Premium Chromium Carbide Overlay Plate

Protecting the World From Wear
SAS Global Corporation has over 50 years of expertise with abrasion resistant materials. During those 50 plus years SAS Global has developed a proprietary manufacturing method for producing a Chromium Carbide Overlay Wear Plate known as SA1750CR. SAS not only developed the manufacturing method, but also built and engineered the equipment. All of the alloys used in the creation of SA1750CR are custom blended by SAS Global, enabling quality control from start to finish, and insuring you receive the finest product available today.

SA1750CR sets the industry standard for controlling abrasive wear. SA7150CR is a Chromium Carbide Overlay Plate consisting of a Hypereutectic Matrix with up to 40% Chromium Carbides metallurgically fused to an appropriate steel substrate. This large amount of hard chromium carbides allows SA1750CR to thrive in environments of extremely high abrasion.

The hardness of a SA1750CR overlay is a composite of the hard chromium carbides (1750 Vickers), with that of the tough, austenitic matrix. The macro-hardness of the overlay is 55-62 Hrc, depending on the thickness of the overlay.

The Chromium Carbide surface is comprised of a series of beads (3/4" to 1-1/2" wide) with many hairline cracks. These cracks are a natural phenomenon created during the overlay process. Cracks in the overlay are both desirable and necessary. They allow the overlay surface to be formed into complex shapes and to withstand impacts that cause other hard materials to fracture.

A mild steel substrate is used for all stock plate. This backing material plays an integral part to the plate’s formability and impact resistance. A variety of substrates, such as stainless steels, nickel alloys and quenched & tempered steels are used in manufacturing the SA1750CR overlay plate. Custom blending alloys for specific overlay properties are utilized by many customers. SAS engineers can help you determine the perfect substrate and alloy combination for your specific application.

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**Extensive Range of Available Thicknesses**

From thick to thin, SAS Global has you covered. Thicknesses range from the thinnest 1/8" on 1/8" to the thickest 1/2" on 1/2" (Heavier sizes available). The 1/8" on 1/8" SA1750CR is the perfect choice when weight is an issue and you still require unparalleled wear resistance. Every available thickness has unsurpassed chromium carbide content, a hardened matrix, even penetration, and industrial leading flatness.
Technical Data

Chemical Composition: C: 4.0-5.0% Mn: 1.0-1.5% Cr: 30-40% Fe and others: balance
Please note: Actual chemistry will vary with overlay thickness. Custom chemistries can be developed for specific applications.

Macro-Hardness: 55-62 HRc
The hardness is a composite of the hard chromium carbides (1750 V) and the tough austenitic matrix. The hardness can vary depending on the thickness of the overlay.

Abrasion Resistance: 30 to 1 over mild steel / 8 to 1 over heat treated AR400
ASTM G-65 RWAT procedure “A” results are available upon request.

Impact Resistance: Will withstand continuous to moderate impact
Custom overlays can be formulated to withstand higher impact.

Temperature Range: 1100 degrees Fahrenheit (594 degrees Celsius)
Custom chemistries can be developed for higher operating temperatures.

Flatness Tolerance: ± 1/8” over 5 feet of the length of the plate
This manufacturing specification is crucial when forming and fabricating.

Microstructure: An austenitic matrix with 40-45% hexagonal primary carbides M₇C₃ & 15-20% blade-like secondary carbides M₇C₃, along with additional M₃C formations. These metallurgical phases are formed during the controlled cooling process as the weld beads are deposited.

Characteristics: The overlay surface of SA1750CR consists of a series of beads with numerous hairline cracks. These properly spaced crosscheck cracks are a natural stress relief phenomenon and are beneficial to the material. These cracks propagate through the overlay and end at the fusion line.

Types of Wear

- Sliding Abrasion: unsurpassed excellent wearability under this condition
- Mild Impact: excellent wearability under sustained mild impact
- Moderate Impact: good wearability under continuous moderate impact
- Direct Impact: not recommended

Wear Life Comparison

<table>
<thead>
<tr>
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<tr>
<td>Mild Steel</td>
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<td>3X-4X</td>
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Copyright © 2009 SAS Global Corporation
A true premium chromium carbide overlay plate.

Eutectic Phase Chart
Primary and Secondary Chromium Carbide Development

Overlay Bead
3/4” to 1-1/2” wide

Stress Crack
ends at the base plate

Very Flat Surface

SA1750CR Overlay

Fusion Line

Stress Crack
ends at the base plate
Mining Industry

- Dragline Bucket Liners
- Truck Bed Liner Systems
- Dozer Blade Liner Systems
- Shovel Bucket Liners
- Front End Loader Liner Systems
- Raw Material Chute
- Grader Blade Liner Systems
- Rock Crusher Housing
- Raw Material Funnel
- Square to Round Transition
- Classifier Blades
- Wheel Loader Liner Systems
SA1750CR is available in a large range of thicknesses. Our advanced technology permits overlays on unusually thin base plates for lower weight solutions or other customer applications.

### Finished Plate Dimensions
- 90" x 120" (3/16" thru 1" base plates)
  (2.286m x 3.048m (4.76mm thru 25.40mm base plates))
- 56" x 120" (1/8" overlay on 1/8" base plate)
  (1.422m x 3.048m (3.17mm overlay on 3.17mm base plate))

<table>
<thead>
<tr>
<th>Overlay Thickness</th>
<th>1/8&quot; (3.17mm)</th>
<th>3/16&quot; (4.76mm)</th>
<th>1/4&quot; (6.35mm)</th>
<th>3/8&quot; (9.52mm)</th>
<th>1/2&quot; (12.70mm)</th>
<th>5/8&quot; (15.87mm)</th>
<th>3/4&quot; (19.05mm)</th>
<th>1&quot; (25.40mm)</th>
</tr>
</thead>
<tbody>
<tr>
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### On-Time Shipments for any Deadline
SAS Global Corporation’s ability to deliver on-time shipments is second to none, no matter how tight the deadline. SAS Global’s delivery integrity is supported by our highly efficient, premier quality manufacturing process. The ability to provide a premium product, coupled with on-time delivery puts SAS Global miles ahead of the competition.

### Servicing the World with five Locations
- SAS Global World Headquarters: Warren, MI, USA
- SAS Global: Longview, TX, USA
- SAS Global Mining: Elko, NV, USA
- SAS Global Europe: Helsingor, Denmark
- SAS Global China: Tianjin, China
Ensuring you receive only the highest quality plate.

**Quality Control**

Our strict quality control methods and high concentration of chromium carbides make SA1750CR the right choice for your most severe wear conditions.

SAS Global Corporation produces consistent quality by managing tight control over all phases used in the manufacturing process of SA1750CR products.

SAS Engineers have developed the SA1750CR chemistry to surpass all industry standards to date. The elements in the SA1750CR formula are tested and blended at the SAS Global headquarters. Our proprietary technology and manufacturing machinery maintain consistent chromium carbide deposits throughout the plate.

Each plate is visually inspected for quality and manually checked for flatness. Random samples are tested for chemistry, hardness and microstructure in the SAS Metallurgical / Quality Assurance Laboratory.

**SAS Global Laboratory Capabilities**

- Spectrometry
- Digital Macro and Microstructure Image Analysis
- Brinnell Hardness
- Magnetic Particle
- Dye Penetrant
- Ultrasound for Measurement
- G-65 Rubber Wheel Abrasion Testing

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**SAS Global Metallurgical / Quality Assurance Laboratory**
Fabricating With SA1750CR

Special techniques are used when fabricating with SA1750CR. The unique properties found when an ultra hard overlay of chromium carbide is fused with a mild steel substrate requires special steps for cutting, shaping, attaching, and welding. The following techniques are used in our shop. Our Engineering staff is on hand to answer any questions you may have.

**Cutting**

SA1750CR can be cut by using three different methods: plasma burning, air arc, or abrasive saw. Conventional shearing or oxy-fuel flame cutting cannot be used. SA1750CR overlay plate is best cut with an air inert gas plasma-arc system (minimum of 150 amp power supply). We recommend cutting on the alloy side. Slag build-up can be controlled by adjusting the cutting speed. Carbon arc cutting (gouging) should be performed from the substrate side. A silicon carbide cutting wheel is required for abrasive saw cutting.

**Machining**

SA1750CR is not machinable by ordinary methods. For best results SAS Global recommends Electric Discharge Machining (EDM) to cut and counter sink all small holes. Larger holes can be plasma burned. Plasma arc cutting or carbon arc gouging may be used to produce counter sunk holes for bolts. Pre-machined mild steel inserts may be welded into straight holes for additional machining. Surface machining can be done by Blanchard grinding only.

**Forming**

SA1750CR can be cold formed into curves and conicals using plate rolls or press brake machines. Very severe bends should be performed perpendicular to the overlay pass. The minimum and maximum recommended radius will differ depending on the thickness of the overlay material and type and thickness of the substrate.

Convex shapes, with overlay surface out, will open the stress cracks. This does not normally present a problem. Tighter than recommended radii will require filling opened cracks using SA1750CR electrode. Concave shapes with chromium carbide overlay on the inside tightly compress the overlay surface and close the stress cracks.

**SA1750CR Surface In**

- 3/16” - 1/4” Thick: 4” Inside Radius *
- 3/8” Thick: 8” Inside Radius *

*Radius must increase as overlay thickness increases.

**SA1750CR Surface Out**

- 3/16” - 1/4” Thick: 36” Outside Radius *
- 3/8” Thick: 60” Outside Radius *

** Forming with SA1750CR overlay on the outside surface will cause cross-check cracks to open. Forming to smaller radii will open cracks further, which will require weld repair.
SA1750CR overlay plate can be joined together by welding substrate to substrate with SA100NMC, E7018, E70S-6, or E70T-1 wire/weld rod. It is important the chromium carbide overlay not contaminate substrate welds. This leads to embrittlement of the weld. In cases where contamination is likely, SAS recommends using SA100NMC electrode. All exposed joints exposed to wear should be protected by a cap of SA1750CR rod/wire.

**Fillet Weld**
- Remove 1/4" minimum of the SA1750CR Overlay

**Butt Weld**
- Remove 1/4" minimum of the SA1750CR Overlay
- 1/16" - 1/8" (2mm - 3mm)
- Welding angle over the joint will provide extra strength.

**Plug Weld**
- Holes for plug welding should be a minimum of 1" (25 mm) diameter, spaced 12" to 24" (600 mm to 1200 mm) apart. The outside diameter of the hole needs to be welded 360°.

**Studs**
- Studs can be attached to the substrate side. (stainless steel is recommended) Thru bolts should be capped with a protective layer of SA1750CR weld rod/wire.
SA1750CR Hardfacing Drop Packages

SAS Global has an endless supply of SA1750CR wear drops in various lengths, thicknesses, shapes and dimensions. They are available in rectangles, squares, and miscellaneous shapes that fit on a standard pallet. Available thicknesses range from 1/8" on 1/8" thru 1/2" on 1/2". (Please call to verify available sizes and thicknesses.) These strips are perfect for quickly adding abrasion protection to the areas that need it most. SA1750CR drops are bundled and packaged in 1500 or 2000 pound pallets to meet your specific needs.

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**FEATURES**
- Total Chromium Carbide content of 30-60%
- Maro-hardness of 55-62 Hrc
- Available in a vast variety of thicknesses
- Smooth surface finish - low coefficient of friction
- Flatness tolerance of ± 1/8" over 5 feet
- Remains abrasion resistant up to 1100° F
- Not subject to seizure erosion
- Can withstand continuous moderate impact
- Can be supplied on various substrates for special applications
- Custom Carbide Overlays can be developed to meet specific needs

SA1750CR Hardfacing Plates

SA1750CR Hardfacing Plates are a quick, easy and economical way to instantly hardface a heavy wear surface. Their easy to manage size of 3" X 6" allows for maximum arrangement to fit virtually any surface shape. Available in a wide variety of thicknesses to meet all of your specific application requirements. Each plate attaches with a simple plug weld, so you're able to put down several square feet fast and easy.

Weld Rod and Wire

Weld rod and wire are available for field use. Installation gaps can be filled and high wear areas can be built up or repaired. A variety of alloy combinations are available to suit your needs. Please consult your SAS Global representative for more information.

- SA1750CR - 1/8" dia. / 5/32" dia.
  - For hardfacing to counteract extremely severe abrasive operating conditions. Good for low to medium impact. Good corrosion resistance. Good high temp. (up to 1000° F) abrasion resistance.

- SA1750CRP - 1/16" dia. / .045" dia.
  - Ideal for hard-to-reach and out-of-position build-up. This is an extra high carbon chromium carbide overlay designed for abrasion and abrasion with mild impact. Multiple layers will provide hardness of 58-62 HRC in hardness.

- SA100NMC - 1/8" dia. / 3/32" dia. / 3/16" dia. / .045" dia.
  - For welds joining dissimilar steels - steels that are difficult to weld such as austenitic manganese steel. Good for wear and corrosion resistant build-ups. Used for buffer layers in hard-facing. Use flux cored wire for impact service build-up.

- SAS50NM - 1/8" dia. / 5/32" dia. / 3/16" dia. / .045" dia.
  - For joining and build-up parts subject to extreme shock impact and abrasion. Extreme resistance to hot cracking where contraction strain cannot be relieved. Use flux cored wire for build-ups on austenitic manganese steel parts subject to heavy pressure and impact wear.