

General Outcomes

The student will:

- describe the purpose and nature of materials testing
- apply testing principles to construct or use a piece of materials testing apparatus
- test and compare the properties of common materials used in construction and fabrication

Standard

Performance rating of 3 for each applicable task.

Rating Scale

The student:

- 4 exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. *Quality, particularly details and finishes, and productivity are consistent and exceed standards.*
- 3 meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. *Quality and productivity are consistent.*
- 2 meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. *Quality and productivity are reasonably consistent.*
- 1 meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. *Quality and productivity are reasonably consistent.*
- 0 has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

TASK PERFORMANCE CRITERIA

The student:

Preparation and Planning

- prepares self for task
- organizes and works in an orderly manner
- interprets and carries out instructions accurately
- plans and uses time effectively, safely and efficiently
- displays leadership in adhering to routine procedures
- attempts to solve problems prior to requesting help

Teamwork

- cooperates with group members
- shares work appropriately among group members
- negotiates with sensitivity for solutions to problems
- displays effective communication skills

Use of Equipment and Materials

- independently selects and uses equipment/materials
- demonstrates concern for safe procedures/techniques
- weighs and measures accurately and efficiently
- minimizes waste of materials
- identifies and corrects potential health and safety hazards

Investigative Techniques

- makes predictions that can be tested, e.g., which material is the hardest
- plans, sets up and conducts experiments to test a prediction
- analyzes relationships among manipulated/responding variables
- obtains accurate results that confirm/reject prediction and answers related questions
- summarizes, applies and evaluates experimental outcomes.

PERFORMANCE ASSESSMENT

CRITERIA	STUDENT RATING					STANDARD	COMMENTS
Preparation and Planning	4	3	2	1	0	3	
Teamwork	4	3	2	1	0	3	
Use of Equipment and Materials	4	3	2	1	0	3	
Investigative Techniques	4	3	2	1	0	3	

General Outcomes

The student will:

- identify health and safety hazards associated with GTAW, and take preventive measures to avoid accidents and personal injury to self and others
- outline the advantages of GTAW over other forms of welding
- demonstrate basic GTAW competencies in the flat and horizontal positions

Standard
Performance rating of 3 for each applicable task.

Rating Scale

- The student:*
- 4 exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. *Quality, particularly details and finishes, and productivity are consistent and exceed standards.*
 - 3 meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. *Quality and productivity are consistent.*
 - 2 meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. *Quality and productivity are reasonably consistent.*
 - 1 meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. *Quality and productivity are reasonably consistent.*
 - 0 has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

TASK PERFORMANCE CRITERIA

The student:

Preparation and Planning

- prepares for task and develops an effective work plan
- interprets and carries out instructions accurately
- plans and uses time in a logical manner
- attempts to solve problems prior to requesting help
- reads weld specifications to determine:
 - type of weld and position
 - type of weldment and filler metal
 - equipment settings
 - welding techniques
- identifies appropriate personal protection equipment (PPE) and ventilation controls

Content

- lists the advantages and disadvantages of Gas Tungsten Arc Welding
- identifies common materials that can be welded with the GTAW process
- identifies and describes methods to cool a GTAW torch

Use of Equipment and Materials

- wears the proper PPE
- follows accepted start-up, operation and shut-down procedures
- recognizes and corrects potential health and safety hazards
- fulfills clean-up and maintenance responsibilities

Task Performance

- completes mild steel fillet and groove welds in the:
 - flat
 - horizontal
 - vertical
 positions as instructed

PERFORMANCE ASSESSMENT

CRITERIA	STUDENT RATING	STANDARD	COMMENTS
Preparation and Planning	4 3 2 1 0	3	
Content	4 3 2 1 0	3	
Use of Equipment and Materials	4 3 2 1 0	3	
Task Performance	4 3 2 1 0	3	

General Outcomes

The student will:

- examine and maintain sheet metal arc welding (SMAW) equipment and accessories
- read and interpret weld drawings and symbols
- demonstrate advanced level SMAW competencies in the vertical position

Standard

Performance rating of 3 for each applicable task.

Rating Scale

The student:

- 4 exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. *Quality, particularly details and finishes, and productivity are consistent and exceed standards.*
- 3 meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. *Quality and productivity are consistent.*
- 2 meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. *Quality and productivity are reasonably consistent.*
- 1 meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. *Quality and productivity are reasonably consistent.*
- 0 has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

TASK PERFORMANCE CRITERIA

The student:

Preparation and Planning

- prepares self for task and develops an effective work plan
- interprets and carries out instructions accurately
- plans and uses time in a logical manner
- attempts to solve problems prior to requesting help
- reads weld specifications and drawings to determine:
 - type of weld and position
 - type of weldment and filler metal
 - equipment settings
 - welding techniques

- identifies appropriate personal protective equipment (PPE) and ventilation controls

Content

- identifies components of a weld symbol
- describes how weld symbols are used to identify:
 - weld location
 - type of weld
 - root opening
 - type of filler metal

Use of Equipment and Materials

- wears the proper PPE
- follows accepted start-up, operation and shut-down procedures
- recognizes and corrects potential health and safety hazards
- maintains equipment according to the manufacturers' recommendations
- fulfills clean-up responsibilities

Task Performance

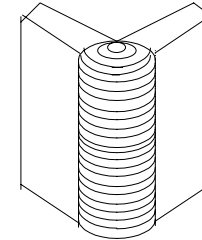
- produces two or more acceptable single and multi-pass vertical:
 - lap joint using 3/8" (10 mm) mild steel plate and E6010 (E41010) and E7018 (E48018) electrodes
 - outside corner joint using 3/8" (10 mm) mild steel plate and E6010 (E41010) and E7018 (E48018) electrodes

PERFORMANCE ASSESSMENT

CRITERIA	STUDENT RATING					STANDARD	COMMENTS
Preparation and Planning	4	3	2	1	0	3	
Content	4	3	2	1	0	3	
Use of Equipment and Materials	4	3	2	1	0	3	
Task Performance	4	3	2	1	0	3	

General Outcome*The student will:*

- demonstrate advanced level SMAW competencies in the vertical position

Task Performance Appraisal**PROCEDURE**

Weld Type:	Outside Corner Weld
Position:	vertical
Base Metal:	2 – 3/8" x 2" x 5" (10 mm x 50 mm x 125 mm) mild steel plate
Preparation:	cut plates to 5" (125 mm) and wire brush corner joint
Filler Metal:	1/8" E6010 (E41010) electrodes
Number of Passes:	three
Machine Set-up:	DCRP, 90 –120 amps
Fit-up:	tack plates corner to corner at 90°
Manipulation:	electrode angle ½ of included joint angle with an electrode inclination of 10°–45°. Stringer bead root pass and weave fill and cover beads.

Desirable Weld

The cover pass should be convex and smooth with close ripples that are free of voids, slag inclusion and high spots. Edges of the weld should have good fusion with no evidence of overlapping or undercutting. The back side should show complete and uniform penetration.

Acceptable Weld

Beads should be smooth and free of high spots, voids and slag inclusion. Penetration should be complete and evidence of spatter, overlapping and undercutting is minimal.

Comments:

General Outcomes

The student will:

- explain the effects heating and cooling have on a weld and weldment
- demonstrate advanced level sheet metal arc welding (SMAW) competencies in the flat, horizontal and vertical positions

Standard

Performance rating of 3 for each applicable task.

Rating Scale

The student:

- 4 exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. *Quality, particularly details and finishes, and productivity are consistent and exceed standards.*
- 3 meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. *Quality and productivity are consistent.*
- 2 meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. *Quality and productivity are reasonably consistent.*
- 1 meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. *Quality and productivity are reasonably consistent.*
- 0 has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

TASK PERFORMANCE CRITERIA

The student:

Preparation and Planning

- prepares self for task
- organizes and works in an orderly manner
- interprets and carries out instructions accurately
- thinks through problems before asking for help
- reads weld specification and drawing to determine:
 - weld type and position
 - type of weldment
 - type of electrode
 - equipment settings
 - welding techniques
- lists variables that contribute to weld quality
- identifies appropriate personal protective equipment (PPE) and ventilation controls

Content

- describes the effects of heating and cooling on the base metal and previously deposited filler metal
- determines when it is necessary to preheat or postheat a weldment

Use of Equipment and Materials

- wears the proper PPE
- follows accepted start-up, operation and shut-down procedures
- recognizes and corrects potential health and safety hazards
- maintains equipment according to the manufacturers' recommendations
- fulfills clean-up responsibilities

Task Performance

- completes two or more acceptable multi-pass vee groove butt welds in the flat position, using 3/8" (10 mm) mild steel and E6010 (E41010) or E6011 (E41011) electrodes
- completes acceptable multi-pass vee groove butt welds in the flat, vertical and horizontal position using 3/8" (10 mm) mild steel and E6010 (E41010) or E6011 (E41011) electrodes

PERFORMANCE ASSESSMENT

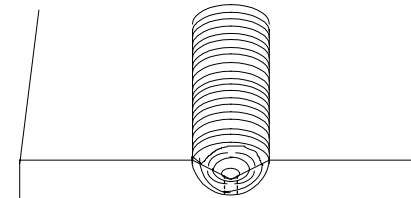
CRITERIA	STUDENT RATING					STANDARD	COMMENTS
Preparation and Planning	4	3	2	1	0	3	
Content	4	3	2	1	0	3	
Use of Equipment and Materials	4	3	2	1	0	3	
Task Performance	4	3	2	1	0	3	

General Outcome

The student will:

- demonstrate advanced level sheet metal arc welding (SMAW) competencies in the flat, horizontal and vertical positions

Task Performance Appraisal



Desirable Weld

Each pass should be of uniform width and height. Ripple should be close and free of voids, high spots and slag inclusion. Face of weld should be slightly convex and free of overlapping and undercutting. The back side of the weld should have complete and uniform penetration.

Acceptable Weld

Each pass should be smooth and free of high spots, voids and slag inclusion. Penetration should be complete and evidence of spatter, overlapping and undercutting is minimal.

PROCEDURE

Weld Type:	Vee-groove Butt Joint
Position:	flat
Base Metal:	2 – 3/8" x 2" x 5" (10 mm x 50 mm x 125 mm) mild steel plate
Preparation:	60° included angle 3/32"–1/8" (2 mm–3 mm) land, wire brush to remove oxides
Filler Metal:	E6010 or 11 (E41010 or 11) electrodes
Number of Passes:	three or four
Machine Set-up:	DCRP 90 –120 amps
Fit-up:	3/32"–1/8" (2 mm–3 mm) root opening, tacked on back side at each end
Manipulation:	electrode angle ½ of included joint angle (90°) electrode 0°–15° backhand on root fill and cap.

Comments:

General Outcomes

The student will:

- identify health and safety hazards associated with pipe and enclosed vessel welding, and take preventive measures to avoid accident and personal injury to self and others
- describe the advances made in pipe welding, and identify common types of joints and welding procedures
- demonstrate basic pipe/tube preparation and welding competencies

Standard

Performance rating of 3 or as stated for each applicable task.

Rating Scale

The student:

- 4 exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence.
- 3 meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively.
- 2 meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately.
- 1 meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately.
- 0 has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

TASK PERFORMANCE CRITERIA

The student:

Preparation and Planning

- prepares for task and develops an effective work plan
- interprets and carries out instructions accurately
- plans and uses time in a logical and efficient manner
- attempts to solve problems prior to requesting help
- reads weld specifications to determine:
 - type of weld and position
 - type of weldment and filler metal
 - equipment settings
 - welding techniques
- accurately lays out and prepares weld joints
- identifies appropriate personal protection equipment (PPE) and ventilation controls

Use of Equipment and Materials

- wears proper PPE
- follows accepted start-up, operation and shut-down procedures
- recognizes and corrects potential health and safety hazards
- fulfills clean-up and maintenance responsibilities

Task Performance

- prepares joint appropriately
- selects appropriate welding process and filler metal
- completes an acceptable pipe/tube joint weld
- evaluates weld using destructive and non-destructive tests

Content

- describe the advantages of welding pipe over other fastening systems
- names the different type of pipe welds and welding processes
- describes typical methods used to align pipes/tubes prior to welding

PERFORMANCE ASSESSMENT

CRITERIA	STUDENT RATING					STANDARD	COMMENTS
Preparation and Planning	4	3	2	1	0	3	
Content	4	3	2	1	0	3	
Use of Equipment and Materials	4	3	2	1	0	3	
Task Performance	4	3	2	1	0	3	

General Outcomes

The student will:

- perform basic shop drawing take-off skills
- exhibit advanced level resource management skills
- demonstrate appropriate prefabrication skills and practices

Standard

Performance rating of 3 for each applicable task.

Rating Scale

The student:

- 4 exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. *Quality, particularly details and finishes, and productivity are consistent and exceed standards.*
- 3 meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. *Quality and productivity are consistent.*
- 2 meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. *Quality and productivity are reasonably consistent.*
- 1 meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. *Quality and productivity are reasonably consistent.*
- 0 has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

TASK PERFORMANCE CRITERIA

The student:

Planning and Management

- determines the product outcome by analyzing performance needs and related issues
- generates a variety of different product ideas using available resources and advice from knowledgeable sources
- selects a solution that has a high potential for success
- analyzes drawings to determine an efficient and safe event sequence and production flow
- prepares a material estimate for the working drawings
- is sensitive to a variety of feedback mechanisms and alters plans when the current approach to the task is ineffective
- produces the necessary jigs and fixtures
- creates a meaningful timeline

Fabrication Techniques

- rough cuts all lengths leaving room for mounting and finishing
- layout of all pieces according to plan
- prefabricates all pieces within stated tolerances
- finishes each part as required
- assembles parts according to product plan

Work Skills

- accurately interprets and follows directions
- creates and adheres to detailed timelines
- works cooperatively and collaboratively with others
- uses appropriate personal protective equipment
- models proper lifting, handling and storage procedures
- fulfills clean-up and tool maintenance responsibilities

Product Presentation

- describes the purpose and scope of the product
- summarizes and reports on major events
- assesses design processes and production techniques
- makes recommendations to improve product quality and productivity

PERFORMANCE ASSESSMENT

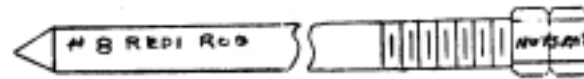
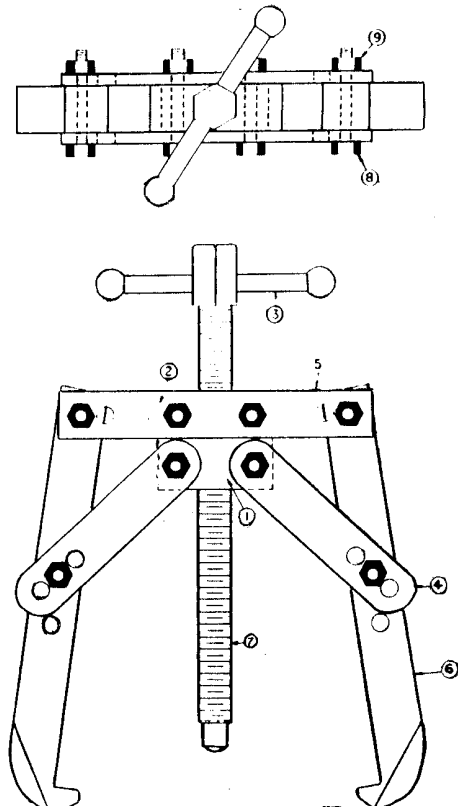
CRITERIA	STUDENT RATING					STANDARD	COMMENTS
Preparation and Planning	4	3	2	1	0	3	
Fabrication Techniques	4	3	2	1	0	3	
Work Skills	4	3	2	1	0	3	
Product Presentation	4	3	2	1	0	3	

GEAR PULLER SPECIFICATIONS

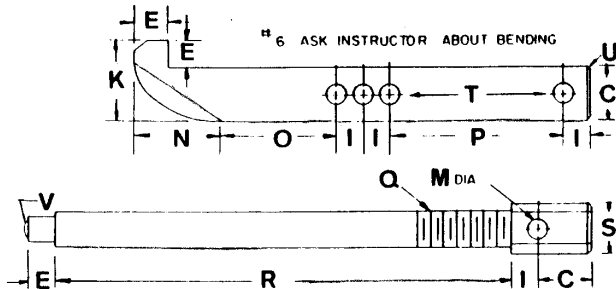
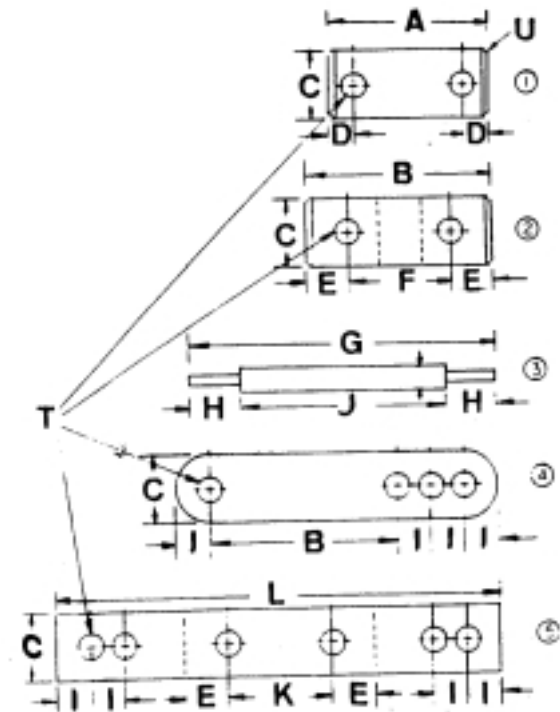
MATERIALS			
Item	Description	Style	QT
	Bottom Spacer F.R. 1Z1 C.R. Steel	4000-D-0002-H01	1
2.	Top Spacer F.R. 1 x 1 C.R. Steel	4000-D-0002-H02	1
3.	Handle F.R. 3/8" Round, C.R. Steel	4000-D-0002-H03	1
4.	Side Arms F.R. 1 x 3/16 H.R. Flat Steel	4000-D-0002-H04	4
5.	Top Support F.R. 1 x 5/16"	4000-D-0002-H05	2
6.	Jaws F.R. 1 x 1 C.R. Steel	4000-D-0002-H06	2
7.	Threaded Shaft F.R. 1 Round C.R. Steel	4000-D-0002-H07	1
8.	Bolts 5/16 x 2 (N) N.C.	4000-D-0002-H08	8
9.	Nuts 5/16 N.C.	4000-D-0002-H09	8

	*Metric	Imperial		*Metric	Imperial
A	60	2 1/4	L	160	6 3/8
B	67	2 3/4	M	10	3/8
C	25	1	N	40	1 9/16
D	10	3/8	O	55	2 1/8
E	15	5/8	P	80	3 1/4
F	37	1 1/2	Q	M20X2	3/4 - 11
G	115	4 1/2	R	210	8 3/8
H	00	3/4	S	22	7/8
I	12	1/2	T	8	5/16
J	75	3	U	45°	45°
K	37	1 1/2	V	10mm	3/8

Note: Project should be made in metric or Imperial - do not mix
*Soft conversion only



OPTION B



FABRICATION PROCEDURES		
Step	Procedure	Options/Alternate Activities
1.	Cut off all materials to Rough Length , as per blueprint.	use power saw or hand hacksaw
2.	Lay out all pieces to respective lengths and centre mark requirements.	use steel rule, square and scribe or surface gauge, vernier height gauges
3.	Centre punch and drill all holes as per blueprint.	use hand drill <u>or</u> drill press
4.	Straight and drawfile all required parts. (A, B & C)	use file for chamfers and surface grind parts (A, B and C)
5.	Bend jaw as per demonstration.	use oxyacetylene torch or forge
6.	Cut, shape and file to finished size.	use file or pedestal grinder
7.	Finish as per step #4.	use file on surface grinder and milling machine
8.	Fabricate threaded shaft.	use #8 ready rod or thread on the lathe use round or hexagon stock
9.	Finish thread end.	grind to point and harden and temper or drill on the lathe and install ball bearing as per demonstration
10.	Drill hole in hexagon head if optional handle is to be used.	machine handle and balls on lathe
11.	Assemble all parts using grade 5 bolts.	use bolts <u>or</u> machine pins with cotter pin holders

REFLECTIONS/COMMENTS:

QUALITY INDICATOR				
	Part Name	Specific Assessment	Indicator	Actual
1.	Bottom Spacer	– Finished length – Chamfers – Hole tapped square	± .1 mm 45° & uniform 90°	
2.	Top Spacer	– Finished length – Chamfers – Hole drilled square	± .1 mm 45° & uniform 90	
3.	Handle & Knobs	– Length of handle – Diameter of knobs	± .1 mm ± .1 mm	
4.	Side Supports	– Length – Radius – Holes	± .1 mm 13 mm Radius gauge Straight & evenly spaced	
5.	Top Supports	– Length – Holes	± .1 mm Straight & evenly spaced	
6.	Jaws	– Lengths – Chamfers – Holes – 45° Bevels – Lip Finish	± .1 mm 45° uniform Straight & evenly spaced 45° uniform ± .1 mm	
7.	Threaded Shaft	– Thread length – Thread fit – Thread finish – Ball bearing end & finish – Hex head – Hex finish & chamfer	± .1 mm Class 3 Even & no chips ± .1 mm Must fit 22 mm wrench 45° & uniform	
	Assembly	Fit and overall finish	Components are secure and operate smoothly	

Project prepared by Mike Blackwell, Wetaskiwin Composite High School

General Outcomes

The student will:

- identify variables that affect the quality of gas metal arc welds, and identify strategies to evaluate and improve weld quality
- demonstrate safe GMAW practices to perform groove welds on mild steel plate in the horizontal and vertical positions

Standard

Performance rating of 3 for each applicable task.

Rating Scale

The student:

- 4 exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. *Quality, particularly details and finishes, and productivity are consistent and exceed standards.*
- 3 meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. *Quality and productivity are consistent.*
- 2 meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. *Quality and productivity are reasonably consistent.*
- 1 meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. *Quality and productivity are reasonably consistent.*
- 0 has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

TASK PERFORMANCE CRITERIA

The student:

Preparation and Planning

- prepares self for task and develops an effective work plan
- interprets and carries out instructions accurately
- plans and uses time in a logical manner
- attempts to solve problems prior to requesting help
- reads weld specifications and drawings to determine:
 - type of weld and position
 - type of weldment and filler metal
 - equipment settings
 - welding techniques
- identifies appropriate personal protective equipment (PPE) and ventilation controls

Content

- lists and describes the characteristics of a desirable weld and test methods
- discusses strategies to improve weld quality related to:
 - mode of metal transfer
 - type of filler metal
 - machine set-up
 - manipulation

Use of Equipment and Materials

- wears the proper PPE
- follows accepted start-up, operation and shut-down procedures
- recognizes and corrects potential health and safety hazards
- maintains equipment according to the manufacturers' recommendations
- fulfills clean-up responsibilities

Task Performance

- produces two or more acceptable multi-pass fillet and butt welds in the:
 - flat
 - horizontal
 - vertical
 positions using gas metal and/or flux core processes

PERFORMANCE ASSESSMENT

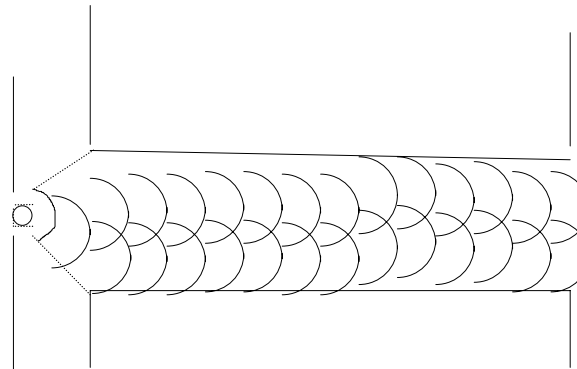
CRITERIA	STUDENT RATING					STANDARD	COMMENTS
Preparation and Planning	4	3	2	1	0	3	
Content	4	3	2	1	0	3	
Use of Equipment and Materials	4	3	2	1	0	3	
Task Performance	4	3	2	1	0	3	

General Outcomes

The student will:

- identify variables that affect the quality of gas metal arc welds, and identify strategies to evaluate and improve weld quality
- demonstrate safe GMAW practices to perform groove welds on mild steel plate in the horizontal and vertical positions

Task Performance Appraisal



Desirable Weld

There should be evidence of complete penetration. Beads should be straight and evenly spaced. Build up should be slightly higher than base metal. Excessive spatter on surface should not be evident.

Acceptable Weld

Each pass should be smooth and free of high spots and voids. Penetration should be complete and evidence of spatter should be minimal.

Comments:

PROCEDURE

Weld Type:	Single Vee Butt Joint
Position:	horizontal
Base Metal:	2 – 3/8" x 2" x 5" (10 mm x 50 mm x 125 mm) mild steel plate
Preparation:	30° bevel, 1/16" (2 mm) land, wire brush to remove oxides
Filler Metal:	0.035" (0.9 mm) ER70S
Shielding Gas	CO ₂
Number of Passes:	three to four stringer beads
Machine Set-up	according to the manufacturer's recommendations
Fit Up	5/32" (4 mm) root opening, tack on each end
Manipulation:	½ included angle with gravity correction. 15°–30° backhand root pass.

STANDARD: all procedures to be performed correctly

Name: _____ Date: _____

*START-UP PROCEDURES

The student:

- operates the equipment only with the teacher's permission
- removes/confines loose apparel and long hair
- selects the proper personal protective equipment
- selects and mounts the proper drill bit or accessory
- removes the key from the chuck
- adjusts the machine to the correct speed
- checks the condition and position of all guards
- mounts the work securely in the proper vise or clamp
- adjusts the depth stop to the correct depth
- centre punches metal parts prior to drilling
- checks drill bit for straightness
- positions the work piece

*OPERATING PROCEDURES

The student:

- wears the proper PPE; e.g., goggles or face shield
- checks drill bit alignment and depth of cut
- applies even pressure when drilling
- raises the drill bit occasionally to clear cuttings
- eases up on drilling pressure as the drill breaks through the work
- uses cutting fluids if necessary
- drills a pilot hole for larger holes
- uses a V-block to hold round stock
- removes cuttings with a brush
- keeps floor free from scrap materials
- sets speed or adjusts work only after the machine has come to a complete stop
- maintains proper clearance between drill press table and clamping devices

*SHUT-DOWN PROCEDURES

The student:

- removes and carefully stores work pieces
- returns tools and accessories to their proper location
- cleans the equipment and work area as instructed
- returns equipment to original state

REFLECTIONS/COMMENTS:

*** Procedures may differ according to each manufacturer's recommendations**

STANDARD: all procedures to be performed correctly

Name: _____

Date: _____

*START-UP PROCEDURES

The student:

- operates the equipment with the teacher's permission
- removes/confines loose apparel and long hair
- checks to see that all guards and safety shields are in place and properly adjusted
- makes sure tool rest is at the correct angle and distance from the stone
- checks condition of stone prior to turning on
- asks for assistance if the stone needs "dressing"
- selects proper personal protective equipment

*OPERATING PROCEDURES

The student:

- wears the proper PPE; e.g., goggles or face shield
- stands to one side when starting the machine
- small work pieces are held with locking pliers
- applies firm, even pressure allowing the wheel to operate at maximum RPM
- moves work piece across stone to prevent grooving
- always grinds on face of wheel
- always grinds on the down side or below the centreline of the stone
- reports grinding wheels that are worn down or cracked

*SHUT-DOWN PROCEDURES

The student:

- allows the machine to come to a full stop before cleaning up or leaving the work site
- returns tools

REFLECTIONS/COMMENTS:

*** Procedures may differ according to each manufacturer's recommendations**

STANDARD: all procedures to be performed correctly

Name: _____

Date: _____

*START-UP PROCEDURES

The student:

- operates the equipment only with the teacher's permission
- removes/confines loose apparel and long hair
- selects the proper personal protective equipment - particularly eye protection
- properly mounts and secures work
- always removes the chuck key
- rotates spindle by hand to check for clearance
- mounts the appropriate cutter
- selects/adjusts for the proper depth of cut, spindle speed and feed rate

*OPERATING PROCEDURES

The student:

- wears the proper PPE; e.g., safety glasses or goggles
- rechecks all adjustments with the power turned off
- "jog" starts (on off) to check operation before fully engaging the power
- uses coolants and lubricants where applicable
- stops machines before clearing chips away with a brush
- maintains proper feed and spindle speed parameters
- removes tool holder and post before filing or polishing
- keeps hands away from all moving parts
- remains with the machine for the duration of each operation

*SHUT-DOWN PROCEDURES

The student:

- removes and carefully stores workpiece and lathe accessories
- returns all tools to their proper panel
- cleans the equipment and work area as instructed
- returns equipment to original state

REFLECTIONS/COMMENTS:

* Procedures may differ according to each manufacturer's recommendations.

STANDARD: all procedures to be performed correctly

Name: _____

Date: _____

*START-UP PROCEDURES

The student:

- operates the equipment only with the teacher's permission
- removes/confines loose apparel and long hair
- selects the proper personal protective equipment - particularly eye protection
- checks to see that all guards are in place
- selects the appropriate cutters for a specific milling application
- secures work by means of a vice or with clamps
- tightly mounts cutter in arbour or collet
- sets proper width and depth of cut; cutter speed and feed rate

*OPERATING PROCEDURES

The student:

- wears the proper PPE; e.g., safety glasses or goggles
- rechecks all adjustments with the power turned off
- "jog" starts (on off) to check operation before fully engaging the power
- makes sure cutters are rotating in the right direction
- uses coolants and lubricants where applicable
- stops machines before clearing chips away with a brush
- keeps hands away from cutters and points of operation
- remains with the machine for the duration of each operation

*SHUT-DOWN PROCEDURES

The student:

- removes and carefully stores cutters and workpieces
- returns all tools and accessories to their proper location
- cleans the equipment and work area
- returns equipment to original state

REFLECTIONS/COMMENTS:

*** Procedures may differ according to each manufacturer's recommendations.**

STANDARD: all steps to be performed correctly and in the proper sequence

Name: _____

Date: _____

***START-UP PROCEDURES (using cylinders)**

The student:

- checks the condition of the workstation and cleared it of all physical hazards
- visually checks the torch valves, hoses, regulators, gauges, and personal protective equipment
- installs correct size of tip
- checks to see that the cylinder valves and torch needle valves are closed and regulator screws are backed off
- opens both the oxygen and acetylene cylinder valves as recommended by the manufacturer
- turns in regulator screws until pressure starts to rise on the gauges
- individually purges the oxygen and acetylene lines before lighting
- turns in regulator screws until the pressures rise to the appropriate welding pressures for both gases
- opens acetylene torch valve ¼ turn and lights with a striker
- ensures that the flame does not come in contact with equipment or combustibles
- adjusts the acetylene flame until it leaves the smoke range (stops producing heavy soot)
- opens the oxygen torch valve and adds oxygen to the flame until a neutral flame is established.

***SHUT-DOWN PROCEDURES (using cylinders)**

The student:

- closes the acetylene torch needle valve before the oxygen valve
- closes the oxygen and acetylene cylinder valves
- opens and closes the acetylene and oxygen torch needle valve to bleed lines
- turns out acetylene and oxygen regulator adjusting screws
- rechecks cylinder valves, regulator and torch valves
- stores tip, torch and hoses as directed
- cleans-up the work station

REFLECTIONS/COMMENTS:

*** Procedures may differ according to each equipment manufacturer's recommendations.**

STANDARD: all steps to be performed correctly and in the proper sequence

Name: _____ Date: _____

***START-UP PROCEDURES**

The student:

- checks the condition of the workstation, welding equipment and personal protective equipment
- puts up adequate screening for people in the immediate area
- ensures proper ventilation
- makes sure all electrical connections are correctly attached and grounded
- checks for the proper shielding gas and wire electrode
- adjusts the machine for the appropriate wire speed, voltage and amperage
- turns on shielding gas and checks flow meter
- checks shielding nozzle for gas obstructions
- uses the proper personal protective equipment
- posts a fire watch if necessary
- turns on machine

***SHUT-DOWN PROCEDURES**

The student:

- carefully removes and cools all hot welding materials
- turns off power supply to welder
- shuts off shielding gas and closes the cylinder valve
- hangs up all cables and stores equipment as directed
- cleans up the work station

REFLECTIONS/COMMENTS:

*** Procedures may differ according to each equipment manufacturer's recommendations.**

General Outcomes

The student will:

- identify health and safety hazards associated with GMAW, FCAW and SAW processes, and take preventative measures to avoid accidents and personal injury to self and others
- demonstrate safe GMAW and/or FCAW processes on light gauge mild steel and/or mild steel plate in the flat and horizontal positions

Standard
Performance rating of 2 for each applicable task.

Rating Scale

- The student:*
- 4 exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. *Quality, particularly details and finishes, and productivity are consistent and exceed standards.*
 - 3 meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. *Quality and productivity are consistent.*
 - 2 meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. *Quality and productivity are reasonably consistent.*
 - 1 meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. *Quality and productivity are reasonably consistent.*
 - 0 has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

TASK PERFORMANCE CRITERIA

The student:

Preparation and Planning

- prepares self for task
- identifies appropriate personal protective equipment and ventilation controls
- organizes and works in an orderly manner
- interprets and carries out instructions accurately
- understands first-aid treatment for minor cuts, burns and bruises
- reads weld specifications to determine:
 - weld type and position
 - type of weldment
 - type of filler metal
 - equipment settings
 - welding techniques

Use of Equipment and Materials

- wears appropriate personal protective equipment
- follows accepted start-up, operation and shut-down procedures
- recognizes potential health and safety hazards
- measures accurately
- carries out proper fit-up procedures
- selects the correct type of electrode and wire gauge
- adjusts equipment according to weld specifications and manufacturer’s recommendations
- manipulates the gun and electrode as instructed
- cleans weld appropriately
- stores and disposes materials as instructed

Content/Theory

- describes GMAW, FCAW and SAW equipment and processes
- lists four advantages of GMAW, FCAW and SAW processes; e.g.:
 - welding is continuous and therefore faster
 - minimum weld clean-up
 - can be used with ferrous and non-ferrous materials
 - results in less zone affected by heat
- lists two advantages and two disadvantages of each of the following methods of metal transfer:
 - short circuit
 - globular
 - spray

Task Performance

- produces two or more acceptable:
 - lap joint welds on light gauge mild steel in the horizontal and vertical positions
 - tee joint welds on light gauge mild steel in the horizontal and vertical positions
- evaluates a given weld according to:
 - overall appearance
 - weld profile
 - plate penetration
 - degree of undercutting and coldlapping
 - slag inclusions (if using flux core wire)

PERFORMANCE ASSESSMENT

CRITERIA	STUDENT RATING	STANDARD	COMMENTS
Preparation and Planning	4 3 2 1 0	3	
Use of Equipment and Materials	4 3 2 1 0	3	
Content/Theory	4 3 2 1 0	3	
Task Performance	4 3 2 1 0	3	

**PRESENTATIONS/REPORTS: COMPONENTS OF SEMI-AUTOMATED/
AUTOMATED WELDING**

Semi-automated/Automated Welding: FAB1048–2

General Outcomes

The student will:

- identify power sources used in GMAW, FCAW and SAW processes
- select appropriate electrode wires and shielding gases for use in GMAW and FCAW processes

Standard

Performance rating of 1 for each applicable task.

Rating Scale

The student:

- 4 exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. *Quality, particularly details and finishes, and productivity are consistent and exceed standards.*
- 3 meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. *Quality and productivity are consistent.*
- 2 meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. *Quality and productivity are reasonably consistent.*
- 1 meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. *Quality and productivity are reasonably consistent.*
- 0 has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

TASK PERFORMANCE CRITERIA

The student:

Preparation and Planning

- sets goals and describes steps to achieve them
- uses personal initiative to formulate questions and find answers
- plans and uses time effectively

Content/Theory

- lists power sources used in SMAW, GMAW, GTAW, FCAW and SAW processes
- identifies the four types of drive roll configurations and their applications
- describes changes that occur as the slope is adjusted
- describes the effect of inductance on weld quality
- explains appropriate uses of push, pull and push-pull feed systems
- describes different types of gun configurations
- defines terms associated with GMAW and FCAW wire; e.g., flux, composite wire, stickout
- describes methods of fabricating solid (GMAW) and tubular (FCAW) wire
- explains the difference between the following designations and types of wire:
 - Canadian Standards Association (CSA) and American Welding Society (AWS)
 - gas metal arc welding (GMAW) and flux core arc welding (FCAW)
- explains the purpose of sealed containers and spool covers

Content/Theory (continued)

- lists possible problems caused by damp wire, rusty wire and a clogged liner
- explains the benefits of using shielding gas; i.e.:
 - oxides
 - nitrates
- explains the effects that shielding gases have on the welding process; e.g.:
 - method of metal transfer
 - tendency to undercut
 - cleaning action
 - speed of welding
 - mechanical/chemical properties of weld
 - weld profile
- explains the difference between a shielding gas and a shielding gas mixture
- lists the gases used in spray transfer and FCAW
- identifies two types of flowmeters
- explains the purpose of a regulator

Presenting/Reporting

- demonstrates effective use of one or more communication media:
 - e.g., *Written:* spelling, punctuation, grammar, basic format
 - Oral:* voice projection, language
- uses correct grammatical conventions and technical terms
- communicates information in a logical sequence

PERFORMANCE ASSESSMENT

CRITERIA	STUDENT RATING	STANDARD	COMMENTS
Preparation and Planning	4 3 2 1 0	3	
Content/Theory	4 3 2 1 0	3	
Presenting/Reporting	4 3 2 1 0	3	

EQUIPMENT CHECKLIST: GMAW/FCAW START-UP AND SHUT-DOWN PROCEDURES

Semi-automated/Automated Welding: FAB1048-3

STANDARD: all steps to be performed correctly and in the proper sequence

Name: _____

Date: _____

***START-UP PROCEDURES**

The student:

- checks the condition of the work station, welding equipment and personal protective equipment
- puts up adequate screening for people in the immediate area
- ensures proper ventilation
- makes sure all electrical connections are correctly attached and grounded
- checks for the proper shielding gas and wire electrode
- adjusts the machine for the appropriate wire speed, voltage and amperage
- turns on shielding gas and checks flowmeter
- checks shielding nozzle for gas obstructions
- uses the proper personal protective equipment
- posts a fire watch, if necessary
- turns on machine

***SHUT-DOWN PROCEDURES**

The student:

- carefully removes and cools all hot welding materials
- turns off power supply to welder
- shuts off shielding gas and closes the cylinder valve
- hangs up all cables and stores equipment as directed
- cleans up the work station

REFLECTIONS/COMMENTS:

*** Procedures may differ according to each equipment manufacturer's recommendations.**

General Outcome

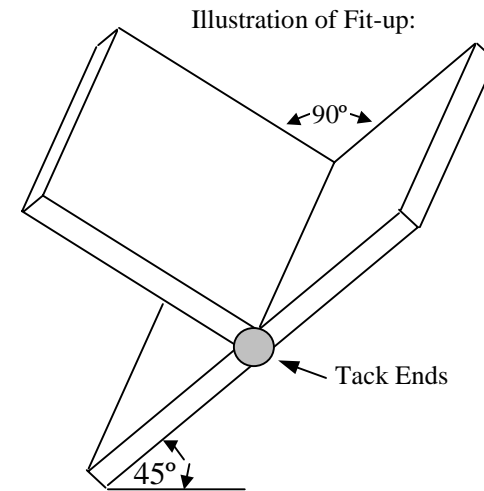
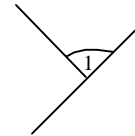
The student will:

- demonstrate safe GMAW and/or FCAW processes on light gauge mild steel and/or mild steel plate in the flat and horizontal positions

PROCEDURE

Weld Type:	GMAW Tee Fillet Weld
Position:	flat
Base Metal:	2 –10 gauge × 1" × 5" long (for FCAW, use 3/16" or 1/4" plate)
Preparation:	clean metal prior to fit-up
Number of Passes:	one
Machine Set-up:	according to manufacturer's recommendation
Fit-up:	as illustrated to the right

Bead Sequence:



TASK PERFORMANCE APPRAISAL

Beads should be slightly convex, and of uniform width and height. Ripples are to be close, bullet shaped and free of voids, high spots, undercutting and coldlapping.

Characteristics of a desirable weld include:

- slightly convex bead
- uniform height
- consistent ripples
- top/bottom edges of weld are even
- no visible structural defects; e.g., undercut, porosity
- equal leg.

Comments:

General Outcome

The student will:

- demonstrate safe GMAW and/or FCAW processes on light gauge mild steel and/or mild steel plate in the flat and horizontal positions

PROCEDURE

Weld Type:	GMAW Lap Joint Fillet Weld
Position:	horizontal
Base Metal:	2 – 10 gauge × 1" × 5" long (for FCAW, use 3/16" or 1/4" plate)
Preparation:	clean metal prior to weld
Number of Passes:	one
Machine Set-up:	according to manufacturer's recommendation
Fit-up:	as illustrated to the right

Bead Sequence:

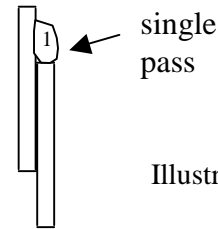
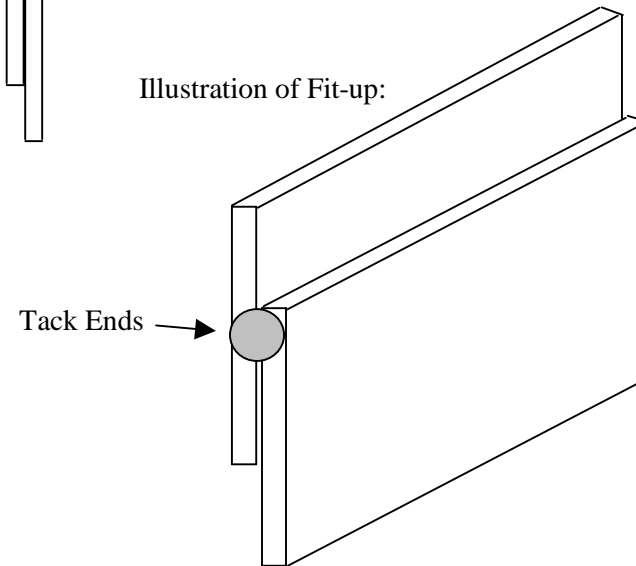


Illustration of Fit-up:



TASK PERFORMANCE APPRAISAL

Beads should be slightly convex, and of uniform width and height. Ripples are to be close, bullet shaped and free of voids, high spots, undercutting and coldlapping.

Characteristics of a desirable weld include:

- slightly convex bead
- uniform height
- consistent ripples
- top/bottom edges of weld are even
- no visible structural defects; e.g., undercut, porosity.

Comments:

General Outcome

The student will:

- outline the advantages and disadvantages of FCAW processes versus other forms of arc welding processes

Standard
Performance rating of 2 for each applicable task.

Rating Scale

- The student:*
- exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. *Quality, particularly details and finishes, and productivity are consistent and exceed standards.*
 - meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. *Quality and productivity are consistent.*
 - meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. *Quality and productivity are reasonably consistent.*
 - meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. *Quality and productivity are reasonably consistent.*
 - has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

TASK PERFORMANCE CRITERIA

The student:

Preparation and Planning

- sets goals and describes steps to achieve them
- uses personal initiative to formulate questions and find answers
- accesses a range of relevant in-school/community information sources
- interprets, organizes and combines information into logical sequence
- records information accurately with appropriate supporting detail and uses correct technical terms
- plans and uses time effectively

Content/Theory

- describes the equipment and process of flux core arc welding
- lists six advantages of FCAW processes; e.g.:
 - good weld appearance; smooth and uniform with excellent contour on horizontal fillet welds
 - high quality weld metal deposits
 - suitable for welding many steel types and thicknesses
 - reduced distortion when compared to SMAW
 - high tolerance for contaminants that may cause weld cracking
 - the visible arc is easy to use

Content/Theory (continued)

- lists four disadvantages of FCAW processes; e.g.:
 - slag removal is necessary
 - presently limited to welding ferrous metals and nickel-based alloys
 - equipment is more expensive to purchase than that required for SMAW
 - more smoke and fumes are generated, therefore requiring suitable exhaust removal equipment

Presenting/Reporting

- demonstrates effective use of one or more communication media:
 - e.g., Written: spelling, punctuation, grammar, basic format*
 - Oral: voice projection, language*
 - Audio-visual: techniques, tools*
- uses correct grammatical conventions and technical terms
- provides an introduction that describes the purpose of the project
- communicates information in a logical sequence

PERFORMANCE ASSESSMENT

CRITERIA	STUDENT RATING	STANDARD	COMMENTS
Preparation and Planning	4 3 2 1 0	3	
Content/Theory	4 3 2 1 0	3	
Presenting/Reporting	4 3 2 1 0	3	

General Outcomes

The student will:

- describe the characteristics of a desirable flux core arc weld
- demonstrate safe FCAW practices and perform:
 - fillet welds on mild steel plate in the flat, horizontal and vertical positions
 - groove welds on mild steel plate in the flat position

Standard

Performance rating of 3 for each applicable task.

Rating Scale

The student:

- 4 exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. *Quality, particularly details and finishes, and productivity are consistent and exceed standards.*
- 3 meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. *Quality and productivity are consistent.*
- 2 meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. *Quality and productivity are reasonably consistent.*
- 1 meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. *Quality and productivity are reasonably consistent.*
- 0 has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

TASK PERFORMANCE CRITERIA

The student:

Preparation and Planning

- prepares self for task and develops an effective work plan
- identifies appropriate personal protective equipment and ventilation controls
- interprets and carries out instructions accurately
- plans and uses time in a logical manner
- attempts to solve problems prior to requesting help
- reads weld specifications and drawings to determine:
 - weld type and position
 - type of weldment and filler metal
 - equipment settings
 - welding techniques

Use of Equipment and Materials

- wears appropriate personal protective equipment
- follows accepted start-up, operation and shut-down procedures
- recognizes and corrects potential health and safety hazards
- maintains equipment according to manufacturer’s recommendations
- fulfills clean-up responsibilities

Content/Theory

- lists and describes the characteristics of a desirable weld and test methods that are commonly used
- discusses strategies to improve weld quality; i.e.:
 - method of metal transfer
 - type of filler metal
 - machine set-up
 - manipulation

Task Performance

- uses flux core arc welding processes to produce two or more acceptable multi-pass fillet and/or butt welds in each of the following positions:
 - flat
 - horizontal
 - vertical
- uses flux core arc welding processes to produce two or more acceptable multi-pass groove welds in the flat position

PERFORMANCE ASSESSMENT

CRITERIA	STUDENT RATING	STANDARD	COMMENTS
Preparation and Planning	4 3 2 1 0	3	
Use of Equipment and Materials	4 3 2 1 0	3	
Content/Theory	4 3 2 1 0	3	
Task Performance	4 3 2 1 0	3	

STANDARD: all steps to be performed correctly and in the proper sequence

Name: _____

Date: _____

***START-UP PROCEDURES**

The student:

- checks the condition of the work station, welding equipment and personal protective equipment
- puts up adequate screening for people in the immediate area
- ensures proper ventilation
- makes sure all electrical connections are correctly attached and grounded
- checks for the proper shielding gas and wire electrode
- adjusts the machine for the appropriate wire speed, voltage and amperage
- turns on shielding gas and checks flowmeter
- checks shielding nozzle for gas obstructions
- uses the proper personal protective equipment
- posts a fire watch, if necessary
- turns on machine

***SHUT-DOWN PROCEDURES**

The student:

- carefully removes and cools all hot welding materials
- turns off power supply to welder
- shuts off shielding gas and closes the cylinder valve
- hangs up all cables and stores equipment as directed
- cleans up the work station

***MAINTENANCE PROCEDURES**

The student:

- maintains wire drive system
- maintains gun assembly

REFLECTIONS/COMMENTS:

*** Procedures may differ according to each equipment manufacturer's recommendations.**

General Outcome

The student will:

- demonstrate safe FCAW practices and perform:
 - fillet welds on mild steel plate in the flat, horizontal and vertical positions

PROCEDURE

Weld Type:	Tee Fillet Weld
Position:	flat
Base Metal:	2 – 3/8" × 2" × 5" long
Preparation:	clean base metal prior to weld
Filler Metal:	according to manufacturer's recommendation
Number of Passes:	three
Weld Size:	3/8" fillet
Machine Set-up:	according to manufacturer's recommendation
Fit-up:	as illustrated to the right

Bead Sequence:

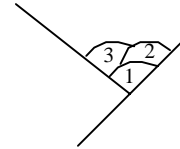
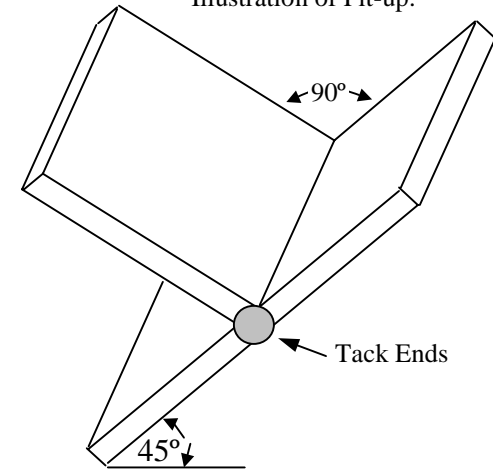


Illustration of Fit-up:



TASK PERFORMANCE APPRAISAL

Welds are to be free of visible structural defects and are to have uniform reinforcement.

Characteristics of a desirable weld include:

- equal leg (approximately 3/8")
- no visible structural defects; e.g., undercut
- even spacing on bead no. 2 and no. 3.

Comments:

General Outcome

The student will:

- demonstrate safe FCAW practices and perform:
 - fillet welds on mild steel plate in the flat, horizontal and vertical positions

PROCEDURE

Weld Type:	Tee Fillet Weld
Position:	horizontal
Base Metal:	2 – 3/8" × 2" × 5" long
Preparation:	clean base metal prior to fit-up
Filler Metal:	according to manufacturer's recommendation
Number of Passes:	three
Weld Size:	3/8" fillet
Machine Set-up:	according to manufacturer's recommendation
Fit-up:	as illustrated to the right

Bead Sequence:

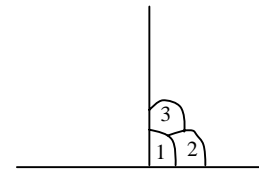
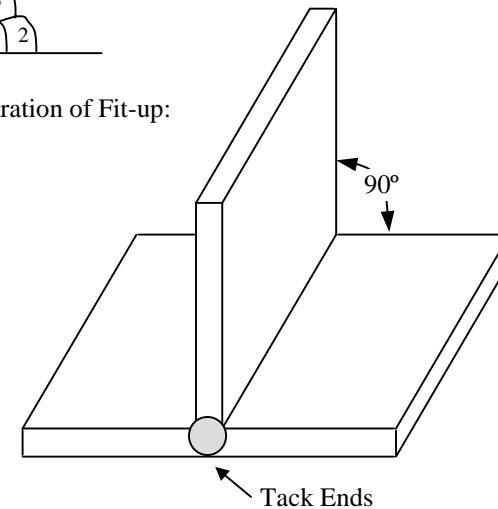


Illustration of Fit-up:

**TASK PERFORMANCE APPRAISAL**

Welds are to be free of visible structural defects and are to have uniform reinforcement.

Characteristics of a desirable weld include:

- equal leg (approximately 3/8")
- no visible structural defects; e.g., undercut
- even spacing on bead no. 2 and no. 3.

Comments:

General Outcome

The student will:

- demonstrate safe FCAW practices and perform:
 - fillet welds on mild steel plate in the flat, horizontal and vertical positions

PROCEDURE

- Weld Type: Tee Fillet Weld
- Position: vertical (i.e., up hand)
- Base Metal: 2 – 3/8" × 2" × 5" long
- Preparation: clean prior to fit-up
- Filler Metal: according to manufacturer's recommendation
- Number of Passes: three
- Weld Size: 3/8" fillet
- Machine Set-up: according to manufacturer's recommendation
- Fit-up: as illustrated to the right

Bead Sequence:

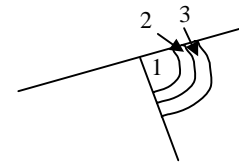
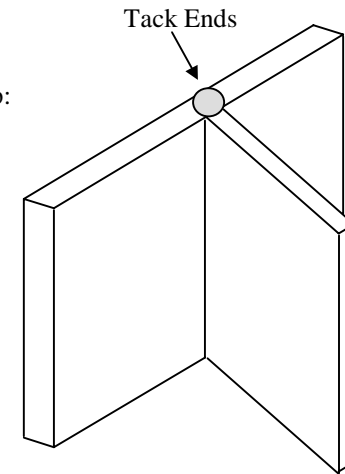


Illustration of Fit-up:



TASK PERFORMANCE APPRAISAL

Welds are to be free of visible structural defects and are to have uniform reinforcement.

Characteristics of a desirable weld include:

- equal leg (approximately 3/8")
- no visible structural defects; e.g., undercut
- consistent ripples
- straight edges at the sides of the weld.

Comments:

General Outcome

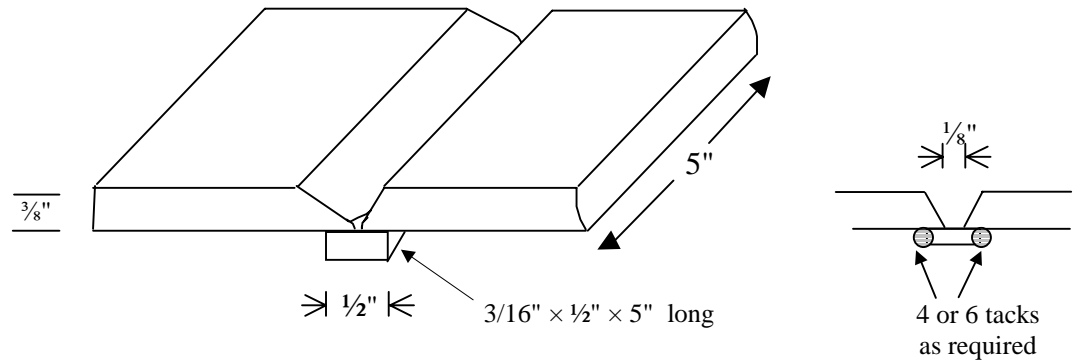
The student will:

- demonstrate safe FCAW practices and perform:
 - groove welds on mild steel plate in the flat position

PROCEDURE

Weld Type:	Single Vee Butt Joint Weld
Position:	flat
Base Metal:	2 – 3/8" × 2" × 5" long Backer: 3/16" × 1/2" × 5" long
Preparation:	30° bevel, no land; i.e., no root face
Filler Metal:	according to manufacturer's recommendation
Number of Passes:	as required
Machine Set-up:	according to manufacturer's recommendation
Fit-up:	as illustrated at the right; root opening: 1/8" or as preferred

Illustration of Fit-up:



TASK PERFORMANCE APPRAISAL

Welds are to be free of visible structural defects and are to have uniform reinforcement.

Characteristics of a desirable weld include:

- build up slightly higher than base metal
- uniform bead(s) or ripples
- surface is free of splatter
- no signs of visible structural defects; e.g., undercut.

Comments:

General Outcomes

The student will:

- identify variables that affect the quality of flux core arc welds, and identify strategies to evaluate and improve weld quality
- demonstrate safe FCAW practices and perform groove welds on mild steel plate in the horizontal and vertical positions

Standard
Performance rating of 3 for each applicable task.

Rating Scale

- The student:*
- 4 exceeds defined outcomes. Plans and solves problems effectively and creatively in a self-directed manner. Tools, materials and/or processes are selected and used efficiently, effectively and with confidence. *Quality, particularly details and finishes, and productivity are consistent and exceed standards.*
 - 3 meets defined outcomes. Plans and solves problems in a self-directed manner. Tools, materials and/or processes are selected and used efficiently and effectively. *Quality and productivity are consistent.*
 - 2 meets defined outcomes. Plans and solves problems with limited assistance. Tools, materials and/or processes are selected and used appropriately. *Quality and productivity are reasonably consistent.*
 - 1 meets defined outcomes. Follows a guided plan of action. A limited range of tools, materials and/or processes are used appropriately. *Quality and productivity are reasonably consistent.*
 - 0 has not completed defined outcomes. Tools, materials and/or processes are used inappropriately.

TASK PERFORMANCE CRITERIA

The student:

Preparation and Planning

- prepares self for task and develops an effective work plan
- identifies appropriate personal protective equipment and ventilation controls
- interprets and carries out instructions accurately
- plans and uses time in a logical manner
- attempts to solve problems prior to requesting help
- reads weld specifications and drawings to determine:
 - weld type and position
 - type of weldment and filler metal
 - equipment settings
 - welding techniques

Use of Equipment and Materials

- wears appropriate personal protective equipment
- follows accepted start-up, operation and shut-down procedures
- recognizes and corrects potential health and safety hazards
- maintains equipment according to manufacturer's recommendations
- fulfills clean-up responsibilities

Content/Theory

- lists and describes the characteristics of a desirable weld and test methods that are commonly used
- identifies variables that affect weld quality; e.g.:
 - welding current and voltage
 - type of shielding gas/flux
 - diameter and type of filler metal
 - type and condition of equipment
 - welding technique
- identifies possible causes of welding defects; e.g.:
 - surface/subsurface porosity
 - lack of fusion
 - burn through
 - lack of penetration
 - coldlapping
- suggests strategies to improve weld quality; e.g.:
 - method of metal transfer
 - type of filler metal
 - machine set-up
 - manipulation
- suggests solutions to problems common to out of position welding

Task Performance

- uses flux core arc welding processes to produce two or more acceptable multi-pass groove welds in each of the following positions:
 - horizontal
 - vertical

PERFORMANCE ASSESSMENT

CRITERIA	STUDENT RATING	STANDARD	COMMENTS
Preparation and Planning	4 3 2 1 0	3	
Use of Equipment and Materials	4 3 2 1 0	3	
Content/Theory	4 3 2 1 0	3	
Task Performance	4 3 2 1 0	3	

EQUIPMENT CHECKLIST: FCAW SET-UP, MAINTENANCE AND TROUBLESHOOTING PROCEDURES

Flux Core Arc Welding 2: FAB3048-2

STANDARD: all steps to be performed correctly and in the proper sequence

Name: _____

Date: _____

***START-UP PROCEDURES**

The student:

- checks the condition of the work station, welding equipment and personal protective equipment
- puts up adequate screening for people in the immediate area
- ensures proper ventilation
- makes sure all electrical connections are correctly attached and grounded
- checks for the proper shielding gas and wire electrode
- adjusts the machine for the appropriate wire speed, voltage and amperage
- turns on shielding gas and checks flowmeter
- checks shielding nozzle for gas obstructions
- uses the proper personal protective equipment
- posts a fire watch, if necessary
- turns on machine

***SHUT-DOWN PROCEDURES**

The student:

- carefully removes and cools all hot welding materials
- turns off power supply to welder
- shuts off shielding gas and closes the cylinder valve
- hangs up all cables and stores equipment as directed
- cleans up the work station

***MAINTENANCE PROCEDURES**

The student:

- maintains wire drive system
- maintains gun assembly

***TROUBLESHOOTING PROCEDURES**

The student:

- diagnoses problems related to malfunctioning FCAW equipment
- demonstrates appropriate corrective measures for malfunctioning FCAW equipment

REFLECTIONS/COMMENTS:

*** Procedures may differ according to each equipment manufacturer's recommendations.**

General Outcome

The student will:

- demonstrate safe FCAW practices and perform groove welds on mild steel plate in the horizontal and vertical positions

PROCEDURE

Weld Type: Single Vee Butt Joint Weld

Position: horizontal

Base Metal: 2 – 3/8" × 2" × 5" long
 Backer: 3/16" × 1/2" × 5" long

Preparation: 30° bevel, no land; i.e., no root face

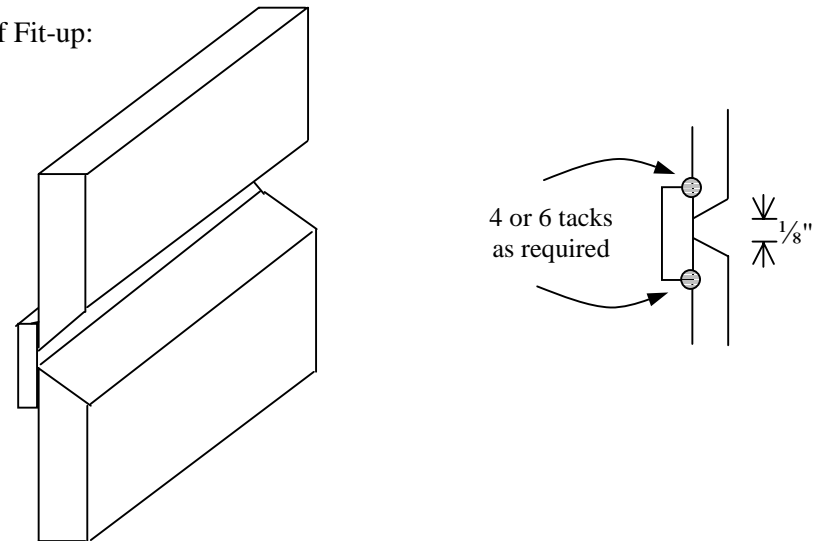
Filler Metal: according to manufacturer's recommendation

Number of Passes: as required (stringer beads)

Machine Set-up: according to manufacturer's recommendation

Fit-up: as illustrated at the right; root opening: 1/8" or as preferred

Illustration of Fit-up:



TASK PERFORMANCE APPRAISAL

Welds are to be free of visible structural defects and are to have uniform reinforcement.

Characteristics of a desirable weld include:

- build up slightly higher than base metal
- constant ripple on beads
- even spacing on beads
- no visible structural defects; e.g., undercut on top side of weld, improper lapping of stringer beads, sagging bead profile on bottom of weld.

Comments:

General Outcome

The student will:

- demonstrate safe FCAW practices and perform groove welds on mild steel plate in the horizontal and vertical positions

PROCEDURE

Weld Type: Single Vee Butt Joint Weld

Position: vertical; i.e., up hand

Base Metal: 2 – 3/8" × 2" × 5" long
 Backer: 1/4" × 1/2" × 5" long

Preparation: 30° bevel, no land; i.e., no root face

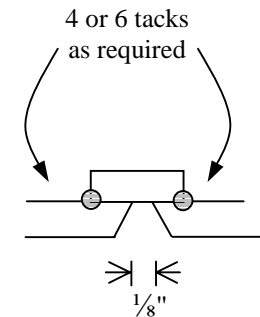
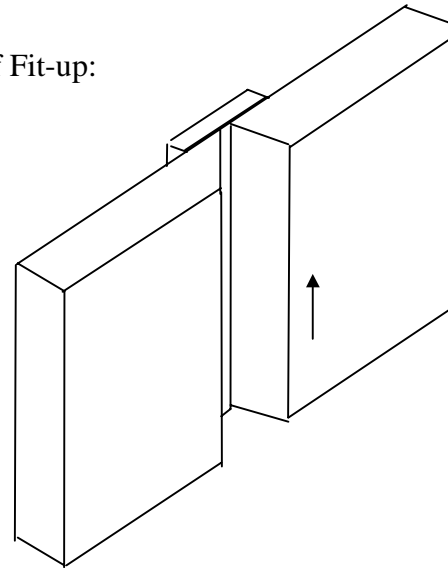
Filler Metal: according to manufacturer's recommendation

Number of Passes: as required (weave weld)

Machine Set-up: according to manufacturer's recommendation

Fit-up: as per illustration;
 root opening: 1/8" or as preferred

Illustration of Fit-up:



TASK PERFORMANCE APPRAISAL

Welds should be free of visible structural defects and are to have uniform reinforcement.

Characteristics of a desirable weld include:

- build up slightly higher than base metal
- constant ripple on weave beads
- no visible structural defects; e.g., undercut, crater at end of weld.

Comments: