should be calculated in accordance with the equation provided in SAE J706, Rating of Winches, and reproduced as Equation 1.

$$P = P_{max} \frac{d+D}{d(2n-1)+D} \qquad \textit{(Equation 1)}$$

where:

P = rated line pull (pounds)
d = wire rope diameter (inches)
D = drum barrel diameter (inches)
n = layer number
P_{max} = maximum (first layer) rated line pull (pounds)

d. On each cable/rope layer tested, apply marks to the cable/rope of known distance. Synthetic rope can be susceptible to chemicals, which can weaken the rope; therefore, it is important to give consideration to the method used to apply marks to synthetic rope.

e. Obtain line speeds by timing the marks of known distance applied to the cable/rope as they pass a stationary reference point. For the most accurate results, it is recommended to use a video camera synced with the data acquisition system.

f. Complete a sufficient number of test runs to ensure consistent/repeatable results. At a minimum, three test runs should be completed at each test iteration.

g. Determine or calculate a line speed for each drum speed when multiple drum speeds are provided through varying gear ratios.

4.3 Overload Test.

Winch overload protection devices are historically inaccurate and may allow loads in excess of the rated capacity on the winch, particularly mechanically driven winches that use a shear pin for overload protection. The ability of the winch to withstand inadvertent overloading is determined by applying a test load 1.25 times the rated winch capacity while winding the first cable layer on the drum. For this test, the overload protection device is modified or adjusted to accommodate the increase loading.

4.4 Functional Test of System Components.

4.4.1 Boom.

a. For systems that have a boom, raise (or extend) the boom, without a load, from its travel position to maximum height (or length), and then return the boom to the travel position.

b. Determine the ability of the boom to lift, move, and lower the specified weights with the spade emplaced or stowed per specification.

4.4.2 Spade.

Evaluate the spade hoisting system for ability to stabilize the vehicle when winching or hoisting maximum specified loads and for ability to raise the spade to stowed position within the time limit specified.

4.4.3 Cab Traversing and Braking.

When appropriate, check the ability of movable cabs, turrets, or other crew compartments to traverse with the specified loads on the boom, with the spade stowed or emplaced on level ground or specified side slope, for compliance with the position, and determine the ability of the traverse brake to stop and prevent cab rotation.

4.4.4 Level Wind Device.

Evaluate the ability of the level wind device to provide proper wrapping of the cable under various loads throughout the winch tests.

4.5 Functional Tests of Winches.

Functional tests of winches require coordination with all equipment test stakeholders to determine both standardized test procedures and allowable variances in environmental conditions during testing.

a. Perform functional tests with the vehicle on a 60-percent longitudinal grade, or other grades as appropriate, by using a suitable anchor for the cable end and employing the winch to pull the vehicle with maximum payload up a representative portion of the slope.

b. The winch may be tested under conditions (such as soft soil) that immobilize the vehicle. Using another vehicle or tree as an anchor, extricate the immobilized vehicle under its own power.

c. In some instances it may be desirable to use the winch to right an overturned vehicle, recover an immobilized vehicle, or tow a vehicle over unpaved roads or various test courses.

4.6 Endurance Testing.

Conduct endurance tests of winches according to the intended application of the winch. In general, these tests consist of repeating winch operation for a prescribed number of test cycles in the manner described for the particular winch type. During these tests, all winches are operated following the manufacturer duty cycle rating of the winch unless otherwise specified. It is recommended that all winches complete some level of endurance testing to ensure full line pulls are conducted on the winch. Endurance test data also supports the determination of the winch's overall safety. Test data should identify any deformation or failures that occur after continued use. Test data should also identify wear of winch components that could cause an unsafe condition or premature failure of system components. Winch components should be inspected periodically between test cycles to track potential failures.

4.6.1 Self Recovery/Like Vehicle Recovery Winches.

The endurance test for front-mounted winches consists of up to 50 cycles of winch operation. The total number of cycles to be performed will be determined from predicted winch usage or the test vehicle requirements document. Each cycle will start on the first layer with the manufacturer specified minimum number of wraps and end after completing a full line pull with the load adjusted to 100 percent of the load capacity for each particular layer. If the winch is equipped with overload protection that prevents a consistent pull at 100 percent capacity the load may be reduced in increments of 10 percent until a consistent pull is attainable. After completing the full line pull, the load will be removed and the cable/rope will be payed out for the next cycle.

4.6.2 Wrecker Recovery Winches.

Determine endurance in the same manner as self-recovery/like vehicle recovery winches, except that up to 100 cycles of operation are completed.

4.6.3 Boom Hoist Winches (Non-Rotating).

Determine winch endurance by repeating the winch duty cycle, with periods of rest between cycles, until 8 hours of actual winch operation are accumulated. The winch duty cycle consists of hoisting and lowering the maximum rated load to and from the height specified. Each duty cycle is followed by a rest period equal to the duty cycle time. Rest period time is not counted toward operation time.

4.6.4 Boom Hoist Winches (Traversing).

The endurance test for these winches consist of 40 hours of operation divided into 20 2-hour lift cycles that are conducted periodically during the vehicle endurance test. A typical lift cycle would consist of the following sequences:

a. Handling the maximum permissible load at maximum boom reach for 40 minutes.

b. Handling the maximum permissible load at an intermediate boom reach for 40 minutes.

c. Lifting a load at the maximum rated capacity of the crane with or without boom jacks for 40 minutes.

4.6.5 Crane Winches.

Determine the endurance of winches used for materials handling cranes on cargo vehicles by conducting 125 cycles of loading and unloading the vehicle payload periodically during the vehicle endurance test. Conduct six cycles without resting the winch. During these six cycles, the crane system components must not overheat.

5. DATA REQUIRED.

5.1 Preliminary Activities.

a. Identification and description of winch, winch cable/rope, and winching components/rigging gear.

b. Manufacturer load ratings of each component.

c. Safety factor of rope/cable.

d. Analysis of winch capacity for specific application of intended use.

e. Physical dimensions of winch to include drum diameter, cable/rope usable length and diameter, distance between drum flanges, drum flange thickness, and total number of cable/rope layers. The distance between drum flanges and drum diameter should be measured at multiple locations. These measurements should be repeated after completion of winch testing to determine if deformation occurred throughout testing.

f. Physical dimensions and weight distribution of vehicle affected by winch installation, if applicable.

g. Details of overload protection device, if applicable.

h. Analysis of sheaves, and drums.

i. Cable/rope attachment method/location on drum.

j. If applicable, analysis of cable lay versus cable anchor point and drum rotation.

k. Details of manufacturer duty cycle rating.

l. Operating mode of vehicle (i.e., high idle) as specified in vehicle's operator's manual.

5.2 Safety Evaluation.

a. Details of winch controls including location of controls and length of cable for remote use.

b. Description and photographs of guards or shields.

c. Analysis of manufacturer load ratings of all winch components.

5.3 Winch Capacity/Overload Protection and Brakes.

a. Line loads achieved throughout the test.

b. Comparison of target line loads versus measured line loads for each cable/rope layer for winches with an overload protection device.

c. Time.

d. Hydraulic oil pressure and temperature (hydraulic winches).

e. Motor current, voltage, and temperature (electric winches).

f. Observations and photographs throughout the test.

5.4 Line Speed.

a. Target line loads for each cable layer.

b. Line loads achieved throughout the test.

c. Time for cable/rope to travel known marked distance.

d. Hydraulic oil pressure and temperature (hydraulic winches).

e. Motor current, voltage, and temperature (electric winches).

f. Observations and photographs throughout the test.

5.5 Overload Test.

a. Line load achieved throughout the test.

b. Time.

c. Hydraulic oil pressure and temperature (hydraulic winches).

d. Motor current, voltage, and temperature (electric winches).

e. Observations and photographs throughout the test.

5.6 Functional Test of System Components.

a. Details of each system component.

b. Time required to perform task (raise/lower, extend/retract, deploy/stow, etc).

c. Lift height/length, if applicable.

d. Details of test weights used, if applicable.

e. Observations and photographs throughout the test.

5.7 Functional Tests of Winches.

a. Details of test area.

b. Obtain the same data as in paragraph 5.3.

c. At the conclusion of testing, obtain the same measurements as in paragraph 5.1 to determine if deformation of components is present.

5.8 Endurance Testing.

a. Loads applied to winch throughout the test.

b. Number of pulls completed.

c. Time required to complete a full line pull.

d. Hydraulic oil pressure, or motor current and voltage should be collected at specific increments throughout the endurance test. These data can be compared to determine degradation in winch performance.

e. At the conclusion of testing, obtain the same measurements as in paragraph 5.1 to determine if deformation of components is present.

f. Observations and photographs throughout the test.

6. PRESENTATION OF DATA.

Tabulate and chart all performance data and test conditions and present in the final report. Sample tables for winch and component information are provided in Appendix A.

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APPENDIX A. SAMPLE TABLES FOR WINCH AND COMPONENT INFORMATION.

TABLE A-1. GENERAL SYSTEM INFORMATION AND FEATURES

COMPONENT	INFORMATION / DESCRIPTION	MANUFACTURER RATING
Winch	Manufacturer Model number Electric motor / hydraulic pump specs Max temperatures Duty cycle	Maximum rated line pull
Rope (cable)	Manufacturer Diameter Drum attachment method Winding method & rope lay Warning stripes Protective covers	Working load limit / breaking strength
Rope hook	Size Grade	Working load limit / breaking strength
Controller	Cable length Pinout	N/A
Fairlead	Roller / Hawse Finish	N/A
Accessories	Shackles Recovery straps Chains Snatch blocks Tree savers	Type Size Working load limit / breaking strength

APPENDIX A. SAMPLE TABLES FOR WINCH AND COMPONENT INFORMATION.

TABLE A-2. WINCH SYSTEM PHYSICAL DIMENSIONS

PARAMETER	PRE-TEST MEASUREMENT		POST-TEST MEASUREMENT	
	Date:		Date:	
	centimeter	inch	centimeter	inch
Drum diameter Left Center Right				
Distance between flanges 0° 120° 240°				
Drum flange diameter				
Rope hook, throat opening				
Rope hook, clevis inside width				
Rope hook thimble, inside width				
Winch mounting receiver (if detachable) Inside height / width Attachment pin diameter				
Winch rope length, total				
Winch rope length, useable (# wraps)				
Winch rope length/layer				
Total cable layers				

APPENDIX B. ABBREVIATIONS.

ASME	American Society of Mechanical Engineers
°C	degrees Celsius
°F	degrees Fahrenheit
FM	Field Manual
SAE	Society of Automotive Engineers
TM	Technical Manual
TOP	Test Operations Procedure
UNI	Ente Nazionale Italiano di Unificazione
WLL	working load limit

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APPENDIX C. REFERENCES.

1. TOP 01-1-011, Vehicle Test Facilities at Aberdeen Test Center and Yuma Test Center, 12 December 2017.

2. Federal Specification RR-W-410H, Wire Rope and Strand, 22 December 20215.

3. UNI EN 14492-1, Power Driven Winches and Hoists, November 2009.

4. ASME B30.7-2011, Winches, 10 April 2012.

5. ASME B30.26-2015, Chapter 26-1, Shackles – Selection, Use, and Maintenance, 7 October 2015.

6. ASME B30.10-2019, Chapter 10-1, Hooks: Selection, Use, and Maintenance, 21 November 2019.

7. Cordage Institute 2001-04, Fiber Rope Inspection and Retirement Criteria, January 2001.

8. ASME B30.30-2019, Chapter 30-1, Steel Wire Rope and Chapter 30-2, Synthetic Rope, 4 March 2019.

9. FM 4-30.31, Recovery and Battle Damage Assessment and Repair, September 2006.

10. SAE J706, Rating of Winches, August 2008.

11. ASME B30.5-2007, Mobile and Locomotive Cranes, 31 March 2009.

12. TM 3-34.86, Rigging Techniques, Procedures, and Applications, July 2012.

13. TOP 02-2-618, Towing and Recovery, 9 October 2018.

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APPENDIX D. APPROVAL AUTHORITY.

CSTE-CI 6 April 2022

MEMORANDUM FOR

Commander, U.S. Army Operational Test Command
Director, U.S. Army Evaluation Center
Commanders, ATEC Test Centers
Technical Directors, ATEC Test Centers

SUBJECT: Test Operations Procedure 02-2-712A Automotive Winches

1. Test Operations Procedure (TOP) 02-2-712A Automotive Winches, has been reviewed by the U.S. Army Test and Evaluation Command (ATEC) Test Centers, the U.S. Army Operational Test Command, and the U.S. Army Evaluation Center. All comments received during the formal coordination period have been adjudicated by the preparing agency.

2. Scope of the document. This TOP describes methods used to assess the performance and endurance of automotive winches, equipped with either steel cable or synthetic rope, that are accessory items on military wheeled and tracked vehicles.

3. This document is approved for publication and has been posted to the Reference Library of the ATEC Vision Digital Library System (VDLS). The VDLS website can be accessed at https://vdls.atc.army.mil/.

4. Comments, suggestions, or questions on this document should be addressed to U.S. Army Test and Evaluation Command (CSTE-CI), 6617 Aberdeen Boulevard-Third Floor, Aberdeen Proving Ground, MD 21005-5001; or e-mailed to usarmy.apg.atec.mbx.atec-standards@mail.mil.

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Director, Directorate for Capabilities Integration (DCI)

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