

Recommended GM Steel Reparability Matrix

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Steel ID Stamping Symbols ⁴	Grade	GM Specifications	Welding Method			Cold repair	Use of Heat for repair	Temp. Range	Maximum Heat
			MIG	RSW	MIG Braze ¹				
	Mild Steel	GM6409M (all) GMW2M (all)	Yes	Yes	Yes	Yes ²	Yes	Up to 1200 °F (650 °C)	90 sec. x 2
	Laminate steel		NO	Yes	NO	Yes ²	NO		
	Bake Hardened	GM6093M (all) GMW3032M(all)	Yes	Yes	Yes	Yes ²	Yes	Up to 1200 °F (650 °C)	90 sec. x 2
	Solid Solution-Strengthened		Yes	Yes	Yes	Yes ²	Yes	Up to 1200 °F (650 °C)	90 sec. x 2
	High Strength, Low Alloy	GM6208M (all), GM6218M(all), GM3032M(HR CR grades)	Yes	Yes	Yes	Yes ²	Yes	Up to 1200F (650 °C)	90 sec. x 2
	Dual Phase ≤799 MPA min. UTS	GMW3032M (HR DP and CR DP grades) GMW3399M (HR DP, CR DP and HR HE grades with TS<800MPa)	Yes	Yes	Yes	Yes ²	No	N/A	N/A
DPX  ≥800MPA	Dual Phase ≥800 MPA min. UTS ³	GMW3399M(all other HR DP, CR DP and HR HE Grades)	Yes ³	Yes	Yes ³	No	No	N/A	N/A
M  B 	UHSS ³ Martensitic ³ Boron (PHS/Hot-Stamped) ³	GM6123M (all) GMW3399M (all MS grades) GMW14400	Yes ³	Yes	Yes ³	No	No	N/A	N/A

¹ Must use 8mm x16mm slotted holes

² Cold repairs can be performed if damage excludes kinks.

³ Mig Plug Only, NO STITCH WELDING. These steels may NOT be used as a backer for stitch welding. NOTE. Deviation from this chart is ONLY allowed if there has been a crash analysis completed by the Design Engineer and a Service procedure has been written. NOTE number values are tensile strength

⁴ ISO Symbol for repair.

Note: GM does not endorse repair of door impact beams.

Dual phase Steels up to DP 800 may be sectioned with a sleeve or backer plate.

Note: GM does not endorse the repair of door impact beams.

Descriptions of GM Steel

Grade	Alloy Content	Heat Treatment	Typical Applications	Comments
Mild Steel, Bake Hardened, Solid Solution Strengthened	Low	Fully Annealed/Dead Soft	Body Panels (Closures, floor pan, dash panel, etc.)	
High Strength Low Alloy	Low	Fully Annealed/Dead Soft	Rails, Structural Members	Strengthened with fine particles and small grain size
Dual Phase	Medium (Manganese, Silicon, Molybdenum, Chromium)	Fully Annealed/Partially Hardened	Rails, Structural Members	15-50% of structure is "hard" martensite
Ultra High Strength Steel (Martensitic, Boron)	Low	Fully Hardened	Rocker reinforcements, door beams, bumper beams	100% of structure is "hard" martensite
TRIP (Transformation Induced Plasticity) Steel	High (Manganese, Phosphorus, Silicon, Aluminum)	Fully Annealed/Partially Hardened	TBD	Complex microstructure for high strength and ductility

Mild Steel

This information provides repair recommendations and general guidelines for steel classified as Mild Steel. This type of steel normally has a tensile strength less than 270 MPa. This includes the common steel names of:

- Mild Steel
- Bake Hardenable Steel (BH)
- Solid Solution Strengthened Steel

General Motors recommends the following when repairing or replacing this type of steel during collision repair.

Recommended Repairs:

- Cold repairs can be performed on this type of steel, unless the damage includes kinks. If the damage includes kinks, the part should be replaced.
- Controlled use of heat can be used to repair damage, if the heat does not exceed 1200°F (650°C). The heat should be applied a maximum of 2 times, for up to 90 seconds.
- Sectioning or partial replacement of this type of steel is recommended only at approved locations, in a specific sectioning procedure.
- This type of steel can be used as a sleeve, or backer plate, when recommended in a specific sectioning procedure.
- Squeeze Resistance Spot Welding can be used to replace factory spot welds, where applicable.
- MIG plug welding and MIG stitch welding can be used on this type of steel.
- MIG Brazing can be used on this type of steel.

High Strength Low Alloy Steel

This information provides repair recommendations and general guidelines for steel classified as High Strength Low Alloy Steel, also known as HSLA. This type of steel normally has a tensile strength range from 300-700 MPa. General Motors recommends the following when repairing or replacing this type of steel during collision repair.

Recommended Repairs:

- Cold repairs can be performed on this type of steel, unless the damage includes kinks. If the damage includes kinks, the part should be replaced.
- Controlled use of heat can be used to repair damage, if the heat does not exceed 1200°F (650°C). The heat should be applied a maximum of 2 times, for up to 90 seconds.
- Sectioning or partial replacement of this type of steel is recommended only at approved locations, in a specific sectioning procedure.
- This type of steel can be used as a sleeve, or backer plate, during sectioning procedures.
- Squeeze Resistance Spot Welding can be used to replace factory spot welds, where applicable.
- MIG plug welding and MIG stitch welding can be used on this type of steel.
- MIG Brazing can be used on this type of steel.

Ultra High Strength Steel

This information provides repair recommendations and general guidelines for steel classified as Ultra High Strength Steel, also known as UHSS. This type of steel normally has a tensile strength greater than 700 MPa.

This includes the common steel names of:

- Ultra High Strength Steel (UHSS)
- Martensitic Steel (MS)
- Press Hardened Steel (PHS)
- Boron Steel

General Motors recommends the following when repairing or replacing this type of steel during collision repair.

Important:

- Repair of this type of steel is not recommended.
- This type of steel should be replaced only, at factory joints. Sectioning or partial replacement is not recommended.
- The use of heat to repair damage is not recommended for this type of steel.
- Stitch Welding is not recommended for this type of steel.
- This type of steel can not be used as a backing reinforcement or a sleeve for a sectioning joint.

Recommended Repairs:

- Squeeze Resistance Spot Welding can be used to replace factory spot welds, where applicable.
- MIG plug welding can be used to replace factory spot welds.
- MIG Brazing can be used to replace factory spot welds.

Dual Phase Steel

This information provides repair recommendations and general guidelines for steel classified as Dual Phase Steel (Dual Phase Steel with a tensile strength up to and including 800 MPa), also known as DP. General Motors recommends the following when repairing or replacing this type of steel during collision repair.

Important:

- The use of heat to repair damage is not recommended for this classification of steel.

Recommended Repairs:

- Cold repairs can be performed on this type of steel, unless the damage includes kinks. If the damage includes kinks, the part should be replaced.
- Sectioning or partial replacement of this type of steel is recommended only at approved locations, in a specific sectioning procedure.
- This type of steel can be used as a sleeve, or backer plate, when recommended in a specific sectioning procedure.
- Squeeze Resistance Spot Welding can be used to replace factory spot welds, where applicable.
- MIG plug welding and MIG stitch welding can be used on this type of steel.
- MIG Brazing can be used on this type of steel.

Ultra High Strength Dual Phase Steel

This information provides repair recommendations and general guidelines for steel classified as Ultra High Strength Dual Phase Steel (Dual Phase Steel with a tensile strength greater than 800 MPa), also known as DPX. General Motors recommends the following when repairing or replacing this type of steel during collision repair.

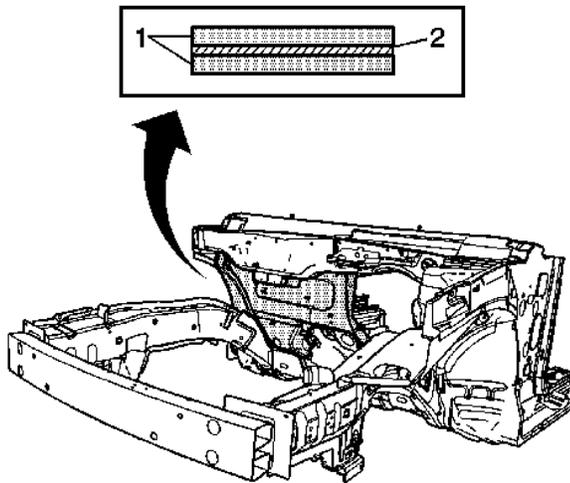
Important:

- Repair of this type of steel is not recommended.
- This type of steel should be replaced at factory joints only. Sectioning or partial replacement is not recommended.
- The use of heat to repair damage is not recommended for this type of steel.
- Stitch Welding is not recommended for this type of steel.
- This classification of steel can not be used as a backing reinforcement or a sleeve for a sectioning joint, unless a specific procedure is available.

Recommended Repairs:

- Squeeze Resistance Spot Welding can be used to replace factory spot welds, where applicable.
- MIG plug welding and can be used to replace factory spot welds.
- MIG Brazing can be used to replace factory spot welds.

Laminated Steel



This information provides repair recommendations and general guidelines for steel classified as Laminated Steel. This type of steel is constructed by bonding 2 pieces of cold rolled steel (1) with a viscoelastic layer of adhesive (2).

General Motors recommends the following when repairing or replacing this type of steel during collision repair.

Important:

- The use of heat to repair damage is not recommended for this type of steel.
- This type of steel should be replaced at factory joints. Sectioning or partial replacement is not recommended.
- This classification of steel can not be used as a backing reinforcement or a sleeve for a sectioning joint.
- The use of MIG Plug and Stitch Welding is not recommended for this type of steel.
- The use of MIG Brazing is not recommended for this type of steel.

Recommended Repairs:

- Cold repairs can be performed on this classification of steel, unless the damage includes kinks. If the damage includes kinks, the part should be replaced.
- Adhesive bonding with specified rivets can be used to replace factory spot welds, when a specific procedure is provided.

- Squeeze Resistance Spot Welding can be used for full panel replacement to replace factory spot welds, where applicable.