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Land Vehicle Tire Qualification

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LAND VEHICLE TIRE QUALIFICATION



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- Qualification for Land Vehicle Tires for Tires Successor Initiative (TSI) Contract
- Classifications
 - SAE J2014 / Manufacturer's Approved Part No.
 - Cooperative Approved Tire List (CATL)
 - Product Description (ZZ-T-391, ZZ-T-410, ZZ-T-1619)
- Qualification Process Dependent upon Classification
- Vehicle qualification testing inherently qualifies OEM tire for that vehicle system
- Replacement tires qualified via testing requirements per classification

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SAE J2014 / Manufacturer's Approved Part No. Tire Qualification Process

- Need or interest established for additional tire source for vehicle system*
- Testing criteria defined based on vehicle performance requirements (Vehicle Mission Profile, Military Requirements, etc.)*
- Testing funded by tire manufacturer unless Govt. determines critical need for second source*
- SAE J2014 test costs prohibitive (est. \$800K-\$1.4M)*
- Upon successful completion of testing/PM approval, tire P/N added to specific NSN*

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SAE J2014:

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- Society of Automotive Engineers' specification
- Pneumatic Tires for Military Tactical Wheeled Vehicles
- Developed by SAE Military/Industry Tire Technology Subcommittee
- Describes test and test methodology to evaluate tire and tire/vehicle related performance
- Tests required based on vehicle system and mission profile
- Used as basis for procurement for military vehicles
- Currently being updated per SAE Truck and Bus Military Industry Tire Task Force

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SAE J2014:

- Tire Traction 4.6
- Vehicle Evasive Maneuver 4.7
- Bead Unseating 4.8
- Rolling Resistance 4.9
- Dimensional Criteria 4.10
- Ride Handling and Stability 4.11
- Mechanical Reliability 4.13
- Tire Treadlife Durability 4.14
- Comparative Stopping Distance 4.15
- Tire Single Wheel, Skid-Resistance 4.16

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SAE J2014 4.6 Tire Traction

- Traction performance of candidate tire relative to reference tire.*
- Mud / Sand /Snow*
- No less than 95% of reference tire.*

SAE J2014 4.7 Vehicle Evasive Maneuver

- NATO Lane Change*
- Wet /Dry Pavement*
- Comparison to reference tire*
- Mixed Fitment (reference tire & candidate tire on same vehicle)*

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SAE J2014 4.8 Bead Unseating

- Determine tire/rim slip, air loss or bead unseating at minimum recommended inflation pressure*
- Figure 8 course
- Sand (moisture content as prescribed)
- Candidate tires as prescribed air loss (same as reference)

SAE J2014 4.9 Rolling Resistance

- In Accordance with SAE J1269*
- Rolling Resistance Coefficient of candidate tire not exceed reference tire by more than 5%*

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SAE J2014 4.10 Dimensional Criteria

- Measurements of Candidate Tire compared to Reference*
- Overall diameter, section width, weight, revolutions per mile, bead width
- Additional: deflection, spring rate, footprint at various loads/inflations
- Comply with T&RA or ETRTO
- Meet requirements for compatibility with reference tire

SAE J2014 Ride Handling and Stability 4.11

- Candidate tire must provide acceptable ride, handling and stability characteristics*
- Various course profiles specific to mission profile*
- Jury Ride evaluation equal or above reference tire rating (may be supplemented by instrumented data)*

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SAE J2014 4.13 Mechanical Reliability

- Tire durability in off-road conditions
- Durability course: washboard (as prescribed)
rock terrain (as prescribed)
cross-country (hills/curves with
embedded stones)
- 2400 miles duration (Inspection as prescribed)
- Criteria:
 - Candidate tire must exceed 95% of reference tire mileage
 - Candidate tire: less than two like failures or less than reference tire
 - Candidate tire equal to better than reference tire in Performance (*heel/toe wear, chunking, cutting, stone retention, physical appearance*)

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Failure Criteria:

- Broken or displaced belts or breakers
- Tread separation exposing casing
- Ply separation
- Bead damage / separation
- Severe open splices and/or liner separations
- Tire induced loss of air
- Exposed or broken casing
- Bulges in tread or sidewall

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SAE J2014 4.14 Tire Treadlife Durability

- 10000 miles duration
- Evaluate tread wear performance of candidate tire*
- Measurements at prescribed intervals*
 - Tread depth at centerline & shoulder*
 - Diameter, section width, tread arc width*
- Conducted on courses required for mission profile*

Criteria:

- Candidate tire exceeds 95% of reference tire mileage*
- Candidate tire less than two like failures or less than reference tire*
- Candidate tire equal or better than reference in Performance(heel/toe wear, chunking, cutting, stone retention, physical appearance)*

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SAE J2014 4.15 Comparative Stopping Distance

- Comparison of stopping distance of candidate with reference tire.*
- Wet / Dry Surface
- Candidate tire stopping distance no more than 5% greater than reference tire
- Mixed Fitment

SAE J2014 4.16 Tire Single Wheel, Skid-Resistance

- Candidate tire on test rig vehicle*
- ASTM E274
- Candidate tire peak and slide performance no less than 95% of reference tire*

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Other tests may be required in conjunction with SAE J2014 or specific to the vehicle system

Run flat test

- Performance of tire as part of tire/wheel/run flat system

Steady State Handling SAE J2181

- 200 ft diameter course
- Understeer gradient

Thermal Profiling

- Temperature measurements at centerline / belt edge

Backward Stability ANSI B30.5c

- Crane Application



COOPERATIVE APPROVED TIRE LIST (CATL)



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- CATL offers a list of approved tires qualified through limited testing
- CATL 1922 – Highway Tires
- CATL 1923 – Off Road Tires
- Grouped by Application (passenger, truck, etc.)
- Approved Manufacturers with tire brands listed

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History – Federal Tire Program/ Cooperative Tire Qualification Program (CTQP)

- (1966-1996) Qualified Products List (QPL) program for tires, managed in-house by the General Services Administration (GSA)
 - Past Names (Federal Tire Program, Qualified Products List, Quality Assurance Facility Inspection Program)
 - Past Standards
 1. Spec ZZ T-381 (Highway Tires)
 2. Spec ZZ T-1083 (Off Road Tire)
 3. Spec ZZ T-441 (Retreads)



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(History cont'd)

- (1997-2005) CTQP- Cooperative Tire Qualification Program
 - Contractor managed with government oversight
 - CATL – Cooperative Approved Tire List
 - Qualified tire products, manufacturers and retreaders are added to the CATL
 - The CATL is used by government agencies when purchasing tires and retreads
 - CPQC – Cooperative Plant Quality Certification
 - Standards Used
 - ASTM F 1922 (Highway)
 - ASTM F 1923 (OR)
 - CTQP 441 (for Retreads)
- (2005- Present) CTQP private contractor (ACTS) replaced with DLA to have overall management responsibility and Engineering Support Agency (ESA) remains with TARDEC

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- Historically, CATL used by government agencies when purchasing tires and retreads
 - Department of Defense (Land Vehicle Contract)
 - U.S. Postal Service
 - Department of the Interior
 - State, city and local governments
- Competitive within the approved sources
- DOD Land Vehicle Contract (145 NSNs)
- More cost effective than to test every NSN

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Standards Used

- ASTM F-1922, Standard, Test Method for Highway Tires
- CTQP-AM-1922 Administrators Manual for Highway Tire Tests

Test Requirements

- 20,000 miles - highway with limited gravel for certain applications
- Reference tires run on the same vehicle at the same time as candidate tires
- Tread Depth measurement of reference and candidate tires taken at specified intervals
- Candidate tires must complete the test and tread wear projections must be at least 95% of that of the reference tire

CATL 1922 Tires

Groups

- Group 1, passenger car tires
- Group 2, light truck tires
- Group 3, medium and heavy truck/bus tires, and Special Application tires

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Classification:

Group 1 Off-the-road tires used in intermittent highway service

Class ML (mining and logging)

Group 2 Earthmoving Mining and Logging tires used for short hauls, fork-lift tires, mobile cranes, shovels, mining cars, front end loaders and dozers.

Class C - (compactor)

Class E - (earthmoving)

Class L - (loader and dozer)

Group 3 – Road Grader

Class G - (grader)

Class TG - (traction grader)

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Standards Used

- ASTM F-1923 Standard Test Method for Off Road and Low Speed Tire
- CTQP-AM-1923 Administrator Manual for Off Road and Low Speed Tire Tests

Test Requirements:

- Off-road, low-speed tires measured and tested in the laboratory.
- Plunger Energy, tensile strength, ultimate elongation, and dimensional criteria must fall within specified limits.

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Test Evaluation Criteria

- CATL 1922 (20K Treadwear Test)
 - With control tires performing at 100% level for tread wear, the candidate tire must meet 95% projected mileage
- CATL 1923
 - Dimensional Criteria
 - Plunger Energy
 - Tensile Strength
 - Tread (1700 PSI)
 - Sidewall (900 PSI)
 - Ultimate Elongation
 - Tread (400% minimum)
 - Sidewall (300% minimum)

RETREADING ISSUES ^{UNCLASSIFIED}

- For testing, all tire casings furnished shall meet applicable requirements of Federal Motor Vehicle Standards 139, 109, 110, 117, 119 and 120 part 574; part 575.104; as well as state and local regulations, as applicable.
- Casings furnished for Style Y tires shall be from a tire purchased new in the United States which the original tread rubber has been worn off while in service in the United States.
- The retread facility's identification code shall be located on the same sidewall and as close as possible to the original casing manufacturer's DOT code.
- Any speed category codes and M&S designations that were placed on the casing sidewall by the new tire manufacturer shall also be removed.
- Retreaded tires submitted for testing shall meet the requirements in the Administrator's Approval and Requirements Manual for Tire, Pneumatic: Retreaded and Repaired (CTQP-441)

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REQUALIFICATION

- Once a tire manufacturer's particular model/retreading process of tire has been qualified, it shall remain qualified and be listed on CATL 1922 for a period of: four years for Group 1, five years for Group 2, and six years for Group 3. The period of qualification for CATL 1923 is 10 years for all groups.
- At the end of the appropriate time period, the manufacturer shall requalify the original tire model/retreading process which was submitted for qualification or any other tire model to which qualification was extended based on the qualification of the original tire model.

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Tires defined by Product Description (ZZ-T-391, ZZ-T-410, ZZ-T-1619)

- *Tire must meet product description and requirements by referenced specification*
- *Commercial item (agricultural, mining, skid steer, solid tires)*
- *Dimensional requirements (tire diameter, width, tread depth) must be in accordance with industry standards (T&RA, ETRTO)*
- *Tire must address additional requirements as defined in specification (ozone resistance, identification, carcass strength, etc)*



QUALIFICATION PROCESS



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QUESTIONS?

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