

Industry/Segment: Email: Phone:

# Multi-State Advanced Manufacturing Consortium

US DOL SPONSORED TAACCCT GRANT: TC23767

# **MSAMC Master Performance Based Objectives (PBO) Review Template**

 Instructions

 The following tab lists PBOs for the topic area Welding . Please review each of the PBOs, and rate each PBO with one of the following ratings:

 1 = Skill or understanding is required for employees.

 2 = Skill is useful, but is not crucial for employees.

 2 = Skill is not useful for employees, or isn't relevant for typical work assignments.

 0 = PBO is unclear.

 Additionally, for each PBO, note any comments or recommendations that you may have about how to improve the PBO. If any PBOs or skill sets seem to be missing from the list, please add them in the space at the bottom of the list.

 Please enter your information below

 Name:

 Company/Plant:

 Department/Division:

20150608\_pbo\_review\_ind\_ welding found in Resources by the M-SAMC Multi-State Advanced Manufacturing Consortium www.msamc.org is licensed under a Creative Commons Attribution 4.0 International License.



# Welding

## M-S AMC Industry Partner PBO Review

Please review the following PBOs to identify the appropriate skill set for a given job title / category / classification (see row 10 below).
\* In the "Importance" column, identity how important each PBO is for someone in the relevant position. For each PBO, type 1 if the PBO must be covered in the coursework, enter 2 if the PBO is helpful but not necessary and would not impair the performance of the employee in the workplace if missed, and enter 3 if the PBO would not benefit the student or doesn't apply to the typical work assignments. If you don't understand the PBO, enter 0.

\* Note any comments or feedback for improving each PBO (in the "Comments" column). Note: It is the intention of competency based instruction to have each student individually demonstrate their proficiency of the skills indicated.

Reviewing PBOs fc TYPE JOB TITLE HERE (from whose perspective are you rating PBO importance?)

Sub-Topic	Торіс	PBO ID	Performance Based Objective (PBO)	Importance 1 = Need 2 = nice to have 3 = N/A 0= Don't understand	<b>Comments</b> Notes to improve the PBO, PBO is unclear, etc.
	WD	1	Demonstrate proper welding safety in the lab environment.		
	 WD	2	Interpret an industrial drawing with welding symbols.		
	 WD	3	Identify welding joints and welding positions.		
	WD	4	Interpret welding terms.		
	WD	5	Identify the correct welding code for a given weldment.		
Weld Joint Design and Prep	WD	6	Demonstrate satisfactory knowledge of measuring tools used on weld and weldments.		
	 WD	7	Demonstrate satisfactory knowledge of hand tool safety.		
	 WD	8	Use hand tools properly.		
	 WD	9	Identify welding flaws.		
	 WD	10	Demonstrate proper set-up and use of an Oxy/Fuel cutting outfit.		
	 WD	11	Demonstrate proper set-up and use of an Oxy/Fuel line cutter.		
	 WD	12	Demonstrate proper set-up and use of a Plasma Arc Cutter.		
	 WD	13	Demonstrate proper safety and use of power tools.		
	WD	14	Demonstrate fillet and groove joint assembly.		
	 WD	15	Demonstrate proper safety practices for Shielded Metal Arc Welding.		
	WD	16	Apply the proper welding machine settings for a given competency using the Shielded Metal Arc Welding process.		
	WD	17	Identify and explain various welding electrodes used in the Shielded Metal Arc Welding process.		
	WD	18	Demonstrate proper welding technique in flat position using the Shielded Metal Arc Welding process.		
	WD	19	Demonstrate proper welding technique in horizontal position using the Shielded Metal Arc Welding process.		
	WD	20	Perform multiple welds using proper welding technique for a given weldment.		
	WD	21	Demonstrate proper safety practices for Shielded Metal Arc Welding.		

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Weiding       WD       36       Perform weids using proper preparation and weiding technique for a given weiding technique in vertical position with steel.         WD       37       Demonstrate the proper weiding technique in vertical position with steel.         WD       38       Demonstrate the proper weiding technique in vertical position with steel.         WD       39       Perform weids using proper preparation and weiding technique for a given weidement.         WD       40       Demonstrate the proper weiding technique in flat position with aluminum.         WD       40       Demonstrate the proper weiding technique in flat position with aluminum.         WD       40       Demonstrate the proper weiding technique in horizontal position with aluminum.         WD       41       horizontal position with aluminum.         WD       42       Demonstrate the proper weiding technique in weiding technique in weiding technique for a given weiding technique in horizontal position with aluminum.         WD       42       Demonstrate the proper preparation and weiding technique for a given weiding technique in weiding technique for a given weiding technique in weiding technique in weiding technique in metal type and thickness.         WD       43       Perform weids using proper preparation and weiding technique in given metal type and thickness.         WD       44       Demonstrate proper safety practices for the Gas         MWD       45		WD	35	horizontal position with stainless steel.	
Weiding       WD       36       Perform weids using proper preparation and weiding technique for a given weiding technique in vertical position with steel.         WD       37       Demonstrate the proper weiding technique in vertical position with steel.         WD       38       Demonstrate the proper weiding technique in vertical position with steel.         WD       39       Perform weids using proper preparation and weiding technique for a given weidement.         WD       40       Demonstrate the proper weiding technique in flat position with aluminum.         WD       40       Demonstrate the proper weiding technique in flat position with aluminum.         WD       40       Demonstrate the proper weiding technique in horizontal position with aluminum.         WD       41       horizontal position with aluminum.         WD       42       Demonstrate the proper weiding technique in weiding technique in weiding technique for a given weiding technique in horizontal position with aluminum.         WD       42       Demonstrate the proper preparation and weiding technique for a given weiding technique in weiding technique for a given weiding technique in weiding technique in weiding technique in metal type and thickness.         WD       43       Perform weids using proper preparation and weiding technique in given metal type and thickness.         WD       44       Demonstrate proper safety practices for the Gas         MWD       45	Gas Tungsten Arc				
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WD       37       vertical position with steel.         WD       38       Demonstrate the proper welding technique in vertical position with stainless steel.         WD       39       Perform welds using proper preparation and welding technique for a given weldment.         WD       40       Demonstrate the proper welding technique in flat position with aluminum.         WD       41       Demonstrate the proper welding technique in horizontal position with aluminum.         WD       41       Demonstrate the proper welding technique in horizontal position with aluminum.         WD       42       Demonstrate the proper welding technique in vertical position with aluminum.         WD       43       Perform welds using proper preparation and welding technique for a given weldment.         WD       43       Perform welds using proper preparation and welding technique for a given weldment.         WD       43       Perform welds using proper preparation and welding technique for a given weldment.         WD       44       Demonstrate proper safety practices for the Gas Metal Arc Welding process.         WD       45       Prepare the Gas Metal Arc Welding machine for a given metal type and thickness.         Select the proper filler metal for a given weldment using the Gas Metal Arc Welding process.       Perform welding technique in flat position.         WD       46       Demonstrate the proper welding technique in	weiung				
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WD       38       vertical position with stainless steel.         WD       39       Perform welds using proper preparation and welding technique for a given weldment.         WD       40       Demonstrate the proper welding technique in flat position with aluminum.         WD       41       Demonstrate the proper welding technique in horizontal position with aluminum.         WD       42       Demonstrate the proper welding technique in horizontal position with aluminum.         WD       42       Demonstrate the proper welding technique in wertical position with aluminum.         WD       43       Perform welds using proper preparation and welding technique for a given weldment.         WD       43       Perform welds using proper preparation and welding technique for a given weldment.         WD       44       Demonstrate proper safety practices for the Gas Metal Arc Welding process.         WD       45       Prepare the Gas Metal Arc Welding machine for a given metal type and thickness.         Select the proper filter metal for a given welding technique in flat position.       Select the proper welding technique in flat position.         WD       47       Demonstrate the proper welding technique in flat position.         WD       47       Demonstrate the proper welding technique in flat position.	_				
WD       39       Perform welds using proper preparation and welding technique for a given weldment.         WD       40       Demonstrate the proper welding technique in flat position with aluminum.         WD       41       Demonstrate the proper welding technique in horizontal position with aluminum.         WD       42       Demonstrate the proper welding technique in wertical position with aluminum.         WD       42       Demonstrate the proper welding technique in wertical position with aluminum.         WD       43       Perform welds using proper preparation and welding technique for a given weldment.         WD       43       Perform welds using proper safety practices for the Gas Metal Arc Welding process.         WD       44       Demonstrate proper safety practices for the Gas Metal Arc Welding machine for a given weldment using the Gas Metal Arc Welding machine for a given weldment using the Gas Metal Arc Welding process.         WD       45       Prepare the Gas Metal Arc Welding machine for a given weldment using the Gas Metal Arc Welding process.         WD       46       Select the proper welding technique in flat position.         WD       47       Demonstrate the proper welding technique in flat position.         Gas Metal Arc       WD       47		WD	38		
Image: Second	-			vertical position with stainless steel.	
Image: Second		WD	30	Perform welds using proper preparation and	
WD       40       Demonstrate the proper welding technique in flat position with aluminum.         WD       41       Demonstrate the proper welding technique in horizontal position with aluminum.         WD       42       Demonstrate the proper welding technique in vertical position with aluminum.         WD       42       Demonstrate the proper welding technique in vertical position with aluminum.         WD       43       Perform welds using proper preparation and welding technique for a given weldment.         WD       43       Perform welds using proper preparation and welding technique for a given welding technique for a given metal type and thickness.         WD       44       Demonstrate proper safety practices for the Gas Metal Arc Welding machine for a given metal type and thickness.         WD       45       Prepare the Gas Metal Arc Welding machine for a given weldiment using the Gas Metal Arc Welding process.         WD       46       Select the proper welding technique in flat position.         Gas Metal Arc       WD       47         Demonstrate the proper welding technique in flat position.       Periors and thickness.			35		
WD       40       flat position with aluminum.         WD       41       Demonstrate the proper welding technique in horizontal position with aluminum.         WD       42       Demonstrate the proper welding technique in vertical position with aluminum.         WD       42       Demonstrate the proper welding technique in vertical position with aluminum.         WD       43       Perform welds using proper preparation and welding technique for a given weldment.         WD       44       Demonstrate proper safety practices for the Gas Metal Arc Welding process.         WD       45       Prepare the Gas Metal Arc Welding machine for a given metal type and thickness.         Select the proper filler metal for a given welding technique in flat position.       Select the proper welding technique in flat position.					
WD       41       Demonstrate the proper welding technique in horizontal position with aluminum.         WD       42       Demonstrate the proper welding technique in vertical position with aluminum.         WD       42       Demonstrate the proper welding technique in vertical position with aluminum.         WD       43       Perform welds using proper preparation and welding technique for a given weldment.         WD       44       Demonstrate proper safety practices for the Gas Metal Arc Welding process.         WD       44       Demonstrate the groper diler metal for a given welding technique for a given welding technique for a given welding technique for a given metal type and thickness.         WD       45       Prepare the Gas Metal Arc Welding machine for a given weldment using the Gas Metal Arc Welding process.         WD       46       Select the proper filler metal for a given weldment using the Gas Metal Arc Welding process.         WD       47       Demonstrate the proper welding technique in flat position.         Gas Metal Arc       Preportstrate the proper welding technique in flat position.		WD	40		
WD       42       Demonstrate the proper welding technique in vertical position with aluminum.         WD       42       Demonstrate the proper welding technique in vertical position with aluminum.         WD       43       Perform welds using proper preparation and welding technique for a given weldment.         WD       44       Demonstrate proper safety practices for the Gas Metal Arc Welding process.         WD       45       Prepare the Gas Metal Arc Welding machine for a given weldment to given metal type and thickness.         WD       46       Select the proper filler metal for a given welding process.         WD       47       Demonstrate the proper welding technique in flat position.				Demonstrate the proper welding technique in	
WD       42       vertical position with aluminum.         WD       43       Perform welds using proper preparation and welding technique for a given weldment.         WD       44       Demonstrate proper safety practices for the Gas Metal Arc Welding process.         WD       44       Demonstrate proper safety practices for the Gas Metal Arc Welding machine for a given metal type and thickness.         WD       45       Prepare the Gas Metal Arc Welding machine for a given metal type and thickness.         Select the proper filler metal for a given weldment using the Gas Metal Arc Welding process.       VD         WD       46       Demonstrate the proper welding technique in flat position.         Gas Metal Arc       Demonstrate the proper welding technique in flat position.		WD	41		
WD       43       Perform welds using proper preparation and welding technique for a given weldment.         WD       43       Perform welds using proper preparation and welding technique for a given weldment.         WD       44       Demonstrate proper safety practices for the Gas Metal Arc Welding process.         WD       45       Prepare the Gas Metal Arc Welding machine for a given metal type and thickness.         WD       46       Select the proper filler metal for a given weldment using the Gas Metal Arc Welding process.         WD       46       Demonstrate the proper welding technique in flat position.			42		
Gas Metal Arc       WD       44       Demonstrate proper safety practices for the Gas Metal Arc Welding process.         WD       44       Demonstrate proper safety practices for the Gas Metal Arc Welding process.         WD       45       Prepare the Gas Metal Arc Welding machine for a given metal type and thickness.         Select the proper filler metal for a given weldment using the Gas Metal Arc Welding process.       Select the proper filler metal for a given welding technique in flat position.		000	-12	vertical position with aluminum.	
Gas Metal Arc       WD       44       Demonstrate proper safety practices for the Gas Metal Arc Welding process.         WD       44       Demonstrate proper safety practices for the Gas Metal Arc Welding process.         WD       45       Prepare the Gas Metal Arc Welding machine for a given metal type and thickness.         Select the proper filler metal for a given weldment using the Gas Metal Arc Welding process.       Select the proper filler metal for a given welding technique in flat position.					
WD       44       Demonstrate proper safety practices for the Gas Metal Arc Welding process.         WD       45       Prepare the Gas Metal Arc Welding machine for a given metal type and thickness.         WD       46       Select the proper filler metal for a given weldment using the Gas Metal Arc Welding process.         WD       47       Demonstrate the proper welding technique in flat position.		WD	43		
WD       44       Metal Arc Welding process.         WD       45       Prepare the Gas Metal Arc Welding machine for a given metal type and thickness.         WD       46       Select the proper filler metal for a given weldment using the Gas Metal Arc Welding process.         WD       47       Demonstrate the proper welding technique in flat position.					
WD       45       Prepare the Gas Metal Arc Welding machine for a given metal type and thickness.         WD       46       Select the proper filler metal for a given weldment using the Gas Metal Arc Welding process.         WD       47       Demonstrate the proper welding technique in flat position.		WD	44	, , ,	
WD     46     given metal type and thickness.       WD     46     Select the proper filler metal for a given weldment using the Gas Metal Arc Welding process.       WD     47     Demonstrate the proper welding technique in flat position.	-			initial Arc weiging process.	
WD     46     given metal type and thickness.       WD     46     Select the proper filler metal for a given weldment using the Gas Metal Arc Welding process.       WD     47     Demonstrate the proper welding technique in flat position.		WD	45	Prepare the Gas Metal Arc Welding machine for a	
WD     46     Select the proper filler metal for a given weldment using the Gas Metal Arc Welding process.       WD     47     Demonstrate the proper welding technique in flat position.       Gas Metal Arc     Demonstrate the proper welding technique in					
WD     46     weldment using the Gas Metal Arc Welding process.       WD     47     Demonstrate the proper welding technique in flat position.					
WD         47         Demonstrate the proper welding technique in flat position.           Gas Metal Arc         Demonstrate the proper welding technique in		WD	46		
Gas Metal Arc				process.	
Gas Metal Arc			47	Demonstrate the proper welding technique in	
Gas Ivietal Arc Demonstrate the proper welding technique in	6 Max 1.6	000	4/		
WD 48		WD	48	Demonstrate the proper welding technique in	
Welding horizontal position.	Welding	110		horizontal position.	

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	WD	49	Perform welds using proper preparation and	
		-3	welding technique for a given weldment.	
			Demonstrate the proper welding technique in	
	WD	50	vertical position.	
	WD	51	Demonstrate the proper welding technique in	
		51	overhead position.	
	WD	52	Perform welds using proper preparation and	
			welding technique for a given weldment.	
	WD	53	Describe different types of ferrous metal.	
	WD	54		
			Describe the crystal structure of carbon steels. Describe the effects of heat treating on carbon	
	WD	55	steel.	
	WD	56	Explain the effects of heating and cooling of steel	
			using the Iron/Carbon phase diagram.	
	WD	57		
		57	Describe different types of non ferrous metals.	
	WD	58	Identify and explain phase diagrams.	
	WD	59	Explain the effects of alloying on non ferrous	
Weld Metallurgy		33	metals.	
Stere metalion by	WD	60	Explain the effects of heat treating of non ferrous	
			metals. Identify and explain bend and break tests as	
	WD	61	destructive weld tests.	
			Identify and explain various non destructive weld	
	WD	62	tests.	
	WD	63		
		03	Demonstrate destructive weld test procedures.	
	WD	64	Demonstrate non destructive weld test	
			procedures. Evaluate destructive and non destructive weld	
	WD	65	test results.	
	WD	66	Explain the heat affected zone in a welded joint.	
	WD	67	Demonstrate proper safety practices for pipe	
		07	welding.	
	WD	68	Identify and explain the 2G and 5G pipe welding	
			positions. Demonstrate the proper alignment techniques	
	WD	69	for welded pipe joints.	
			Demonstrate proper welding technique for an	
	WD	70	open root pass on plate.	
	WD	71	Perform a weld using the proper techniques for	
			the 2G and 5G positions using the Shielded Metal	
			Arc Welding process.	
			Perform a weld using the proper techniques for	
	WD	72	the 2G and 5G positions using the Gas Tungsten	
			Arc Welding process.	
	WD	73	Demonstrate proper safety practices for pipe	
		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	welding.	
	WD	74	Identify and explain the 6G pipe welding	
Pipe Welding			positions. Demonstrate the proper alignment techniques	
	WD	75	for welded pipe joints.	
			Perform a weld using the proper techniques for	
	WD	76	the 6G positions using the Shielded Metal Arc	
			Welding process.	
			Perform a weld using the proper techniques for	
	WD	77	the 6G positions using the Gas Tungsten Arc	
			Welding process. Demonstrate proper safety practices for pipe	
	WD	78	welding.	
				<b>↓</b>

	WD	79	har and the state of the state	
			Identify and explain a socket pipe joint.	
	WD	80	Identify and explain a flanged pipe joint.	
	WD	81	Demonstrate the proper alignment techniques	
		01	for the socket and flanged pipe joints.	
	WD	82	Perform a weld using the proper techniques for	
		02	the socket and flanged pipe joint using the	
			Shielded Metal Arc Welding process. Demonstrate proper safety practices for tool and	
	WD	83	die welding.	
-	WD	84	Identify and explain tool steels.	
			Identify the proper filler metals used in the repair	
	WD	85	of tools and dies.	
	WD	86	Explain the proper preparation techniques for	
			the repair of a tool or a die.	
	WD	87	Explain the proper welding procedures for the repair of a tool or die.	
			Demonstrate proper preparation techniques for	
Tool and Die	WD	88	the repair of a tool or die.	
Welding				
	WD	89	Perform a weld using the proper techniques for	
			the repair of a tool or die using the Gas Tungsten Arc Welding process.	
			Demonstrate the proper preparation techniques	
	WD	90	for the repair of a tool or die.	
	WD	91	Perform a weld using the proper techniques for	
			the repair of a tool or die using the Shielded Metal Arc Welding process.	
			Demonstrate the proper technique for removing	
	WD	92	a broken bolt.	
	WD	93	Demonstrate assembly of a test weld following	
			the American Welding Society D1.1 code. Perform a weld using the proper technique to	
	WD	94	successfully complete a weld following the	
			American Welding Society D1.1 code.	
			Perform the proper testing method to	
Shielded Metal	WD	95	successfully complete a weld following the	
Arc Welding -			American Welding Society D1.1 code.	
AWS Cert	WD	96	Demonstrate assembly of a test weld following	
			the American Welding Society D1.1 code.	
			Perform a weld using the proper technique to	
	WD	97	successfully complete a weld following the American Welding Society D1.1 code.	
			Perform the proper testing method to	
	WD	98	successfully complete a weld following the	
			American Welding Society D1.1 code.	
	WD	99	Demonstrate assembly of a test weld following the American Welding Society D1.1 code.	
Gas Tungsten Arc			Perform a weld using the proper technique to	
	WD	100	successfully complete a weld following the	
			American Welding Society D1.1 code.	
		404	Perform the proper testing method to	
	WD	101	successfully complete a weld following the American Welding Society D1.1 code.	
Welding AWS			American weiding society D1.1 Lode.	
Cert	WD	102	Demonstrate assembly of a test weld following	
			the American Welding Society D1.1 code.	
			Perform a weld using the proper technique to	
	WD	103	successfully complete a weld following the	
		1	American Welding Society D1.1 code.	

			Perform the proper testing method to	
	WD	104	successfully complete a weld following the	
		-	American Welding Society D1.1 code.	
	WD	105	Demonstrate assembly of a test weld following the American Welding Society D1.1 code.	
	WD	106	Perform a weld using the proper technique to successfully complete a weld following the American Welding Society D1.1 code.	
Gas Metal Arc Welding AWS	WD	107	Perform the proper testing method to successfully complete a weld following the American Welding Society D1.1 code.	
Cert	WD	108	Demonstrate assembly of a test weld following the American Welding Society D1.1 code.	
	WD	109	Perform a weld using the proper technique to successfully complete a weld following the American Welding Society D1.1 code.	
	WD	110	Perform the proper testing method to successfully complete a weld following the American Welding Society D1.1 code.	
	WD	111	Devise a product to be produced in the welding lab.	
	WD	112	Design the product to be made.	
	WD	113	Formulate a plan to be used to move this product to the fabrication stage.	
Welding	WD	114	Determine materials used and material costs for the project.	
Fabrication	WD	115	Prepare materials for the project.	
Project	WD	116	Perform the needed joining methods for the project.	
	WD	117	Prepare components to be used on the final project.	
	WD	118	Examine and assess any flaws that need to be addressed before final assembly.	
	WD	119	Construct the fabricated parts and components to produce a final product.	

Additions: Please add any additional objectives that we may have overlooked.

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