

Comparison of Laser Ablation to SSPC-SP Surface Preparation

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Elzly and HII-Newport News

Background

- Laser ablation technology for coating removal and surface preparation has advanced greatly in the past several years
- Laser ablation devices are less costly and more readily available
- Several shipyards now have laser ablation capabilities and are investigating beneficial use cases
- AMPP has recently released a laser ablation surface preparation guide for ferrous substrates (SP21511)
- Outstanding questions remain for laser effectiveness compared to traditional abrasive blasting and power tool preparation methods

Scope of Work

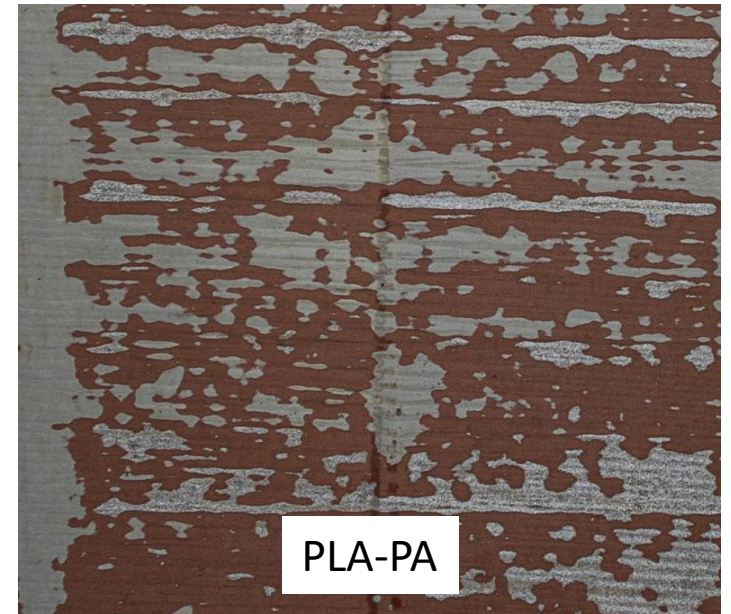
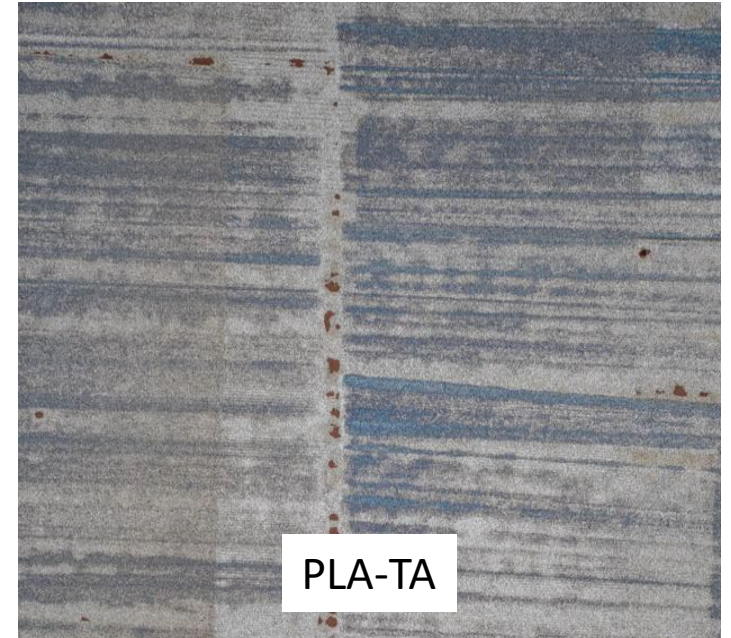
- Use current training, guidance from AMPP, and lessons learned from previous work to evaluate laser ablation use for coating removal and surface preparation compared to standard surface preparation methods
- Goals/Objectives
 - Gauge shipyard laser ablation equipment availability and usage.
 - Evaluate the production rate, surface profile, and degree of cleanliness produced when laser ablating steel in a shipyard setting.
 - Compare laser ablation to power tool and abrasive blasting surface preparation.
 - Evaluate additional benefits of laser ablation and specific applications where it will be a valuable preparation option.

Tasks

- Identify Laser Ablation Equipment Currently Owned by Shipyards and Extent of Use
 - Discuss and define current laser ablation status quo with shipyards
 - GC-500 and GC-1000 most common
- Shipyard Laser Ablation Surface Preparation Comparisons
 - Prepare test samples with laser ablation, power tools, and abrasive blasting at a shipyard. Document production rate, profile, and level of cleanliness for each method.
- Coating Performance Testing and Shipyard Use Evaluation
 - Apply Navy Epoxy coatings to prepared samples and expose in cyclic corrosion and Cathodic Disbondment testing to evaluate coating performance over each type of surface preparation.
- Final Report
 - Evaluate data collected during testing and deliver a final report of results and conclusions

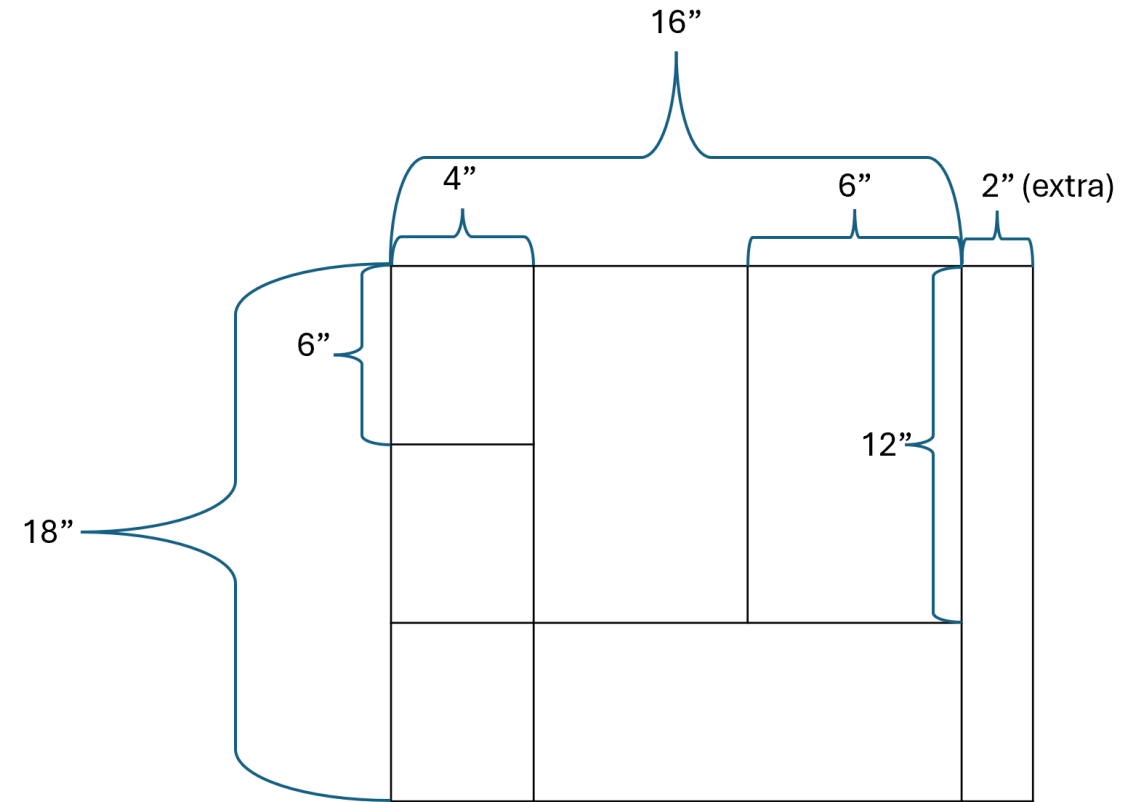
Testing Considerations

- Sample Initial Conditions
 - Pre-Construction Primer
 - MIL-PRF-23236 Epoxy
- Intended Levels of Cleanliness
 - PCP
 - Thorough Pulsed Laser Ablation (PLA-TA)
 - GC-500 vs GC-1000
 - SSPC-SP 10 – Abrasive Blast
 - SSPC-SP 11 – Power Tool
 - Grinder vs Bristle Impact Tool
 - Epoxy
 - Thorough Laser Ablation (PLA-TA)
 - GC-500 vs GC-1000
 - SSPC-SP 6 – Abrasive Blast
 - SSPC-SP 3 – Power Tool
 - Grinder vs Bristle Impact Tool



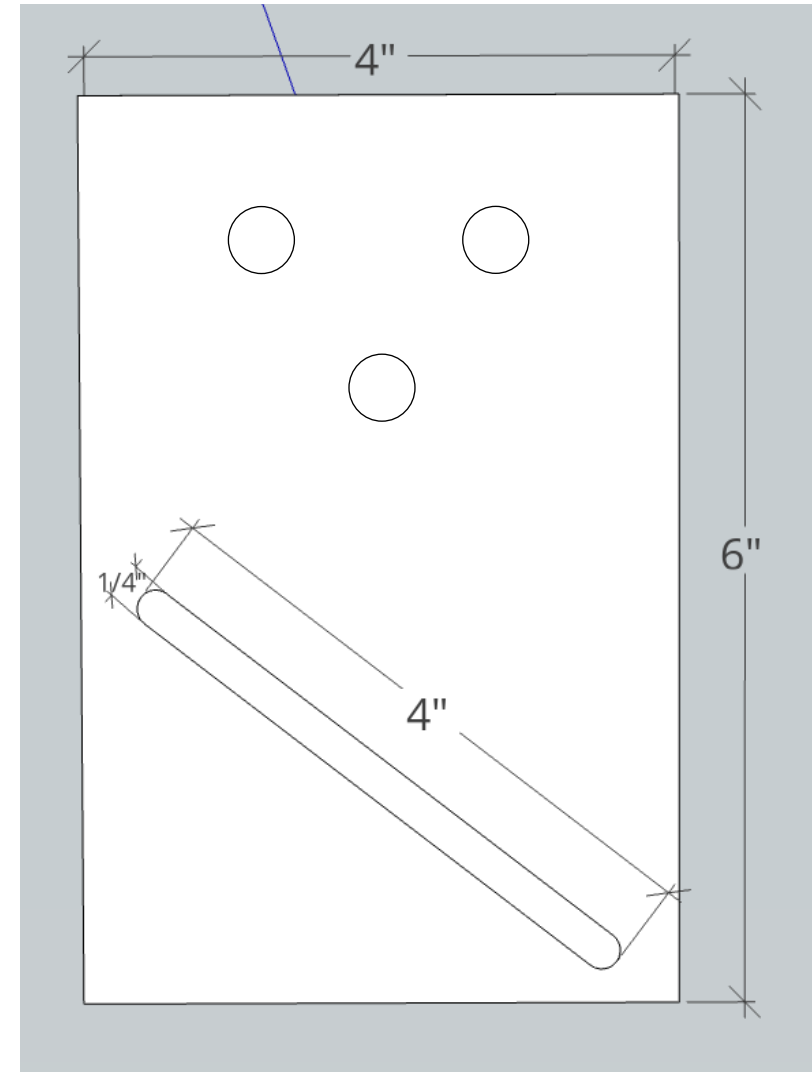
Testing Samples

- 18"x18" plates initially blasted to SP-10 (2-4 mil profile)
- Half of plates coated with PCP. Other half coated with 1 coat 23236 Type VI primer
- 4 Plates for Laser Ablation coating removal at HII Newport News
 - GC-500 and GC-1000
- 2 Plates abrasive blasting coating removal in lab
 - Steel grit
- 4 plates power tool coating removal in lab
 - Rotary sander/grinder and bristle impact tool
- ~~After coating removal, plates will be cut into appropriate test samples sizes and cut for coating performance testing.~~
- **UPDATE: Plates were cut into panels prior to coating removal testing. Data from previous power tool and abrasive blasting programs will be used for production rate comparison**



Performance Evaluation

- Preparation Production Rate
- Cathodic Disbondment
- ASTM D5894 Cyclic Corrosion
 - ASTM G85 Annex 5 solution
- Dolly Pull Adhesion
- Scribe Cutback
- Rust Through and Blistering



Test Matrix

Condition	Preparation	Test	Sample Count	Sample Size
MIL-PRF-23236 Type VI	Laser – 1000W	Cathodic Disbondment	3	6"x12"
	Laser – 500W	Cathodic Disbondment	3	6"x12"
	SP 10	Cathodic Disbondment	3	6"x12"
	SP 11-Grinder	Cathodic Disbondment	3	6"x12"
	SP 11-Bristle	Cathodic Disbondment	3	6"x12"
	Laser – 1000W	Accelerated Corrosion	3	4"x6"
	Laser – 500W	Accelerated Corrosion	3	4"x6"
	SP 10	Accelerated Corrosion	3	4"x6"
	SP 11-Grinder	Accelerated Corrosion	3	4"x6"
	SP 11-Bristle Blaster	Accelerated Corrosion	3	4"x6"
PCP	Laser – 1000W	Cathodic Disbondment	3	6"x12"
	Laser – 500W	Cathodic Disbondment	3	6"x12"
	SP 10	Cathodic Disbondment	3	6"x12"
	SP 11-Grinder	Cathodic Disbondment	3	6"x12"
	SP 11-Bristle	Cathodic Disbondment	3	6"x12"
	Laser – 1000W	Accelerated Corrosion	3	4"x6"
	Laser – 500W	Accelerated Corrosion	3	4"x6"
	SP 10	Accelerated Corrosion	3	4"x6"
	SP 11-Grinder	Accelerated Corrosion	3	4"x6"
	SP 11-Bristle Blaster	Accelerated Corrosion	3	4"x6"
Total			30	6"x12"
			30	4"x6"

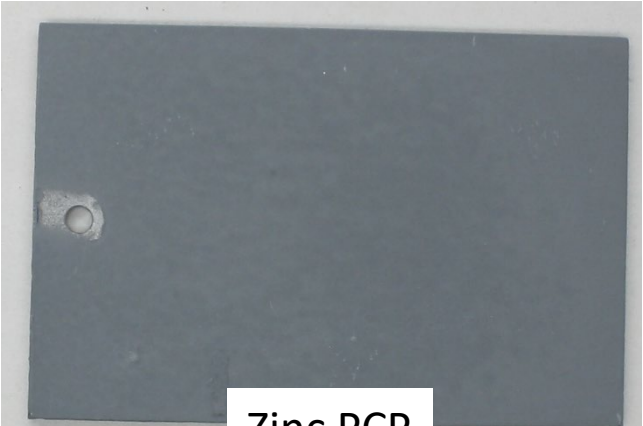
Initial Coating Application



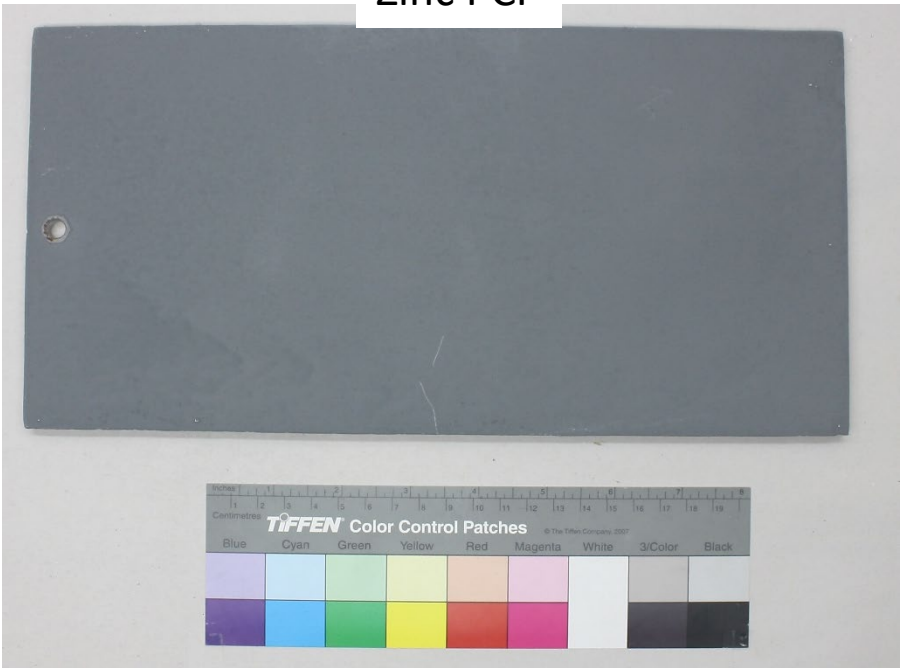
Blasted



MIL-PRF-23236



Zinc PCP



Path Forward

- Perform surface preparation comparisons with HII laser ablation device and traditional techniques
- Re-apply coatings
- Perform coating performance testing
- Deliver analytical report on testing and results

