

# TRIMAY®

*Protecting heavy industry  
from wear since the 1950's*







**TRIMAY®**

# **Industries Served**

**Mining**

**Oil Sands**

**Aggregate and Asphalt**

**Forestry**

**Power Generation**

**Material Handling**

**Recycling**

**Glass Production**

**Steel Production**

**Grain and Oil Seed Processing**

**Dredging**

**Cement and Concrete**

## About Trimay<sup>®</sup>

### Corporate Objective:

To research, develop and manufacture the highest quality Advanced Wear Materials. Trimay<sup>®</sup> achieves its high quality standard through research and development, partner companies and exclusive suppliers, as well as through experimentation and process optimization.

### Company History:

**1950s:** Trimay<sup>®</sup> begins manufacture of wear plate.

**1984:** Trimay<sup>®</sup> opens a distribution centre in Edmonton, Alberta, Canada.

**1993:** Trimay<sup>®</sup> begins manufacturing wear plate at its Edmonton distribution centre.

**1997:** A group of Canadian investors purchase the Edmonton manufacturing centre, the Trimay<sup>®</sup> brand, and rights to all proprietary information.

**1998-2005:** Trimay<sup>®</sup> expands wear plate overlay selection to include not only Chromium wear plates, but Complex and Tungstens as well.

**2005:** Trimay<sup>®</sup> begins R & D for wear pipe division with the goal to optimize welding parameters so as to create the highest quality overlay on the insides of pipe, elbows and the transitions by minimizing elongation and pipe shrinkage throughout the application process.

**2008:** Trimay<sup>®</sup> begins to offer the new T171 overlay on plates. T171 overlay is developed by Trimay<sup>®</sup> Wear Plate Ltd. using Nano technology.

**2009:** Trimay<sup>®</sup> Pipe products begins operating!

**2012:** New VR connector concept, 2015 CRN issued.

**2014:** T168i developed,

**2016:** Launched of T168i.

**2017:** Trimay<sup>®</sup> opens an Engineering Technology department to create, modify and store client drawings and data.

**2018 :** Providing Non-Metallic Liner (Rubber, Polyurethane & Neoprene).

- Acquired line of Rotary Selector Valves.

**2019:** Launched T-Series (T-Plate)

For questions or information requests, please contact Trimay<sup>®</sup>



## About Trimay<sup>®</sup> Plate

### Overview:

Trimay<sup>®</sup> has been operating in Edmonton, Alberta, Canada since 1984. Trimay<sup>®</sup> First began distributing chrome and tungsten alloy clad wear plates in the 1950s, however, in 1993, Trimay<sup>®</sup> began manufacturing in Edmonton, and later in 1997, a group of Canadian investors centralized Trimay's<sup>®</sup> operations in Edmonton. The operating name Trimay<sup>®</sup> and the proprietary alloy formulas and application processes were included in the transaction.

Since 1997, Trimay<sup>®</sup> Wear Plate Ltd. has been developing new processes and alloy applications. What Trimay<sup>®</sup> has done encompasses optimizing welding parameters and procedures, implementing strict quality control procedures and sending experimental products for impact and wear testing. Simply put, in 1997, Trimay<sup>®</sup> began to evaluate, adjust, test and re-evaluate all the variables that affect the quality of our wear plates so as to maximize the service life of the wear products we offer.

### Welding Process

Trimay<sup>®</sup> Wear Plate Ltd. manufactures wear plate using proprietary patented bulk overlay submerged-arc welding process and solid-core weld wires. Each table is capable of manufacturing 2 or 3 wear plates at the same time, and is supervised by a welder who ensures a clean welding surface, a steady wire-feed rate, and a consistent flow of alloy powder and flux. The weld supervisor also manipulates the welding parameters (amperage, voltage, etc.) to maintain the targeted dilution rate and to ensure the substrate integrity is maintained. These factors are controlled based on a number of variables such as overlay type, base plate thickness and overlay thickness.

### Quality: *"Each Trimay wear plate is thoroughly inspected."*

Each Trimay<sup>®</sup> wear plate is thoroughly inspected to Trimay's quality standards. Rockwell hardness (HRC) is tested and documented. Each plate has traceability back to the powder batch, manufacture date, production equipment and operator, and the MTR of the substrate material.



# Capabilities

## Wearplate Size and Thickness

Trimay® Wear Plate Ltd. has the capability to manufacture the largest sheet sizes of all wear plate manufacturers. We can manufacture plate up to 112 inches wide and 168 inches long. Standard sizes are 56" X 120" and 90" X 118" (see Table 1). Thickness range varies according to overlay type and customer specifications. As a general rule overlay thickness should not exceed beginning substrate thickness. See table 2 for standard plate thickness range for each overlay.

Also note that overlays are usually applied to 44W (300W) carbon steel, stainless steel, or 516 Grade 70 (for pressure applications). Other substrate materials can be used based on customer requirements. All types and sizes can be fabricated to specification.



Regular-size T157 wear plate shown above

Table 1: Wear Plate Size				
Plate Type	Plate Length	Plate Width	Overlay Length	Overlay Width
Regular	120" (3.05m)	60" (1.52m)	120" (3.05m)	56" (1.42m)
Large	240" (6.1m)	120" (3.04m)	240" (6.1m)	116" (2.95m)



Trimay-lined shovel with Trimay bucket teeth

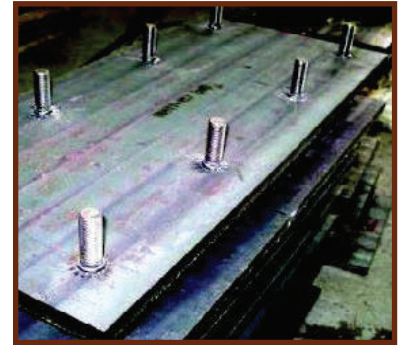
Table 2: Wear Plate Thickness		
Overlay Type	Name	Total Thickness Range
Chrome	T-Plate	1/4" - 1/2" (6mm-12mm)
Chrome	T156	3/8" - 2" (10mm-50mm)
Chrome	T157	7/16" - 2" (11mm-50mm)
Nano-Complex-Carbide	T168i	Custom- Contact Trimay®
Tungsten Carbide	T170	Custom- Contact Trimay®
Nano-Boro-Carbide	T171	3/8" - 2" (10mm-50mm)

Overlay & substrate thickness depend on customer order. Overlay thickness should not exceed beginning substrate thickness. Overlays made with Tungsten >50% flux wire can only go as thick as one weld pass will allow. This is due to Tungsten's high melting point (3422°C, 6192°F) which prevents a second weld pass from properly diluting into first pass. Custom orders outside above sizes available upon request.

# Capabilities

## Fabrication:

Trimay® wear plate is available in sheet quantity or can be fabricated to specific dimensions. It can be rolled or formed by press brake and cut via plasma arc or water jet. It cannot be flame cut. Formability is dependent on thickness and whether alloy cladding is on the inner or outer surface. For applications requiring less precision, overlay material can be removed by means of carbon arc gouging. These overlays are non-machinable but surface finishing can be done by grinding or E. D. M if required.



## Installation:

Trimay® wear plate can be installed by plug or fillet welding, bolting, or fabricated with inserts for installation. To ensure even wear on the plate and weld seam, any installation welds should be finished with the proper welding wire (see Table 1) to maintain the integrity of the alloy surface.



Table 1: Recommended Weld Wire for Overlay Type	
Overlay Type	Recommended Weld Wire
T-Plate	TWP56w or TWP57w
T156	TWP57w or TWP61w
T157	TWP57w or TWP61w
T168i	TWP68iw
T170	TWP70w
T171	TWP71w
Stainless & Cushion Layers	TW1968w

T171 overlay is developed by Trimay® Wear Plate Ltd. using Nano technology. For questions or information requests, please check our website at [www.trimay.com](http://www.trimay.com) or contact us in the numbers provided below.

## About Trimay<sup>®</sup> Pipe

### Overview:

Trimay<sup>®</sup> Pipe Products Ltd. is a division of Trimay<sup>®</sup> which was established in 2005 for the sole purpose of researching and developing an optimal welding process to apply innershield flux wires on pipe internals and externals for abrasive and corrosive wear environments.

By 2008, Trimay<sup>®</sup> Pipe Products had accomplished its goal.

By 2009, pipe was being sold to selected customers willing to test Trimay<sup>®</sup> pipe.

Today Trimay<sup>®</sup> offers quality wear pipe products from 3" to 60" diameter to customers world wide.

### Welding Process:

Trimay<sup>®</sup> pipe, bends and elbows are manufactured using an automated welding system involving an operator, a welding machine, and innershield flux wires. Each machine is supervised by a welder who ensures a clean welding surface, a steady spool rate, and a consistent overlay thickness. The welder supervisor also manipulates the welding parameters (amperage, voltage, etc.) to maintain an optimum dilution rate of 15%. All these factors contribute to the the highest quality that separates Trimay's wear from all the rest.

### Key Features:

- » Minimal elongation and pipe shrinkage (less than 1% in length, and under 1% on inside diameter shrinkage).
- » Even weld bead throughout length of pipe due to a steady dilution rate.
- » Strong cohesion between the overlay and substrate

### Key Benefits:

- » Easy on-site alignment and installation because of minimal pipe distortion
- » Longer-lasting welds at installation seams because of elimination of offsets.
- » Even wear potential at any point on the pipe because of consistent welding parameters and manufacturing processes.
- » Flanging/theaded fabrication possible.

# Capabilities

## Pipe Size and Overlay Thickness:

Trimay® Pipe Products are offered in five different overlays with similar thickness options (except for high percentage Tungsten - see table 1), and certain size capabilities (see table 2). Categorically, there are five choices of flux wire overlays that Trimay offers: Chrome, Complex, Tungsten < 50%, Tungsten >50%, and Boro-carbide. Base pipe can vary; however, most overlays are welded on the inside of carbon steel pipe. See the below tables for thickness and size capabilities.

Table 1: Overlay Type and Thickness	
Flux Wire Type Used	Overlay Thickness Range
Chrome	1/16" - 3/8" (1.5mm-9mm)
Complex	1/16" - 3/8" (1.5mm-9mm)
Tungsten < 50%	1/16" - 3/8" (1.5mm-9mm)
Tungsten > 50%	1/16" - 3/16" (1.5mm-4.5mm)
Boro (T171)	1/16" - 3/8" (1.5mm-9mm)

Overlays made with Tungsten >50% flux wire can only go as thick as one weld pass will allow. This is due to Tungsten's high melting point (3422o C, 6192o F) which prevents a second weld pass from properly diluting into the first. Second passes of Tungsten >50% is not recommended. T171 overlay is developed by Trimay® Wear Plate Ltd. using NanoSteel® technology .

Table 2: Pipe Size		
Pipe Selection	Inside Diameter (I.D.) Range	Length Range
Straight Pipe	4" to 60" (1.01 to 1.5m)	Up to 40' (12.19m)
Elbows/Bends	Contact Trimay For information	
Transitions	Contact Trimay For Information	

Transition I. D. capability range is based on the mounting end of the transition/reducer. The smallest end of the transition is always the mounting end.

## Fabrication:

Regardless of overlay type, Trimay® Pipe Products Ltd. can be flanged or threaded similarly to any regular steel pipe. All pipe fabrication concurs with ASME, ABSA and API certification where applicable.



# Overlay

## Overlay Overview:

Trimay<sup>®</sup> manufactures 4 types of overlays ( Chromium-Carbide, Complex-Chromium-Carbide, Nano-Boro-Carbide, Tungsten-Carbide). Some Trimay<sup>®</sup> overlays wear better than others and all wear longer than any steel - austenitic, hardened or any other kind. The length that each overlay will last in particular applications is dependent on a number of variables, and before choosing an overlay customers should ask themselves:

- ▶ “Optimum life required?”
- ▶ “How abrasive and what size (micro or nano) is the material causing the wear?”
- ▶ “Is the overlay exposed to heavy impact?”

## Overlay Types:

- » Chromium-Carbide overlays are the most widely used and are well rounded wear deterrents capable of absorbing some impact. Trimay<sup>®</sup> offers 3 chromium Carbide overlays. Optimum performance occurs in moderate-to-heavy wear environments with mild-to-moderate impact.
- » Complex-Chromium-Carbide overlays have a unique combination of carbides that form a tight crystalline matrix well-suited for corrosive, high-temperature environments. The complex chromium carbide overlay offers slightly better wear than chrome overlays and it maintains performance up to 650°C (1202°F). T161 operates best in heavy wear environments with mild-to-moderate direct impact.
- » Tungstens-Carbide are offered in a matrix content below and above 50%. Tungsten alloy above 50% by volume can only be applied in one layer whereas Tungsten alloys below 50% can be applied in a range up to 3 layers thick. Tungstens are top wear performers for most applications and absorb higher impact than CrC overlay.
- » Nano Boro-carbide is Trimay's<sup>®</sup> newest overlay developed by Trimay Wear Plate Ltd. using Nano technology. It is a sub-micron, Nano Boro-carbide glass forming metal alloy that achieves or even exceeds the wear of tungstens at significantly reduced cost. T171 performs best in heavy-to-extreme wear environments with moderate direct impact.

# T Plate Overlay

## Application Process

Sub Arc Bulk Welding

## As-Welded Material Chemistry (wt%)

Chromium	<24%
Molybdenum	<1%
Manganese	<2%
Carbon	<3.5%
Iron	Balance

## Wear Resistance

ASTM G65-04 Procedure A  
6,000 cycles mass loss  
0.20g (+/-0.03)

## Rockwell C (HRc) Hardness

HRc 54 - 60

## Substrate Materials

44W (or 300W) steel

## Overlay Thickness

Standard :  
3mm (1/8") on 3mm (1/8")  
4mm (3/16") on 4mm (3/16")  
6mm (1/4") on 6mm (1/4")  
9mm (3/8") on 9mm (3/8")  
12mm (1/2") on 12mm (1/2")

## Overlay Description

T Plate is a iron-based steel overlay wear plate solution with a unique proprietary chemical composition designed to withstand moderate direct impact and mild-to-moderate wear environments.

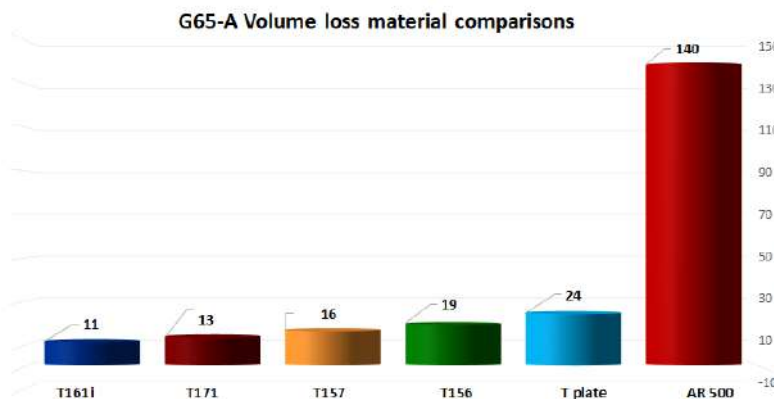
## Overlay Attributes

T Plate consistently rates between 54 - 60 HRc for hardness, and only loses 0.20 g (+/-0.03) on ASTM G65-04 Procedure A mass loss test. This amazing products is only at the beginning of Trimay's product line, yet it boasts excellent wear characteristics.

## Common Application

It is economical to use T Plate for areas exposed to moderate wear and impact, which can benefit from Trimay's overlay. T Plate is often used as a liner for chutes, small buckets and processing equipment. Most places Abrasion Resistant (AR) plates and through hardened plates are used with 4x plus thickness to thickness wear resistance.

Wear Comparison Chart



T Plate can be cut by plasma arc or water jet cutting.



## Production

## and

## Installation

As a wear plate solution, T Plate can be applied on most types of steel. T Plate wear plate is applied using Trimay's proprietary flux cored open arc process and can be cut and fabricated to specification. It can be rolled or formed by press brake and cut via plasma arc, laser or water jet. It cannot be flame cut. Formability is with either brake or rolls, care must be taken in protecting equipment because of the hardness of the Trimay. For applications requiring less precision, T Plate overlay material can be removed by means of carbon arc gouging. These overlays are non-machinable and, if necessary, surface finishing can be done by grinding or E. D. M. T Plate wear plate can be installed by plug or fillet welding, bolted or fabricated with inserts for installation. Any weld seams should be overlaid with Trimay's TWP56w wire to ensure even wear on the plate and weld seam.

# T156 Overlay

### Application Process

Sub Arc Bulk Welding

### As-Welded Material

#### Chemistry (wt%)

Cromium	<27%
Molybdenum	<2%
Manganese	<1.5
Carbon	<3.25
Iron	Balance

### Wear Resistance

ASTM G65-04 Procedure A  
6,000 cycles mass loss  
0.16g (+/- 0.03)

### Rockwell C (HRc) Hardness

HRc 54 - 56

### Substrate Materials

44W (or 300W) steel  
Stainless steel  
516 Grade 70 for

### Overlay Thickness

Standard (single pass): 1/4"  
or 6 mm  
Maximum: 11/16" or 17 mm

### Overlay Description

T156 is an iron-based steel overlay wear solution with a unique proprietary chemical composition designed for moderate wear environments with moderate impact. T156 has smooth surface and chemical make-up; however, extra Chromium and Molybdenum makes T156 more resistant.

### Overlay Attributes

T156 consistently rates between 54 - 56 HRc for hardness, and only loses 0.16 g (+/-0.03) on ASTM G65-04 Procedure A mass loss test. Just like all other Trimay® overlays, T156 has a low drag coefficient of 0.185 to deter material build up.

### Common Application

T156 is used primarily in medium to high abrasion environments. It is formable to 10" radius. T156 is similar to competitor's premium products but with generally better alloy distribution, optimum carbide formation and minimum dilution zone resulting in longer wear life.

### Production and Installation

T156 wear overlay is applied using Trimay's® proprietary Submerged Arc Bulk Overlay Welding Process and can be cut and fabricated to specification. It can be rolled or formed by press brake and cut via plasma arc or water jet. It cannot be flame cut. Formability is dependant only on thickness and whether weld position is on the inner or outer diameter. For applications requiring less precision, T156 overlay material can be removed by means of carbon arc gouging. These overlays are non-machinable and, if necessary, surface finishing can be done by grinding or E. D. M. T156 wear plate can be installed by plug or fillet welding, bolted or fabricated with inserts for installation. Any weld seams should be overlaid with Trimay's® TWP57w wire to ensure even wear on the plate and weld seam.

The coal-crushing trunion below is lined with T156.



T156 is often used to make durable drilling augers.





# T157 Overlay

### Application Process

Sub Arc Bulk Welding

### As-Welded Material Chemistry (wt%)

Chromium	<30%
Molybdenum	<2%
Manganese	<2%
Carbon	<4%
Iron	Balance

### Wear Resistance

ASTM G65-04 Procedure A  
6,000 cycles mass loss

### Rockwell C (HRc) Hardness

HRc 56 - 58

### Substrate Materials

44W (or 300W) steel  
Stainless steel  
516 Grade 70 for pressure applications

### Overlay Thickness

Standard (single pass):  
5/16" or 8 mm  
Maximum: 11/16" or 17

### Overlay Description

T157 is an iron-based steel overlay wear solution with a unique proprietary chemical composition designed to withstand heavy wear environments exposed to mild-moderate direct impact. T157 is the top performing chromium carbide wear plate on the market. It has a smooth surface, and T156 overlays, plus extra Chromium and Manganese gives T157 up to 30% more wear resistance than the T156.

### Overlay Attributes

T157 consistently rates between 56 - 58 HRc for hardness, and only loses 0.13 g (+/-0.03) on ASTM G65-04 Procedure A mass loss test. T157 has a slick drag coefficient of 0.185 to deter material buildup, and it lasts up to 30% longer than Trimay's® T156.

### Common Application

T157 is Trimay's premium Chromium Carbide alloy and has virtually no competition in the market place. It achieves excellent wear life in highly abrasive environments and exhibits high impact resistance.

### Production and Installation

As a wear solution, T157 can be applied on most types of steel (please see the most commonly used substrates on the left). T157 wear plate is applied using Trimay's® proprietary Submerged Arc Bulk Overlay Welding Process and can be cut and fabricated to specification. It can be rolled or formed by press brake and cut via plasma arc or water jet. It cannot be flame cut. Formability is dependant only on thickness and whether weld position is on the inner or outer diameter. For applications requiring less precision, T157 overlay material can be removed by means of carbon arc gouging. These overlays are non-machinable and, if necessary, surface finishing can be done by grinding or E. D. M. T157 wear plate can be installed by plug or fillet welding, bolted or fabricated with inserts for installation. Any weld seams should be overlaid with Trimay's TWP57w or TWP61w wire to ensure even wear on the plate and weld seam.

T157 is often used to prolong fan life at concrete plants.



T157 is often used to protect against chain abrasion.



# T168i Overlay

## Application Process

OAW - FCAW  
(shielding gas not required)

## Material Chemistry

Boron  
Molybdenum  
Carbon  
Manganese  
Silicon  
Iron  
Chromium

## Wear Resistance

ASTM G65-04 Procedure A  
less than 0.1 grams lost  
(5mm<sup>3</sup> -11mm<sup>3</sup>) (low stress  
abrasion)

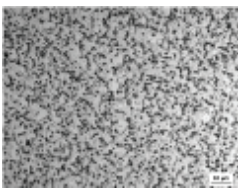
## Rockwell C (HRC) Hardness

HRC 64.5- 68

## Weld Deposit Properties

Density (g/cm<sup>3</sup>) 7.6

## Microstructure



*T Double-layer welding of  
T168i is NOT recommended*

## Overlay Description

T168i is a revolutionary new material specifically designed to provide extreme wear and impact resistance. Having the ability to be heat-treatable, meaning it preserves excellent performance before and after standard quench and temper heat treatments. T168i provides the best performance in aggressive environments where impact and abrasive wear are critical sources of material failure. In terms of wear resistances, the high density of complex borides and carbides in a martensitic matrix allow it to compete with the wear performance of WC/Ni overlays at a substantially lower price point. The extremely fine lamellar structure of the complex borides and the spherical morphology of the carbides allow for impact performance 20X that of WC/Ni, and chromium carbide overlays (CCO).

## Key Performance Characteristic

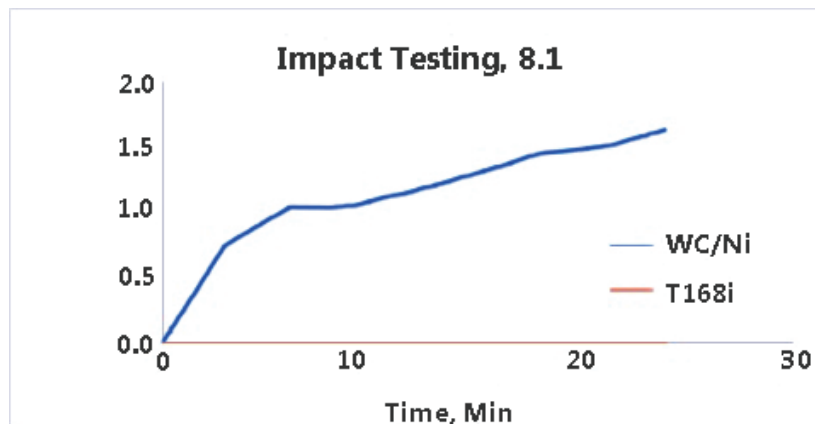
- ▶ Impact resistance: >10,000 20J
- ▶ Hard Boride/Carbide Fractions: ~33%  
(Double-layer welding of TWP68i is NOT recommended)

## Applications

T168i overlays are suggested for use in any applications where abrasion and impact resistance is required. The revolutionary improvement in impact resistance and toughness will typically result in an extended lifetime over WC PTA and Chromium Carbide coatings.

## Impact Resistance

Low energy high frequency rotary impact test at requires a result of less than 3 grams material loss after 24 minutes is considered a pass. After 24 minutes the T168i had 0g loss.



# T170 Overlay

### Application Process

Sub Arc Bulk Welding

### As-Welded Material Chemistry (wt%)

Tungsten by weight	<50-55%
Chromium	<1.8%
Nickel	<56%
Carbon	<1.4%
Iron	<8.6%

### Wear Resistance

ASTM G65-04 Procedure A  
6,000 cycles mass  
loss 0.05g (+/- 0.03)

### Rockwell C (HRC) Hardness

HRC 46 - 50

### Substrate Materials

44W (or 300W) steel  
Stainless steel  
516 Grade 70 for  
pressure  
Applications

### Thickness

Standard (single pass):  
5/16" or 8 mm  
Maximum: 9/16" or 14 mm

### Overlay Description

T170 is at the top of Trimay's® product list. T170 is a nickel-based steel overlay wear solution with a unique proprietary alloy composition designed to withstand heavy impact and severe wear environments. T170 is unrivalled in wear resistance and impact resistance due to the high nickel chemistry

### Overlay Attributes

T170 consistently rates between 46 - 50 HRC for hardness, and only loses 0.05 g (+/-0.03) on ASTM G65-04 Procedure A mass loss test. T170's Nickel Chrome Iron Matrix (NCIM), with Macrocrystalline Tungsten Carbide (MTC) and other elements added, forms this nickel-based alloy. Furthermore, because MTC carbides do not degrade throughout the overlay application process, the finished overlay keeps ductility and is able to absorb impact rather than fracture.

### Common Application

T170 is used in extreme wear environments, most commonly in areas exposed to frequent direct impact and severe wear.

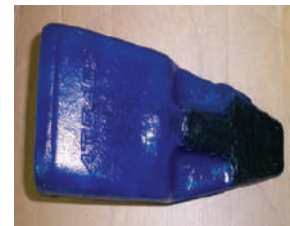
### Production and Installation

As a wear plate solution, T170 can be applied on most types of steel (please see the most commonly used substrates on the left). T170 wear plate is applied using Trimay's® proprietary Submerged Arc Bulk Overlay Welding Process and can be cut and fabricated to specification. It can be rolled or formed by press brake and cut via plasma arc or water jet. It cannot be flame cut. Formability is dependant only on thickness and whether weld position is on the inner or outer diameter. For applications requiring less precision, T170 overlay material can be removed by means of carbon arc gouging. These overlays are non-machinable and, if necessary, surface finishing can be done by grinding or E. D. M. T170 wear plate can be installed by plug or fillet welding, bolted or fabricated with inserts for installation. Any weld seams should be overlaid with Trimay's® TWP61w wire to ensure even wear on the plate and weld seam.

*T170 is used to protect key wear points on crusher rolls like the one*



*T170 withstands impact and can be used to make durable bucket teeth*



Please contact Trimay® for more information.

O  
V  
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# T171 Overlay

### Application Process

Sub Arc Bulk Welding

### As-Welded Material Chemistry (wt%)

Chromium	<25%
Boron	<10%
Molybdenum	<10%
Niobium	<10%
Manganese	<5%
Silicon	<5%
Carbon	<2%
Iron	Balance

### Wear Resistance

ASTM G65-04 Procedure A  
6,000 cycles mass loss  
0.08g (+/- 0.03)

### Rockwell C (HRc) Hardness

HRc 68- 71

### Deposit Properties

Density (g/cm<sup>3</sup>) 7.36

### Impact Resistance

Drop Impact Testing - Passed

### Overlay Description

T171 is a patented iron based steel overlay wear solution with a near nanoscale (submicron) microstructure. T171 is well suited for the toughest jobs in the most extreme service environments. T171 is developed by Trimay® Wear Plate Ltd. using Nano technology.

### Key Performance Characteristics

- ▶ E68-71 HRc single and double pass weld deposits
- ▶ Maintains high hardness after exposure to high temperatures
- ▶ Exceptional resistance to severe sliding abrasion
- ▶ Toughness equivalent to 400 Brinell Q&T plate

T171 is a steel alloy with a unique glass forming chemistry that allows high undercooling to be achieved during welding. This results in considerable refinement of the crystalline microstructure to a near nanosize (submicron) range. The ultra refined microstructure allows T171 to provide vastly improved hardness that lasts significantly longer than traditional carbide remedies.

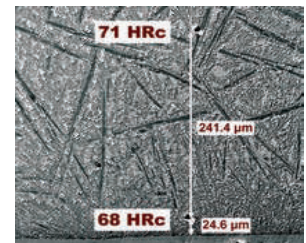
### High Hardness

T171 maintains maximum hardness performance of 68-71 HRc from the weld interface throughout the entire overlay in single pass applications. This allows the overlay to be fully protective throughout the volume. The micrograph to the right shows how 68-71 HRc maximum hardness is achieved within several microns of the weld overlay interface. HRc hardness values in the micrograph were measured from a single pass T171 overlay applied to 44W/300W mild steel plate substrate.

### Exceptional Wear Resistance

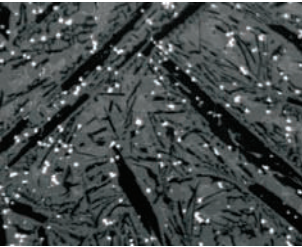
T171 provides exceptional resistance to severe sliding abrasion in extreme service environments. T171 can be built up to 1/2” overlay thickness in two passes as necessary with all layers providing maximum wear resistance of 0.08 - 0.10 g (+/- 0.03) mass loss in ASTM G65-04 abrasion test.

Single Layer HRc Hardness



HRc hardness properties are consistent throughout the entire layer

SEM Micrograph - 500x



T171 microstructure showing uniform distribution of borocarbide phases

### Impact Resistance

The superior toughness of T171 results from the in-weld formation of a large quantity of refined complex borocarbide phases which are surrounded by ductile ferrite phases. The borocarbide phases are completely wetted by the matrix and prevent premature pull-out, delamination and crack nucleation. Their refined nature allows the reduction of stress concentration sites and the ductile matrix supplies effective crack blunting and bridging, resulting in improved impact resistance.

### Production and Installation

As a wear plate solution, T171 can be applied as an overlay on carbon steel and low alloy steel substrates. T171 wear plate is produced using Trimay's® proprietary submerged arc process. T171 wear plate responds very similar to standard chrome carbide overlay during forming, cutting and fabrication. T171 wear plate can be rolled or formed by press brake into desired shapes for specific applications. Formability is similar to standard overlays and dependant on thickness and weld position on the inner or outer diameter. Plasma arc or water jet cutting is recommended for shape cutting and large hole piercing. Like other overlays, T171 wear cannot be flame cut. For applications requiring less precision, T171 overlay material can be removed by means of carbon arc gouging. T171 overlays are non-machinable and, if necessary, surface finishing can be done by grinding or EDM. T171 wear plate can be installed by plug or fillet welding, or bolted into place. T171 overlay pipelines can be threaded and coupled together or flanged much like regular steel pipelines. Any weld seams should be overlaid with T171 wire, available exclusively to Trimay® customers, to protect from wear caused by undercutting of the overlay at the seams.

Please contact Trimay® for more information.

# TWP56 Wire & Electrode

### Application Process

OAW - FCAW  
(Shielding gas not required)

### Material Chemistry (wt%)

Chromium  
Carbon  
Manganese  
Silicon  
Iron

### Rockwell C (HRc) Hardness

Wire 52 - 58 HRc  
Electrode: 57 - 60 HRc

### Packaging

**Wire:**  
.045" (1.1mm) -15kg spools  
1/16" (1.6mm) -15kg spools  
3/32" (2.4mm) -15kg spools  
7/64" (2.8mm) -15kg spools

**Electrode:**  
1/8" (3.25mm) - 4.5kg sleeves  
5/32" (4.0mm) - 4.5kg

### Description

TWP56 is a chromium-based flux cored wire electrode used to protect equipment and parts from moderate wear and impact. TWP56 has wide welding parameters, allowing for easy installation, and its compatible composition allows it to be applied on a wide array of materials.

### Key Performance Characteristics

- ▶ Moderate abrasion and impact resistance
- ▶ Compatible composition
- ▶ Uniform carbide distribution throughout weld deposit
- ▶ Ease of use (wide voltage and average welding parameters)

### Applications

TWP56 can be applied to carbon steel, manganese base materials and mild or alloy steels. The maximum recommended deposit thickness of TWP56 is 2 - 3 layers, or 1/4" (6.35mm). TWP56 is primarily used to cover exposed bolts and seams from installation of T138 wear plate and parts, however, TWP56 wire and electrodes are also welded to parts and equipment which require protection only on one or two concentrated wear areas.

### Welding Procedure

TWP56 should only be applied on clean surfaces free of contaminants. TWP56 electrode should be held vertically to the work piece, and a short arc should be maintained. Depending on the parent material, pre-heating is necessary and post weld cooling should be gradual to keep 'cross-checking' or stress relieving to a minimum. When welding to manganese steels, a 'cushion layer' is recommended. The resulting deposit is not machinable or forgeable, and grinding is only possible with diamond tools. TWP56 is versatile and has a wide range of welding parameters.

### Moderate abrasion and impact resistance

Diameter	Stickout +/- .25"(6.35mm)	Amps	Volts
.045" (1.1mm)	1.5" (38.1mm)	100 - 220	18 - 24
1/16" (1.6mm)	1.5" (38.1mm)	160 - 260	20 - 26
3/32" (2.4mm)	1.5" (38.1mm)	280 - 340	22 - 26
7/64" (2.8mm)	1.5" (38.1mm)	320 - 400	25 - 28

The above is based on a FCAW welding process with DC Reverse polarity, using no shielding gas.

### TWP56 Electrode Welding Parameters

Diameter	Amps
1/8" (3.25mm)	100 - 140
5/32" (4.0mm)	120 - 160
3/16" (5.0mm)	160 - 180

The above is based on SMAW welding process with DC Reverse or AC polarity.



# TWP57 Wire & Electrode

### Application Process

OAW - FCAW  
(Shielding gas not required)

### Material Chemistry (wt%)

Chromium  
Carbon  
Manganese  
Silicon  
Iron

### Rockwell C (HRc) Hardness

Wire  
layer 1: 59 HRc, layer 2: 63 HRc  
Electrode: 61 - 63 HRc

### Packaging

Wire:  
1/16" (1.6mm) - 25kg spools  
3/32" (2.4mm) - 25kg spools  
7/64" (2.8mm) - 25kg spools

Electrode (4 sleeves = 1 box):  
1/8" (3.25 mm) - 4.5kg sleeves  
5/32" (4.0 mm) - 4.5kg sleeves  
3/16" (5.0 mm) - 5kg sleeves

### Description

TWP57 is a chromium-based flux cored wire electrode used to protect equipment and parts from heavy wear and mild-to-moderate direct impact. TWP57 has a compatible composition that allows it to be applied on a wide array of materials and it maintains good Rockwell Hardness (HRc) and wear ability at elevated temperatures.

### Key Performance Characteristics

- ▶ Heavy abrasion and mild/moderate impact resistance
- ▶ Compatible composition for welding
- ▶ Hardness increase on underlying layer(s)
- ▶ Good hardness at elevated temperatures

### Applications

TWP57 can be applied to carbon steel, manganese base materials and mild or alloy steels. The maximum recommended deposit thickness of TWP57 is 2 - 3 layers, or 1/4" (6.35mm). TWP57 is used to cover exposed bolts and seams for installation of T156 wear plate and parts, as well as for small area lining of heavy wearing parts and equipment such as the front lip 'bullnose' of asphalt screeds.

### Welding Procedure

TWP57 should only be applied on clean surfaces free of contaminants. TWP57 electrode should be held vertically to the work piece, and a short-to-medium arc should be maintained. Depending on parent material, pre-heating is necessary and post weld cooling should be gradual to keep 'cross-checking' or stress relieving to a minimum. For manganese steels, a 'cushion layer' is recommended and pre-heating is not recommended. The resulting deposit is not machinable or forgeable, and grinding is only possible with diamond tools.

### TWP57 Wire Welding Parameters

Diameter	Stickout +/- .25" (6.35mm)	Amps	Volts
1/16" (1.6mm)	1.5" (38.1mm)	180 - 200	26 - 30
3/32" (2.4mm)	1.5" (38.1mm)	250 - 300	26 - 30
7/64" (2.8mm)	1.5" (38.1mm)	300 - 350	26 - 30

The above is based on a FCAW welding process with DC Reverse polarity, using no shielding gas.

### TWP57 Electrode Welding Parameters

Diameter	Amps
1/8" (3.25mm)	120 - 150
5/32" (4.0mm)	130 - 180
3/16" (5.0mm)	180 - 220

The above is based on a SMAW welding process with DC Reverse or AC polarity.

TWP57 is used for a screed plate 'bullnose'.



On the 'bullnose' or front lip of the screed, FCAW is used to apply TWP57.

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# TWP61 Wire & Electrode

### Application Process

OAW - FCAW  
(Shielding gas not required)

### Material Chemistry (wt%)

Chromium  
Boron  
Carbon  
Manganese  
Silicon  
Vanadium

### Rockwell C (HRc) Hard

Wire: 63 - 65 HRc  
Electrode: 60 - 64 HRc

### Packaging

**Wire:**  
.045" (1.1 mm) - 15kg spools  
1/16" (1.6 mm) - 25kg spools  
3/32" (2.4 mm) - 25kg spools  
7/64" (2.8 mm) - 25kg spools

**Electrode** (4 sleeves = 1box):  
1/8" (3.25 mm) - 4.5kg sleeves  
5/32" (4.0 mm) - 4.5kg sleeves  
3/16" (5.0 mm) - 5kg sleeves

### Description

TWP61 is a complex-carbide flux cored wire electrode used to protect equipment and parts from heavy wear in extreme temperatures. TWP61 has a unique composition that forms a tight crystalline matrix, and is able to deter heavy wear in temperatures up to 842°F (450°C).

### Key Performance Characteristics

- ▶ Heavy abrasion resistance
- ▶ High heat resistance
- ▶ Tight crystalline matrix
- ▶ Good corrosion resistance

### Applications

TWP61 can be applied to carbon steel, manganese base materials and mild or alloy steels. The maximum recommended deposit thickness of TWP61 3/8" (9.53mm) in 2 - 3 layers. TWP61 is used for the installation of T157 wear plate and parts, as well as for hot wear applications such as burner tips, classifier cones and smokestacks.

### Welding Procedure

The surfaces should be free from oil, rust and other contaminants by grinding if necessary. The weld deposit may be applied using stringer or weave beads. Overlay as per parent material welding procedure for pre/post heat, post weld cooling should be gradual. grinding is possible, the deposit is not machinable or forgeable. Stress relieving (cross-checking) occurs during cooling.



Wire Spools  
Spool size depends on type of wire and size

### TWP61 Wire Welding Parameters

Diameter	Stickout +/- .25" (6.35mm)	Amps	Volts
.045" (1.1mm)	1.5" (38.1mm)	100-220	18 - 24
1/16" (1.6mm)	1.5" (38.1mm)	190-200	26-30
3/32" (2.4mm)	1.5" (38.1mm)	250-300	26-30
7/64" (2.8mm)	1.5" (38.1mm)	300-350	26-30

### TWP61 Electrodes Welding Parameters

Diameter	Amps
1/8" (3.25 mm)	170 - 190
5/32" (4.0mm)	210 - 320
3/16" (5.0mm)	250 - 270

The above is based on a FCAW welding process with DC Reverse polarity, using no shielding gas.

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# TWP68i Weld Wire

## Wire Products: TWP68i

Patent pending

### 1 Introduction

TWP68i is an iron-based alloy specifically designed to produce overlays using conventional overlay process that replicate the microstructure of tungsten carbide PTA overlays.

TWP68i grows extremely hard molybdenum boride particles homogeneously throughout the entire weld bead. These molybdenum boride particles are harder and smaller than the tungsten carbide hard phase in PTA weld overlays — a characteristic that enhances impact resistance.

TWP68i is particularly suitable for applications where resistance to gouging or high-stress abrasion is required. Coatings of TWP68i pair the toughness required for high impact applications with superb wear resistance that rival most other wear-resistant coatings on the market. Its welded microstructure looks similar to tungsten carbide - nickel PTA overlays while simultaneously avoiding the long, needle-like particles known to cause problematic embrittlement in chro-mium carbide overlays and many nanostructured steel alloys.

#### 1.1 Typical Uses and Applications

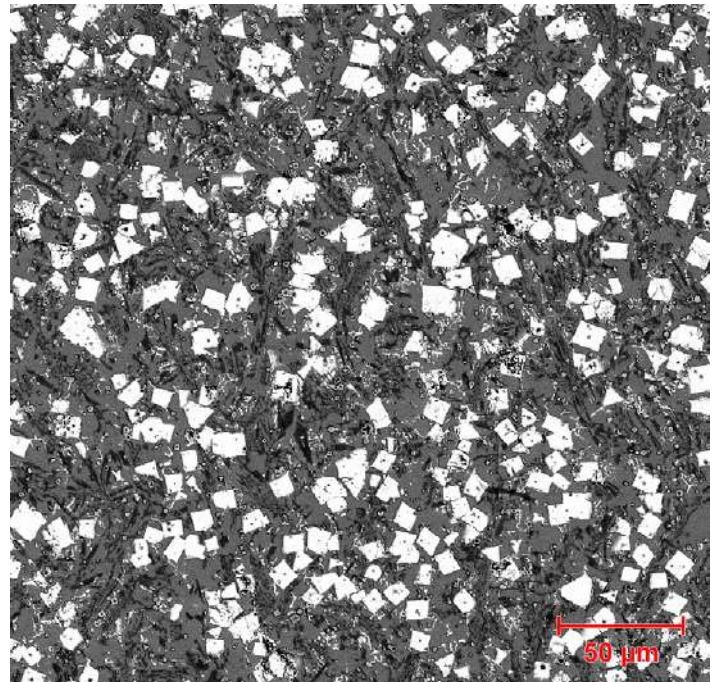
TWP68i overlays are suggested for use in any application where wear resistance to gouging or high-stress abrasion is required.

Specific applications include:

- Shaker screens
- Grader blades and other ground engaging tools
- Chute blocks
- Pipe inner walls
- Mill liners
- Slurry pipes
- Shovel wear packages
- Cutter rings
- Primary and secondary crusher teeth
- Grouser risers
- Other mining applications

### Quick Facts

Classification	Alloy, iron-based
Chemistry	Proprietary
Manufacture	Composite wire
Abrasion Resistance	0.09 to 0.11 g lost (ASTM G65A low stress abrasion)
Service Temperature	540 °C (1000 °F)
Impact Resistance	> 6000 impacts @ 20 J without failure
Overlay Hardness	65 to 70 HRC
Hard Phase	> 40%
Purpose	Gouging and high stress abrasion resistance
Processes	GMAW, BMAW, SAW



Typical as-welded coating microstructure of TWP68i. Note distribution of complex Molybdenum Boride particles with hardness of approx. 2600 HV.



## 2 Material Information

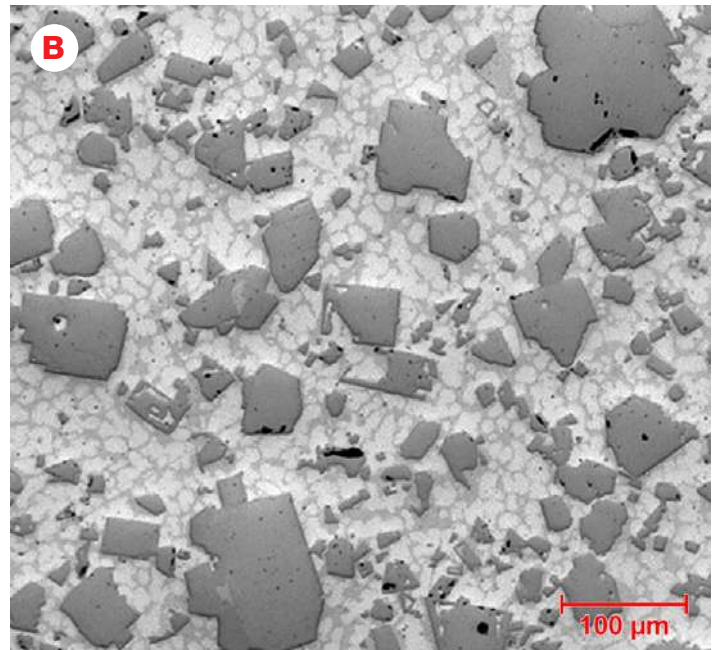
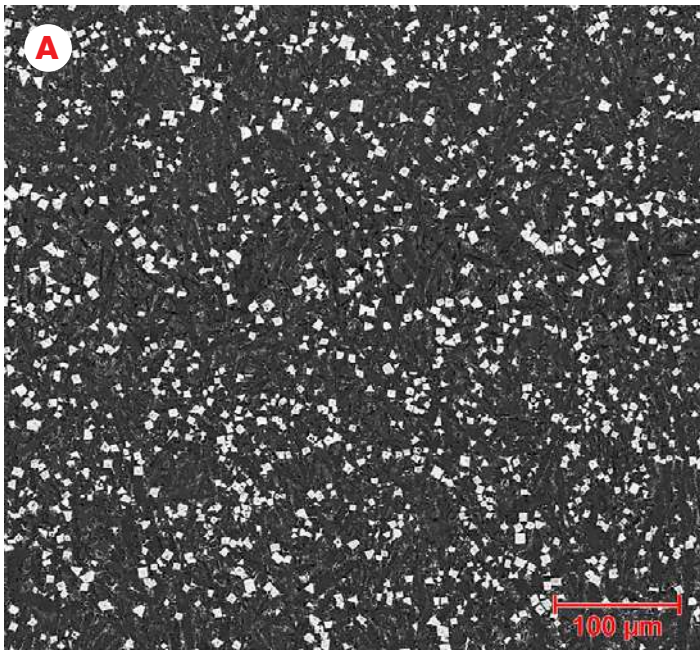
### 2.1 Physical Properties and Characteristics

Product	Nominal Chemistry	Product Form	Size	Recommended Process
TWP68i	Proprietary FeMoCr alloy	Composite Wire	1/16 in (1.6 mm)	GMAW
			7/64 in (2.78 mm)	BMAW, SAW

### 2.2 Key Selection Criteria

■ **Fine-Scale Microstructure:** TWP68i forms a unique microstructure that exhibits good high stress abrasion and gouging resistance. The TWP68i microstructure somewhat mimics the structure of a tungsten carbide-based (WC) matrix composite hardfacing. The thermodynamics of TWP68i drive the precipitation of extremely hard, cubic, complex molybdenum borides. The complex borides have a very high hardness comparable to WC. These complex boride particles are roughly 10 to 50  $\mu\text{m}$  in size with an inter-particle spacing of 75  $\mu\text{m}$  or less. Furthermore, the complex boride particles are embedded in a hard, martensitic matrix also contains a high fraction of fine scale carbides and borides. The combined high hardness of both the molybdenum boride particles and the matrix result in a structure that is very resistant to high stress abrasion and gouging.

- **Homogeneity:** TWP68i forms a high fraction of both carbides and borides as precipitates. The microstructure is the same throughout the deposit, whether near the weld interface or the deposit surface. The carbide size and spacing is very homogeneous throughout the entire deposit. The carbides are precipitated, thus they do not float nor settle and there are no regions that are enriched or depleted of the hard borides and carbides.
- **Consistent Performance:** The homogeneous microstructure results in consistent performance from the surface of the weld down to the weld interface. For example, ASTM G65 testing on the weld surface and halfway into the weld thickness generate the same results. The entire weld thickness will perform according to the performance specifications of the material.



Microstructure comparison of TWP68i deposit [A] versus WC-Ni GMAW deposit [B]. Note the fine hard phase and more homogeneous structure created by TWP68i versus the very large hard phase particles in the GMAW deposit.

TWP68i have a good compromise between abrasion performance and impact performance, with impact resistance that is still better than many common hard facing materials.. TWP68i delivers a uniquely high level of hard phase constituents (carbides + borides) that can be achieved using the GMAW process.

### 3 Key Coating Information

#### 3.1 Using TWP68i

TWP68i can be deposited as stringer beads or oscillated beads using GMAW, SAW or BMAW processes. TWP68i should be welded as a single layer deposit. Multiple layer deposits can reduce the impact resistance of the overlay.

Process	GMAW	SAW / BMAW
Wire Diameter	0.063 in (1.6 mm)	0.109 in (2.8 mm)
Current	DCEP	DCEP
Desired weld thickness	3 to 6 mm (0.12 to 0.24 in)	3 to 8 mm (0.12 to 0.31 in)
Voltage	25.5 to 27 V	25 to 27 V
Amperage (approx.)	225 A	400 A
Shielding gas	100% Ar	None
Stickout	28.6 mm (1.125 in)	32 mm (1.25 in)
Interpass temperature	< 260 °C (500 °F)	< 260 °C (500 °F)
Torch drag angle	5° to 15°	5° to 15°
Acceptable dilution	5% to 25%	15% to 35%
Expected hardness	65 to 70 HRC	65 to 70 HRC
Expected ASTM G65	0.09 to 0.1 g mass loss	0.09 to 0.1 g mass loss

### 4 Commercial Information

#### 4.1 Ordering Information and Availability

Product	Form	Size	Package Size	Availability	Distribution
TWP68i	Wire	0.063 in (1.6 mm)	25 lb (11 kg) spool	Stock	Global
TWP68i	Wire	0.109 in (2.78 mm)	25 kg (55 lb) spool	Stock	Global
TWP68i	Wire	0.109 in (2.78 mm)	250 kg (550 lb) drum	Stock	Global

#### 4.2 Handling Recommendations

- Store in the original container in a dry location.



Toll Free: 1-800-782-5445  
 Local Phone:  
 780-451-2206  
 Fax: 780-451-2087  
 Email: trimay@trimay.ca

# TWP70 Wire & Electrode

## Application Process

OAW - FCAW  
(Shielding gas not required)

## Material Chemistry (wt%)

Macrocrystalline TC  
Nickel  
Boron

## Rockwell C (HRC) Hardness

Wire: 50 - 56 HRC  
Electrode: 48- 57 HRC

## Packaging

Wire:  
1/16" (1.6mm) - 15kg (33lb) spools  
3/32" (2.4mm) - 15kg (33lb) spools  
7/64" (2.8mm) - 25kg (55b) coils

Electrode (4 sleeves = 1 box):  
All sizes - 5 kg (11lb) sleeves

## General Characteristics

Macrocrystalline nickel tube which can be welded with or without shielding gas. Macrocrystalline tungsten has a higher melting point than that of the molten welding puddle, therefore the matrix is not affected by the degradation of Tungsten carbides throughout the matrix. The result is a stable matrix which is not brittle and can absorb impact without cracking.

## Key Performance Characteristics

- ▶ Highest abrasion resistance
- ▶ Highest impact resistance
- ▶ Uniform carbide distribution throughout weld deposit
- ▶ Crackless weld deposit

## Welding Procedure

The surface should be free from oil, rust and other contaminants by grinding if necessary. The weld deposit may be applied using stringer or weave beads. Overlay as per parent material welding procedure for pre/post heat, post weld cooling should be gradual. Grinding is possible, the deposit is not machinable or forgeable. Minor stress relieving (cross-checking) occurs during cooling.

## Applications

TWP70 can be applied on ferritic and austenitic steels using an open or closed arc welding procedure, with or without gas shielding. TWP70 is used to overlay and protect areas which are exposed to the most extreme abrasion and/or impact. TWP70 has been used for diamond bit augers, cement factory fan blades, bucket teeth, and crusher rolls.

## Wire Welding Parameters

Diameter	Stickout +/- .25"(6.35mm)	Amps	Volts
1/16" (1.6 mm)	1.5" (38.1mm)	170-210	17- 20
3/32" (2.4 mm)	1.5" (38.1mm)	180-230	18 - 22
7/64" (2.8 mm)	1.5" (38.1mm)	230-290	20- 24

The above is based on a FCAW welding process with DC Reverse polarity, using no shielding gas.

## Electrode Welding Parameters

Diameter	Amps
5/32" (4.0mm)	110 - 130
3/16" (5.0mm)	130 - 150
1/4" (6.0mm)	140 - 160

The above is based on a SMAW welding process with DC Reverse polarity, using no shielding gas.

## TWP70 Drilling Augers



The above augers are lined with TWP70 to prevent wear and reduce switchouts.

## Wire Spools



Spool size depends on type of wire and size

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# TWP71 Weld Wire

### Application Process

OAW-FCAW  
(shielding gas not required)

### Material Chemistry (wt%)

Chromium  
Boron  
Molybdenum  
Niobium  
Aluminum  
Carbon  
Manganese  
Silicon

### Rockwell C (HRC) Hardness

66 - 71 HRC

### Wear Resistance

ASTM G65-04 Procedure A  
6,000 cycles mass loss  
0.09 - 0.11 g (+/-0.03)

### Weld Deposit Properties

Density (g/cm<sup>3</sup>) 7.36

### Impact Resistance

Drop Impact Passed multiple  
Testing impacts at 165 ft-lbs

### Packaging

**Wire:**  
.045" (1.1 mm) - 15kg spools  
1/16" (1.6 mm) - 25kg spools  
3/32" (2.4 mm) - 25kg spools  
7/64" (2.8 mm) - 25kg spools

### General Characteristic

TWP71w is an iron based steel alloy with a near nanoscale (submicron) microstructure that includes chromium, molybdenum and niobium in the material chemistry, resulting in an overlay wear solution well suited for the toughest jobs in the most extreme service environments. TWP171w is a multicomponent steel alloy with a unique uniform glass-forming melt chemistry that allows high undercooling to be achieved during welding. This results in considerable refinement of the crystalline microstructure down to a near nanosize (submicron) range. Unlike conventional weld overlay materials which are macrocomposites containing hard particles and general carbides in a distinct hard particles in a binder and is a uniformly hard matrix when welded. This allows TWP171w to provide vastly improved hardness macrocomposites. Additionally, TWP171w is an iron-based alloy without tungsten carbide particulates.

### Key Performance Characteristics

- ▶ 66- 71 HRC single and double pass weld deposits
- ▶ Exceptional resistance to serve sliding abrasion
- ▶ Provides longer lasting wear life than most chrome carbide and complex carbide

### Applications

TWP71w can be applied to carbon steel, manganese base materials and mild or alloys steels. The maximum recommended deposits thickness of TWP71w is 2 layers, or 1/4" (6.35mm). TWP71w is used to cover exposed bolts and seams for installation of wear plate and parts, as well as for small area lining of heavy wearing parts and equipment.

### High Hardness

TWP171w maintains maximum hardness performance of 66-71 HRC from the weld interface throughout the entire overlay in single pass applications allowing the overlay to be fully protective throughout the volume.

### High Wear Resistance

TWP171w weld deposits should be limited to two layers maximum for most applications. Both single and double layers provide exceptional wear resistance of 0.09 - 0.11 g (+/- 0.02) mass loss in ASTM G65-04 dry sand rubber wheel abrasion tests.

### Damage Tolerance

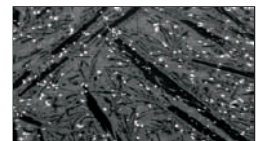
The superior toughness of TWP171w occurs from the in-situ formation of high-volume fraction phases allows the reduction of stress concentration sites and the ductile matrix supplies effective crack blunting and bridging, resulting in improved impact resistance.

### TWP71 Wire Parameters

Diameter	Stickout +/- .25" (6.35mm)	Amps	Volts
.045" (1.2mm)	1" (25.4mm)	135 - 185	24
1/16" (1.6mm)	1" (25.4mm)	220 - 270	24
3/32" (2.4mm)	1" (25.4mm)	375 - 425	25
7/64" (2.8mm)	1.25" (31.75mm)	450- 500	26

The above is based on a FCAW welding process with DC Reverse polarity

Microstructure



TWP71w features a near nanoscale microstructure with grain sizes less than 100 nm.

## Cement\_CS\_Clinker Stacker

### Problem(s):

- P1) Clinker chute of clinker stacker. Previous ceramic liner service life: 3 months.
- P2) Raw mill separator hub post liners. Previous Ni-Hard service life: 4 months.
- P3) Fan housings.commodo consequat.

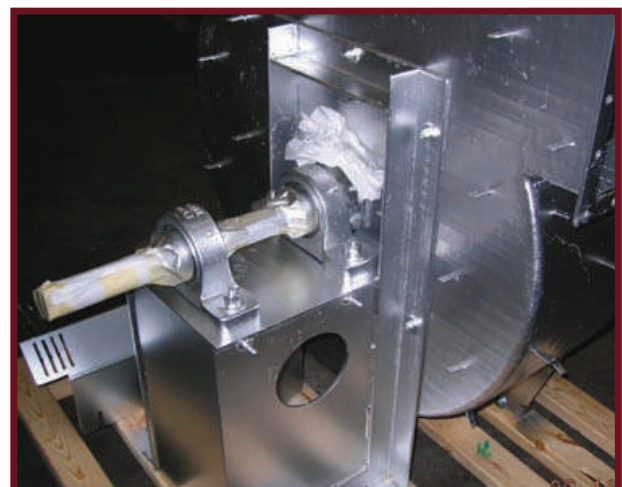
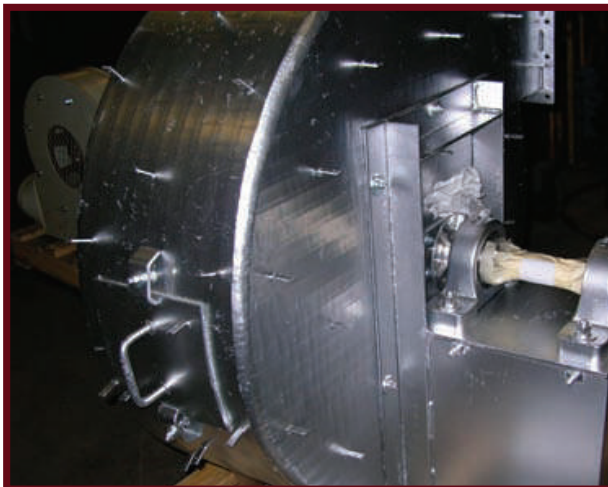
### Solution(s):

One of Trimay's longest-standing products, T157, a chromium-based wear overlay, was selected because of the tight carbide formation inside the overlay matrix. Trimay<sup>®</sup> now recommends the new T171 for all cement and concrete applications where maximum life of the equipment is desired.

- S1) T157 12mm overlay.
- S2) T157 14mm overlay.
- S3) T157 9mm overlay.

### Result(s):

- R1) 18+ months. More than 6 x previous ceramic liners.
- R2) 19+ months. Almost 5 x longer life than previous nickel/cobalt plate.
- R3) 36+ months. Over 3 years for shape air fan housing.



# Asphalt\_CS\_Screed Plates

## Problem(s):

Highly abrasive aggregate used in manufacture of asphalt causes premature wear on standard screed plates. This results in mid-season change out causing downtime and loss of revenue.

## Solution(s):

Trimay wear plate is used to manufacture premium screed plates that outlast most standard screed plates up to 10x, resulting in no mid-season change outs and no loss of production on revenue.

## Result(s):

The screed plate shown below was removed and replaced by a paving client. The screeds paved 650,000 metric tons (about 8x that of the OEM screed) and 750,000 metric tons (about 10x that of the OEM screed) in the same aggregate environment.

Images 1, 2 & 3 : New T156 screed plate.

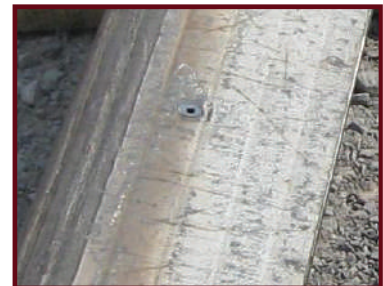
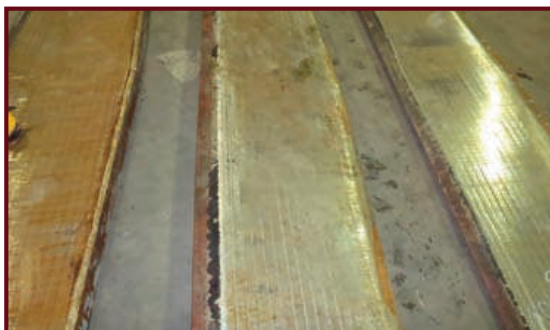


Image 4: Used Screed Plates



Left - processed 750,000 tonnes of asphalt (about 10 times the amount the original manufacturer screed can process). Middle, right - processed 650,000 tonnes of asphalt (about 8 times the amount the original manufacturer screed can process).

Image 5: Used Screed Face



Above - close-up of the right screed from image 1. You can see the bullnose wore quicker than the face.



# Mining\_CS\_Skip Deflector

## Problem(s):

Hard-rock sliding abrasion and impact on skip deflector plates in an underground Canadian gold mine. During loading, ore drops 30 feet (9 meters) onto a deflector plate and slides into 20-tonne capacity skip. During unloading, the skip is tilted at a 30 degree angle on one side and the ore slides over the deflector onto a belt conveyor for transport to the next station.

## Solution(s):

Trimay® T171. To extend the life of the skip deflector and reduce surface material loss, the mine installed T171 wear plate, 1/2 inch thickness.



## Result:

The T171 overlay wear plate was prematurely removed from service for maintenance after deflecting more than 1 million tonnes of ore. The comparison materials were completely worn and the skip needed to be re-lined, even though mine engineers estimated T171 to deflect another 1 million tonnes before requiring replacement.

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# Mining\_CS\_Oilsand Slurry

## Problem(s):

Oilsand tailings corrosive and abrasive wear. Traditional CCO pipe overlay often suffers from undulation and mis-alignment at installation seams. The resulting disruption of material flow causes difficult to predict, inconsistent wear patterns and premature.

## Solution(s):

Trimay pipe products. In 2009, Chromium overlay was installed on 28" (71.1cm) diameter pipe. Trimay's® pipe overlay is produced to make installation as easy as possible, without distorting the base pipe. The result speaks for itself.

## Result(s):

After six months of transporting oilsand slurry, only 6% of the chromium overlay was lost.

Image 1 & 2 show the original .25" (6.35mm) of chromium overlay lost only .06" (1.5mm) in six months. This translates to 24% loss every six months, at 4% loss per month.

Note that lines can be rotated to extend pipe life.

Image 1: Six Month Use Test

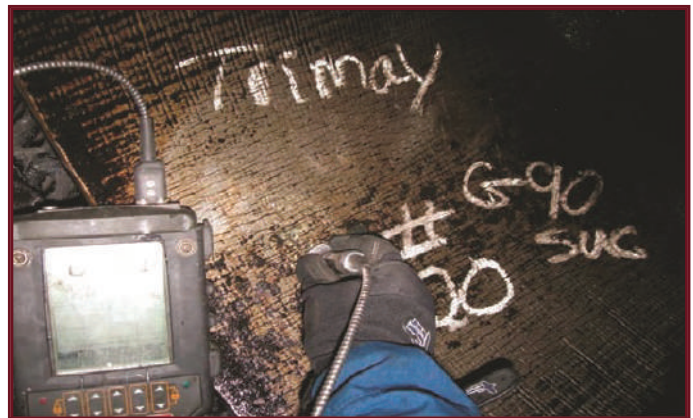


Image 2: Six Month Use Test



## Mining\_CS\_Uranium Slick Line

### Problem(s):

A 550 meter vertical (free-fall) concrete delivery system to an underground uranium mine in northern Saskatchewan, Canada. The previously used 9-5/8" OD API 5CT Gr. L80 casing wore through in approximately 18 months, requiring installation of another line.

### Solution(s):

Trimay<sup>®</sup> T171 6mm overlay was chosen rather than a 12mm chromium carbide (T157) overlay. T171's superior wear ability allowed for an overall reduction of weight and an increase of 1.2cm inside diameter space for concrete. T171 also proved to be more ductile than chromium when applied to the L80 casing.

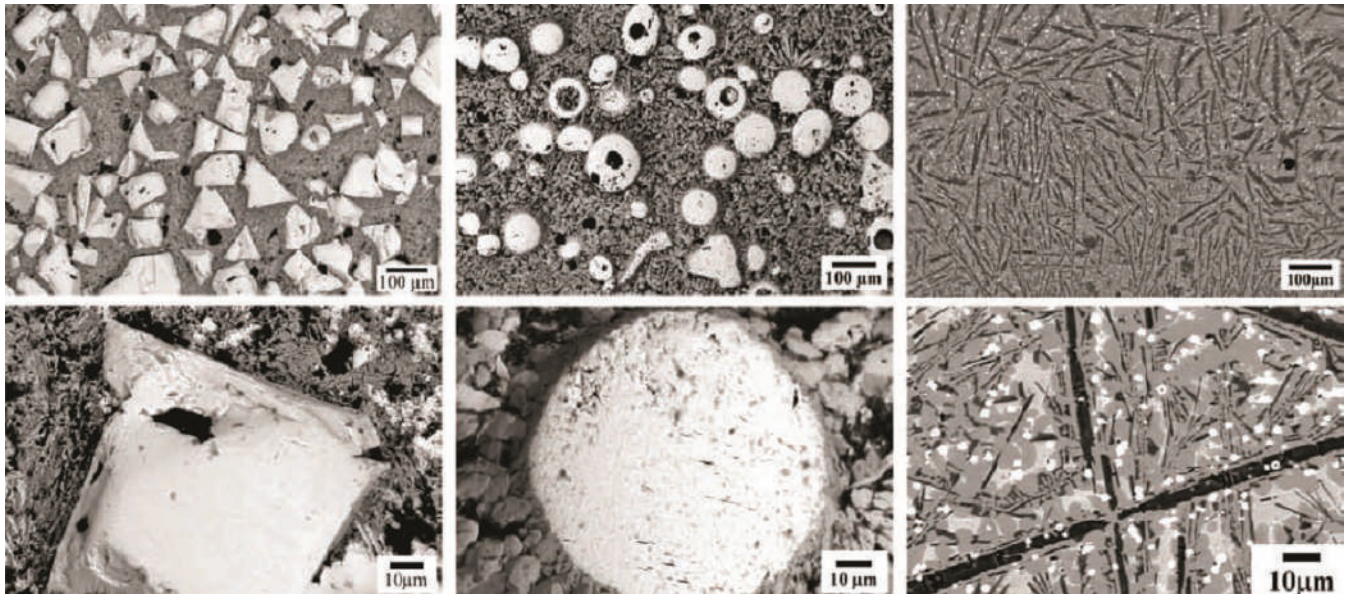


### Result:

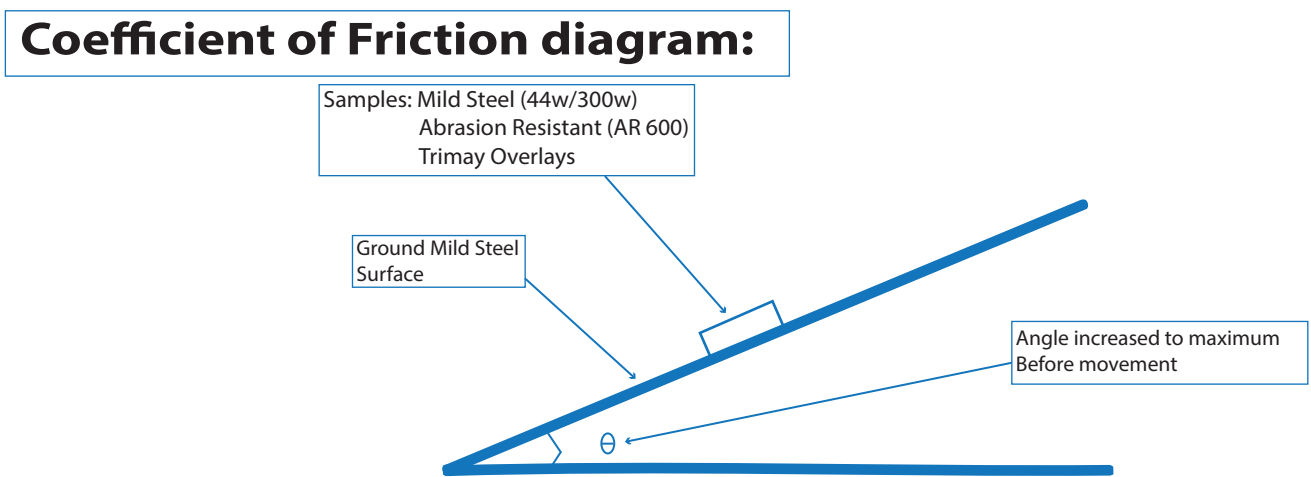
The vertical concrete delivery system was installed via male-to-male zero-clearance threaded couplers, and is conservatively estimated to last over 12.5 years according to G65 wear test results for mild steel, T171 overlay, and the previous 18 month lifespan. Test tolerances were added/subtracted such that 12.5 years is the shortest/most conservative .



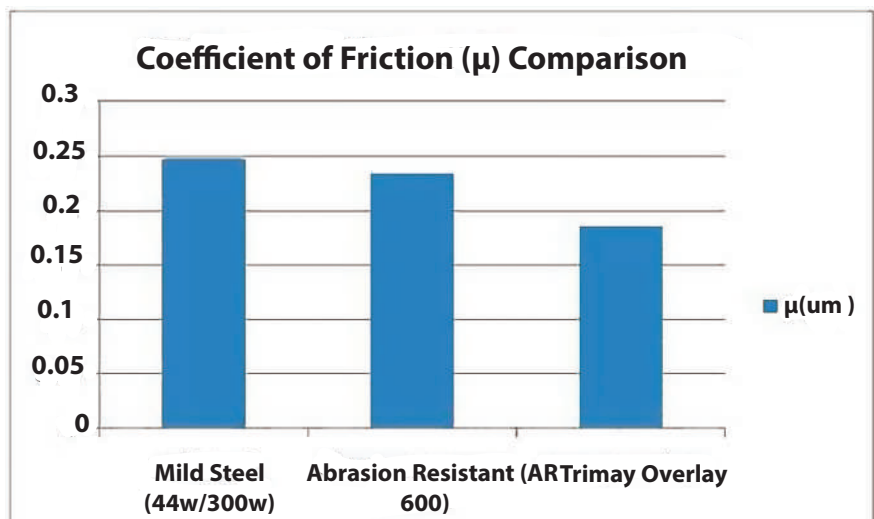
**Figure 1: Micrographs of T171 & T170:**



**Figures 2 & 3: Trimay's coefficient of friction advantage:**



*Trimay's overlays have a coefficient of friction of 0.185.*







**TRIMAY®**

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