Rubber Track Undercarriage

For Cat® Compact Track Loaders





Management Guide

- Undercarriage Design and Function
- Factors Affecting Undercarriage Wear
- Operating for Minimal Wear and Best Results
- Track Tension and Adjustments
- Undercarriage Clean-Out
- Evaluation of Worn Components

CAT®

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Caterpillar designs and builds the robust undercarriage for the Cat Compact Track Loader (CTL) to set it apart from Cat Skid Steer Loaders and other competitive compact track loaders. The simple design lowers the machine's sensitivity to challenging underfoot conditions and adverse operation. CTL undercarriage is designed to fit your need for unmatched suspension, traction, flotation, speed, productivity and versatility in a wide range of environments.

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Manage it well. Make it last.

This guide gives you the tools to get maximum value from your Cat Compact Track Loader. Understanding how the undercarriage works and wears can help you minimize wear and keep operating costs down.

Following proper operation and maintenance guidelines puts you in control of the life and performance of your investment. And your Cat dealer is always available to answer questions and provide whatever help you need.



This management guide offers information, tips, and ideas but is not intended as a technical manual or a substitute for the advice and recommendations of our parts and service experts. By referencing this manual and following the recommendations in your Operation and Maintenance Manual, you can maximize the productivity, service life, and value of your Cat machines.



Undercarriage Design and Function

The steel-embedded rubber tracks on Cat Compact Track Loaders (CTL) do more than provide excellent traction control. Their unique design also contributes to high flotation, low ground pressure, machine stability and smooth ride.

Low owning and operating costs are attributable to the rubber-and-steel undercarriage that contains specialized components similar to what is found on track-type tractors. The undercarriage is designed to work as a complete system and is unlike any rubber-tired machine.



Steel-Embedded Rubber Track

The steel-embedded rubber tracks used on Cat CTLs are specially designed for durability in challenging environments.

Steel embeds provide rigid support the width of the track, distributing the weight of the machine over more area and reducing ground pressure. The embeds mate with the drive sprocket and transfer torque to ground. Guide tabs on each embed keep the track aligned by following the path provided by roller wheels and idlers. The embeds are sealed with smooth rubber, which provides an even rolling surface for roller wheels and idlers. Internal steel cables keep the track from stretching when tensioned as the tread pattern increases traction while maintaining a smooth ride.

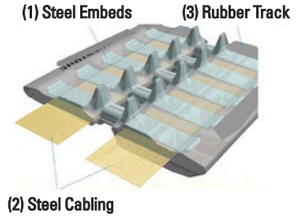
The tension at which the track is maintained is important; however, the system does not depend on high tension to drive the track as is the case on friction-drive track systems. Some slack in the track is normal. The Operation and Maintenance Manual that came with your Cat CTL will specify the proper track tension and tensioning procedure.

The Cat CTL track is a tough, durable component, and proper use can dramatically increase wear life and reduce owning and operating costs. Working in severe applications such as demolition, quarry, or scrap, where the undercarriage is exposed to sharp, ragged edges can significantly impact track and undercarriage component life.

The CTLs use a steel embedded rubber track. This industry standard track assembly relies on a system of embedded steel bars bound together with steel cables, which provide the strength and durability required for the undercarriage. A rubber track's footprint provides lower ground pressures and less ground disturbance to sensitive surfaces when compared to a wheeled skid steer loader.

Cat rubber tracks are designed to provide a smooth ride, low ground disturbance, and excellent traction.





The steel embeds (1) encased within the rubber track ensure rigid support from the entire width of the track. The steel cables (2) that connect these embeds provide tensile strength to ensure there is no stretch in the track. The cables are continuously wound around the entire track length, eliminating overlap joints that can often result in weak spots within a track construction. Each of the steel embeds have tabs, perpendicular to the track width. These provide a method for track guiding and ensure that the track does not slip or de-track. The rubber track (3) is constructed of an anti-gouge rubber compound for maximum cut resistance. This helps increase the durability of the track and allows for operation in a variety of applications and underfoot conditions.

Tensioning of the track is easily done using a simple recoil grease tensioner. The CTL undercarriage performs best when tensioned correctly, as improperly maintained tracks can lead to premature wear of all drive components. Periodic monitoring of tension will result in the best performance of both the undercarriage and the machine.

Drive System

Cat CTLs use external positive drive to transfer tractive effort from the power train to the track. Drive motors independently drive sprockets on the left and right side undercarriage. The sprockets engage the steel embed and, due to metal-on-metal contact, wear on these components is to be expected. When replacing track, it's a good idea to ask whether or not sprocket replacement is required. Sprocket teeth wear on opposing sides in forward and reverse. When drive sprocket wear is noticed, these may be exchanged from right to left to offer additional wear life for the undercarriage, lowering maintenance and repair costs. Always consult the machine's Operation and Maintenance Manual for detailed wear and replacement guides.

In common with larger Cat Track-Type Tractors, the CTL has an open elevated drive sprocket design. This elevated position helps bring the drive components up and out of the dirt, keeping them free from debris buildup and aiding in both the serviceability and durability of the drive components. Periodic cleaning of the drive sprocket area is recommended in order to minimize owning and operating costs.

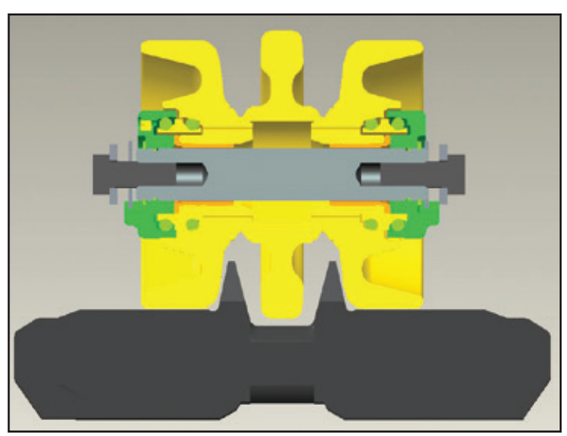
Planetary drive motors help increase the pushing power, or torque, of the CTL, ensuring the machine can be successfully operated within a variety of applications and underfoot conditions. The two-speed system allows for rapid operation and the fully independent torsion axle suspension system ensures a smooth and forgiving ride.

Roller Wheels

The Cat CTL has a simple and proven undercarriage roller system containing permanently sealed and lubricated, triple flange rollers as well as a dual or triple flange front idler and single or triple flange rear idler. These components, constructed from high strength austempered ductile iron, transfer the machine's weight to the steel embeds within the rubber track. The steel embeds are located in the track, which allows them to transfer the load over the width of the track and ensure low ground contact pressure and high flotation. As a comparison, a skid steer loader concentrates machine weight on the four points where tires contact the ground. The rollers also provide excellent durability in adverse conditions, such as operation in abrasive materials or where high material ingestion is an issue.

The Cat CTL undercarriage rollers incorporate heavy-duty metal face seals which are sealed for life. This design helps avoid contamination leaks, and provides a long service life for the bearings. This is proven technology as seen on B2 and C-Series Multi-Terrain Loaders as well as larger Cat Track-Type Tractors.

Mid Rollers



Triple-flange roller wheels help guide the track and provide a smooth ride by channeling the steel tabs of the track down the middle flange while the outer flanges roll on the thick rubber portion of the track. Many competitive models use the single flange front idler design with the idler operating on the steel embeds themselves. The Cat CTL design features a dual or triple flange front idler which operates with two flanges that roll along thick rubber on the inner surface of track, instead of the steel embeds, therefore improving the ride. The Cat CTL uses either a single flange rear idler design to improve wear life or a triple flange rear idler for maximum track retention and ride comfort.

Undercarriage Design and Function

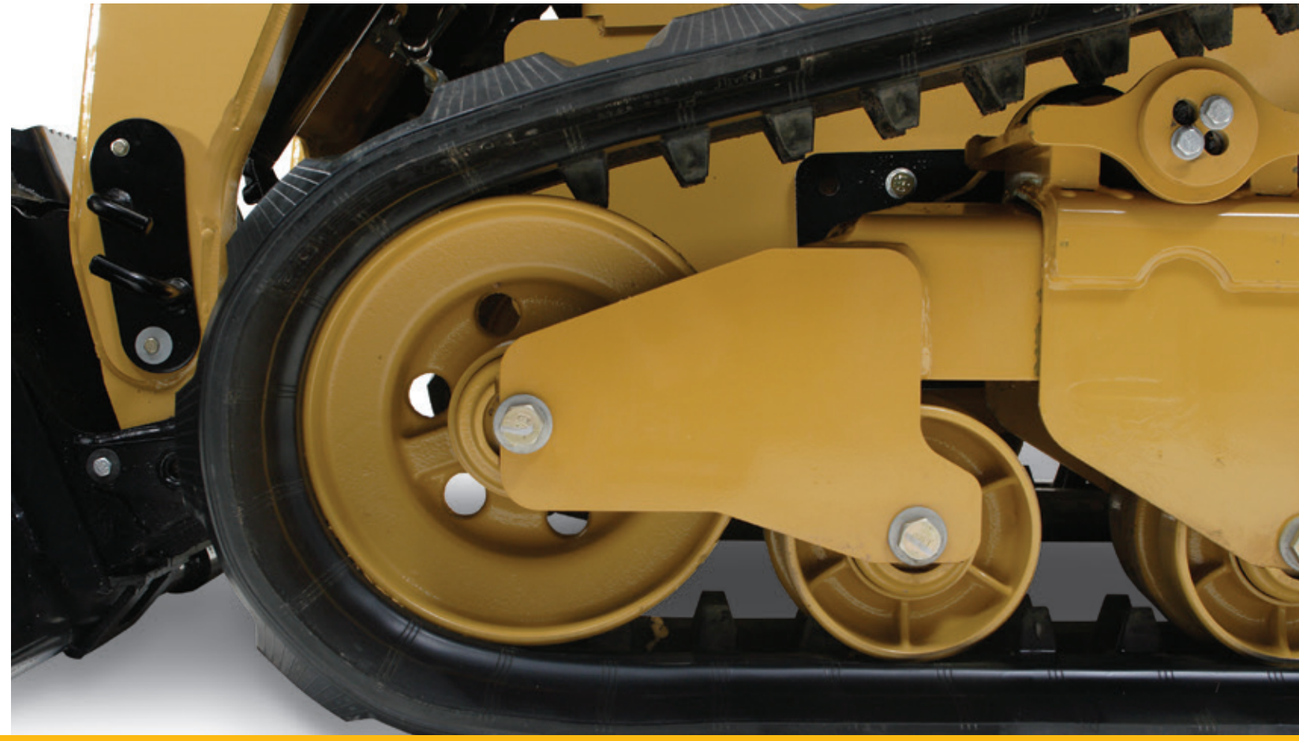
Suspension

Undercarriage on Cat CTLs feature a suspension system to improve traction and stability for better operator comfort and machine durability. Each undercarriage is mounted to the machine frame using four torsion axles—two in front and two in rear—which allows movement in an upward and/or downward direction. The left and right torsion axle pairs are independent of each other to allow separate pivoting of the left and right sides of the undercarriage. These independent axles help absorb shocks when riding over objects, providing a comfortable ride and maintaining constant track-to-ground contact over uneven surfaces with greater load retention (especially when using two-speed functionality equipped on some models).

Recoil

Track tensioning for the Cat CTL is a straightforward process. The undercarriage uses a recoil grease tensioner. This tensioning system consists of a recoil spring attached to the front idler and the most forward track roller. The recoil spring allows the frame to compress under high loads. This recoil absorbs and dissipates front impacts and prevents debris trapped in undercarriage components from stretching and damaging the track. The spring restores the frame after an impact event or upon removal of trapped debris.

With the steel embed type track, correct track tension is crucial. If a track is incorrectly tensioned it may compromise the life of the track and some of the undercarriage components. As a result, it is crucial to have the track tensioned to the correct specification. Please see the machine Operation and Maintenance Manual for details in checking track tensioning method. This method for track tensioning mirrors that of the larger Cat Track-Type Tractors.



Factors Affecting Undercarriage Wear

Several factors affect how fast a Cat CTL undercarriage wears. The key to maximizing productivity and service life of undercarriage components is to recognize these factors and make adjustments whenever possible to minimize their effect.

Application

The job application of a machine has a direct influence on undercarriage life. Common applications include excavation (digging), load and carry, trenching, dozing, and grading.

The amount of torque and horsepower required by an application has a direct impact on undercarriage component wear. Working any piece of equipment to its fullest potential will cause maximum wear to certain components. In general, tough applications—like excavation and dozing—maximize the torque and horsepower being transferred through the sprocket to the tracks and cause increased wear. Easier, less demanding jobs—including trenching and finish grading—require less torque and horsepower and cause minimal wear.

Underfoot Conditions

The material you work in can have as much or more of an impact on the service life of Cat CTL undercarriage components than some applications. In general, the more abrasive the material, the faster components wear. As an example, rocky, jagged material or construction debris can cause accelerated wear on some components of an undercarriage. Working on soft, loamy soil can reduce wear. When working on non-abrasive surfaces, such as turf and finished landscaping, there is generally reduced component wear.

Because they have high flotation, traction and versatility, Cat CTLs will work on any material, including scrap or demolition debris; however, harsh conditions may cause significant premature wear on the undercarriage. Consider the cost of replacing undercarriage components when working on any abrasive materials.

Operating Techniques

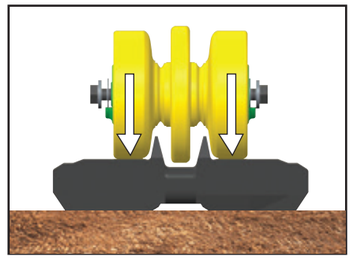
Proper operation of the Cat CTL is one of the most influential factors in undercarriage wear and operating costs.

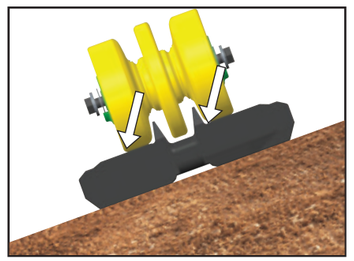
Aggressive operation may help get the job done faster, but it can also increase the rate of wear and overall operating costs. For example, making a quick change in travel direction by counter-rotating, can ingest material into the undercarriage and may cause unnecessary wear on the tracks and undercarriage components. Three-point turns are a good way of turning, when practical. Turning without counter-rotating may take more time but can extend the service life of undercarriage components. Only counter-rotate when necessary. Operating at the minimum ground speed required to complete the task will extend the service life of the track. The two-speed functionality allows for increased productivity on the job site and should be used when needed. However, higher operating speeds may accelerate undercarriage component wear.

Operating on slopes also accelerates wear. Adjust operating technique when on slopes to minimize wear. For more information, see the section on Operating for Minimal Wear and Best Results.

The terrain type—hilly, bumpy or flat—is another wear factor to consider. Working a CTL on a level surface can cause the least undercarriage wear, whereas working on rugged, heavily sloped terrain can cause components to wear faster.

Cat CTLs are designed to operate continuously on slopes no greater than 3-to-1. A 3-to-1 slope is defined as having one foot of rise for every three feet of run, or equivalent to an 18-degree slope. Machine stability and engine life are adversely affected if operated on slopes greater than 3-to-1.





On a flat surface (above), the track supports the full downward weight of the machine. However, on slopes (below), machine weight causes side loading and wear to roller wheels, guide-tabs, and guiding-surface of the track. Uneven or excessive wear to the edge of guide tabs or roller wheels is usually attributable to operating on slopes, and is normal. Adjust operating technique when on slopes to minimize wear. For more information see the section on Operating for Minimal Wear and Best Results. In addition, consult the Operation and Maintenance Manual for proper machine operation on slopes.

Maintenance Practices

The compact track loader undercarriage is not high-maintenance; however, following some simple preventive maintenance procedures maximizes service life and the value of your undercarriage components.

A properly adjusted track maximizes track service life and machine performance. Loose or overly tight track reduces service life and machine performance. See the following section on Track Tension and Adjustments for more information.

Cleanliness of the machine's undercarriage is also critical. Much of the wear to an undercarriage is caused by debris lodged between components. Some unnecessary wear can be avoided by keeping the undercarriage free of debris. See the section on Undercarriage Clean-Out for more information.

Cat CTLs use front and rear torsion axles for suspension that require daily greasing. The grease points are easily accessible from the ground. Regular greasing of the torsion axles is important to ensure the suspension system will continue to provide a comfortable ride and improved load retention while reducing shock and vibration throughout the machine. The CTL Operation and Maintenance Manual will specify the location and procedure for lubrication.

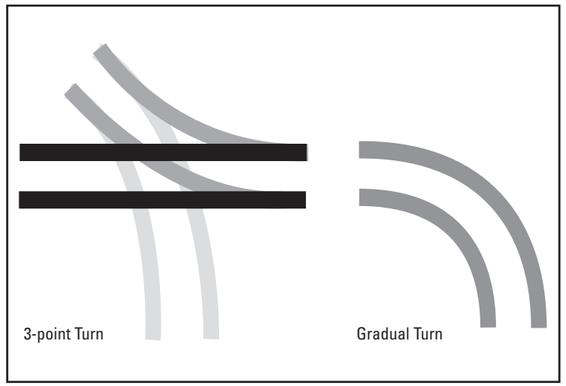


Operating for Minimal Wear and Best Results

Cat CTLs are built to withstand the rigors of quick, aggressive operation. However, adjusting your operating technique is a proven way to maximize undercarriage value and life. Operators familiar with similar equipment, such as skid steer loaders, will quickly maximize a compact track loader's productivity by taking advantage of additional traction, flotation, and stability. For operators making the transition from a skid steer loader to a compact track loader, it's important to remember that some adjustments in operating technique will improve results.

Turning Techniques

Any operator with skid steer loader experience knows counter-rotating, as a regular means of turning, is the quickest way to change direction. It is also the quickest way to wear out tires. A skid steer can readily counter-rotate because of the relative ease that tires can lose traction, skid, and spin. Counter-rotating a compact track loader, with significantly more tread on the ground and traction, is more difficult. Counter-rotating a compact track loader could lead to unnecessary wear on the tracks and other components.



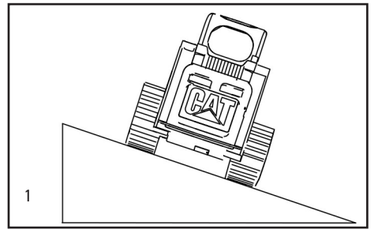
To help maximize the life of a compact track loader undercarriage, counter-rotations should be used only when required, such as in very confined areas. Instead, use more gradual, or 3-point, turns while slowly moving in forward or reverse.

Sharp turns on abrasive material, like jagged rock, will cause premature wear to the track and roller wheels. Gradual turns will minimize cuts and tears and help maximize undercarriage component life.

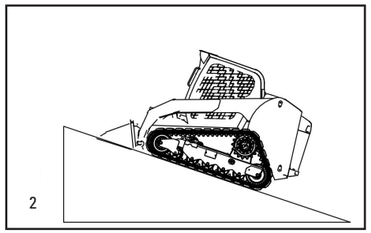
When turning on soft, sensitive surfaces make gradual turns. Sharp turns and counter-rotations can cause scuffing and unwanted material deposits.

Working on Slopes

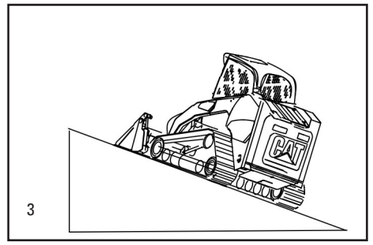
With significantly more stability than similarly sized wheeled machines, a compact track loader is ideal for use on slopes. All Cat CTLs are rated for work on slopes up to 3-to-1. As mentioned earlier, working across slopes (Illus. 1) can cause faster wear to undercarriage components. You can reduce unnecessary side-loading wear by operating up and down a slope, rather than across, whenever possible.



When working up and down a slope (Illus. 2), always keep the heaviest end of the machine uphill. You should also avoid unusually heavy loads and always keep loads as low as possible. Consult the Operation and Maintenance Manual for proper machine operation on slopes.



Turning when on a slope requires special attention. When turning to go DOWN a slope, first stop the machine. Then slowly turn the machine while backing down the slope (Illus. 3). When turning to go UP a hill, again, stop the machine, then turn the machine while you slowly back down the slope or until the machine is facing the desired direction of travel. Then carefully proceed forward.



Avoid making direct 90-degree turns when operating on a slope—either on a side hill or straight up and down. Sharp turns on slopes can cause unnecessary wear on track guides (tabs) and can shove material between the track and roller wheels. In some cases, this could lead to track derailment and track damage.

Working Over Transitions

A transition is any place you encounter a change in slope or elevation, such as where a level surface changes to a slope. A curb or ledge can also be considered a transition.

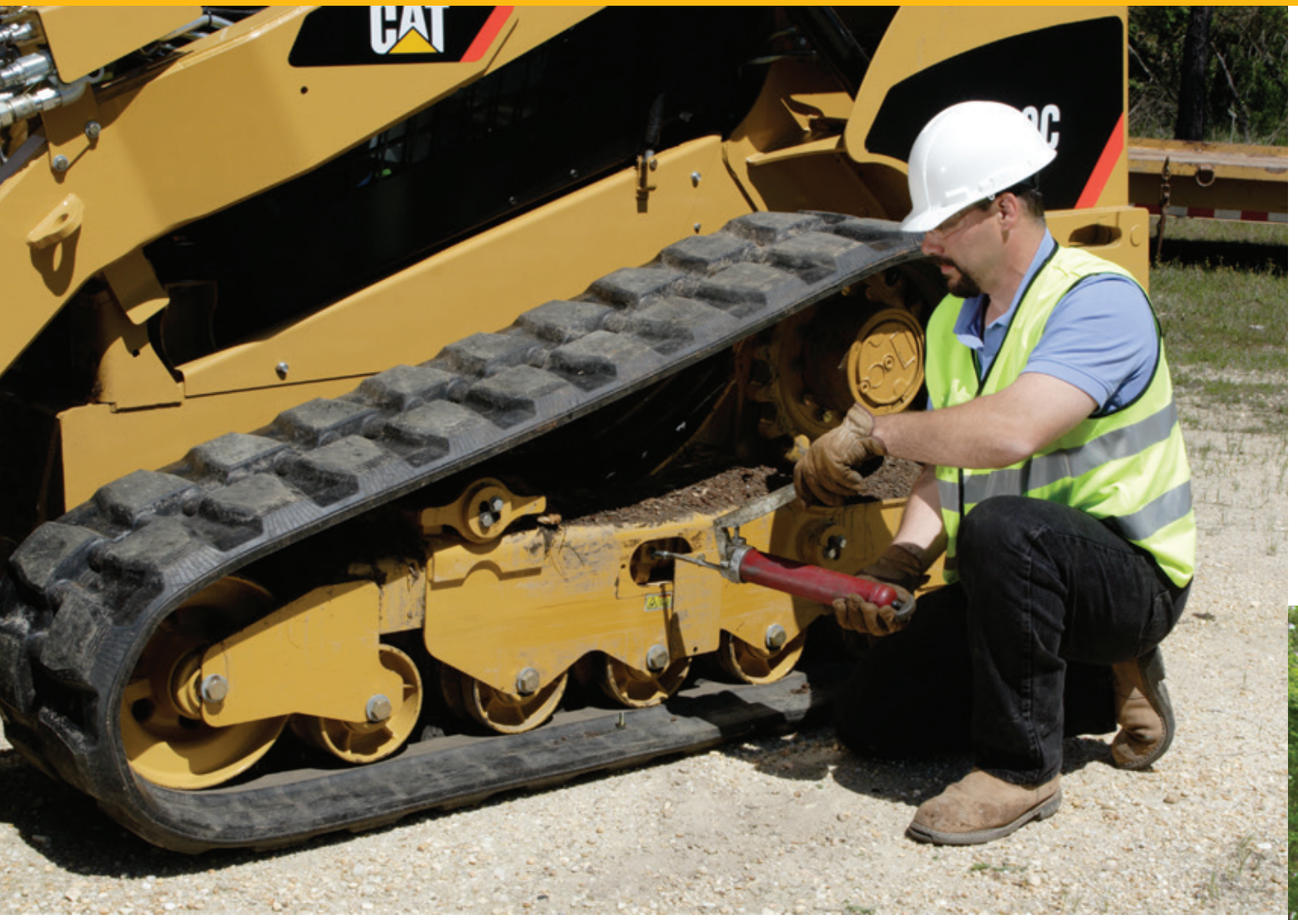
If you must travel over transitions, do so with the machine 90 degrees to the transition. Avoid working along a transition where one of the machine's tracks is not fully supported by the ground. Without the full support of the ground, the track and roller wheels are subjected to side stress that could lead to track derailment or track damage.

Backdragging

Some skid steer operators like to apply enough down force on the loader to raise the front tires off the ground, maximizing down-pressure on the bucket when backdragging. Using this same technique with a Cat CTL has the opposite effect—you lose traction, spin the track, and promote premature wear of the track and rear roller wheels.



Keeping the full length of track on the ground provides the most traction and takes advantage of the machine suspension. You can get excellent results and maximize the life of your undercarriage by backdragging with loader arms using the FLOAT function. If more down pressure is needed, the CTL suspension system will allow for additional down pressure to be applied without raising the undercarriage off of the ground. Add only the pressure required to smooth the surface.



Undercarriage Clean-Out

Your undercarriage is often exposed to mud, gravel, debris and other abrasive materials. Cleaning the undercarriage on a regular basis is recommended. How often the undercarriage needs to be cleaned depends on the material being worked in. A daily cleaning is normally sufficient. Cohesive and abrasive materials, like mud, sand, clay and gravel, should be cleaned out as often as possible, even several times a day, to reduce unnecessary wear to undercarriage components.

Pay particular attention to cleaning between roller and idler wheels and around the sprocket where material can accumulate. A pressure washer works well if available. If not, use a small shovel or similar tool to dislodge and remove foreign materials from the undercarriage, however, be careful not to damage any of the undercarriage components. If working in scrap or debris, remove any loose strands of material, such as wire, that can wrap around wheel axles.

When the undercarriage is cleaned can be a factor in how easy or difficult the job becomes. Removing materials like mud at the end of the day is much easier than trying to remove it the next morning after it has dried.

In cold climates or whenever freezing temperatures are expected between work shifts, we recommend running the machine forward and in reverse before shutting it down to reduce moisture and material build-up and help prevent freeze-ups.

Track Tension and Adjustments

The tracks on a compact track loader are critical components of the undercarriage. Proper track tension is required for optimum performance and maximum service life. Some slack in the track between the drive sprocket and front roller wheel is normal.

Please refer to the Operation and Maintenance Manual for recommended methods of checking and adjusting track tension.

Once new tracks have been adjusted, they normally don't need constant readjustment. However, periodically check the track tension. Tracks that are run out of the recommended tension specifications cause accelerated wear of undercarriage components. A track that is too loose can allow the track drive embeds to jump over sprocket teeth. This condition, called "ratcheting," can cause accelerated wear or damage to steel embeds or sprocket teeth. A track that is too tight also causes accelerated undercarriage wear. It's important to note that over-tensioning tracks (too tight) is not a solution for track derailments that result from improper operating techniques. Consult the Operations and Maintenance Manual for proper track tension, inspection and maintenance procedures and intervals.



Evaluation of Worn Components

Part Replacement

The replacement of worn components has a direct impact on the owning and operating costs of all equipment. Cat CTL undercarriage components are all designed to provide optimum performance and service life. When they have reached the end of their service life, components should be replaced immediately. Failure to replace worn components can lead to accelerated wear or failure of other related components, leading to higher owning and operating costs. Conversely, replacing worn components before the end of their service life, even though they may appear rough and worn, can also unnecessarily increase owning and operating costs. It's important to be able to evaluate worn components as either useable or non-useable.

Your Cat dealer is your best resource for evaluating worn components on all Cat equipment. Whenever possible, have a trained technician advise you when components need replacement.

The following section contains guidelines to help you understand the service limits of some key areas of your undercarriage that will wear during operation. By understanding how your undercarriage wears you can work with your dealer to plan for component replacement alleviating unplanned downtime.

Idler/Roller Wheels

The key functions of undercarriage idler/roller wheels are:

1. To distribute weight of machine from the frame to the track.

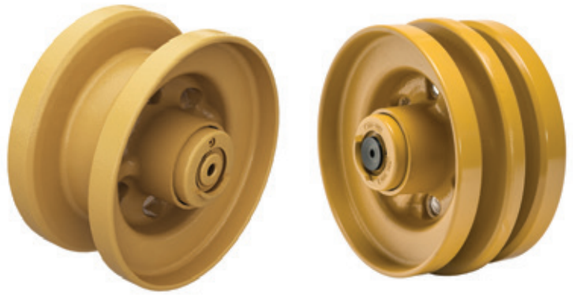
2. To guide the track.

Idler/Roller wheels are wear items and will need to be replaced periodically. Operation in abrasive conditions causes idlers and rollers to wear faster. If the wheels become damaged in a way that creates a sharp cutting edge or drastic unevenness, the wheel should be replaced immediately to prevent excess wear to the track. As long as roller wheels continue to function as described, there is no reason to replace them. Keeping the undercarriage free of rocks and debris helps reduce internal track wear caused by wheels grinding material against the track. A main function of the idlers and rollers is to guide the rubber track as it travels around the undercarriage. In some applications, the track tines will contact the inner webbing (does not include single flange idlers) of the roller or idler causing both the tine and roller or idler to wear.

Periodic checks of the roller or idler outer flange webbing thickness may indicate the need for a modification of machine operation or a 180 degree rotation of the roller or idler to move the worn side away from the track tine interaction.

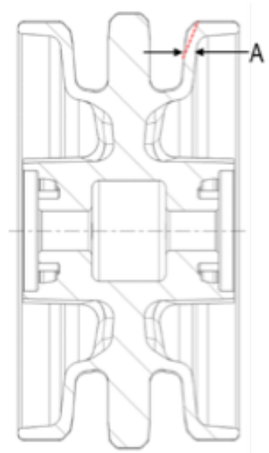
Side hilling applications, underfoot conditions, counter rotations and roller/idler misalignments can impact this wear.

The following charts contain the idler and roller wear measurement guidelines:



Rubber Track Triple Flange Idler/Roller, Dual Flange Idler

	Triple/Dual Flange Idler	Triple Flange Roller
Life	Wall Thickness (A) (mm)	
100%	9	15
75%	8	12.5
50%	7	10
25%	6	7.5
0%	5	5





Track

Because of the wide range of applications, materials and operating techniques possible with a Cat CTL, the service life of tracks may vary. Working in harsh materials can accelerate wear of the tracks, as does working continuously on slopes. In virtually all applications and materials, a set of tracks can develop scuffs, cracks, cuts, and missing rubber chunks. This is normal and does not necessarily degrade the performance of the machine. However, due to increased corrosive action, if at any time embedded steel cording within the track is exposed, immediate repair is recommended. Excessive operation in this exposed state could lead to a costly and inconvenient component repair. Cat dealer for repair information.

However, not all steel exposure in the undercarriage warrants repair. As Cat CTLs accumulate service hours, steel-guide tabs may shed their rubber. This type of wear is normal and expected, and is part of the break-in process.

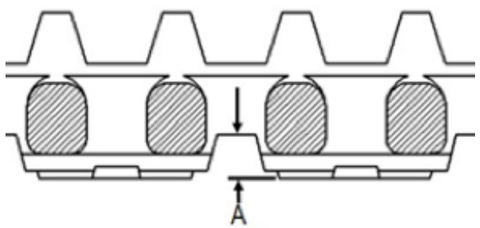
The key criteria to evaluating the serviceability of a track are:

1. A track must be able to maintain proper tension to be useable. A track that is torn or damaged to the extent that it can no longer maintain tension should be replaced.
2. Embeds should not continually skip over sprocket teeth or ratchet when the track is properly tensioned. If embeds continually ratchet because they are worn or damaged, the track and sprocket should be evaluated for possible replacement.

Track Tread Wear

This measurement will outline tread wear performance. Measurement should be taken from topmost portion of grouser to lowest level on top surface of track. Underfoot conditions and operating techniques will impact this wear.

	Block	Bar	General Duty
Life	Tread Depth (mm)		
100%	26	21	25
75%	21	17.5	20.5
50%	17	14.5	16.5
25%	12	11	12
0%	8	8	8

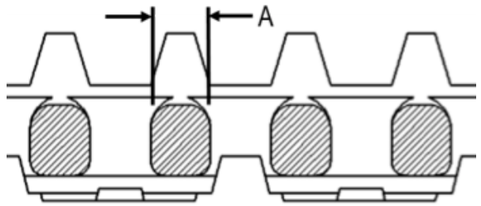


If tread depth is less than 8 mm, then the track should be replaced.

Track Bar Forging Wear

This measurement will indicate wear between sprocket and track interface. Underfoot conditions, operating techniques and maintaining proper track tension can impact this area for wear.

Life	Forging Width (mm) All Rubber Tracks
100%	40
75%	38.5
50%	37
25%	35.5
0%	34



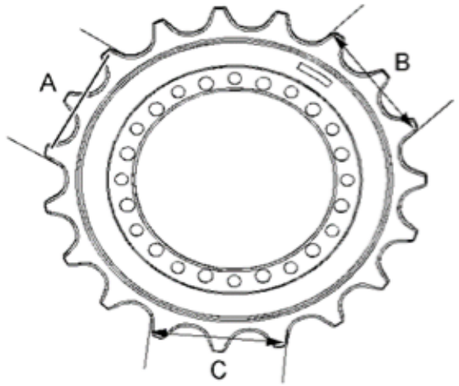
If track forging is less than 34 mm, the track should be replaced.

Drive Sprocket

The compact track loader's drive sprockets transfer horsepower and torque from the drive train to the track. The sprocket will wear naturally against the steel embeds of the track. When replacing the track, the sprocket should be evaluated for wear. The sprocket may need to be replaced at this time to maximize the life of the replacement track. In some cases, where minimal teeth wear has occurred, the sprocket may be rotated and reused for lower owning and operating costs. Underfoot conditions, operation techniques and maintaining proper track tension can impact this area for wear. If the average sprocket 3 tooth measurement is 50% wear, then change the sprocket to opposite side. If the average 3 tooth measurement reaches 0%, then replacement is needed.

	239/249/259	279/289/299
Life	Average Width (mm)	
100%	187	192
75%	181	185
50%	176	178
25%	170	172
0%	165	165





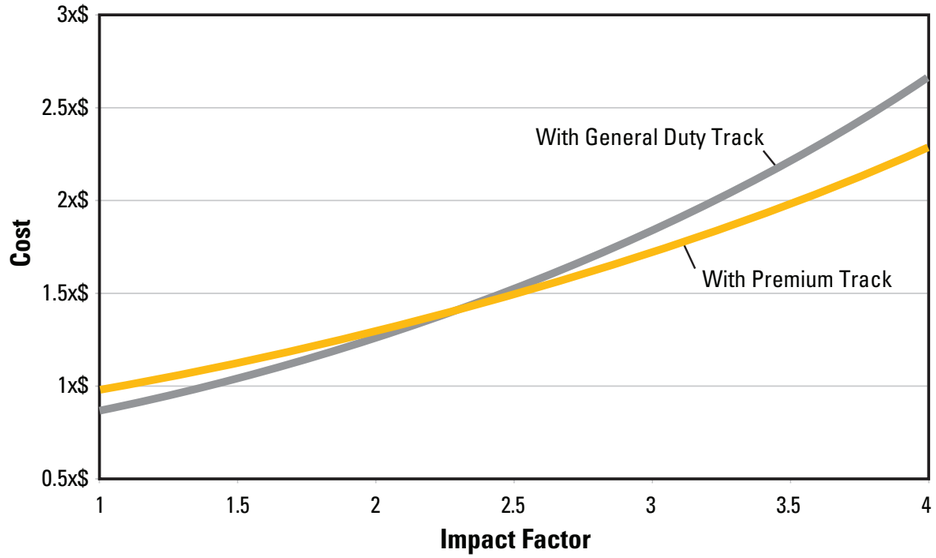


Working Conditions – Key Owning & Operating (O&O) Cost Factors

	Application	Operating Techniques	Underfoot Conditions	Maintenance Practices
1 – Excellent	Snow Material Handling Auger	3 Point Turns Doesn't Spin Tracks Rubber track trained operator	Snow Turf Concrete	**Daily** Cleaning, Track Tension Check, Inspection
2 – Good	Digging Grading Trenching	Stop track turns Pivot Turns Up & Down slopes	Dirt Mud Clay	**Weekly** Cleaning, Track Tension Check, Inspection
3 – Poor	Dozing Cold Planning Forestry	Counter-rotating Loaded Turning Spinning Tracks	Milled asphalt Rock 2" Dirt with 10-20% rock	**Monthly** Cleaning, Track Tension Check, Inspection Loosely follow OMM
4 – Bad	Recycling Demolition	Transition Turning Travel over curbs at speed	Stone >2" Dirt with 20-50% rock	**Rare** Cleaning, Track Tension Check, Inspection Do not know OMM

Increasing Impact on O&O

Increasing Impact on O&O



To see the impact of your practices on costs, please select the value that most often represents your practices for each of the categories below (1-4):

Application	(1-4) x 0.05	weighting factor ____	Total	____
Operating Techniques	(1-4) x 0.25	weighting factor ____	**Impact Factor (Total/4)**	____
Underfoot Conditions	(1-4) x 0.35	weighting factor ____		
Maintenance Practices	(1-4) x 0.35	weighting factor ____		

Expect more from the experts

Maximize the life of your undercarriage

To get the most out of your investment, it pays to know your undercarriage. Following the operating techniques and maintenance practices outlined in this guide can greatly extend service life. And your Cat dealer is ready to help – with parts and service solutions, or just some advice along the way. We're built to put you in control.

Call your Cat dealer with questions about machine operation, maintenance or service.

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