

C-SADDLE™

U.S. Patent No. 9,360,139 B1

“A LOW-FRICTION NON-CORROSIVE WEAR PAD SYSTEM”



C-SADDLES ARE THE NEXT GENERATION PROTECTION BETWEEN THE PIPE AND PIPE SUPPORT THAT STOPS DANGEROUS CREVICE CORROSION.

- **C-SADDLE** pipe wear pads are a major improvement on current technologies in crevice corrosion protection.
- What makes the **C-SADDLE** process so much better?
 - The **C-SADDLE** uses a flat sliding surface between the saddle and the pipe support.
 - Old technologies use the rounded surfaces of the fiberglass or PVC saddle as the contact points between the pipe and support. This leads to excessively high PSI point loadings on the support that result in accelerated wear to the old style saddles. The broken seal is now a trap for moisture and a hidden source of the dangerous crevice corrosion.
 - The flat sliding surfaces on the **C-SADDLE** can reduce the PSI point loading between the pipe and the support as much as 90%.
 - The flat sliding surfaces on the **C-SADDLES** keep the saddles directly under the pipe and will not allow the saddles to rotate from under the pipe, as is the tendency of the old style saddles.
- **C-SADDLES** use a superior wear resistant structural NSM nylon sliding pad that has solid lubricant imbedded in the material.
 - NSM Nylatron is over 300 times more abrasion resistant than Teflon with a similar coefficient of friction.
 - This same material is being used as boom sheaves in crane booms throughout the industry.
- **C-SADDLES** are perfect for your new construction jobs but work just as well in your maintenance and retrofit projects. You can get **C-SADDLES** in multiple colors through special orders.
- **C-SADDLES** are inexpensive and reduce maintenance cost.
- **C-SADDLES** with its peel and stick technology can easily be installed by your field personnel following our simple installation procedures.
- To learn more about **C-SADDLES** or to get ordering information, give C-Saddle a call at 888/364-6413 OR e-mail sales@clementcompanies.com.
P.O. BOX 62, CADE, LA. USA 70519 OFFICE: (337) 364-6413 TOLL FREE: (888) 364-6413



C-SADDLE, LLC

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GENERAL SPECIFICATIONS

C-SADDLE™

U.S. Patent No. 9,360,139 B1

A LOW-FRICTION NON-CORROSIVE WEAR PAD SYSTEM
FOR THE
PREVENTION OF CREVICE CORROSION
BETWEEN
PIPE AND PIPE SUPPORTS

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1. SCOPE

1.1. PRODUCT

This document contains the specifications for the *C-SADDLE*, a peel and stick wear pad with a proprietary adhesive and Nylatron[®] NSM Bearing Pad that provides inherent corrosion protection for a pipe or conduit at the interface with the pipe support. It is specifically designed for dynamic applications where the pipe can be expected to move through expansion, contraction and/or vibration, but can be used for all pipe/pipe support interfaces. The Nylatron[®] NSM Bearing Pad on the *C-SADDLE* has similar friction properties of Teflon but is approximately 300 times more abrasive resistant.

1.2. PROBLEM

At the point where a pipe comes in contact with the support, abrasion associated with pipe vibration and movement can wear away protective coatings on the pipe and pipe support. Without the benefit of a protective coating, the steel of the pipe will be in direct contact with the steel of the support. A corrosion cell is created and the moisture that collects at the contact point, or crevice, accelerates corrosion. This corrosion will cause pitting or other loss of steel wall, creating the potential for leaks and other failures.

1.3. USAGE

To avoid corrosion problems associated with pipe supports, companies often insert some form of “insulator” to isolate the pipe from its support. Traditional “insulators” require several steps to install, increasing cost. Likewise, traditional “insulators” do not have the physical properties necessary to withstand the stresses caused, by the point loadings due to the weight of the pipe, the pipe movement and outside environmental factors that affect the interface between a pipe and its support. Consequently, traditional “insulators” will wear out and will have to be replaced frequently, driving up maintenance cost. Some traditional “insulators” have to be drilled in order to hold them in place on the support. This will cause a natural weak point increasing the chances of a pre-mature failure. Normal epoxy glues are not designed to adhere to the most commonly used traditional “insulators”. When the epoxies lose their adhesion traditional “insulators” will walk out from under the pipe that it is suppose to be protecting.

1.4. ADVANTAGES

The *C-SADDLE* pipe wear pads have been engineered to be the ultimate corrosion protection wear pad system. This was achieved by combining the best features of the top most commonly used “insulators” that are on the market today, along with engineered adhesives designed for the

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C-SADDLE. *C-SADDLES* utilize a non-corroding Fiberglass Reinforced Pipe (FRP) support base that holds the specially designed non-corroding Nylatron® NSM Bearing Pad in place. Major Advantages of the *C-SADDLE* System are;

- 1.4.1. *C-SADDLES*, with its peel and stick feature, takes less than a minute to install and requires no mixing, special tools or training. Minimum pipe preparation is required.
- 1.4.2. *C-SADDLES* utilize a very high bond strength adhesive along with Nylatron® NSM Bearing Pad that will keep the *C-SADDLE* firmly secured to the pipe, when overcoming the friction between the pipe and pipe support associated with pipe movement.
- 1.4.3. Most traditional “insulators” because of their design create excessively high point loads between the pipe and the pipe support. In most cases the point loads created have PSI’s that exceed the yield strength of the insulating materials. The flat surface of the *C-SADDLE’S* Nylatron® NSM Bearing Pad increases the loading area on the pipe support. PSI loadings can be reduced over 90% extending the life of the *C-SADDLE*.
- 1.4.4. The flat surfaces of the Nylatron® NSM Bearing Pad on the *C-SADDLE* will keep the *C-SADDLE* firmly in place in the high vibration areas. *C-SADDLES* will not walk out from under your pipe.

2. PHYSICAL CHARACTERISTICS OF THE C-SADDLE PIPE WEAR PADS

2.1. COMPONENTS

- 2.1.1. The Fiberglass Reinforced Pipe (FRP) Shell Support Base. This FRP is built to conform to the outside diameter of the pipe.
- 2.1.2. 3M™ Adhesive (Doubled Sided) applied to the inside of the FRP Support Base at the factory with an exterior release liner for easy handling.
- 2.1.3. Nylatron® NSM Bearing Pad, is approximately 300 times more abrasion resistant than Teflon with similar friction coefficients to Teflon.
- 2.1.4. An Epoxy Adhesive is used between the Nylatron® NSM Bearing Pad and the FRP Support Base.

2.2. FIBERGLASS REINFORCED PIPE SUPPORT BASE

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- 2.2.1. Filament wound, fiber reinforced thermo set pipe (FRP)
- 2.2.2. Manufactured as ASTM 2296 Classification, Type 1, Grade 2
- 2.2.3. UV inhibitor incorporated into the resin matrix
- 2.2.4. Each FRP Support Base is manufactured using a mandrel representing the diameter of the pipe to be fitted, with an arc length between 60° and 90°, depending on the diameter of the pipe to be protected and the potential for movement of the pipe due to expansion, contraction and vibration. The length of the Support Base is depended upon on the application.
- 2.2.5. Physical Data:

Minimum Wall Thickness	0.375"
Temperature Resistance	Restricted by Adhesive
Hoop Tensile Yield	12,800 psi (ASTM D 2992)
Compression Yield	7,000 psi (ASTM D 695)
Flexural Yield	6,100 psi (ASTM D 790, ASTM D 2412)
Flammability	Will support oxidation when exposed to direct ignition, but will self extinguish when fire is removed

2.3. ADHESIVE LINER (BETWEEN PIPE AND C-SADDLE)

- 2.3.1. 3M™ VHB™ Acrylic Foam Tape
- 2.3.2. Modified, acrylic adhesive on both sides of the conformable foam.
- 2.3.3. Factory applied to the interior of the **C-SADDLE** FRP Support Base.
- 2.3.4. Exterior surface protected by release liner, removed prior to installation
- 2.3.5. Physical Data:



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Toxicity	None when used properly
Shelf-life	Unlimited
Color	Black
Service Temperature	-30° C to +121° C
Thickness	1.5 mm (approximate)
Density	640 kg/m ³
90° Peel Adhesion (Based upon ASTM D 3330)	N/100mm
Normal Tensile (ASTM D-897)	620 k Pa
Dynamic Overlap Shear (ASTM D-1002)	550 k Pa
Static Shear @ 22°C (ASTM D-3654)	1000-grams/weight that ½ square inch will hold 10,000 minutes
Static Shear @ 66°C (ASTM D-3654)	500-grams/weight that ½ square inch will hold 10,000 minutes
Dielectric Constant @ 1 kHz (ASTM D 150)	0.0065 Dissipation Factor
Dielectric Constant @ 1 MHz (ASTM D 150)	0.0506 Dissipation Factor
Dielectric Breakdown Strength (ASTM D 149)	455 (in Volts/mil)
Resistivity (Surface Resistance) (ASTM D 257)	>10 ¹⁶ (in ohms/square)
Resistivity (Volume Resistance) (ASTM D 257)	>2.5 x 10 ¹⁴ Volume Resistance (in ohms/cm)
Solvent and Fuel Resistance (Water, Salt Water, Hydraulic Fluid, 10W30 Motor Oil)	100% Adhesion Retention

2.4. Nylatron® NSM BEARING PAD



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- 2.4.1. Nylatron® NSM is a proprietary cast nylon 6 formulation containing solid lubricant additives which grant this material self-lubricity, excellent frictional properties, superior wear resistance and outstanding pressure-velocity.
- 2.4.2. Factory applied on the *C-SADDLE*.
- 2.4.3. Approximately 300 times more abrasive resistant than Teflon.
- 2.4.4. Contains UV inhibitors



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2.4.5. Physical Data:

Color	Grey
Density	1.14 g/cm ³
Melting Temperature	220° C
Thermal Conductivity @ 23° C	.29 W/(KM)
Coefficient of Linear Expansion – Average value between 23° & 60° C	80*10 ⁻⁶ m/(m*K)
Max Allowable Service Temp (in air)	165° C
Min Allowable Service Temp (in air)	-30° C
Tensile Stress @ Yield	76 MPa
Tensile Strain @ Break	25 %
Tensile modulus of Elasticity	3100 MPa
Compression Test – Compression stress @ 1/2/5% Nominal Strain	23/44/81 MPa
Charpy Impact Strength - Unnotched	≥ 100 kJ / m ²
Charpy Impact Strength - Notched	4 kJ / m ²
Izod Impact, Notched @23° C	4 kJ / m ²
Rockwell Hardness	M 81
Electric Strength	25 kV/mm
Volume Resistivity	>10 ¹⁴ ohm-cm
Surface Resistivity	>10 ¹³ ohm
Water Absorption, Immersion 24 hrs	40 mg
Water Absorption, Immersion Saturation	6.3 %
Flammability	HB



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2.5. ADHESIVE (BETWEEN Nylatron® Pad AND C-SADDLE BASE)

2.5.1. Epoxy Adhesive

2.5.2. Factory applied on the *C-SADDLE*.

2.5.3. Resist a wide variety of chemicals

2.5.4. Physical Data:

Toxicity	FDA Approved after curing
Shelf-life	1 Year
Color	Light Gray
Service Temperature	-275° F to + 200° F
Mixing Ratio, by Volume Resin (Part A); Cure (part B)	1 : 1
Flash Point (C.O.C.) Resin (Part A)	210° F
Flash Point (C.O.C.) Cure (part B)	180° F
Compressive Strength	8,000 psi
Barcol Hardness (Scale E)	80
Bond to Steel	1,200 psi
Bond to Concrete	Greater than Concrete

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3. APPLICATION CHARACTERISTICS OF THE C-SADDLE

- 3.1. No Interference with cathodic protection
- 3.2. Not Subject to cathodic disbandment
- 3.3. Super adhesion to pipe and almost any coating or synthetic wrap
- 3.4. Will not walk out from under the pipe.
- 3.5. Not subject to UV degradation
- 3.6. Excellent resistance to;
 - 3.6.1. Condensation, moisture and water
 - 3.6.2. Most Chemicals and Acids
- 3.7. A corrosion barrier not subject to physical degradation.

4. C-SADDLE ORDERING AND APPLICATION PROCEDURES

4.1. ORDERING INFORMATION

- 4.1.1. It is important that the *C-SADDLE* fit well. When ordering *C-SADDLES*, the outside diameter of the pipe to be protected should be included along with the length of the *C-SADDLE* required to fully isolate the pipe from the support with an overlap at each end. The recommended arc length of the individual *C-SADDLE* ranges from 60° to 90° and is a function of the diameter of the pipe to be protected and the degree to which the pipe is expected to move once the *C-SADDLE* has been installed.
- 4.1.2. Prior to installation, the dimension of the *C-SADDLE* should be checked against the pipe and the support to insure proper fit.

4.2. C-SADDLE APPLICATION

Please refer to the *C-SADDLE* Installation Procedure.



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INSTALLATION PROCEDURE

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INSTALLATION PROCEDURE

The **C-SADDLE** serves as a low-friction non-corrosive barrier by isolating the pipe from its support. **C-SADDLES** consist of a Nylatron® NSM Wear Pad on a fiberglass shell which has been lined with 3M™ Acrylic Foam Tape. The double-sided, high bond strength adhesive layer is protected by a plastic, release liner for a “peel and stick” application in accordance with the following installation procedure.

1. Without removing the plastic release liner, which protects the adhesive layer, place the **C-SADDLE** on the pipe to confirm that the **C-SADDLE** fits snugly.
2. Raise the pipe off of the support a minimum of 5/8” to facilitate the placement of the **C-SADDLE** between the pipe and the support. Care should be taken to raise the pipe at a perpendicular angle to the support so that when the pipe is lowered it will not side across the support
3. Use a wire brush to remove any loose scale or other material. Then clean the pipe using a 50:50 mixture of isopropyl alcohol and water. Wipe clean and inspect for any anomalies such as raised surfaces that would prevent the **C-SADDLE** from fitting snugly against the pipe. If there is any moisture forming on the pipe, it must be wiped dry before application of the **C-SADDLE**.
4. If the pipe is acceptable, peel the release liner from the interior of the **C-SADDLE**. To avoid contamination of the adhesive surface, immediately place the **C-SADDLE** under the pipe and center it on the support, making certain that the **C-SADDLE'S** shell extends beyond the support on each side. With the **C-SADDLE** in position, lower the pipe down onto the **C-SADDLE**. Assure that the Nylatron® NSM Wear Pad is in full contact and flat on the surface of the support.

The installation procedure for **C-SADDLE** being installed with the approved, provided adhesive is enumerated below. Direction concerning surface preparation and adhesive application is give with respect to the surface of the **C-SADDLE** that faces the pipe. The ambient air temperature and surface temperature should be within 40°F and 100°F. The adhesive will generally dry within 8 to 12 hours but can take upwards of 48 hours to develop fully.

1. Ensure surface of the **C-SADDLE** facing the pipe is scoured to increase bond strength of the **C-SADDLE** and the provided adhesive.
2. Raise the pipe off of the support a minimum of 5/8” to facilitate the placement of the **C-SADDLE** between the pipe and the support. Care should be taken to raise the pipe at a perpendicular angle to the support so that when the pipe is lowered it will not side across the support



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3. Use a wire brush to remove any loose scale or other material. Then clean the pipe using a 50:50 mixture of isopropyl alcohol and water. Wipe clean and inspect for any anomalies such as raised surfaces that would prevent the **C-SADDLE** from fitting snugly against the pipe. If there is any moisture forming on the pipe, it must be wiped dry before application of the **C-SADDLE**.
4. Following pipe preparations, apply a thin film (1/16" to 1/8") of adhesive utilizing cross-hatching or sweeping technique with the provided adhesive or epoxy. Ensure full coverage of the adhesive across the face of the **C-SADDLE**. Place **C-SADDLE** ensuring that it is seated centrally with respect to the support and parallel with the surface of the support. Place the **C-SADDLE** as soon as possible to reduce possibility of surface contamination.
5. Making certain that the **C-SADDLE'S** shell extends beyond the support on each side, lower the pipe down onto the support. Assure that the Nylatron® NSM Wear Pad is in full contact and flat on the surface of the support.

NOTE:

For high vibration applications or pipe with excessive movements, contact C-Saddle, LLC to insure the correct selection of the **C-SADDLE**.