

GMAW for Manufacturing-Semi Automatic

Safety

Topics

Welding Safety Overview

Hazards Unique to Welding Overview
Hazards Unique to Welding - SVAMCoe Shop Specific
Typical Shop Safety Precautions-Non-Welding Related

Area Safety

Hazards around you.-Be Aware of your Surroundings
Housekeeping-Avoiding Trip Hazards
Hood Down, you cant see-Know what's around you
Working at Heights-Fall Protection Basics
Moving Machinery Hazards-Pinch Points
Workers Around You-Protect yourself and Others.
Fire Safety Intro.

Welding PPE

Safety Glasses
Clothing
Gloves
Hood
Respirator

Fumes and Gases

Gases-Ozone
Gases-Hex Chrome
Gases-Carbon Monoxide
Gases-Inert Gas Accumulation
When is a respirator a good idea
When is a Respirator Required
Removing the Hazard-Ventilation

Hot Work Permits and Fire Watches

Understand the Fire Hazards
Inspecting the Area
Fire Extinguisher Types and Uses
Hot Work Permits and their Use

Confined Space Work

Confined Space Entry Requirements
Confined Space Hazards
Types of Confined Spaces
How Welding Changes Rules
OSHA Rules

Material Handling

Know the ratings for lifting equipment
Know the weight
Know the CG
Know the lifting Equipment Capacities.
Rigging and Lifting training Required
Crush Hazards

Safety

Topics

Electrical Safety

The chance of shock can be reduced by proper grounding and insulation.

Tool Shock hazards exist from power tools

Welding Shock hazards exist when welding

Reaction to Shock

Power Tool Safety

Power Tools VS Flesh

Electrical Shock Hazards

Cylinder Storage and Handling

Handling Safely-Secured When using.

Handling Safely-Storage Caps When Moving

Handling Safely-Moving

Handling Safely-Lifting

Storage Rules-Ventilation Issues

Storage Rules-Properly Secured

Storage Rules-Oxy and Fuel Separated

Cylinder Safety Devices

Safety Data Sheets

HAZCOM Standard Overview

Employees have a right to see the SDS.

MSDS's are stored in a specific location

Your companies safety rules ARE NOT listed on the SDS.

Allowable Limits are listed on the SDS.

Firefighting Measures are listed on the SDS

Recommended PPE is listed on the SDS

Hazards are listed on the SDS

SDS stands for Safety Data Sheet

Safety Review

Quiz-Short on Topics Names.

Safety Quiz

30 Question Quiz

Safety Planning and Emergency Action Plans

Emergency Action plans assist with informing everyone regarding specific actions to be taken in unsafe

Cutting and Welding on Containers

Chemical Hazards from Containers

Explosion Hazards from Containers

Oxy-Fuel Welding and Cutting Safety

Acet Pressure

Cylinder Hazards

Fire Hazards

Securing Equipment After Use

Equipment Setup Precautions

Oxy and Accelerated Burning

MFG-Intro to Drawings-Online

Topics

MFG-Intro to Drawings-Online

Topics

Introduction to Blueprints-Skills 180-DWG-1001

Title Block Info

Notes

Drawing Sizes

Zones

BOM

Tolerances

Drawing Terminology-Skills 180-DWG-1002

Points

Lines

Planes

Angles

Square and perpendicular

Arcs, Circles, Tangent points

Engineering Drawing Views-Skills 180-DWG-1003

Isometric- Not for dimensions

Isometric to Orthographic

Projections-The Glass Box

1st and 3rd angle USA vs the world.

6 Possible "Views"

Front, Top, side most common

Section Views Plane and other section.

Rotated Views

Drawing Line Types-Skills 180-DWG-1004

Lines-Straight, Curved and Broken

Visible

Hidden

Center

Phantom

Dimension

Extension

Leader

Drawings Dimensions and Tolerances-Skills 180-DWG-1005

Dimension Types

Tolerance Locations

ANSI standard- Mention

Everything is NOT perfect.

MFG-GMAW Process Theory-Online Pre-Requisite

Topics

GMAW History and Overview-Miller Openbook Online

Been around awhile

Multiple Transfer Modes

Semi-Automatic

AWS GAMW Definition

New technology Variations

Advantages over other processes

MFG-GMAW Process Theory-Online Pre-Requisite

Topics

Applications
Machine and Automatic Welding
GMAW Circuit/Electrical Terms

GMAW Equipment-Miller Openbook Online

Power Source
Wire Feeder
Gas Supply
Gun and Cables
CV vs CC
Inverter
Transformer/Rectifier
Duty Cycle

Basic Electricity-Miller Openbook Online

AC/DC and Current Flow
Basic Circuit
Primary vs Secondary Power
Voltage/Amperage/Resistance
Conductors and Insulators
HERTZ
OHMS Law

GMAW Variables-Miller Openbook Online

Travel Angles
Travel Speed
Voltage
Wire Feed Speed
Electrode Extension

GMAW Process Detailed Overview

Topics

GMAW Process Safety

Electric Shock
Light
Strain
Fumes
Gas Suffocation
Wire through hand
Installing Wire
Compressed Gas Cylinders
Hot Parts/Nozzle

GMAW Process Description

When developed
Where Developed
Capabilities
Advantages
Disadvantages
Uses and Applications
Transfer Modes

GMAW Process Detailed Overview

Topics

Shielding Gases

GMAW Process Equipment-With Machine

Power Sources

Cables

Gun

Gas

Ground

Filler Metal

Tips

Liners

Nozzles

Drive Rolls

Connector Types

GMAW Consumables

Carbon Steel Wires and Gases

Aluminum Wires and Gases

Stainless Steel Wires and Gases

GMAW Process Variables

Voltage and What is Affected

WFS and What is Affected

Inductance and What is Affected

CTWD and What is Affected

Contact Tip Size and What is Affected

Gas Cup Dia. and What is Affected

Gas Type and What is Affected

Gas Flow Rate and What is Affected

Drive Roll Tension/Type and What is Affected

Travel Angle and What is Affected

Travel Speed and What is Affected

Work Angle What is Affected

Transfer Modes and What is Affected

Pulsing and What is Affected

TRIM/ARC Adjust and What is Affected

GMAW Welding Techniques

Getting Comfortable

Being able to See

Low energy (Sheet Metal) VS High Energy (Plate)

Push VS Pull

Weaving

CTWD

Electrode Classification Differences

Whipping/Jacking

GMAW-Transfer Modes

Topics

Short Circuit

Thick Material may be a problem

GMAW-Transfer Modes

Topics

Puddle Freezes Quickly
Low Heat Input
Good For Root Passes
Works on any Machine

Globular

Large Globules of metal across arc
Weld Spatter an Issue
Out of position welds difficult-Metal Falls before reaching puddle.
Deep Penetration with CO2 shielding.
Works on any machine with enough power

Spray

High Deposition Rate and Efficiency
Small Droplets of metal across arc
Weld Spatter Not an Issue
Out of position welds difficult-large Fluid Puddle-HOT.
Smooth Bead Profile
Works on any machine with enough power (Transition Current)
Needs large percentage of ARGON

Spray Pulsed

Capable of very stable arc at very low wire feed speeds.
Customizable arc characteristics on many machines
Weld Spatter Not an Issue
Out of position welds possible. Compare to SC.??
Smooth Bead Profile
Requires a special power source and wire feeder.
Needs large percentage of ARGON since based on Spray???
High Deposition Rate and Efficiency when properly set.

Manufacturers Waveforms

RMD
Rapid Arc
Precision Pulse
SST
Sometimes an easier way to do things that are already possible.

What is Synergic

WFS and Other Settings Matched based on input.
Can Often be "tuned" for specific characteristics.
Voltage Setting Knob "tunes" the arc.
Older machines-Everything had to be set.

Gen-Base Metal Preparation-Types of joints

Topics

Joint Types

Butt Joint Description
Tee Joint Description
Lap Joint Description
Corner Joint Description
Edge Joint Description

Gen-Base Metal Preparation-Types of joints

Topics

Weld Types

Fillet Welds
Groove Welds
Plug and Slot Welds
Surfacing Welds
Seal Welds

Groove Types

Square Groove Joints
Bevel Groove
Vee Groove
J Groove
U groove
Flare Groove (Bevel and Vee)

Joint Terms

Root Opening/Gap
Root Face/Land
Bevel Face
Bevel Angle
Groove Angle/Included Angle
Radius
Misalignment/Hi-Lo

Metal Types

Carbon Steel-Overview
300 Series SS-Overview
Aluminum-Overview
Duplex Alloys-Overview
Nickel Alloys-Overview

Metallurgy-Mechanical Properties

Topics

Tensile

Pulling Apart
Filler Metal Classifications
Typical Tests

Hardness

Related to Tensile in Steel
Can be changed by heat treatment depending on chemistry-CS
Can Be Changed By Cold Working- Stainless Steel
Sometimes checked around weld areas.

Ductility

Bend vs break
improper matching Filler Metal may affect test results

Impact Resistance

Not always an issue
Affected by Heat Input
Impact Testing description.

Metallurgy-Mechanical Properties

Topics

Fatigue

*Can be a concern for items cycled often-
Notches Make worse
Also see Creep*

Thermal Conductivity

*Affects Energy needed to weld
May change cracking tendencies
Preheat/Interpass
Low Thermal Conductivity might make position welds harder*

Review how welding may affect mechanical properties of various materials

*Tensile-Filler Metals
Hardness Filler Metal and Heat Input
Ductility-Filler Metal, Heat input in some cases, ,Defects
Impact Resistance-Heat Input
Fatigue-Notches/Contour
Thermal Conductivity-Affects Welding*

Test for Mechanical Properties

*Bend Tests
Tensile Tests
Impact Tests
Hardness Tests*

MFG-Welding Symbols

Topics

Symbol Overview

*Why are they Needed
What information is shared
AWS "MAP"*

The Reference Line and Arrow

*Always Required
Can be a welding symbol without anything else
Arrow Side and Other Side
Arrow Direction on pcs not symmetrical*

The Weld Symbol vs the Welding Symbol

*Intro AWS Standard
Use Proper Terminology but don't get hung up on it.
One Cannot exist without the other
One can exist without the other.*

Weld Symbols-Fillets and Groove Welds

*Vee and Bevel Groove
Arrow pointing for single PC prepared.
J and U groove
Flare Vee and Flare Bevel
Square Groove
Backing, Back Welds, and Back Gouging
When is it CJP*

MFG-Welding Symbols

Topics

Fillet Symbol-Vert to left
Fillet, May be used with Groove
Fillet, Size, Length, Pitch Intro
Groove Depth and Throat Intro

Weld Sizes and Dimensions.

Sizes to the left
Lengths to the right
What if no dimensions
Read the Notes
Flare joints are special
Unequal Legs are special
Other countries may detail throat vs leg for fillets.

Contour Symbols

Flat
Convex
Concave
Finishing Methods
Considered Supplem. Symbols

Finishing Symbols

Machine
Roll
Grind
Etc....

Supplementary Symbols

Field Weld
Weld all round
Melt Through
Insert
Backing
Contour

Assess previous Topics

Multiple Operations

Nearest Arrow to Farthest
May be referenced in Tail - Back Weld vs Backing Weld
May Include Inspection Steps

Plug and Slots

Dia/Length
Depth of Fill

Resistance Welds

Spot
Seam
Numbers and Spacing

AWS A2.4 Overview

Has Requirements for drawing
More Detail than Class

MFG-Welding Symbols

Topics

Where purchased

Changes over the years-Old Field Weld

Drawing Welding Symbols

See the Standard

Draw Fillet Welds with Size-Exercise

Draw PJP Grooves with depth of Prep-Exercise

Draw Multiple Operation-Exercise

Practical Exercise-Reading and Applying

USE AWS SENSE Print for welding Sample or verbally explain

Select one joint from sample print and sketch

Select one joint sketch and create symbol

Show Weldcad program

Weld Quality-Weld Defects-Definitions and Causes

Topics

Cracks

Description

Causes

Methods for Detection

Preventing

Types of Cracks

Incomplete Fusion

Description

Causes

Methods for Detection

Preventing

Incomplete Penetration

Description

Causes

Methods for Detection

Preventing

Overlap

Description

Causes

Methods for Detection

Preventing

Porosity

Description

Causes

Methods for Detection

Preventing

Quiz

Describe possible causes

Name discontinuities from written description

Slag Inclusion

Description

Weld Quality-Weld Defects-Definitions and Causes

Topics

Causes

Methods for Detection

Preventing

Tungsten Inclusion

Description

Causes

Methods for Detection

Preventing

Weld Quality-Inspection Methods Overview

Topics

Visual

Equipment

Techniques

Interpretation

Discontinuities found

Advantages and Disadvantages

Liquid Penetrant

Equipment

Techniques

Interpretation

Discontinuities found

Advantages and Disadvantages

Magnetic Particle

Equipment

Techniques

Interpretation

Discontinuities found

Advantages and Disadvantages

Radiography

Equipment

Techniques

Interpretation

Discontinuities found

Advantages and Disadvantages

Ultrasonic

Equipment

Techniques

Interpretation

Discontinuities found

Advantages and Disadvantages

QUIZ

GMAW Pad Welds

Topics

GMAW Pad Welds

Topics

GMAW Pad Welding Flat Position

Bead Placement
Getting Comfortable
Push/Pull
Dry Runs
Maintain CTWD and Angles

GMAW Pad Welding Horizontal

Bead Placement
Getting Comfortable
Dry Runs
Push/Pull
Modifies Work Angle
Maintains CTWD
Maintains Travel Angle
Avoiding overlap

GMAW Pad Welding Vertical

Importance of Heat Input and Base Metal Temperature
Different Bead Placement for uh/vs downhill
Travel Fast and Hot Downhill
Travel Slow and Cool Uphill
Understands Weld Metal Heating and Cooling related to Sagging.
Downhill Pad Welding
Uphill Pad Welding

GMAW Pad Welding Overhead

Getting Comfortable
Holding Gun
Push/Pull
Importance of reducing Splatter

GMAW Tee Joints-Flat and Horizontal Only

Topics

GMAW, Carbon Steel, Tee-Thin-Horiz, Short Circuit Transfer

Consistent Travel
Ability to perform multipass welds
Performs cut and etch on Push vs Pull on 1/4" Plate
Consistent Travel Speed from start to finish
Consistent Work Angle from Start to finish
Equal Leg Size on Fillet weld
Follows Safety Precautions
Replaces Worn Parts if Needed
Sets Gas Flow Rate in accordance with the WPS
Sets Machine Correctly
Verifies the Filler Metal
Weld Meets Visual Acceptance Criteria
Ability to perform 3/16" to 1/4" single pass welds
Practices PUSH and PULL
Consistent CTWD

GMAW Tee Joints-Flat and Horizontal Only

Topics

GMAW, Carbon Steel, Tee-Thin-Horiz-Spray

Consistent Travel Angle
Replaces Worn Parts if Needed
Ability to perform 3/16" single pass welds
Sets Gas Flow Rate in accordance with the WPS
Consistent Work Angle from Start to finish
Consistent Travel Speed from start to finish
Equal Leg Size on Fillet weld
Consistent CTWD
Sets Machine Correctly
Verifies the Filler Metal
Weld Meets Visual Acceptance Criteria
Practices PUSH and PULL
Follows Safety Precautions
Ability to perform multipass welds

GMAW, Carbon Steel, Tee-Thick-Horiz, Spray

Weld Meets Visual Acceptance Criteria
Practices PUSH and PULL
Equal Leg Size on Fillet weld
Cut, Etch, and Break Satisfactory
Sets Machine Correctly
Verifies the Filler Metal
Sets Gas Flow Rate in accordance with the WPS
Replaces Worn Parts if Needed
Follows Safety Precautions
Observed Fusion/Penetration Difficulties with Lower Heat Input and Travel Angle
Ability to perform 1/4" to 5/16" single pass welds
Consistent Travel Angle
Ability to perform multipass welds
Consistent Travel
Consistent Travel Speed from start to finish
Consistent Work Angle from Start to finish
Consistent CTWD

GMAW Lap Joints

Topics

GMAW Lap, Horizontal, , 3/16" to 1/4" (T)

Ability to maintain top edge.
Replaces Worn Parts if Needed
Sets Machine Correctly
Consistent CTWD
Consistent Travel Angle
Sets Gas Flow Rate in accordance with the WPS
Follows Safety Precautions
Consistent Work Angle from Start to finish
Verifies the Filler Metal
Ability to perform 3/16" to 1/4" single pass welds
Equal Leg Size on Fillet weld +/- 1/16"

GMAW Lap Joints

Topics

Consistent Travel Speed from start to finish
Cut, Etch, and Break Satisfactory
Practices PUSH and PULL
Ability to perform multipass welds
Weld Meets Visual Acceptance Criteria

GMAW Lap, Vertical, Short Circuit, 3/16" to 1/4"

Follows Safety Precautions
Practices Uphill and downhill
Ability to maintain front edge.
Cut, Etch, and Break Satisfactory comparing Uphill Vs Downhill)
Ability to perform 3/16" to 1/4" single pass welds
Ability to perform multipass welds
Avoids Excess Convexity with up to 220 IPM WFS with .035"
Replaces Worn Parts if Needed
Sets Gas Flow Rate in accordance with the WPS
Verifies the Filler Metal
Consistent Travel Angle
Equal Leg Size on Fillet weld +/- 1/16"
Consistent CTWD
Consistent Work Angle from Start to finish
Consistent Travel Speed from start to finish
Sets Machine Correctly
Welds Meets Visual Acceptance Criteria

GMAW Lap, Vertical, Pulsed, 3/16" to 1/4"

Sets Gas Flow Rate in accordance with the WPS
Ability to maintain front edge.
Cut, Etch, and Break Satisfactory comparing Uphill Vs Downhill)
Ability to perform 3/16" to 1/4" single pass welds
Ability to perform multipass welds
Welds Meets Visual Acceptance Criteria
Avoids Excess Convexity with up to 250 IPM WFS with .035"
Equal Leg Size on Fillet weld +/- 1/16"
Practices Uphill and downhill
Replaces Worn Parts if Needed
Sets Machine Correctly-Uses Arc Trim/Adjust
Consistent CTWD
Consistent Travel Angle
Consistent Work Angle from Start to finish
Consistent Travel Speed from start to finish
Follows Safety Precautions
Verifies the Filler Metal

GMAW Lap, Thick on Thin Trial

Meets all other Lap Requirements
Avoids melting through thin pc

GMAW Lap, Thin on Thick Trial with 3mm fillet

Avoids weld metal above top of thin pc more than 1/32"
Meets all other Lap Requirements

GMAW Lap Joints

Topics

GMAW Lap, Thin on Thin

- Avoids Melt Through*
- Same Lap requirements*
- Avoids weld metal above top of thin pc more than 1/32"*

GMAW Lap, 3/16" to 1/4" Overhead

- Welds Meets Visual Acceptance Criteria*
 - Consistent Work Angle from Start to finish*
 - Consistent Travel Angle*
 - Consistent CTWD*
 - Sets Machine Correctly*
 - Verifies the Filler Metal*
 - Consistent Travel Speed from start to finish*
 - Practices head to side and in front of joint.*
 - Equal Leg Size on Fillet weld +/- 1/16"*
 - Ability to perform multipass welds*
 - Ability to perform 3/16" to 1/4" single pass welds*
 - Cut, Etch, and Break Satisfactory comparing Uphill Vs Downhill)*
 - Ability to maintain front edge.*
 - Avoids Excess Convexity with up to 250 IPM WFS with .035"*
 - Sets Gas Flow Rate in accordance with the WPS*
 - Replaces Worn Parts if Needed*
 - Follows Safety Precautions*
-

Aluminum-Whats So Special

Topics

Aluminum Oxide

- Room Temperature Formation and Quickly*
- Hard-Used in Abrasives*
- It makes Aluminum corrosion resistant*
- High Melting Temperature*
- Overcome with Cleaning*

Hot Shortness

- Autogenous welds may be worse*
- Some alloys more susceptible than others- 6000 series more than 5000 series*
- Crack Sensitive*
- No Visible Indicator it is going to "break"*
- High Heat Input can be an issue*

Notch Sensitive

- Lower number of cycles till failure (endurance limit) than steel.*
- Sometimes Mechanical Fastening is better than welding*
- In high Fatigue Application, Scratches a problem*

Thermal Conductivity

- Hot to touch while welding. Propping on part.*
- Low Melting point a problem when saturated*
- More Energy To Heat up*
- Energy may need to change when welding small parts due to heating.*

Alloying Elements and Foreign Materials

Aluminum-Whats So Special

Topics

Contamination can cause cracking
Contamination of filler metals easily occurs
Some alloys are not weldable. May Fail unexpectedly

May Be Heat Treated/Tempered

May not bend/form correctly if welded.
Welding Changes Heat Treatment

Aluminum GMAW Intro

Topics

Special Equipment Needed...Only for Wire Feeding

Drive Rolls
Push Pull Guns
Spool Guns

Handles light Aluminum Oxide OK

Hand Brushing works well
Not as critical as GTAW but best to clean
No foreign material
Should Clean

Wire may Deform

Spool Guns put more curve in wire.
Pushing a "rope".
Drive Roll Pressure lower

Special Sizing for Tip

Reflective puddle heats tip
Tip Diameter may be different

No color from heating

Hot Shortness!
Shiny reflective puddle

Welds Great out of position.

Low Melting Point is ok because of thermal conductivity.
Small Pieces may get "saturated" with heat and then out of position harder.
Puddle Freezes Quick which is good. High Thermal Conductivity

Settings may need to be adjusted "on the fly"

Cold at beginning but small parts heat quickly
Synergic machines and adjust WFS while welding may help.
Mass of part determines how long it takes to get too hot
Preheating at beginning may reduce need for adjustment

Spool Guns Are difficult to handle

Curve in the wire may wear tip faster.
Small Spools, Awkward for some welds
Wire runs out quickly

Push Pull Guns work great but \$\$

a little bigger than conventional.
Adjust WFS on Handle with some/most
As comfortable as a conventional gun.

Aluminum GMAW Intro

Topics

Transfer Modes

Pulsed
Short Circuit Not Needed for position welds or thin materials.
Spray

Aluminum Grades

Weldability Differences
Filler Metal "matching"
Aluminum Numbering System Overview

GMAW-Simulated Vee Grooves

Topics

Simulated Vee Groove Base Metal Prep

Cleans Mills Scale
Selects proper material

Simulated Vee Groove Fit-up

Welds Simulated "Backing" pass in Flat 3/16 to 5/16" wide.
Sets at 30 Degrees

Simulated Vee Groove 1st Pass, Flat

Flat contours, fusion to sides
Push and Pull

Simulated Vee Groove Flat, GMAW Spray

Cut, Etch, and visual satisfactory
Sets Gas Flow Rate in accordance with the WPS
Verifies the Filler Metal
Consistent CTWD
Cap Profile meets D1.1
Consistent Work Angle from Start to finish
Consistent Travel Speed from start to finish
Maintains CTWD
Sets proper parameters
Avoids Valleys in Layers
Compensates for stickout on root pass.
can correct variations in fill
Consistent Travel Angle
Practices PUSH and PULL
Follows Safety Precautions
Replaces Worn Parts if Needed
Weld Meets Visual Acceptance Criteria
Consistent Fill depth through length
Ability to perform multipass welds

Simulated Vee Groove Horizontal, GMAW Pulsed or Short Circuit,

Replaces Worn Parts if Needed
Consistent Travel Speed from start to finish
Sets Gas Flow Rate in accordance with the WPS
Practices PUSH and PULL
Consistent CTWD
Verifies the Filler Metal

GMAW-Simulated Vee Grooves

Topics

Follows Safety Precautions
Maintains CTWD
Ability to perform multipass welds
Consistent Travel Angle
Compensates for stickout on root pass.
Sets proper parameters
Consistent Work Angle from Start to finish
Cap Profile meets D1.1
Avoids Valleys in Layers
Stacks from Bottom to top.
Weld Meets Visual Acceptance Criteria
can correct variations in fill
Consistent Fill depth through length
Free of overlap.
Cut, Etch, and visual satisfactory

Simulated Vee Groove Overhead, GMAW Pulsed or Short Circuit

Avoids Valleys in Layers
Consistent Travel Speed from start to finish
Sets Gas Flow Rate in accordance with the WPS
Follows Safety Precautions
Cap Profile meets D1.1
Consistent Work Angle from Start to finish
Maintains CTWD
Compensates for stickout on root pass.
Avoids tip damage from spatter buildup. Tunes out as much spatter as possible/
Cut, Etch, and visual satisfactory
can correct variations in fill
Verifies the Filler Metal
Consistent Fill depth through length
Replaces Worn Parts if Needed
Consistent Travel Angle
Consistent CTWD
Weld Meets Visual Acceptance Criteria
Ability to perform multipass welds
Sets proper parameters
Practices PUSH and PULL

Simulated Vee Groove Vertical, GMAW Pulsed or Short Circuit, Uphill

Consistent Fill depth through length
can correct variations in fill
Sets proper parameters
Consistent Work Angle from Start to finish
Consistent Travel Angle
Consistent CTWD
Sets Gas Flow Rate in accordance with the WPS
Replaces Worn Parts if Needed
Ability to perform multipass welds
Compensates for stickout on root pass.
Avoids Valleys in Layers

GMAW-Simulated Vee Grooves

Topics

Consistent Travel Speed from start to finish
Cut, Etch, and visual satisfactory
Understands effects of cooler base metal for bead profile.
Maintains CTWD
Cap Profile meets D1.1
Verifies the Filler Metal
Weld Meets Visual Acceptance Criteria
Push or Perp.
Follows Safety Precautions

GMAW Butt Joints

Topics

GMAW-CS-Single Pass Butt Joints-Flat With Back Gouging

Consistent Work Angle from Start to finish
Consistent CTWD
Sets Gas Flow Rate in accordance with the WPS
Verifies the Filler Metal
Weld Meets Visual Acceptance Criteria
Follows Safety Precautions
Consistent CTWD
Equal Leg Size on Fillet weld
Replaces Worn Parts if Needed
Practices PUSH and PULL
Consistent Travel Speed from start to finish
Sets Machine Correctly
Consistent Travel Angle
Ability to perform Single pass welds With Acceptable Quality
Selects correct Material

GMAW -CS-Single Pass Butt Joints Horizontal With Back Gouging

Practices PUSH and PULL
Verifies the Filler Metal
Ability to perform Single pass welds With Acceptable Quality
Selects correct Material
Avoids underfill on top side of bead
Sets Gas Flow Rate in accordance with the WPS
Melt Through on Root Side
Consistent Travel Speed from start to finish
Consistent Work Angle from Start to finish
Replaces Worn Parts if Needed
Consistent Travel Angle
Weld Meets Visual Acceptance Criteria
Sets Machine Correctly
Follows Safety Precautions
Consistent CTWD

GMAW-CS-Single Pass Butt Joint-Overhead With Back Gouging

Follows Safety Precautions
Consistent CTWD
Weld Meets Visual Acceptance Criteria

GMAW Butt Joints

Topics

Understands vision restrictions overhead
Consistent Travel Speed from start to finish
Verifies the Filler Metal
Backgouged to Sound Metal
Sets Machine Correctly
Sets Gas Flow Rate in accordance with the WPS
Selects correct Material
Consistent Travel Angle from start to stop-Drag only
Consistent Work Angle from Start to finish
Root penetration
Ability to perform Multipass Groove Welds with Acceptable Quality
Replaces Worn Parts if Needed

GMAW-CS-Single Pass Butt Joint-Vertical With Back Gouging

Consistent Travel Speed from start to finish
Replaces Worn Parts if Needed
Consistent Work Angle from Start to finish
Selects correct Material
Consistent Travel Angle from Start to Finish-Push
Sets Machine Correctly
Sets Gas Flow Rate in accordance with the WPS
Verifies the Filler Metal
Follows Safety Precautions
Practices PUSH
Weld Meets Visual Acceptance Criteria
Consistent CTWD
Acceptable profile without grinding.
Ability to perform Multipass Groove Welds with Acceptable Quality
Root Penetration

GMAW-CS-Single Vee Groove Flat, 3/8", With Backing

Understands vision restrictions overhead
Consistent CTWD
Understands fit-up requirements for Joint with Backing
Consistent Travel Angle
Fuses to backing and bevel edges.
Sets Gas Flow Rate in accordance with the WPS
Weld Meets Visual Acceptance Criteria
Ability to perform Multiple pass welds With Acceptable Quality
Consistent Work Angle from Start to finish
Verifies Proper Fit-up
Follows Safety Precautions
Replaces Worn Parts if Needed
Selects correct Material
Consistent Travel Speed from start to finish
Verifies the Filler Metal
Sets Machine Correctly

GMAW-CS-Single Vee Groove Horizontal, 3/8", With Backing

Consistent Work Angle from Start to finish
Understands fit-up requirements for Joint with Backing

GMAW Butt Joints

Topics

Fuses to backing and bevel edges.
Consistent CTWD
Verifies Proper Fit-up
Consistent Travel Speed from start to finish
Selects correct Material
Consistent Travel Angle
Positions joint to allow comfortable welding.
Weld Meets Visual Acceptance Criteria
Verifies the Filler Metal
Understands vision restrictions overhead
Ability to perform Multiple pass welds With Acceptable Quality
Sets Gas Flow Rate in accordance with the WPS
Replaces Worn Parts if Needed
Follows Safety Precautions
Sets Machine Correctly

GMAW WPQ-1G

Topics

Single Vee Groove W/Backing Base Metal Preparation 3/8" to 1/2"

Root Edge Maintained
Mill Scale Removed
Safety Precautions Followed

Single Vee Groove W/Backing Fit-up 3/8" to 1/2"

Proper Root Opening
No Standoff from Backing
Runoff tabs suitable
Tacks on ends and center of backing outside weld.
Tacks acceptable

Single Vee Groove W/Backing Root Pass, 3/8" to 1/2", 1G, GMAW

No Excess Convexity
within limits of WPS
Fused too all edges and backing
Free of Undercut > 1/32" deep

Single Vee Groove W/Backing Fill and Cap, 3/8" to 1/2", GMAW

Meets D1.1 Visual and Destructive Test requirements
Maximum Bead width followed.
Reinforcement VT before grinding
Performed per WPS
Fill Layers free of deep valleys/notches
Interpass Temp OK