HOBART
FILLER METALS

Hobart® FabCOR® F6™

Metal-Cored Welding Wire for Welding Galvanized Steel

Stronger. Faster. To the Core.

Fuel Economy Driving Use of Lighter-Weight Galvanized Steel

Today's automotive manufacturers are faced with competing objectives. The challenge of complying with increasing fuel economy standards is driving them to make use of lighter-weight materials to reduce vehicle weight — without compromising vehicle strength or corrosion resistance. In this competitive environment, manufacturers must also keep a close eye on profitability by maximizing the efficiency of their operations.

Zinc-coated galvanized steel is quickly becoming the material of choice for automotive manufacturers seeking to satisfy all of these requirements. Often used in engine frames, cradles and suspensions, high-strength galvanized steel maintains its strength and corrosion resistance, especially in thinner gauges.

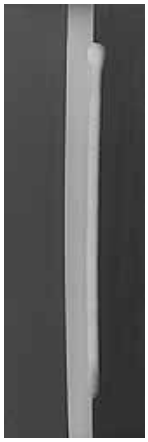
Welding Galvanized Steel

Many automotive manufacturers currently use solid wire or self-shielded, flux-cored wire in galvanized steel welding applications. With welding speeds between 18 and 24 inches per minute (IPM), these wires offer relatively slow throughput and expose many of the pitfalls of welding with galvanized steel, including:

- **Porosity —** gas bubbles caused by interaction with zinc coating can become trapped in the weld, causing defects that compromise steel strength; steel melts at 2,500°F; zinc melts at 782°F and boils/vaporizes at 1,665°F
- **Burn-through —** thinness of galvanized steel can result in weld burn-through defects, resulting in material loss, costly rework and reduced productivity
- **Poor weld penetration —** insufficient side-wall penetration reduces material integrity and can lead to premature weld failure
- **Spatter —** excessive spatter adds to the post-weld cleanup process
- **Zinc-coating —** requires specific welding techniques to maintain galvanized steel integrity

FabCOR F6, AWS E70G-CS

FabCOR F6 Weld



FabCOR F6 Weld X-Ray

Sound weld deposit at 40 IPM travel speed on 1.6 mm galvanized steel

Solid Wire, AWS ER70S-6

Solid Wire Weld

Solid Wire Weld X-Ray

Large volume porosity at 40 IPM travel speed on 1.6 mm galvanized steel

Pros and Cons of High-Strength Galvanized Steel

High-strength, zinc-coated galvanized steel allows a thinner gauge material to be used compared to those traditionally used in automotive manufacturing. It offers many advantages to manufacturers, but comes with important caveats.

Pros

- High corrosion resistance.
- Thinner gauges offer lower weight, better fuel economy.
- Exceptional strength maintains vehicle safety.

Cons

- Thinner materials have greater tendency to burn through for corrosion and rust.
- Zinc coating presents additional welding challenges (porosity and spatter).

FabCOR F6: Specifically Formulated for Robotic Automotive Applications

Hobart's new FabCOR F6 welding wire pairs perfectly with galvanized steel in robotic automotive manufacturing applications. FabCOR F6 is a gas-shielded, metal-cored tubular wire consisting of a metal sheath filled with metallic powders, alloys and arc stabilizers.

With an AWS classification of E70C-GS and a formulation that enables welding with our patent-pending direct current electrode negative (DCEN) straight polarity, FabCOR F6 provides significant advantages for the robotic welding of galvanized steel. The fine ball droplet transfer of our metal-cored wire, combined with higher current densities, deposit more metal into T fillet and T horizontal joints in less time than solid wire.

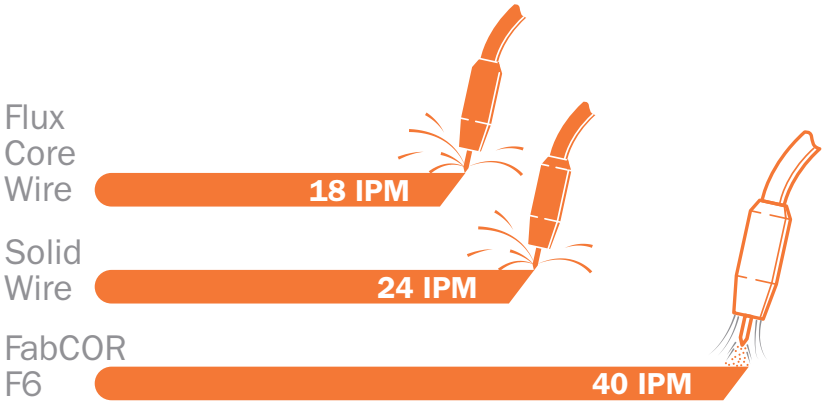
Its faster speeds, consistent weld penetration and reduced porosity preserve the integrity of galvanized steel while delivering significant efficiency and productivity improvements, such as:

- **Faster travel speeds —** robotic up to 40 IPM on galvanized steel
- **Stronger weld deposit —** maintains ductility, impact toughness and fatigue strength
- **High deposition rate —** increases productivity on single-pass, flat and horizontal applications
- **Excellent arc characteristics —** produce a constant wide bead weld with reliable gap bridging
- **Improved penetration profile —** offers consistent penetration from root to toe
- **Low burn-through rate —** soft arc penetration minimizes burn-through on thinner gauge steel
- **Reduced sub-surface porosity —** sufficient arc energy vaporizes zinc coating with minimal surface and subsurface porosity
- **Minimize spatter —** arc stabilizers improve metal transfer from wire to weld and reduce spatter

FabCOR F6 Comparison

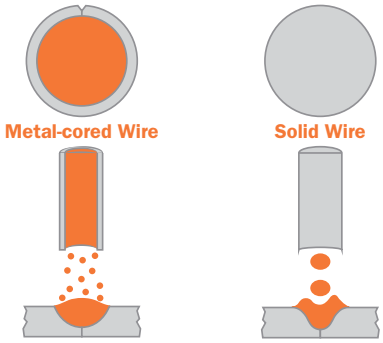
Attribute	FabCOR F6	Solid Wire	Aluminum/Bronze	Self-Shielded
Travel Speed	5	3	3	2
Spatter	5	4	5	2
Porosity	5	2	5	3
Bead Appearance	5	5	5	3
Efficiency	5	5	5	1
Cleanup	5	4	4	1
Initial Wire Cost	4	5	1	2
Total Welding Cost	**5**	**4**	**2**	**3**
RATING SCALE: (5) Excellent (4) Very Good (3) Good (2) Inconsistent (1) Problematic				

When welding on galvanized steel, FabCOR F6 is the superior wire with respect to all welding considerations: labor, costs and efficiency.



Faster, more productive

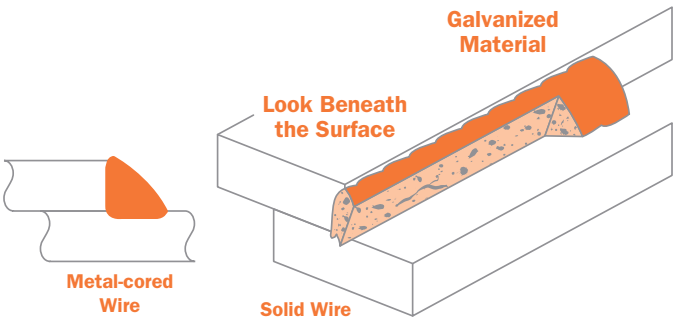
At welding speeds of 40 inches per minute (IPM), FabCOR F6 increases throughput and meets production quotas in less time, using less equipment, space and overhead.



Higher deposition, consistent penetration

More metal deposited in joint compared to solid wire

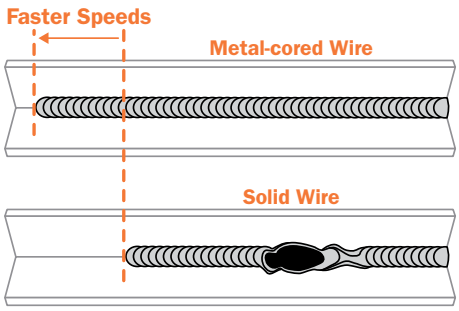
Fine ball droplets transfer creates wide bead weld with good gap bridging



Minimize sub-surface porosity

Sufficient arc energy to vaporize zinc coating and minimize porosity

Low defect rates

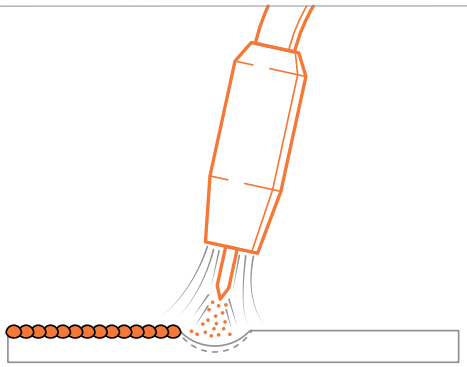


Reduce potential for burn-through

Softer arc penetration

Minimize loss of material

Optimized for thinner material



Decrease potential for spatter

Arc stabilizers improve metal transfer from wire to weld

Reduces post-weld cleanup

Understanding Traditional Welding Costs

Welding costs are attributed to four primary components: labor, filler metal, shielding gas and power. Labor is far and above the most cost-intensive aspect, so finding ways to reduce rework and related expenditures is the key to keeping overall welding costs down.

3% Shielding Gas

Direct	Indirect
Gas type	Smoke generation
Gas flow rate	Spatter generation
Gas leaks	Penetration

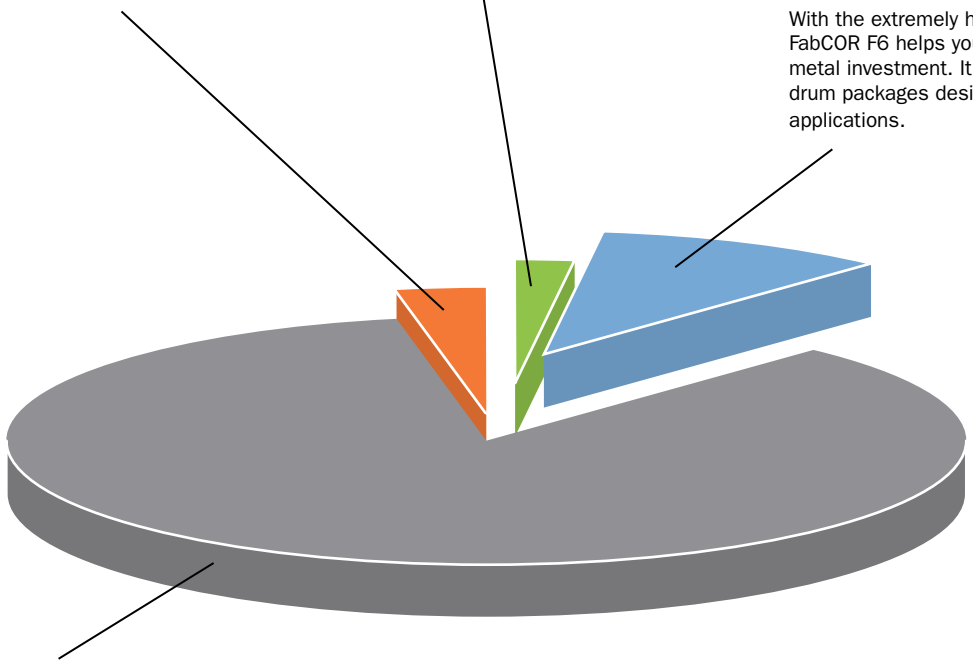
2% Power

Peak demand
Line draw
Power source

10% Filler Metal

Filler metal cost per pound
Packaging
Wire diameter
Deposition efficiency

With the extremely high deposition rates, FabCOR F6 helps you maximize your filler metal investment. It's also available in drum packages designed for automated applications.



85% Labor

Pre-weld activity	Weld activity	Post-weld activity
Weld joint preparation	Welding	Grinding and blending
Sand blasting	Repositioning	Removing spatter
Part assembly	Changing tips	Weld inspection
Grinding and buffing	Cleaning nozzles	Weld repair
Anti-spatter application		Part straightening
Pre-cambering		Part removal

Post-weld repairs are extremely costly, and porosity, followed by burn-through are the most likely causes of weld repairs. Often burn-through is not repairable and must be scrapped. Not simply a matter of removing the damaged part and absorbing the loss, this involves halting production to remove the part, sending it for repairs and then integrating it back into the production line.

FabCOR F6 offers the lowest potential for defects when welding galvanized steel.

FabCOR F6 Gives Automotive Manufacturers a Competitive Edge

The use of galvanized steel in automotive applications is here to stay. Its lighter weight helps meet fuel economy standards, and its strength and durability ensure that vehicles will still keep passengers safe. However, welding galvanized steel requires special considerations. The success of an automotive manufacturer's production is in part due to their ability to maximize the integrity and productivity of the galvanized steel welding process.

That's why Hobart developed its all new metal-cored FabCOR F6 wire formulation: to exploit the speed and efficiencies of robotic welding, improve strength inherent to galvanized steel welds, and reduce costly rework. Not only does FabCOR F6 produce higher deposition rates, it also delivers reliable gap-bridging and quality weld penetration that preserves the steel's impact toughness. At the end of the day, its faster travel speeds and lower defect rates allow automotive manufacturers to increase throughput and grow their bottom line.

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