



Metal Locking Service Inc.
MLS Machine Shop

"FIRST AID FOR METAL"

**CAST IRON
REPAIR
and
IN-SITU
MACHINING
for the
RAILROAD
INDUSTRY**



FDL Frame Repair



Metal Locking Service Inc.
MLS Machine Shop



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www.castironrepair.com

Metal Locking Service Inc. is happy to provide you with this detailed repair brochure for 16-cylinder FDL cast iron locomotive engine frames. We are a worldwide service provider specializing in field repair.

Metal Locking Service is accepted as the only company qualified for repairing FDL Engine frames. 5 decades and thousands of repairs have resulted in qualification for repairs to:

- Crosshead Guides
- Cam Bores
- Lube Headers
- Pan Rails
- Interior Walls and Ribs
- Mounting Feet
- Crankcase Windows

Our repair options will save your company significant money through reduced tear-down and shipping and/or frame replacement. We maintain a cooperative effort with various repair facilities for securing frames for cannibalization (removing of frame sections for use in the field).

We have secured several blanket order contracts with Class 1 railroads as well, please call us to see if you're covered. Some of our railroad customers include: Union Pacific, Norfolk Southern, Burlington Northern Sante Fe, Conrail, CSX, Kansas City Southern, Canadian National, Canadian Pacific and several regional companies.

While the focus of this brochure is on the FDL engine frame, we also repair other frame styles (Evolution Series, HDL, etc.) and components (forward end covers, power assemblies, water jackets, manifolds, etc.).

For a complete history and understanding of Metal Locking Service, please feel free to visit our website at www.castironrepair.com. We are proud to say that we are the oldest cast iron repair company in the world! Visit our website to see why we are also the best.

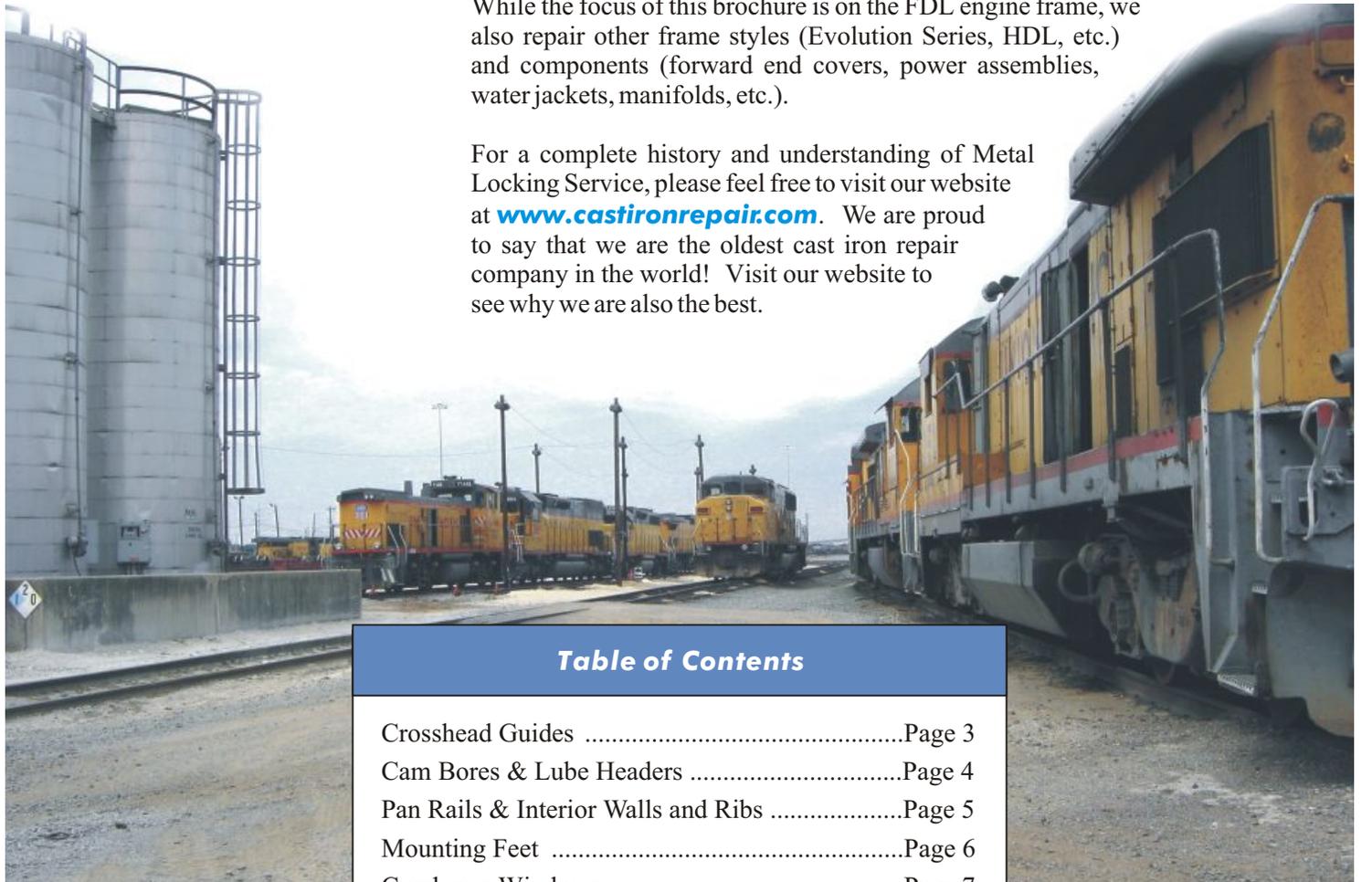


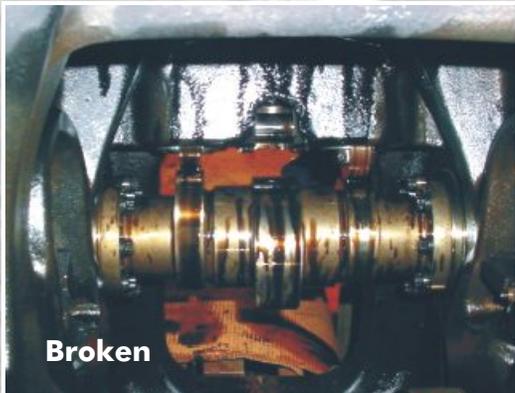
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FDL Engine Frame Repair CROSSHEAD GUIDES



Broken

Crosshead Guide damage can occur for various reasons. Some of the more common reasons are: liner failure, improper lifter lubrication or catastrophic failure of a neighboring component such as a broken connecting rod or cam section.

Typical tear-down requirements include: Removing a single power assembly, a single cam section, a window cover, the external fuel line and finally the flip-down walk plank. If these components are removed prior to our arrival, a typical repair can be accomplished in 4-5 working days.



Machining



Portable Boring System



Machined

Performed on-site
in Los Angeles,
California.



Completed Repair



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FDL Engine Frame Repair CAM BORES + LUBE HEADERS

Cam Bore damage usually occurs when a cam section fails due to improper lifter lubrication or a neighboring component failure such as a broken connecting rod. Damage can include: a worn or scored bore and/or a cracked or broken bore boss.

Typical tear-down requirements include: Removing all the cam sections from the forward end cover to the affected area (allows for the insertion of the line-boring bar), 3 window covers, a single power assembly, the external fuel line and the flip-down walk plant.



Cracked



Portable Equipment

Performed on-site in Winnipeg, Manitoba.



Line-Boring



O.E.M. Installation

Performed on-site in Concord, Ontario.

Lube Header damage typically occurs for two reasons only. Casting defects, referred to as "Chaplets", will result in a progressive crack that will eventually extend up and around the internal oil feed pipe. Neighboring component failure, most often a broken connecting rod, can also result in damage.

Typical tear-down requirements include: Removing 2 power assemblies, a single connecting rod, 2 window covers, the external fuel line and the flip-down walk plant on each side of the frame.



Chaplet Defect

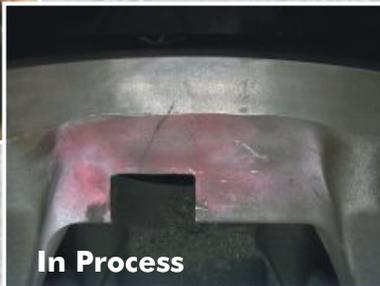


Repaired

Performed on-site in Roanoke, Virginia.



Broken



In Process

FDL Engine Frame Repair **PAN RAILS + INTERIOR WALL/RIBS**



Significant Damage

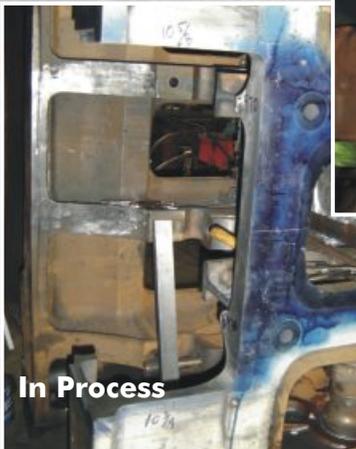
Pan Rail and Interior Wall & Rib repairs are usually caused by a broken connecting rod and/or cam section.

While some Interior Wall & Rib repairs can be done with minimal teardown, Pan Rail repairs usually require the removal of the engine from the cab. The oil pan will need to be removed and the frame supported adequately for safety and access purposes.

All repairs require the use of customer supplied utilities. (110v electric, 95psi air).



Repaired



In Process



Manual Process



Ready for Machining



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FDL Engine Frame Repair MOUNTING FEET

Mounting foot damage and/or separation occurs primarily after a locomotive crash or a rigging error when changing out a generator. Minor damage to the forward mounting feet can occur from typical operational stresses.

Typical teardown requirements include: Removing the engine from the cab and supporting adequately for safety and access purposes. The oil pan may or may not need to be removed depending on the amount of damage and the location of the crack(s).



Broken Mounting Feet



Positioning



Attaching



Verifying



Completed Repair



Forward Mounting Foot

Performed on-site in San Luis Potosi, Mexico.

FDL Engine Frame Repair

CRANKCASE WINDOWS



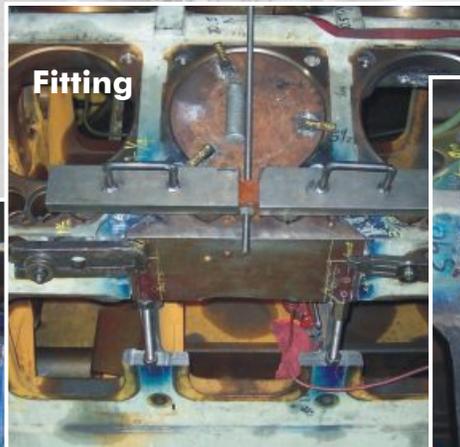
Crankcase Window damage occurs when a connecting rod fails and becomes wedged between the window and the crankshaft. The window is typically blown outward resulting in local crosshead guide damage. This is our most demanding repair as alignment of the replacement piece is critical for correct operation.

Typical tear-down requirements include: Removing the engine from the cab and stripping it down completely, washing or hot-dipping to remove all oils, shipping to our Buffalo, NY facility for repair.

We require a minimum of 3-4 weeks to repair at our shop.



Removal



Fitting



Metal Locked



Completed Repair



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