# Welding Technology

# Weld 115 QC10

## AWS Entry Level Welder

## Instructor's Manual

This Document is prepared in accordance to QC10 AWS SENSE Level 1 - Entry Welder Certification (American Welding Society)

DUE Number: 1801078

Originated By: Edward L. Baltrip
April 2016

Updated By: Stephen Hasselbach
November 2019

# Foreword

This forward is not part of the AWS QC10/11 standards and supplements or the MCCC Student Package and Instructor's Manual, but is included for informational purposes.

The AWS Schools Excelling through National Skill Standards Education (SENSE) program was released in 1995 as a result of being awarded grant number: **V244B3006-95** from the U.S. Department of Education and matching in kind funds from AWS. The QC10 and QC11 standards were updated and released in 2017 along with their respective supplements. The specifications, guidelines, and supplements for SENSE welder training and welder training program accreditation are:

AWS QC10, *Specification for Qualification and Certification of SENSE Level I—Entry Welders*
AWS EG2.0, *Guide for the Training of Welding Personnel: SENSE Level I—Entry Welders*
AWS EG2.0 Supplement, *Supplement SENSE Level I—Entry Welder Training Performance Testing Procedures*

AWS QC11, *Specification for Qualification and Certification of SENSE Level II—Advanced Welders*
AWS EG3.0, *Guide for the Training of Welding Personnel: SENSE Level II—Advanced Welders*
AWS EG3.0 Supplement, *Supplement SENSE Level II—Advanced Welder Training Performance Testing Procedures*

AWS QC21, *Specification for AWS Accreditation of SENSE Welder Training Programs*
AWS EG21, *Specification for the Qualification of SENSE Welder Training Programs*

The latest revision of AWS QC10 and QC11 represents the AWS Education Committee's consensus on the requirements for trainees of SENSE training organizations to receive an AWS SENSE training certificate for full or partial completion of Level I and Level 2 Welder programs, and to be registered in the AWS SENSE Certificate Database.

In 2009, Monroe County Community College (MCCC) was awarded grant number: **CB18204-09-60-A-26** from the U.S. Department of Labor Community-Based Job Training Grant totaling $1.7 million. In 2010, MCCC was donated an off campus facility located at 1004 W. Hurd Rd, by the founders and investors of the former Pump Engineering Inc. In 2011, MCCC used a portion of the DOL grant to renovate the Hurd Rd property into a welding technology center dubbed "Welding Center of Expertise".

The remaining grant funds were used by the college's Applied Science and Engineering Division to offer accelerated 10-week courses to prepare students for the American Welding Society's (AWS) QC10 Specification for Qualification and Certification of Entry Level Welders and QC11 Specification for Qualification and Certification of Advanced Welders. In creating these offerings, the MCCC QC10 and QC11 Student Packages along with Instructor Manuals were developed by Ed Baltrip – MCCC Welding Technology Instructor. The documents were intended to guide both students and teaching personnel through the American Welding Society's National Skill Standards.

In 2018, MCCC was awarded funds from the National Science Foundation (NSF) for an Advanced Technological Education (ATE) grant DUE Number: 1801078. With a portion of the NSF ATE funds, the MCCC Student Package and Instructor manual have been updated, by Stephen Hasselbach CWI/CWE – MCCC Welding Technology Instructor, to reflect the revisions in the 2017 AWS QC documents and supplements.

# References:


American Welding Society. (1998). *Standard symbols for welding, brazing, and nondestructive examination*. Miami, Fla.

American Welding Society. (2012). *Safety in welding, cutting, and allied processes*. Miami, FL.

American Welding Society. (2015). *D1.1/D1.1M:2015 STRUCTURAL WELDING CODE-STEEL.* Miami, Fla.

American Welding Society. (2017). *QC10:2017-Specification for the Qualification and Certification of SENSE Level I-Entry Welders*. Miami, Fla.

American Welding Society. (2017). EG2.*0:2017-Guide for the Training of Welding Personnel: SENSE Level I-Entry Welders*. Miami, Fla.

American Welding Society. (2017). EG2.*0:2017 Supplement-Supplement SENSE Level I-Entry Welder Training Performance Testing*. Miami, Fla.

BOWDITCH, WILLIAM A. (2018). *Modern Welding*. GOODHEART-WILLCOX CO.

# INSTRUCTOR'S GUIDE

Every Instructor shall conduct the QC10 Certification course in a professional manner. The following records may seem extensive but should be consider mandatory for the quality of the instruction and compliance to AWS QC10.

Instructors should record late arrivals, early quits and nonproductive welding activities of each student.

The Instructor MUST maintain the following records:

1. Attendance records
2. Exam completion records
3. Master TAR (Training Achievement Records) for all students (Excel File)

The Instructor is required to maintain a folder for each student. This folder MUST contain all the validation of training records completed during the course.

Successful completion Form(s)
2G Performance Visual Inspection Record
3G Performance Visual Inspection Record
Performance Inspection for 2G and 3G Bend Test
TAR (Training Achievement Record) maintained by student
Job/Time Cards
All inspection records

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**Phone:** 734-735-0617

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## Grading Methodology:

**Partial Certification:**

Students may receive partial certification by completing the following:

1. The four mandatory written tests listed above*.
2. The welding process exam for each certification desired.
3. OFC/OAC Evaluation Rubric.
4. Complete a minimum of 235 class hours.

| Workmanship Qualification Tests | Written Tests | Grade |
|---|---|---|
| OFC/OAC Evaluation Rubric | *Safety (35 ques.) | |
| | *Thermal Cutting (55 ques.) | |
| | *Drawing/Welding Symbols (39 ques.) | |
| | *Weld Inspection & Testing (39 ques.) | |
| EDU-1 FCAW-G<br>EDU-1 FCAW-S | FCAW (30 ques.) | C (All the above plus both FCAW projects) |
| EDU-2 GMAW (Spray)<br>EDU-3A GMAW-S (Short Circuit) | GMAW (29ques) | C (All the above plus both GMAW projects) |
| EDU-3B GTAW (CS)<br>EDU-4 GTAW (SS)<br>EDU-5 GTAW (Alum) | GTAW (49 ques.) | B (All the above plus three GTAW projects) |
| EDU-6A SMAW 2G (CS Plate)<br>EDU-6B SMAW 3G, (CS Plate) | SMAW (40 ques.) | A (All nine projects) |

**Full Certification:**

| WQT Workmanship Qualification Tests | Point Value | WRITTEN EXAMS<br>*Written Exams issued after Welding Projects are completed* | Points Value |
|---|---|---|---|
| 1. EDU-1 FCAW-G | 100 | 1. *Safety (35 ques.) | 100 |
| 2. EDU-1 FCAW-S | 100 | 2. *Thermal Cutting (55 ques.) | 100 |
| 3. EDU-2 GMAW (Spray) | 100 | 3. *Drawing/Welding Symbols (39 ques.) | 100 |
| 4. EDU-3A GMAW-S (Short Cir.) | 100 | 4. *Weld Inspection & Testing (39 ques.) | 100 |
| 5. EDU-3B GTAW (CS) | 100 | 5. FCAW (30 ques.) | 100 |
| 6. EDU-4 GTAW (SS) | 100 | 6. GMAW (29ques) | 100 |
| 7. EDU-5 GTAW (Alum) | 100 | 7. GTAW (49 ques.) | 100 |
| 8. EDU-6A SMAW 2G (CS Plate) | 100 | 8. SMAW (40 ques.) | 100 |
| 9. EDU-6B SMAW 3G, (CS Plate) | 100 | | |
| 10. Performance Objectives | 300 | | |
| SUBTOTAL | 1200 | SUBTOTAL | 800 |
| | | **GRAND TOTAL** | **2000** |

| | | | |
|---|---|---|---|
| **A** | 1850 - 2000 pts. | **C** | 1450 - 1529 pts. |
| **A-** | 1800 - 1849 pts. | **C-** | 1400 - 1449 pts. |
| **B+** | 1730 - 1799 pts. | **D+** | 1330 - 1399 pts. |
| **B** | 1650 - 1729 pts. | **D** | 1250 - 1329 pts. |
| **B-** | 1600 - 1649 pts. | **D-** | 1200 - 1249 pts. |
| **C+** | 1530 - 1599 pts. | **F** | <1199 pts. |

Students receiving a WQT score of less than 80% should repeat the process demonstration and repeat the WQT project.
Safety & Health of Welders Exam (100% minimum), All other written test (75% minimum), *(3 retakes allowed for each test)*

## Method of Student Evaluation:

1) All welds shall receive a visual inspection in accordance with AWS EG2.0-2017. (See pg.11 Student Package or pg. 17 Instructor Manual "Visual Inspection Criteria")
2) Destructive testing of Performance Qualification: AWS2-6 shall be in accordance with AWS QC10-2017.
3) Obeying all safety rules, housekeeping activities and attendance requirements may receive bonus points of up to 10% of final grade.
   - Records must be provided by students to receive extra credit.

## Partial Completion (Alternative Grading) of AWS QC10 Certification

(per EG2.0-2017, Section 3.3.1, Module 4)

The AWS standard (EG 2.0-2017), in which MCCC uses as a model, allows participants to complete as little as a single welding process to receive certification in individual welding processes.

Reasons for changes in grading methodology:
Using the previous grading system could allow a student to become certified in a single welding process but still receive a "D" in the course. By receiving a "D" the student would then be no longer eligible for additional PEL grants or other tuition assistance.

There are many reasons why some participants will not, cannot or choose not to finish all the requirements needed for full QC10 certification. At the top of the list is immaturity, special needs, lack of motivation, lack of basic welding experience or simply being overwhelmed by the amount of information and skills required. It is not unusual for a participant to repeat the same course two or three times before all welding processes are successfully completed.

It is advised that this alternative grading method NOT be discussed until the end of the course because it may encourage students to only complete enough to receive a "C." Many students never challenge themselves and will only complete the bare minimum to receive a passing grade. As instructors, we must challenge them to strive for more than they are capable of.

| Grade A | Grade B | Grade C | Grade C |
|---|---|---|---|
| Complete:<br>Four Welding Process Exams<br>All nine WQT/PQT projects | Complete:<br>Three Welding Process Exams<br>Related WQT/PQT projects | Complete:<br>Two Welding Process Exams<br>Related WQT/PQT projects | Complete:<br>One Welding Process Exam<br>Related WQT/PQT projects |
| All of the following must be successfully completed to receive any grade of "C" or greater.<br>Occupational Orientation (No Exam)<br>Health and Safety (100%)<br>Thermal Cutting (75%)<br>Drawing and Weld Symbols (75%)<br>Welding Inspection and Testing (75%)<br>OFC/OAC rubric evaluation (100%)<br>Attending a minimum of 235 class hours (94% attendance).<br>Exhibit the following skills: good housekeeping, safety, punctuality, hand tool and shop equipment safety and operations. | | | |
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Participants may elect to repeat the QC10 certification class to complete the remaining certifications for up to 3 years. After 3 years from the date of the participant's original certification the AWS records will be closed and permanently archived.

Full QC10 certification is required prior to attending AWS QC11 Advanced Welder's Certification.

**Monroe County Community College**
1555 S Raisinville Rd
Monroe, MI 48161
Phone 734.384.4119

# TIME SHEET

Trainee Name: _____ Course: _____

Trainee Number: _____ Instructor: _____

Building: _____ Week #: _____

| Date | Start Time | End Time | Total Hours | Lab Work Completed |
|---|---|---|---|---|
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| | | **Weekly Totals** | 0.0 | |

All students are required to record and document class hours. Time/Job Cards must reflect accurate dates and times spent on-the-job in preparation for completing assignments.

Trainee signature: _____ Date: _____

Instructor signature: _____ Date: _____

Students will complete time/job cards, reports or other written records as needed. Written records must be completed in a neat and legible order. These records must be turned in with the completed weld projects and will be considered in the overall evaluation of the student's skill. Similar records are required by most large welding companies to determine the productivity of welders and to ensure that each job is charged correctly for time and materials.

Notes:

## INSTRUCTOR'S ATTENDANCE RECORDS (HARD COPY)

(This form is also in electronic form in the File: Weld 115 Attendance & Grades.xlsx)

**ATTENDANCE Days 1-25 WELD 115** (✔=On time, ABS=Absent, L = Late Arrival, E = Early Departure)

| Class Day/50 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dates | | | | | | | | | | | | | | | | | | | | | | | | | |
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**ATTENDANCE Days 26-50** (✔=On time, ABS=Absent, L = Late Arrival, E = Early Departure)

| Class Day/50 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dates | | | | | | | | | | | | | | | | | | | | | | | | | |
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A blank digital Excel Spreadsheet is available in the 115 Shared Dropbox folder for instructor use each semester.

## INSTRUCTOR'S EXAM AND WQT/PQT GRADES (HARD COPY)

All questions on written exams are worth 1 point each. All 8 exams contain 314 questions therefore 314 points are available.

If a students project is graded less than 40 points the student should perform the project again.
Grade should be according to the following criteria:

1. Bill of material accurately completed including metric conversions.
2. All edges are cut squarely and dressed properly if flame cut.
3. All bevels are ground within tolerances.
4. Tight fitups are evident at all weld joints, no gaps.
5. Tack welds are only placed where they will be covered by weld beads.
6. Weld beads are free of undercut exceeding 1/16", Overlap (cold lap), underfill, excessive porosity, etc.
7. Boxing technique used.

**SEE: PROCEDURE FOR FITTING WORKMANSHIP SAMPLE ASSEMBLIES (PAGE 17)**

(This is also in electronic form. See File: Weld 115 Attendance & Grades.xlsx)

| | **WRITTEN EXAMS** | | | | | | | | | **Workmanship Qualification Test** | | | | | | | **Performance Qualification Test** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *1 | *2 | *3 | 4 | *5 | 6 | 7 | 8 | Sub Total | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | Sub Total | Grand Total |
| Maximum Points | 35 | 39 | 40 | 27 | 30 | 49 | 55 | 39 | 314 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 450 | 764 |
| Student's Name | | | | | | | | | | | | | | | | | | | | |
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A blank digital Excel Spreadsheet is available to instructors in the shared 115 Dropbox folder.

**Student Name**_____**Course** WELD 115 AWS QC10 **Class Time/Semester** _____

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## Welding Technology Final Grade Tabulation.

The following segments will be used to calculate your final grade**.**

1. **Attendance Grading Scale**

   A portion of your grade is based upon class participation and attendance. If you miss too many classes, you will end up failing the class. Positive points may be given for perfect attendance or better. Your grade will be reduced by:
   1 (one) full letter grade after the 3rd absence or 15 hours.
   2 (two) full letter grades after the 6th absence or 30 hours.
   3 (three) full letter grades after the 9th absence or 45 hours.
   Dropped after 9 absences.
   3 Tardies = 1 absence (Activated by habitual offenders who are tardy more than 10% of the time.)
   Time sheets must be provided and filled out complete and correct ot receive full or extra credit.

| | |
|---|---|
| **Each Absence** | -100 pts. |

   Total points earned or *deducted* for this segment: _____

2. **Safety**

   Students must abide by all shop rules, policies, and departmental instruction. **More than 2 safety violations will result in an F for this segment and for the class. Positive points may be given for zero violations.**

| | |
|---|---|
| **1 Violation** | -200 pts. |
| **2 Violations** | -400 pts. |
| **3 Violations** | **Fails Course** |

   Total points *deducted* for this segment _____

3. **Performance Welding Objectives**

   Refer to Performance Welding Objective Booklet for total. These objectives meet or exceed the requirements of AWS QC10 Training Achievement Record.

   Total pointed *added* for this segment _____\300

**4. WQT Workmanship Qualification Tests**

Your assigned instructor must approve and sign off on all WQTs. A project score of 40 or less should require the student to repeat the process demonstration and entire project or modified project (i.e. cruciform with base)

| WQT | POINT VALUE | POINTS EARNED |
|---|---|---|
| EDU-1A | 100 | |
| EDU-1B | 100 | |
| EDU-2 | 100 | |
| EDU-3A | 100 | |
| EDU-3B | 100 | |
| EDU-4 | 100 | |
| EDU-5 | 100 | |
| EDU-6A | 100 | |
| EDU-6B | 100 | |

Total points for this segment 0.0 /900

**5. Written Exams**

AWS QC10 Partial Completion (Alternate Grading): To receive partial certification the participant must successfully pass the four core written exams: "Health and Safety", "Thermal Cutting", "Drawing and Weld Symbols" and "Welding Inspection and Testing." The participant must also pass the written exam for the welding process in which they desire certification. If a participant desire only the GMAW certification they must successfully complete the GMAW written exam and both Workmanship Qualification Tests GMAW-S (EDU-3A) and GMAW-Spray (EDU-2). They would then be eligible for QC10 GMAW-S and GMAW-Spray certification only.

*Core Written Exams. Safety & Health of Welders Exam (100% minimum), All other written test (75% minimum), *(3 retakes allowed for each test)*

| EXAM | POINT VALUE | POINTS EARNED |
|---|---|---|
| Safety* (100% Required) | 100 | |
| Thermal Cutting* | 100 | |
| Drawing/Welding Symbols* | 100 | |
| Inspection & Testing* | 100 | |
| FCAW | 100 | |
| GMAW | 100 | |
| GTAW | 100 | |
| SMAW | 100 | |

Total points for this segment 0.0 /800

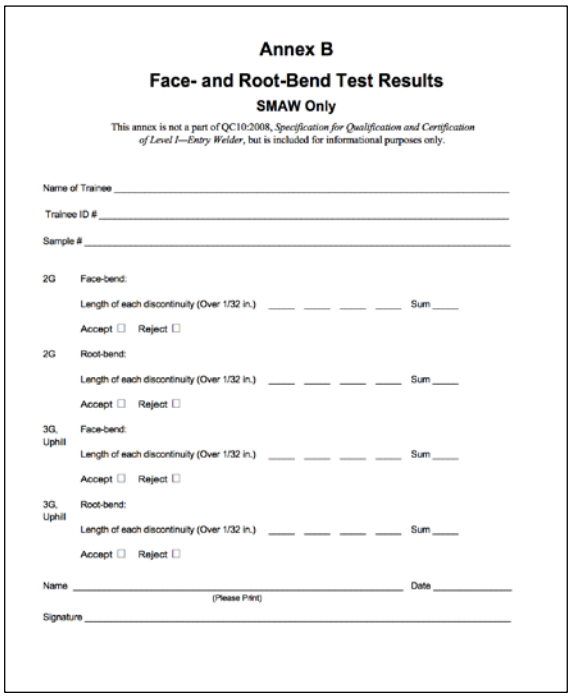
**Final Grade** 0 **/2000**

| Course Grading Scale | | | |
|---|---|---|---|
| **A** | 1850 - 2000 pts. | **C** | 1450 - 1529 pts. |
| **A-** | 1800 - 1849 pts. | **C-** | 1400 - 1449 pts. |
| **B+** | 1730 - 1799 pts. | **D+** | 1330 - 1399 pts. |
| **B** | 1650 - 1729 pts. | **D** | 1250 - 1329 pts. |
| **B-** | 1600 - 1649 pts. | **D-** | 1200 - 1249 pts. |
| **C+** | 1530 - 1599 pts. | **F** | <1199 pts. |

The following four documents are from AWS and can be found at www.senseonline.org. I recommend downloading and pre-filling the information and creating a shared file with the students. and must be submitted to AWS for each student qualifying for QC10 certification.

**Have students download from LMS and pre-fill their information for each project. Save in a dropbox folder and share it with the instructors.**

**Create Fillable PDF for SMAW**



Annex B

Face- and Root-Bend Test Results

SMAW Only

This annex is not a part of QC10:2008, *Specification for Qualification and Certification of Level I—Entry Welder*, but is included for informational purposes only.

Name of Trainee _____

Trainee ID # _____

Sample # _____

2G Face-bend:
Length of each discontinuity (Over 1/32 in.) ____ ____ ____ ____ Sum ____
Accept ☐ Reject ☐

2G Root-bend:
Length of each discontinuity (Over 1/32 in.) ____ ____ ____ ____ Sum ____
Accept ☐ Reject ☐

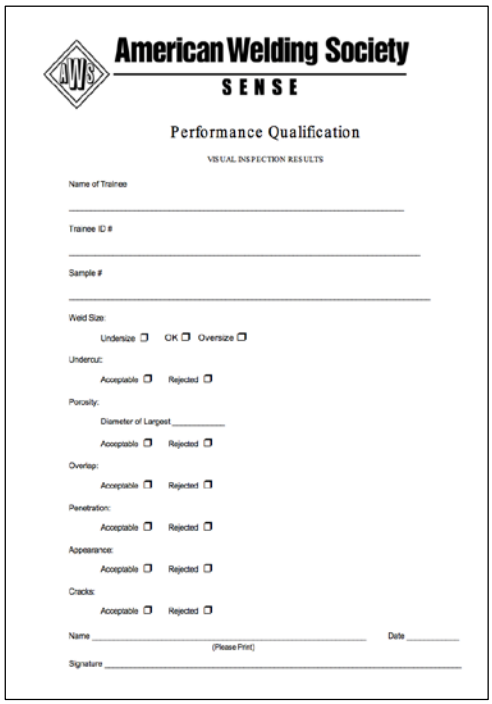
3G, Uphill Face-bend:
Length of each discontinuity (Over 1/32 in.) ____ ____ ____ ____ Sum ____
Accept ☐ Reject ☐

3G, Uphill Root-bend:
Length of each discontinuity (Over 1/32 in.) ____ ____ ____ ____ Sum ____
Accept ☐ Reject ☐

Name _____ Date _____
(Please Print)

Signature _____

**Create Fillable PDF for each Project**



American Welding Society

SENSE

Performance Qualification

VISUAL INSPECTION RESULTS

Name of Trainee

Trainee ID #

Sample #

Weld Size:
Undersize ☐ OK ☐ Oversize ☐

Undercut:
Acceptable ☐ Rejected ☐

Porosity:
Diameter of Largest _____
Acceptable ☐ Rejected ☐

Overlap:
Acceptable ☐ Rejected ☐

Penetration:
Acceptable ☐ Rejected ☐

Appearance:
Acceptable ☐ Rejected ☐

Cracks:
Acceptable ☐ Rejected ☐

Name _____ Date _____
(Please Print)

Signature _____

- Create Dropbox account
  - Share link with students
- Students create dropbox account
- Students create shared folder
- Students download PQ and SMAW PQ
- Students pre-fill information and save one PQ for each sample #
  - 7 PQ Visual Inspection Results
  - 2 Face & Root Bend Results
- Student submits project
- Instructor completes PQ Visual Inspection Results or Face & Root Bend Results in shared folder
- Instructor marks project as pass in SENSEonline.org course for student
- Student and Instructor should retain for 1 year

American Welding Society

SENSE

# Performance Qualification

**VISUAL INSPECTION RESULTS**

Name of Trainee

_____

Trainee ID #

_____

Sample #

_____

Weld Size:

Undersize ❒ OK ❒ Oversize ❒

Undercut:

Acceptable ❒ Rejected ❒

Porosity:

Diameter of Largest _____

Acceptable ❒ Rejected ❒

Overlap:

Acceptable ❒ Rejected ❒

Penetration:

Acceptable ❒ Rejected ❒

Appearance:

Acceptable ❒ Rejected ❒

Cracks:

Acceptable ❒ Rejected ❒

| | |
|---|---|
| Fitup Procedure Reviewed with Trainee | Yes |
| Safety Requirements Reviewed with Trainee | Yes |
| WPS Reviewed with Trainee | Yes |
| Material List Completed | Yes |
| Metric Conversions Completed | Yes |
| Fitup Inspection | Approve |

Notes: 0.0

0

Instructor Signature Date

Name _____ Date _____

(Please Print)

Signature _____

American Welding Society

SENSE

# Face- and Root-Bend Test Results

# SMAW

Name of Trainee _____ Trainee ID # _____

Sample # _____ WPS #: AWS B2.1-1-016

2G Face-bend:

Length of each discontinuity (Over 1/32 in.) ____ ____ ____ ____ Sum 0

Accept ◯ Reject ◯

2G Root-bend:

Length of each discontinuity (Over 1/32 in.) ____ ____ ____ ____ Sum 0

Accept ◯ Reject ◯

3G, Uphill Face-bend:

Length of each discontinuity (Over 1/32 in.) ____ ____ ____ ____ Sum 0

Accept ◯ Reject ◯

3G, Uphill Root-bend:

Length of each discontinuity (Over 1/32 in.) ____ ____ ____ ____ Sum 0

Accept ◯ Reject ◯

**An RT may to be used in lieu of bend testing. However, if you choose this option, the RT shall be in conformance with AWSD1.1, Section 6. The individual who accepts the NDT test shall be qualified for NDT Level II, or III. The RT report should be submitted with this document.**

**RADIOGRAPHIC TEST RESULTS**

| Film Identification Number | Results | Remarks |
|---|---|---|
| | | |

Name : _____ Date _____

(Please Print)

Signature _____ Organization: **Monroe County Community College**

# WORKMANSHIP AND PERFORMANCE QUALIFICATION TESTS

Procedures for completing the "Workmanship Tests" are VERY important for success! All students MUST follow the instructions below "Procedure for Fitting Workmanship Sample Assemblies."

## PROCEDURE FOR FITTING WORKMANSHIP SAMPLE ASSEMBLIES

(The following steps are based on the workmanship sample drawings.)

1. Prepare bill of materials in U.S customary units of measure.
2. Convert bill of materials to S.I. metric units of measure.
   Multiply measurement times 25.4 to convert to millimeters (mm)
3. Cut all parts mechanically or by machine OFC unless specified manual OFC.
4. Inspect beveled edges. If the groove face exhibits a land, condition the face to a feathered edge with a grinder or file.
5. Remove any obstruction that prevents a tight fitup at the root.
6. Weld tacks must not be placed where a weld is not called for.
7. Fit and tack entire assembly on bench before attaching to the weld fixture arm.
8. Attach extension tabs where indicated.
9. All welding to be done in position according to the drawing orientation in accordance to AWS QC10.
10. Employ boxing technique where applicable.
    *The "Boxing Technique" refers to NOT STOPPING OR STARTING a weld bead in corner. Wrap the weld around the inside corner.*

## VISUAL INSPECTION CRITERIA FOR QC10 ENTRY WELDERS

1. There shall be no cracks or incomplete fusion.
2. There shall be no incomplete joint penetration in groove welds except as permitted for partial joint penetration groove welds.
3. The Test Supervisor shall examine the weld for acceptable appearance, and shall be satisfied that the welder is skilled in using the process and procedure specified for the test.
4. Undercut shall not exceed the lesser of 10% of the base metal thickness or 1/32 in. (0.8 mm).
5. Where visual examination is the only criterion for acceptance, all weld passes are subject to visual examination, at the discretion of the Test Supervisor.
6. The frequency of porosity shall not exceed one in each 4 in. (100 mm) of weld length and the maximum diameter shall not exceed 3/32 in. (2.4 mm).
7. Welds shall be free from overlap.

**ESTIMATED MATERIALS FOR ONE CLASS OF 1 OR 15 STUDENTS (with 15% waste).**

| Projects | Attempts | 1/8" x 6" CS Plate | 1/4" x 6" CS Plate | 3/8" x 6" CS Plate | 1/16" (16ga) x 6" Stainless Plate | 1/8" (10ga) x 6" Aluminum Plate |
|---|---|---|---|---|---|---|
| EDU-1A | X2 | | Used as Required For Practice | 52" | | |
| EDU-1B | X2 | | | 52" | | |
| EDU-2 | X2 | | | 24" | | |
| EDU-3A | X2 | 52.5" | | | | |
| EDU-3B | X2 | 52.5" | | | | |
| EDU-4 | X3 | | | | 36" | |
| EDU-5 | X3 | | | | | 28" |
| EDU-6A | X3 | | | 21" | | |
| EDU-6B | X3 | | | 21" | | |
| Total per student | | 105" | 24" | 170" | 36" | 28" |
| +15% waste | | 121" (10.1') | | 195.5" (16.3') | 41.4" (3.5') | 32.2" (2.7') |
| Amt for 15 Students | | 151 feet | 30' feet | 245 feet | 52 feet | 41 feet |

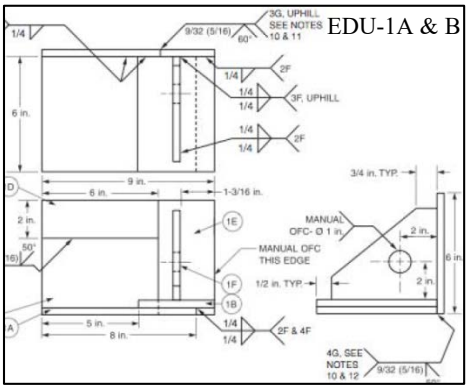
*Attempts: The number of student attempts to complete the project.
If student attempts are more than allowed, the instructor must give additional demonstrations or work personally with student.

## WELD 115 WQT (WORKMANSHIP QUALIFICATION TESTS)

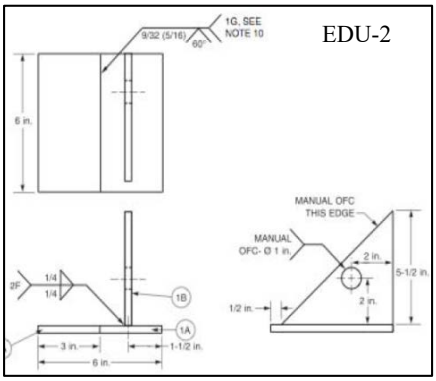
This is a list of the practical hands-on elements of the course.

**Project #1, FCAW-G, EDU-1A, CS**
**Project #2, FCAW-S, EDU-1B, CS**
**Project #3, GMAW SPRAY, EDU-2, CS**
**Project #4, GMAW-S, EDU-3A, CS**
**Project #5, GTAW, EDU-3B, CS**
**Project #6, GTAW, EDU-4, SS**
**Project #7, GTAW, EDU-5, Aluminum**
**Project #8, SMAW, EDU-6A, CS (BEND TEST)**
**Project #9, SMAW, EDU-6B, CS (BEND TEST)**

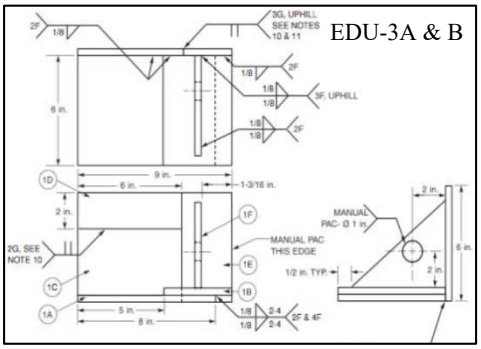
EDU-1A & B



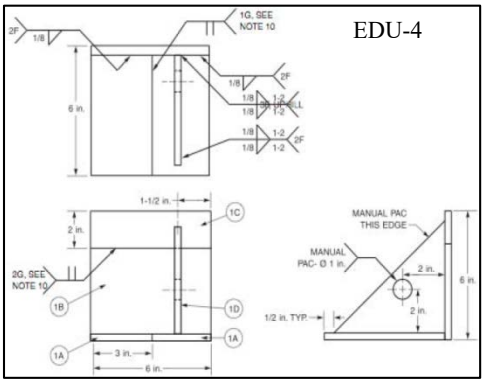
EDU-2



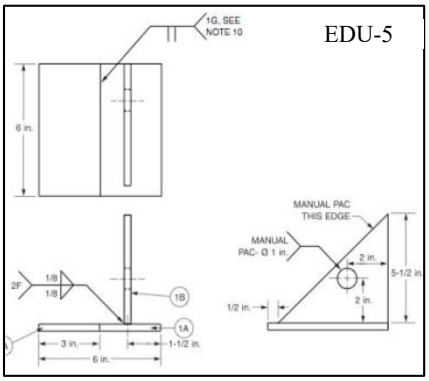
EDU-3A & B



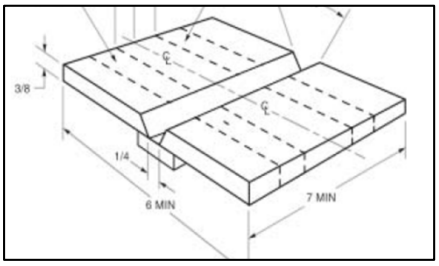
EDU-4



EDU-5



EDU-6A & B



**WELD 115 CLOSED BOOK WRITTEN EXAMS**

EXAM 1 MODULE 2 SAFETY AND HEALTH OF WELDERS
EXAM 2 MODULE 3 DRAWING AND WELDING SYMBOL INTERPRETATION
EXAM 3 MODULE 8 THERMAL CUTTING PROCESS
EXAM 4 MODULE 4 FLUX CORE ARC WELDING
EXAM 5 MODULE 9 WELDING INSPECTION AND TESTING
EXAM 6 MODULE 5 GAS METAL ARC WELDING
EXAM 7 MODULE 7 GAS TUNGSTEN ARC WELDING
EXAM 8 MODULE 4 SHIELDED METAL ARC WELDING

# WPS

## WELDING PROCEDURE SPECIFICATIONS

**Instructor's Notes:**
Review each WPS prior to assigning the project.
Assure student pay particular attention to the shaded areas.

## Instructor(s) should share the following information:

1. This drawing is used for projects EDU-6A and EDU-6B. Two projects must be constructed from this single print.
   EDU-6A uses the SMAW welding process in the 2G horizontal position.
   EDU-6B uses the SMAW welding process in the 3G vertical position.
2. Complete the "Materials List" at the bottom of the print and convert standards measurements into metric. (1"=25.4)
3. Review all welding symbols.
4. Review all "Drawing Notes".
5. Describe the visual inspection criteria to be used during the visual inspection.
6. Describe the final-bend test criteria.
7. Weld tacks must not be placed where a weld is not called for.
8. Assembly maybe tacked up in any position.
9. Use position magnets to accurately assemble project in order to produce properly aligned joints.
10. The backing plate can be 9" long (This allows for 1" run-off tabs on each end).
11. Stress the importance that bending strap must NOT be undersized. Straps MUST be a minimum of 3/8" thick x 1-1/2" wide x 6" long.
12. Installing a "Strongback" is recommended to prevent wraping. (see "Strongback placement" pages)

**WPS WELDING PROCEDURE SPECIFICATION**
**(WPS): AWS1.1-GMAW-S**
**THIS WPS IS FOR EDUCATIONAL PURPOSES ONLY**

**GMAW (Gas Metal Arc Welding – Short Circuit)**

| | | |
|---|---|---|
| **Welding Process:** GMAW-S | **Method:** Semi Automatic | **Supporting SWPS No:** AWS B2.1-1-004 |

| BASE METAL | | |
|---|---|---|
| **Material:** | **Product Form:** | **Thickness:** |
| ASTMA569 or A36 (or equivalent M-1)[1]<br>M#, P#1, Group 1 or 2 | Sheet Metal | 10 Gage per drawing<br>0.134in Nominal (T) |

| FILLER METALS | | | | |
|---|---|---|---|---|
| **Electrode F#:** | **Specifications:** | **Deposit Thickness:** | **Classification:** | **Transfer Mode:** |
| F6 | ANSI/AWS 5.18 | Per Drawing AWS EDU-3 | ER70S-6 | Short Circuit |

| JOINT DESIGN | | | |
|---|---|---|---|
| **Joint Design:** | **Backing:** | **Backing Material:** | **Welding Positions/Progression:** |
| See Drawing AWS EDU-3 | None | None | Multiple / Uphill when applicable |

| PREHEAT, INTERPASS AND POSTHEAT TEMPERATURES | | |
|---|---|---|
| **Preheat:** | **Interpass Temp:** | **Postheat Heat treatment** |
| 50°F minimum | N/A | As Welded Condition |

| ELECTRICAL CHARACTERISTICS | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Electrode** | | **Current** | | | | | |
| **Classification** | **Diameter** | **Volts** | **Amperage** | **Polarity** | **WFS (IPM)** | **Travel Speed** | **CTWD** |
| ER70S-6 | .035 | 17-20 | 100-140 | DCEP | 150-250 | N/A | ½” |

| SHIELDING GAS | | |
|---|---|---|
| **Composition** | **Flow Rate** | **Nozzle Size** |
| 75% Ar/25%CO2 | 20-30 CFH | 1/2” ID Minimum |

| WELD TECHNIQUE | | | |
|---|---|---|---|
| **Weave or Stringer** | **Cleaning** | **Maximum Bead Thickness** | **Peening** |
| Stringer | Mechanical Brushing | Per Drawing AWS EDU-3 | No |

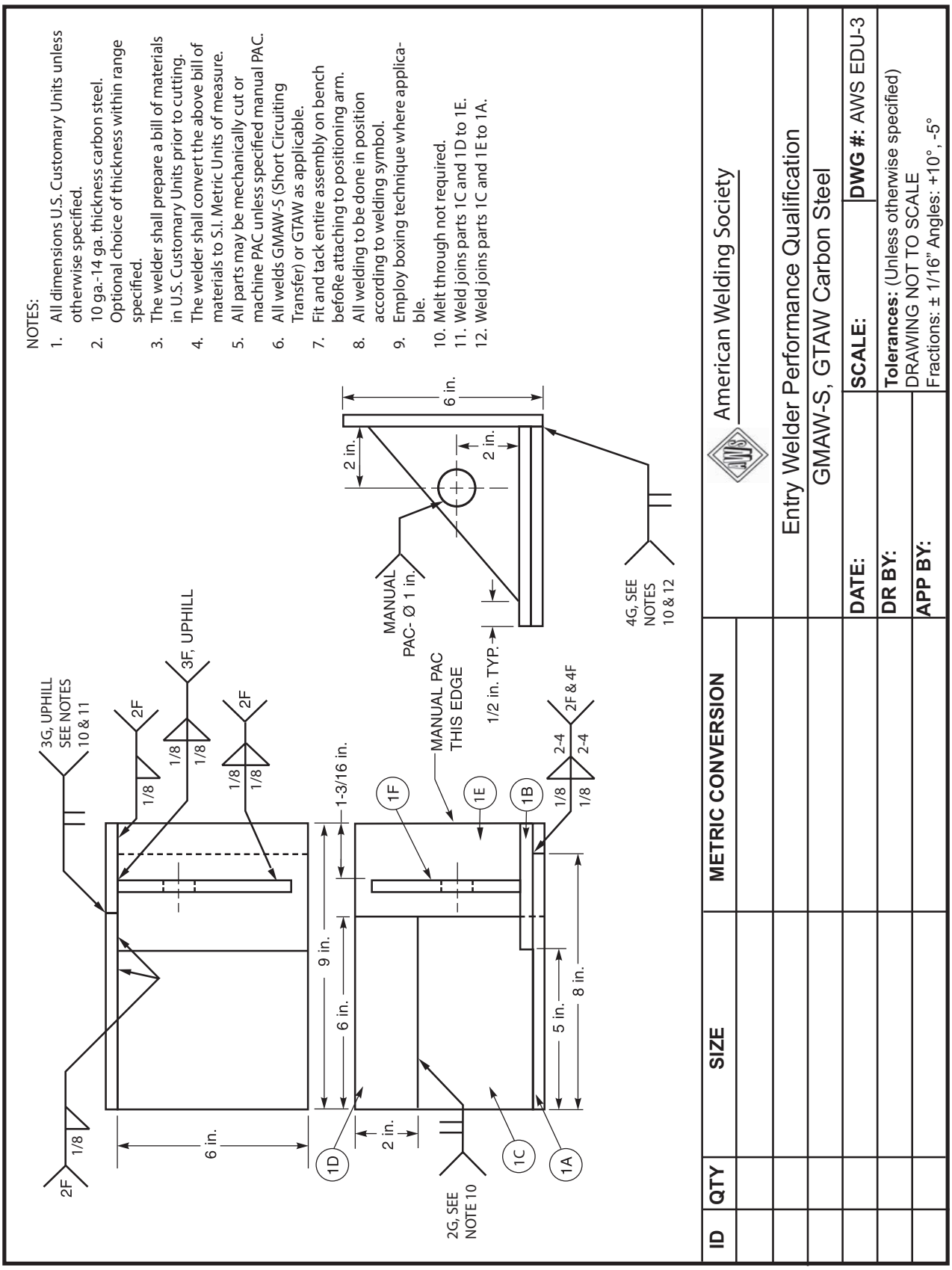
**SUPPORTING PQR(S) AWS-EDU-PQ7**

**SCHOOL NAME:** Monroe County Community College
In the name of the school above, the following personnel are responsible for the acceptance and application of this welding procedure in the school curriculum and corresponding documents.

Date: June 21, 2012 Implemented By: Edward L. Baltrip Title: Senior Welding Instructor
Date: September 2018 Amended By: Stephen Hasselbach Title: CWI/CWE – Instructor
Date: _____ Approved By: _____ Title: _____

Qualification Standard: AWS QC-10 *Specification for Qualification and Certification of Level 1 – Entry Welder*
Acceptance Criteria: Visual Inspection per: AWS QC-10, Table 3.

**Notes:** 1. Base Metal Groupings (M Numbers) per AWS B2.1


NOTES:
1. All dimensions U.S. Customary Units unless otherwise specified.
2. 10 ga.-14 ga. thickness carbon steel. Optional choice of thickness within range specified.
3. The welder shall prepare a bill of materials in U.S. Customary Units prior to cutting.
4. The welder shall convert the above bill of materials to S.I. Metric Units of measure.
5. All parts may be mechanically cut or machine PAC unless specified manual PAC.
6. All welds GMAW-S (Short Circuiting Transfer) or GTAW as applicable.
7. Fit and tack entire assembly on bench befoRe attaching to positioning arm.
8. All welding to be done in position according to welding symbol.
9. Employ boxing technique where applicable.
10. Melt through not required.
11. Weld joins parts 1C and 1D to 1E.
12. Weld joins parts 1C and 1E to 1A.
3G, UPHILL SEE NOTES 10 & 11
2F
3F, UPHILL
1/8
6 in.
9 in.
6 in.
1-3/16 in.
2 in.
5 in.
8 in.
1D
1C
1A
1E
1F
1B
2-4
2F & 4F
MANUAL PAC THIS EDGE
1/2 in. TYP.
MANUAL PAC- Ø 1 in.
2 in.
4G, SEE NOTES 10 & 12
2G, SEE NOTE 10
ID
QTY
SIZE
METRIC CONVERSION
American Welding Society
Entry Welder Performance Qualification
GMAW-S, GTAW Carbon Steel
DATE:
SCALE:
DWG #: AWS EDU-3
DR BY:
Tolerances: (Unless otherwise specified)
DRAWING NOT TO SCALE
Fractions: ± 1/16" Angles: +10° , -5°
APP BY:

**WPS WELDING PROCEDURE SPECIFICATION**
**(WPS): AWS1.4 -GMAW-Spray**
**THIS WPS IS FOR EDUCATIONAL PURPOSES ONLY**

**GMAW (Gas Metal Arc Welding –Spray)**

| | | |
|---|---|---|
| **Welding Process:** GMAW-Spray | **Method:** Semi Automatic | **Supporting SWPS No:** AWS B2.1-1-235 |

| BASE METAL | | |
|---|---|---|
| **Material:** | **Product Form:** | **Thickness:** |
| ASTM A36 | Plate | 3/8” |

| FILLER METALS | | | | |
|---|---|---|---|---|
| **Electrode F#:** | **Specifications:** | **Deposit Thickness:** | **Classification:** | **Transfer Mode:** |
| F6 | ANSI/AWS A5.18 | Per Drawing AWS EDU-2 | ER70S-3 | Spray |

| JOINT DESIGN | | | |
|---|---|---|---|
| **Joint Design:** | **Backing:** | **Back Gouging:** | **Welding Positions/Progression:** |
| See Drawing AWS EDU-2 | None | None | 1G, 2F / NA |

| PREHEAT, INTERPASS AND POSTHEAT TEMPERATURES | | |
|---|---|---|
| **Preheat:** | **Interpass Temp:** | **Postheat Heat treatment** |
| 50°F minimum | N/A | As Welded Condition |

| ELECTRICAL CHARACTERISTICS | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Electrode** | | **Current** | | | | | |
| **Classification** | **Diameter** | **Volts** | **Amperage** | **Polarity** | **WFS (IPM)** | **Travel Speed** | **CTWD** |
| ER70S-3 | .035 | 24 – 28 | 180 – 280 | DCEP | 330 – 500 | N/A | ½ - 1” |

| SHIELDING GAS | | |
|---|---|---|
| **Composition** | **Flow Rate** | **Nozzle Size** |
| 98% Ar/2% $O_2$ | 30-40 CFH | 1/2” ID Minimum |

| WELD TECHNIQUE | | | | |
|---|---|---|---|---|
| **Weave or Stringer** | **Initial Cleaning** | **Interpass Cleaning** | **Maximum Bead Thickness** | **Peening** |
| Either | Chemical or Mechanical; joint shall be dry prior to welding | Mechanical Only | Per Drawing AWS EDU-2 | Not Permitted |

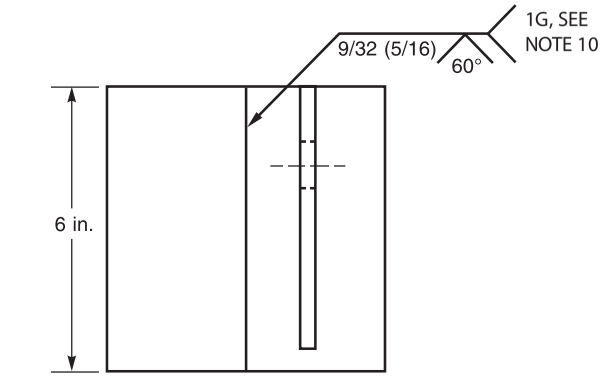
**SUPPORTING PQR(S) AWS-EDU-PQ3**

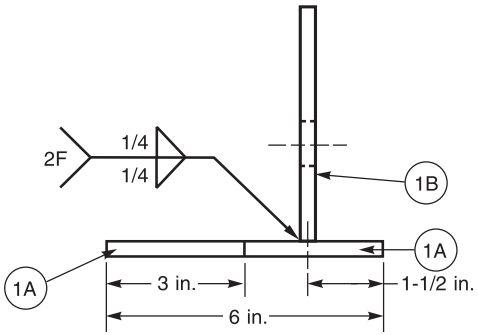
**SCHOOL NAME:** Monroe County Community College
In the name of the school above, the following personnel are responsible for the acceptance and application of this welding procedure in the school curriculum and corresponding documents.

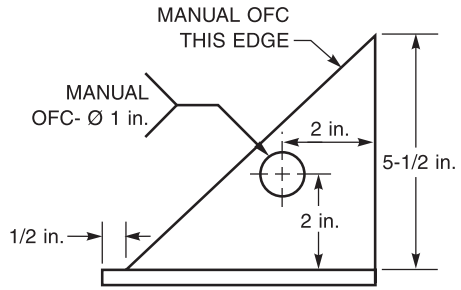
Date: June 21, 2012 Implemented By: Edward L. Baltrip Title: Senior Welding Instructor
Date: September 2018 Amended By: Stephen Hasselbach Title: CWI/CWE – Instructor
Date: _____ Approved By: _____ Title: _____

Qualification Standard: AWS QC-10 *Specification for Qualification and Certification of Level 1 – Entry Welder*
Acceptance Criteria: Visual Inspection per: AWS QC-10, Table 3.
**Notes:** 1. Base Metal Groupings (M Numbers) per AWS B2.1

**Repair:** Defects in welds shall be removed by mechanical or thermal methods. The repair cavity may differ in contour and dimension from a normal joint preparation and may present different restrain conditions. Repair of base metal defects shall be in accordance with the requirements of the fabrication document(s).




NOTES:

1. All dimensions U.S. Customary Units unless otherwise specified.
2. 3/8 in. thickness carbon steel.
3. The welder shall prepare a bill of materials in U.S. Customary Units of measure prior to cutting.
4. The welder shall convert the above bill of materials to S.I. Metric Units of measure.
5. All parts may be mechanically cut or machine OFC unless specified manual OFC.
6. All welds GMAW Spray Transfer.
7. Fit and tack entire assembly on bench before welding.
8. All welding to be done in position according to welding symbol.
9. Employ boxing technique where applicable.
10. Melt through not required.

| ID | QTY | SIZE | METRIC CONVERSION | American Welding Society | | |
|---|---|---|---|---|---|---|
| | | | | Entry Welder Performance Qualification | | |
| | | | | GMAW Spray Transfer, Carbon Steel | | |
| | | | | **DATE:** | **SCALE:** | **DWG #:** AWS EDU-2 |
| | | | | **DR BY:** | **Tolerances:** (Unless otherwise specified) DRAWING NOT TO SCALE Fractions: ± 1/16" Angles: +10°, -5° | |
| | | | | **APP BY:** | | |

**WPS WELDING PROCEDURE SPECIFICATION (WPS): AWS1.3-FCAW-S**
**THIS WPS IS FOR EDUCATIONAL PURPOSES ONLY**

# FCAW-S (Flux Core Arc Welding – Self Shielded)

| | | |
|---|---|---|
| **Welding Process:** FCAW-S | **Method:** Semi Automatic | **Supporting SWPS No:** AWS B2.1-1-027 AWS B2.1-1-018 |

| BASE METAL | | |
|---|---|---|
| **Material:** | **Product Form:** | **Thickness:** |
| ASTM A36 | Plate | 3/8 inch |

| FILLER METALS | | | | |
|---|---|---|---|---|
| **Electrode F#:** | **Specifications:** | **Deposit Thickness:** | **Classification:** | **Transfer Mode:** |
| F6 | AWS 5.20 | Per Drawing AWS EDU-1 | E71T-11 | Globular or Spray |

| JOINT DESIGN | | | |
|---|---|---|---|
| **Joint Design:** | **Backing:** | **Back Gouging:** | **Welding Positions/Progression:** |
| Per QC10 & QC11 Drawings | None | None | Multiple / Uphill |

| PREHEAT, INTERPASS AND POSTHEAT TEMPERATURES | | |
|---|---|---|
| **Preheat:** | **Interpass Temp:** | **Postheat Heat treatment** |
| 50°F minimum | 500 °F Maximum | As Welded Condition |

| ELECTRICAL CHARACTERISTICS | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Electrode** (COREX or NR-211-MP) | | **Current** | | | | | |
| **Classification** | **Diameter[1]** | **Volts** | **Amperage** | **Polarity** | **WFS (IPM)** | **Travel Speed** | **CTWD** |
| E71T-11 | .045 | 16-19 | 140-170 | DCEN | 90-130 | NA | 1/2”-1” |
| E71T-8 (NR-233) | 1/16” | 15-19 | 150-220 | DCEN | 90-150 | NA | 1/2”-1” |

| SHIELDING GAS | | |
|---|---|---|
| **Composition** | **Flow Rate** | **Nozzle Size** |
| NA | NA | NA |

| WELD TECHNIQUE | | | | |
|---|---|---|---|---|
| **Weave or Stringer** | **Initial Cleaning:** | **Interpass Cleaning** | **Maximum Bead Thickness** | **Peening** |
| Either | Chemical or Mechanical, Joint shall be dry prior to welding | Mechanical Only | Per Drawing AWS EDU-1 | NotRequired |

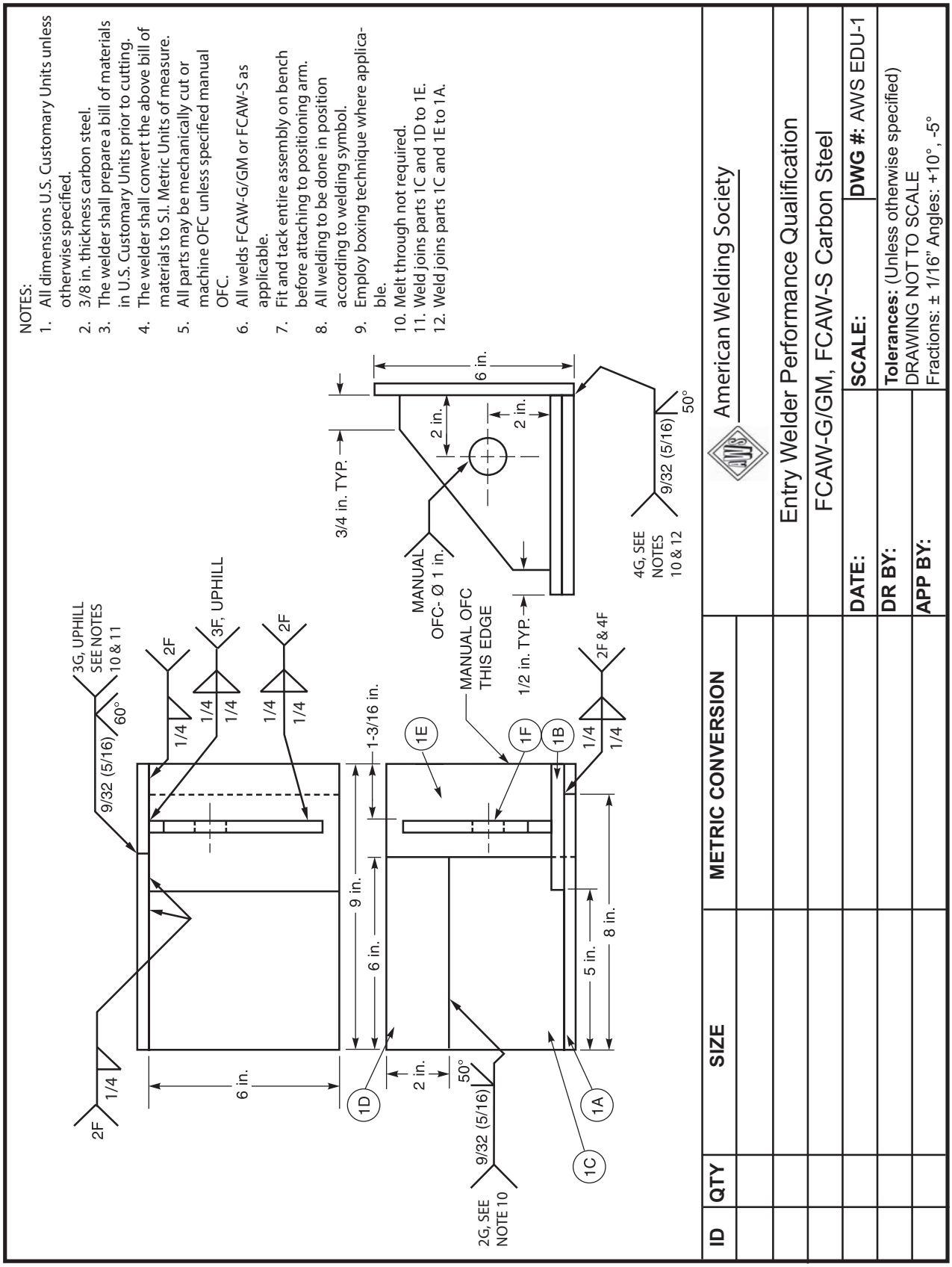
**SUPPORTING PQR(S) AWS-EDU-PQ2**

**SCHOOL NAME:** Monroe County Community College
In the name of the school above, the following personnel are responsible for the acceptance and application of this welding procedure in the school curriculum and corresponding documents.

Date: June 21, 2012 Implemented By: Edward L. Baltrip Title: Senior Welding Instructor
Date: September 2018 Amended By: Stephen Hasselbach Title: CWI/CWE – Instructor
Date: _____ Approved By: _____ Title: _____

Qualification Standard: AWS QC-10 *Specification for Qualification and Certification of Level 1 – Entry Welder*
Acceptance Criteria: Visual Inspection per: AWS QC-10, Table 3.

**Notes:** 1. Electrode Size – Welder’s Choice


NOTES:
1. All dimensions U.S. Customary Units unless otherwise specified.
2. 3/8 in. thickness carbon steel.
3. The welder shall prepare a bill of materials in U.S. Customary Units prior to cutting.
4. The welder shall convert the above bill of materials to S.I. Metric Units of measure.
5. All parts may be mechanically cut or machine OFC unless specified manual OFC.
6. All welds FCAW-G/GM or FCAW-S as applicable.
7. Fit and tack entire assembly on bench before attaching to positioning arm.
8. All welding to be done in position according to welding symbol.
9. Employ boxing technique where applicable.
10. Melt through not required.
11. Weld joins parts 1C and 1D to 1E.
12. Weld joins parts 1C and 1E to 1A.
3G, UPHILL SEE NOTES 10 & 11
3F, UPHILL
2F
2G, SEE NOTE 10
4G, SEE NOTES 10 & 12
9/32 (5/16)
60°
50°
1/4
6 in.
2 in.
9 in.
6 in.
1-3/16 in.
5 in.
8 in.
3/4 in. TYP.
1/2 in. TYP.
MANUAL OFC- Ø 1 in.
MANUAL OFC THIS EDGE
1A
1B
1C
1D
1E
1F
ID
QTY
SIZE
METRIC CONVERSION
American Welding Society
Entry Welder Performance Qualification
FCAW-G/GM, FCAW-S Carbon Steel
DATE:
SCALE:
DWG #: AWS EDU-1
DR BY:
Tolerances: (Unless otherwise specified)
DRAWING NOT TO SCALE
Fractions: ± 1/16" Angles: +10°, -5°
APP BY:

**WPS WELDING PROCEDURE SPECIFICATION (WPS):** AWS1.2B-FCAW-G
**THIS WPS IS FOR EDUCATIONAL PURPOSES ONLY**

# FCAW-G (Flux Core Arc Welding – Gas Shielded)

| **Welding Process:** FCAW-G | **Method:** SemiAutomatic | **Supporting SWPS No:** AWS B2.1-1-020 |
|---|---|---|

| **BASE METAL** | | |
|---|---|---|
| **Grade/Type:** | **Product Form:** | **Thickness:** |
| ASTM A36 | Plate | 3/8 inch |

| **FILLER METALS** | | | | |
|---|---|---|---|---|
| **Electrode F#:** | **Specifications:** | **Deposit Thickness:** | **Classification:** | **Transfer Mode:** |
| F6 | ANSI/AWS 5.20 | Per Drawing AWS EDU-1 | E71T-1M | Globular or Spray |

| **JOINT DESIGN** | | | |
|---|---|---|---|
| **Joint Design:** | **Backing:** | **Back Gouging:** | **Welding Positions/Progression:** |
| Per QC10 & QC11 Drawings | As Required | None | Multiple / Uphill |

| **PREHEAT, INTERPASS AND POSTHEAT TEMPERATURES** | | |
|---|---|---|
| **Preheat:** | **Max Interpass Temp:** | **Postheat Heat treatment** |
| 50ºF Minimum | 500 ºF Maximum | As Welded Condition |

| **ELECTRICAL CHARACTERISTICS** | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Electrode** (ULTRACORE 71A85) | | **Current** | | | | | |
| **Classification** | **Diameter** | **Volts** | **Amperage** | **Polarity** | **WFS (IPM)** | **Travel Speed** | **CTWD** |
| E7XT-1M | .045 | 22-31 | 150-280 | DCEP | 250~600 | NA | .75 – 1.25” |

| **SHIELDING GAS** | | |
|---|---|---|
| **Composition** | **Flow Rate** | **Nozzle Size** |
| 75-85% Ar/Balance CO2, | 40-50 CFH | ½” Minimum |

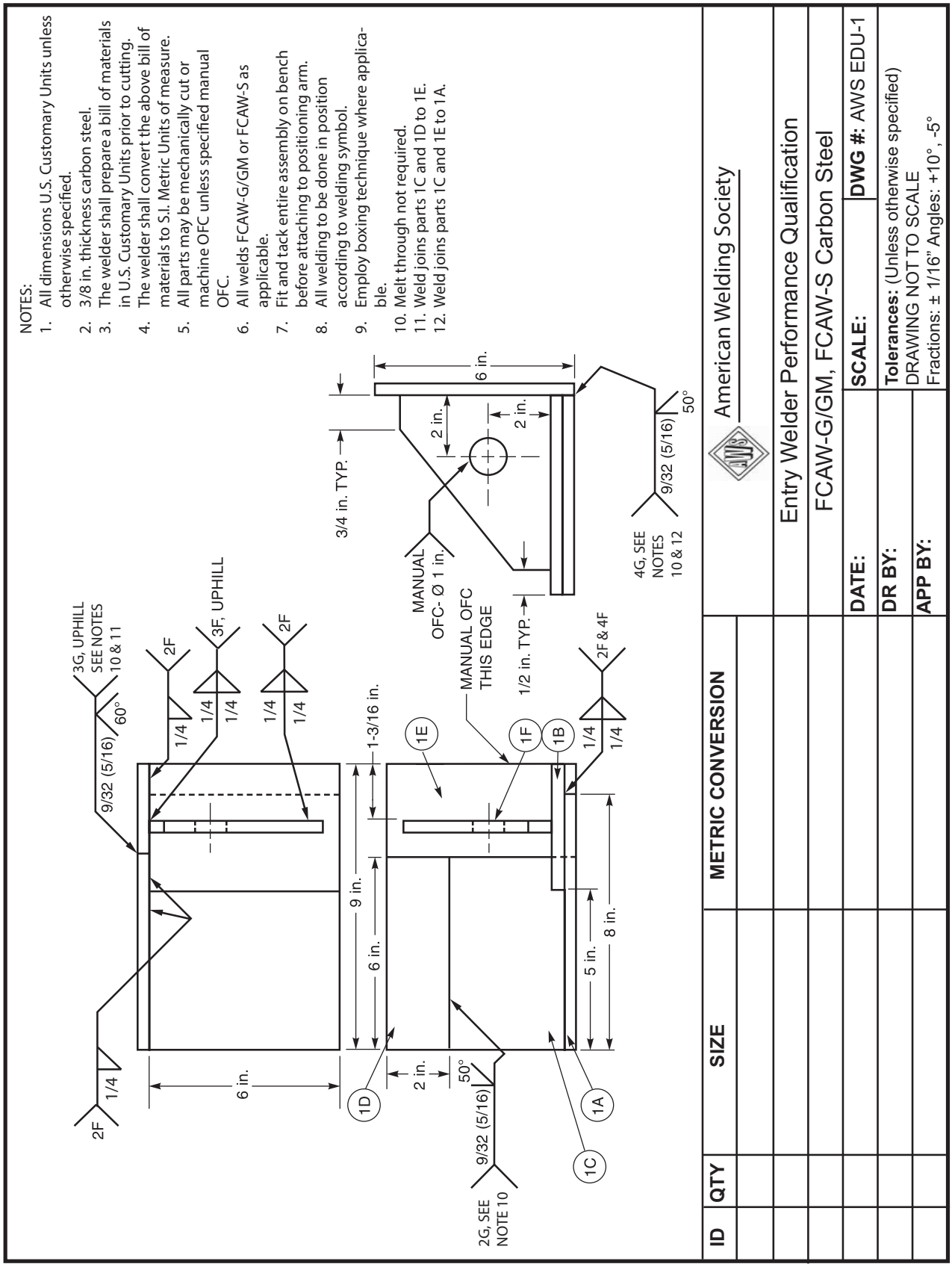
| **WELD TECHNIQUE** | | | | |
|---|---|---|---|---|
| **Weave or Stringer** | **Initial Cleaning:** | **Interpass Cleaning** | **Maximum Bead Thickness** | **Peening** |
| Either | Chemical or Mechanical, Joint shall be dry prior to welding | Mechanical Only | Per Drawing AWS EDU-1 | NotRequired |

**SUPPORTING PQR(S) AWS-EDU-PQ2**

**SCHOOL NAME:** Monroe County Community College
In the name of the school above, the following personnel are responsible for the acceptance and application of this welding procedure in the school curriculum and corresponding documents.

Date: June 21, 2012 Implemented By: Edward L. Baltrip Title: Senior Welding Instructor
Date: September 2018 Amended By: Stephen Hasselbach Title: CWI/CWE - Instructor
Date: _____ Approved By: _____ Title: _____

Qualification Standard: AWS QC-10 *Specification for Qualification and Certification of Level 1 – Entry Welder*
Acceptance Criteria: Visual Inspection per: AWS QC-10, Table 3.


NOTES:
1. All dimensions U.S. Customary Units unless otherwise specified.
2. 3/8 in. thickness carbon steel.
3. The welder shall prepare a bill of materials in U.S. Customary Units prior to cutting.
4. The welder shall convert the above bill of materials to S.I. Metric Units of measure.
5. All parts may be mechanically cut or machine OFC unless specified manual OFC.
6. All welds FCAW-G/GM or FCAW-S as applicable.
7. Fit and tack entire assembly on bench before attaching to positioning arm.
8. All welding to be done in position according to welding symbol.
9. Employ boxing technique where applicable.
10. Melt through not required.
11. Weld joins parts 1C and 1D to 1E.
12. Weld joins parts 1C and 1E to 1A.
3G, UPHILL SEE NOTES 10 & 11
3F, UPHILL
2F
2F & 4F
4G, SEE NOTES 10 & 12
2G, SEE NOTE 10
MANUAL OFC- Ø 1 in.
MANUAL OFC THIS EDGE
9/32 (5/16)
60°
50°
1/4
6 in.
9 in.
6 in.
2 in.
1-3/16 in.
1/2 in. TYP.
3/4 in. TYP.
5 in.
8 in.
1A
1B
1C
1D
1E
1F
ID
QTY
SIZE
METRIC CONVERSION
American Welding Society
Entry Welder Performance Qualification
FCAW-G/GM, FCAW-S Carbon Steel
DATE:
SCALE:
DWG #: AWS EDU-1
DR BY:
Tolerances: (Unless otherwise specified)
DRAWING NOT TO SCALE
Fractions: ± 1/16" Angles: +10°, -5°
APP BY:

**WPS WELDING PROCEDURE SPECIFICATION (WPS) AWS-EDU-GTAW-01**
**THIS WPS IS FOR EDUCATIONAL PURPOSES ONLY**

## GTAW-CS (Gas Tungsten Arc Welding – Carbon Steel)

| **Welding Process:** GTAW | **Method:** Manual | **Supporting SWPS No:** AWS B2.1-1-008 |
|---|---|---|

| **BASE METAL** | | |
|---|---|---|
| **Grade/Type:** | **Product Form:** | **Thickness**: |
| ASTM A569 (or equivalent M-1 steel)[1] | Sheet Steel | 10 Gage to 14 Gage |

| **FILLER METALS** | | | |
|---|---|---|---|
| **Filler Metal F#:** | **Specifications:** | **Deposit Thickness:** | **Classification:** |
| F6 | ANSI/AWS 5.18 | 1/16" – 3/32" | ER70S-X |

| **JOINT DESIGN** | | | |
|---|---|---|---|
| **Joint Design:** | **Backing:** | **Position:** | **Progression:** |
| See Drawing AWS EDU-3 | None | Multiple | Uphill |

| **PREHEAT, INTERPASS AND POSTHEAT TEMPERATURES** | | |
|---|---|---|
| **Preheat:** | **Interpass Temp:** | **Postheat Heat treatment** |
| 50°F minimum, 120 °F Maximum | No Maximum | As Welded Condition |

| **ELECTRICAL CHARACTERISTICS** | | | | | | |
|---|---|---|---|---|---|---|
| **Tungsten Electrode** | | **Filler Metal** | | **Current** | | |
| **Classification** | **Size (in)[2]** | **Classification** | **Diameter** | **Grooves** | **Fillets** | **Polarity** |
| EWCE-2 or E3 (purple) | 3/32 or 1/8 | ER70S-2 or 3 | 3/32" | 57-100 | 86-130 | DCEN |

| **SHIELDING GAS** | | | |
|---|---|---|---|
| **Composition** | **Flow Rate** | **Backing Gas** | **Nozzle Size** |
| 100% Argon | 15-25 CFH | NA | 1/4"-5/8" |

| **WELD TECHNIQUE** | | | | |
|---|---|---|---|---|
| **Beads:** | **Initial Cleaning** | **Interpass Cleaning** | **Maximum Bead Thickness** | **Peening** |
| Stringer or Weave | Mechanical or Chemical, joint shall be dry prior to welding | Mechanical Only | Per Drawing | No |

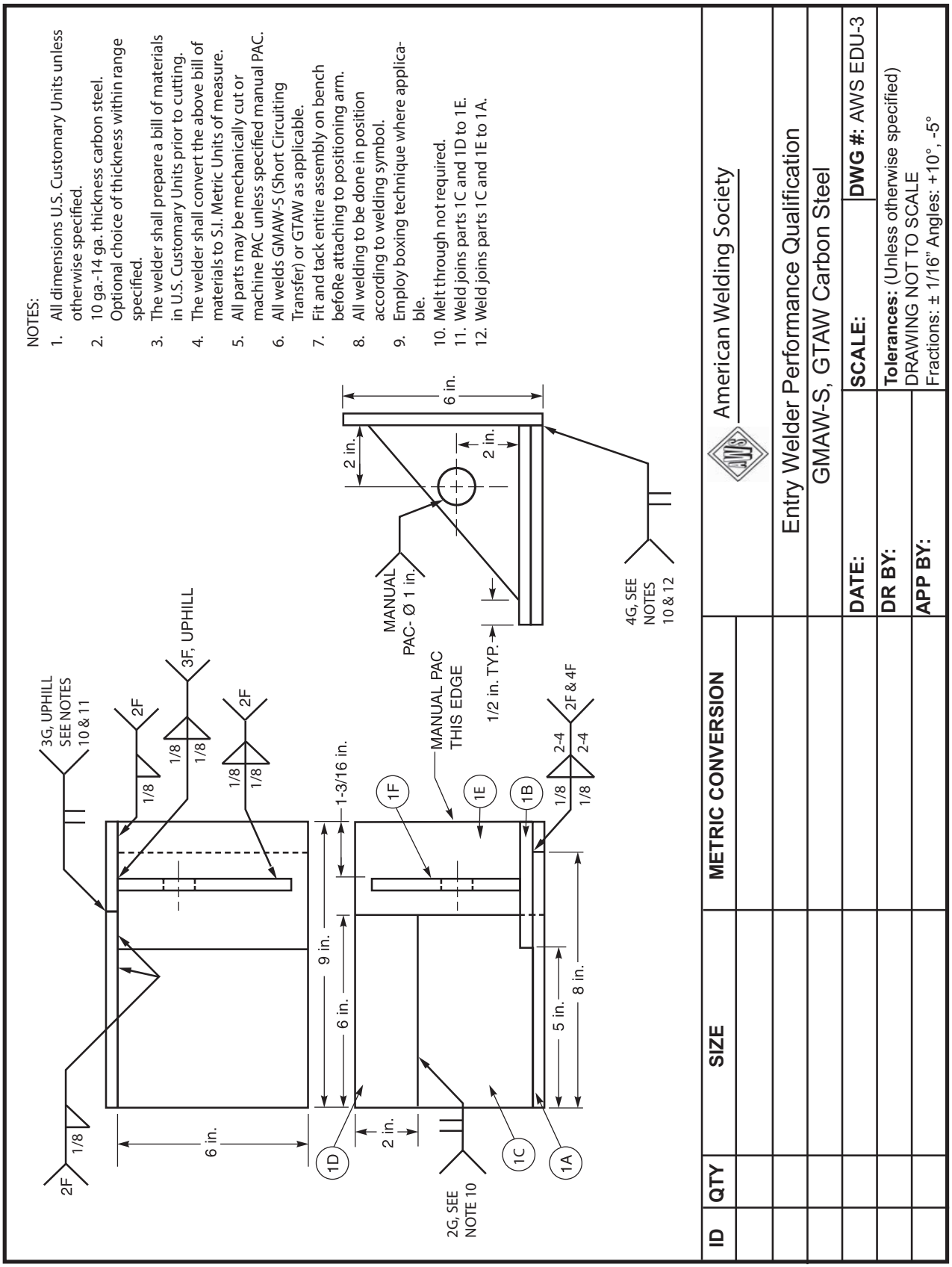
**SUPPORTING PQR(S) AWS-EDU-PQ6**

**NOTES:**
1. Base Metal Groupings (M Numbers) per AWS B2.1
2. Tungsten Electrode size - Welder's choice

**SCHOOL NAME:** Monroe County Community College
In the name of the school above, the following personnel are responsible for the acceptance and application of this welding procedure in the school curriculum and corresponding documents.

Date: June 21, 2012 Implemented By: Edward L. Baltrip Title: Senior Welding Instructor
Date: September 2018 Amended By: Stephen Hasselbach Title: CWI/CWE – Instructor

Qualification Standard: AWS QC-10 *Specification for Qualification and Certification of Level 1 – Entry Welder*
Acceptance Criteria: Visual Inspection per: AWS QC-10, Table 3.


NOTES:
1. All dimensions U.S. Customary Units unless otherwise specified.
2. 10 ga.-14 ga. thickness carbon steel. Optional choice of thickness within range specified.
3. The welder shall prepare a bill of materials in U.S. Customary Units prior to cutting.
4. The welder shall convert the above bill of materials to S.I. Metric Units of measure.
5. All parts may be mechanically cut or machine PAC unless specified manual PAC.
6. All welds GMAW-S (Short Circuiting Transfer) or GTAW as applicable.
7. Fit and tack entire assembly on bench beforRe attaching to positioning arm.
8. All welding to be done in position according to welding symbol.
9. Employ boxing technique where applicable.
10. Melt through not required.
11. Weld joins parts 1C and 1D to 1E.
12. Weld joins parts 1C and 1E to 1A.
3G, UPHILL SEE NOTES 10 & 11
2F
3F, UPHILL
1/8
6 in.
9 in.
6 in.
1-3/16 in.
2 in.
1D
1C
1A
1E
1F
1B
MANUAL PAC THIS EDGE
1/2 in. TYP.
2-4
2F & 4F
2G, SEE NOTE 10
MANUAL PAC- Ø 1 in.
4G, SEE NOTES 10 & 12
2 in.
ID
QTY
SIZE
METRIC CONVERSION
American Welding Society
Entry Welder Performance Qualification
GMAW-S, GTAW Carbon Steel
DATE:
SCALE:
DWG #: AWS EDU-3
DR BY:
Tolerances: (Unless otherwise specified)
DRAWING NOT TO SCALE
Fractions: ± 1/16" Angles: +10° , -5°
APP BY:

**WPS WELDING PROCEDURE SPECIFICATION**
**(WPS) AWS-EDU-GTAW-02**
**THIS WPS IS FOR EDUCATIONAL PURPOSES ONLY**

## GTAW-SS (Gas Tungsten Arc Welding – Stainless Steel)

| | | |
|---|---|---|
| **Welding Process:** GTAW | **Method:** Manual | **Supporting SWPS No:** AWS B2.1-8-009 |

| BASE METAL | | |
|---|---|---|
| **Grade/Type:** | **Product Form:** | **Thickness**: |
| ASTM A240 (or equivalent M-8 steel)[1] | Sheet Steel | 10 Gage to 14 Gage |

| FILLER METALS | | | | |
|---|---|---|---|---|
| **Filler Metal F#:** | **Specifications:** | **Deposit Thickness:** | **Classification:** | **Diameter:** |
| F6 | ANSI/AWS 5.9 | Per Drawing AWS EDU-4 | ER308, ER308L | 3/32” |

| JOINT DESIGN | | | |
|---|---|---|---|
| **Joint Design:** | **Backing:** | **Position:** | **Progression:** |
| See Drawing AWS EDU-4 | Not Permitted | Multiple | Uphill |

| PREHEAT, INTERPASS AND POSTHEAT TEMPERATURES | | |
|---|---|---|
| **Preheat:** | **Interpass Temp:** | **Postheat Heat treatment** |
| 50°F minimum, 120 °F Maximum | No Maximum | As Welded Condition |

| ELECTRICAL CHARACTERISTICS | | | | | |
|---|---|---|---|---|---|
| **Tungsten Electrode** | | **Current - Amperage** | | | |
| **Classification** | **Size (in)[2]** | **Grooves** | **Fillets** | **Polarity** | **Pulsing Current** |
| EWCE-2 or E3 (purple) | 3/32 or 1/8 Sharpened to a point | 51 – 95 | 86 – 130 | DCEN | Not Permitted |

| SHIELDING GAS | | | |
|---|---|---|---|
| **Composition** | **Flow Rate** | **Root Shielding Flow Rate** | **Nozzle Size** |
| 100% Argon | 15-25 $ft^3$/hr | 5 – 15 $ft^3$/hr | 1/4”-5/8” |

| WELD TECHNIQUE | | | | |
|---|---|---|---|---|
| **Bead Width:** | **Initial Cleaning** | **Interpass Cleaning** | **Maximum Bead Thickness** | **Peening** |
| Stringer | Wire Brush, Grind as Required | Wire Brush, Grind as Required | Per Drawing | No |

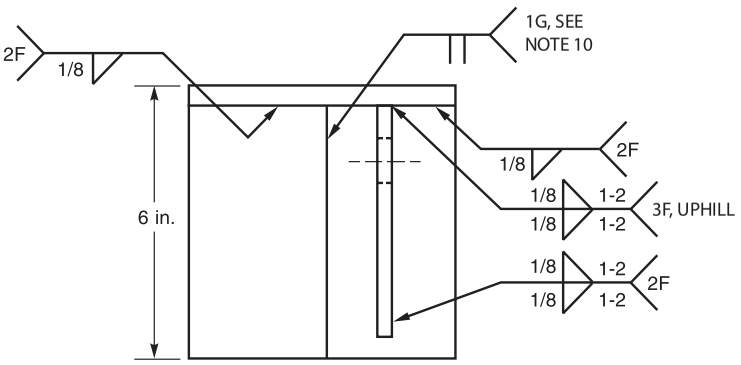
**SUPPORTING PQR(S) AWS-EDU-PQ4**

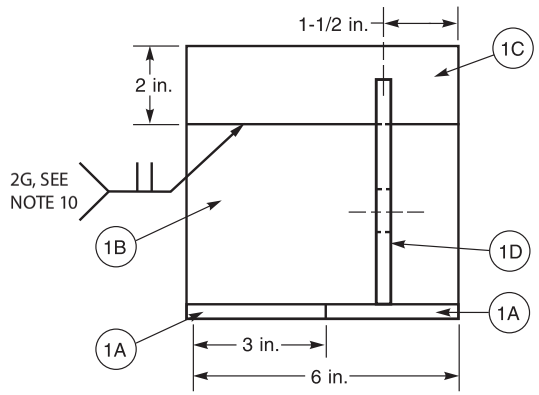
**NOTES:**
1. Base Metal Groupings (M Numbers) per AWS B2.1
2. Tungsten Electrode size - Welder's choice

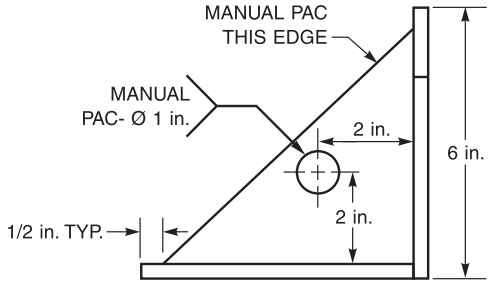
**SCHOOL NAME:** Monroe County Community College
In the name of the school above, the following personnel are responsible for the acceptance and application of this welding procedure in the school curriculum and corresponding documents.

Date: June 21, 2012 Implemented By: Edward L. Baltrip Title: Senior Welding Instructor
Date: September 2018 Amended By: Stephen Hasselbach Title: CWI/CWE – Instructor

Qualification Standard: AWS QC-10 *Specification for Qualification and Certification of Level 1 – Entry Welder*
Acceptance Criteria: Visual Inspection per: AWS QC-10, Table 3.




NOTES:

1. All dimensions U.S. Customary Units unless otherwise specified.
2. 10 ga.-14 ga. thickness austenitic stainless steel. Optional choice of thickness within range specified.
3. The welder shall prepare a bill of materials in U.S. Customary Units prior to cutting.
4. The welder shall convert the above bill of materials to S.I. Metric Units of measure.
5. All parts may be mechanically cut or machine PAC unless specified manual PAC.
6. All welds GTAW.
7. Fit and tack entire assembly on bench before attaching to positioning arm.
8. All welding to be done in position according to welding symbol.
9. Employ boxing technique where applicable.
10. Melt through not required.

| ID | QTY | SIZE | METRIC CONVERSION | American Welding Society | | |
|---|---|---|---|---|---|---|
| | | | | Entry Welder Performance Qualification | | |
| | | | | GTAW Austenitic Stainless Steel | | |
| | | | | **DATE:** | **SCALE:** | **DWG #:** AWS EDU-4 |
| | | | | **DR BY:** | **Tolerances:** (Unless otherwise specified) DRAWING NOT TO SCALE Fractions: ± 1/16" Angles: +10°, -5° | |
| | | | | **APP BY:** | | |

**WPS WELDING PROCEDURE SPECIFICATION (WPS) AWS-EDU-GTAW-03**
**THIS WPS IS FOR EDUCATIONAL PURPOSES ONLY**

# GTAW-AL (Gas Tungsten Arc Welding – Aluminum)

| **Welding Process:** GTAW | **Method:** Manual | **Supporting SWPS No:** AWS B2.1-22-015 |
|---|---|---|

| **BASE METAL** | | |
|---|---|---|
| **Grade/Type:** | **Product Form:** | **Thickness**: |
| M/P-22 Aluminum Sheet[1] | Aluminum Sheet | 10 Gage |

| **FILLER METALS** | | | | |
|---|---|---|---|---|
| **Filler Metal F#:** | **Specifications:** | **Deposit Thickness:** | **Classification:** | **Diameter:** |
| AWS/ASME F23 | ASME/AWS 5.10 | Per Drawing AWS EDU-5 | ER4043 | 1/8” |

| **JOINT DESIGN** | | | |
|---|---|---|---|
| **Joint Design:** | **Backing:** | **Position:** | **Progression:** |
| See Drawing AWS EDU-5 | Not Permitted | Multiple | Uphill |

| **PREHEAT, INTERPASS AND POSTHEAT TEMPERATURES** | | |
|---|---|---|
| **Preheat:** | **Interpass Temp:** | **Postheat Heat treatment** |
| 50ºF minimum, 120ºF Maximum | 250ºF Maximum | As Welded Condition |

| **ELECTRICAL CHARACTERISTICS** | | | | | | |
|---|---|---|---|---|---|---|
| **Tungsten Electrode** | | | **Current - Amperage** | | | |
| **Classification** | **Specification** | **Size (in)[2]** | **Grooves** | **Fillets** | **Polarity** | **Pulsing Current** |
| EWCE-2 or E3 (purple) | AWS A5.12, ASME SFA 5.12 | 3/32 or 1/8 with a balled end | 110 – 125 | 15 – 125 | AC | Not Permitted |

| **SHIELDING GAS** | | | |
|---|---|---|---|
| **Composition** | **Flow Rate** | **Root Shielding Flow Rate** | **Nozzle Size** |
| 100% Argon | 20 – 40 $ft^3$/hr | Not Required | 1/4”-5/8” I.D. |

| **WELD TECHNIQUE** | | | | |
|---|---|---|---|---|
| **Stringer or Weave:** | **Initial Cleaning** | **Interpass Cleaning** | **Maximum Bead Thickness** | **Peening** |
| Either | Mechanical or Chemical, joint shall be dry prior to welding | Mechanical only | Per Drawing EDU – 5 | Not Permitted |

**SUPPORTING PQR(S) AWS-EDU-PQ5**

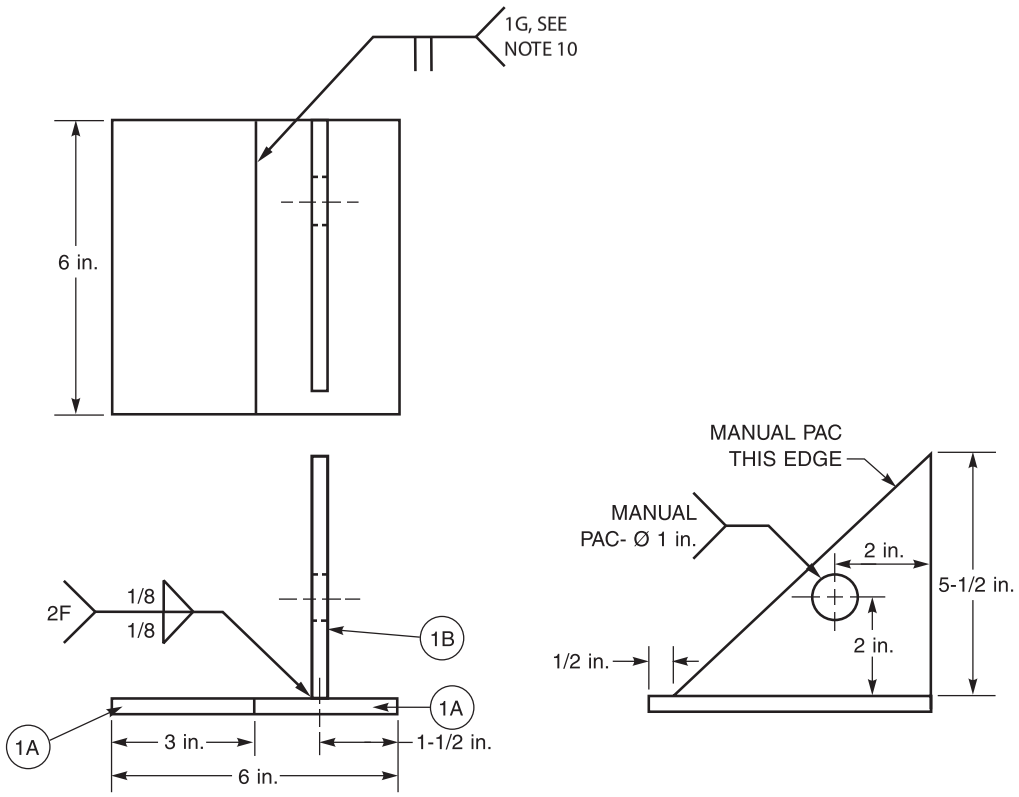
Qualification Standard: AWS QC-10 *Specification for Qualification and Certification of Level 1 – Entry Welder*
Acceptance Criteria: Visual Inspection per: AWS QC-10, Table 3.

**NOTES:**
1. Base Metal Groupings (M Numbers) per AWS B2.1
2. Tungsten Electrode size - Welder's choice

**SCHOOL NAME:** Monroe County Community College
In the name of the school above, the following personnel are responsible for the acceptance and application of this welding procedure in the school curriculum and corresponding documents.

Date: June 21, 2012 Implemented By: Edward L. Baltrip Title: Senior Welding Instructor
Date: September 2018 Amended By: Stephen Hasselbach Title: CWI/CWE – Instructor

**Repair:** Defects in welds shall be removed by mechanical or thermal methods. The repair cavity may differ in contour and dimension from a normal joint preparation and may present different restraint conditions.




NOTES:

1. All dimensions U.S. Customary Units unless otherwise specified.
2. 10 ga.-14 ga. thickness aluminum. Optional choice of thickness within range specified.
3. The welder shall prepare a bill of materials in U.S. Customary Units prior to cutting.
4. The welder shall convert the above bill of materials to S.I. Metric Units of measure.
5. All parts may be mechanically cut or machine PAC unless specified manual PAC.
6. All welds GTAW.
7. Fit and tack entire assembly on bench before attaching to positioning arm.
8. All welding to be done in position according to welding symbol.
9. Employ boxing technique where applicable.
10. Melt through not required.

| ID | QTY | SIZE | METRIC CONVERSION | American Welding Society | | |
|---|---|---|---|---|---|---|
| | | | | Entry Welder Performance Qualification | | |
| | | | | GTAW Aluminum | | |
| | | | | **DATE:** | **SCALE:** | **DWG #:** AWS EDU-5 |
| | | | | **DR BY:** | **Tolerances:** (Unless otherwise specified) DRAWING NOT TO SCALE Fractions: ± 1/16" Angles: +10°, -5° | |
| | | | | **APP BY:** | | |

**WPS WELDING PROCEDURE SPECIFICATION (WPS) AWS-EDU-SMAW-01/02**
**THIS WPS IS FOR EDUCATIONAL PURPOSES ONLY**

# SMAW (Shielded Metal Arc Welding)

| **Welding Process:** SMAW | **Method:** Manual | **Supporting SWPS No:** AWS B2.1-1-016 |
|---|---|---|

| **BASE METAL** | | | |
|---|---|---|---|
| **Grade/Type:** | **Thickness:** | **Product Form:** | **Coupon:** |
| ASTM A36<br>M1, P1, or S1, GROUP 1 or 2 | 3/8” | Plate | 3/8” x 3” min. x 7” min., 2 pieces required |

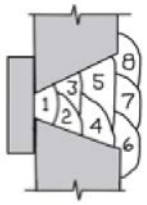
| **FILLER METALS** | | | |
|---|---|---|---|
| **Filler Metal F#:** | **Specifications:** | **Deposit Thickness:** | **Classification:** |
| F4 | ANSI/AWS 5.1 | 3/8” (plus reinforcement) | E7018 |

| **JOINT DESIGN** | | | |
|---|---|---|---|
| **Joint Design:** | **Backing:** | **Back Gouging:** | **Welding Positions:** |
| 45º – see attached Figures for complete details for 2G/3G | Carbon Steel Backing Strip[1] | None | 2G & 3G |

| **PREHEAT, INTERPASS AND POSTHEAT TEMPERATURES** | | |
|---|---|---|
| **Preheat:** | **Interpass Temp:** | **Postheat Heat treatment** |
| 50ºF minimum | 50ºF min - 500ºF max | As Welded Condition |

| **ELECTRICAL CHARACTERISTICS** | | | |
|---|---|---|---|
| **Electrode[3]** | | **Current** | |
| **Classification** | **Diameter[2]** | **Amperage** | **Polarity** |
| E7018 | 3/32” | 70 – 110 | DCEP |
| E7018 | 1/8” | 90 – 150 | DCEP |

**Weld Progression**




| **WELD TECHNIQUE** | | | | | |
|---|---|---|---|---|---|
| **Weave or Stringer** | **Single or Multipass** | **Initial Cleaning** | **Interpass Cleaning** | **Maximum Bead Thickness** | **Peening** |
| Either | Either | Chemical or Mechanical; Joint shall be dry prior to welding | Mechanical Only | 1/4” | No |

**SUPPORTING PQR(S) AWS-EDU-PQ1**

**Qualification Standard:** AWS QC-10 *Specification for Qualification and Certification of Level 1- Entry Welder*

**Acceptance Criteria:** **1.** Visual Inspection per: AWS QC-10, Table 3
**2**. One Face Bend and One Root Bend for each position per: AWS QC-10 Table 4

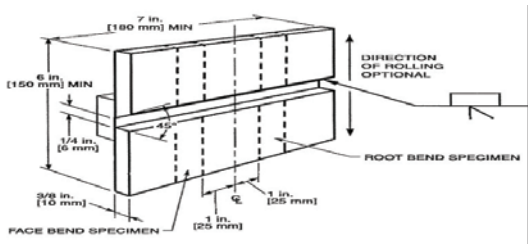
**Notes:** **1.** The backing thickness shall be ¼” min. to $^{3}/_{8}$” max; backing width shall be one inch minimum.
**2.** Electrode Size – Welder’s Choice
**3.** The care and storage of electrodes shall be as recommended by the electrode manufacturer.

**SCHOOL NAME:** Monroe County Community College
In the name of the school above, the following personnel are responsible for the acceptance and application of this welding procedure in the school curriculum and corresponding documents.

Date: June 21, 2012 Implemented By: Edward L. Baltrip Title: Senior Welding Instructor
Date: September 2018 Amended By: Stephen Hasselbach Title: CWI/CWE – Instructor
Date: _____ Approved By: _____ Title: _____

| | | |
|---|---|---|
| | **SENSE PROGRAM WELDER PERFORMANCE QUALIFICATION TECHNIQUE SHEET** | **SENSE TEST No:** Level I - Entry Welder, Test 8 |
| | | **REVISION No:** 1 / **DATE:** 5/15/2015 |
| | | **SUPPORTING SWPS No:** AWS B2.1-1-016 |

| | |
|---|---|
| **MATERIAL:** ASTM A36 | **Joint Details:** |
| **PRODUCT FORM:** Plate | |
| **DIAMETER:** NA / **THICKNESS:** 3/8 in. | |
| **POSITION:** 2G / **PROGRESSION:** NA | |
| **MIN. PREHEAT / MAX INTERPASS TEMP:** 50°F /NA | |
| **CLEANING:** Wire Brush, Grind as Required | |
| **BACKING:** Carbon Steel Backing Strip[1] | |
| **BACKGOUGING:** None | |
| **COUPON:** 3/8" x 3" min. x 7" min., 2 pieces required | |




| VARIABLE | Root and Balance (3/32" Electrode) | Root and Balance (1/8" Electrode) | Root and Balance (5/32" Electrode) |
|---|---|---|---|
| Process | SMAW | SMAW | SMAW |
| Process Type | Manual | Manual | Manual |
| Electrode/Filler Classification | E7018 | E7018 | E7018 |
| Electrode/Filler Size (in.)[2] | 3/32 | 1/8 | 5/32 |
| Consumable Insert | NA | NA | NA |
| Tungsten Electrode Classification | NA | NA | NA |
| Penetration Enhancing Flux | NA | NA | NA |
| Current/Polarity | DCEP | DCEP | DCEP |
| Current Range (Amps) | 70 - 110 | 90 - 150 | 120 - 190 |
| Transfer Mode (GMAW & FCAW) | NA | NA | NA |
| Voltage Range | NA | NA | NA |
| Wire Feed Speed (ipm) | NA | NA | NA |
| Contact Tube to Work (in.) | NA | NA | NA |
| Bead Width (Stringer or Weave) | Either | Either | Either |
| Travel Speed (IPM) | NA | NA | NA |
| Torch Shielding Gas Composition | NA | NA | NA |
| Torch Shielding Gas Flow Rate (cfh) | NA | NA | NA |
| Shielding Gas Cup Size | NA | NA | NA |
| Root Shielding Gas Composition | NA | NA | NA |
| Root Shielding Gas Flow Rate (cfh) | NA | NA | NA |
| Deposit Thickness (in.) | 3/8 (plus reinforcement) | 3/8 (plus reinforcement) | 3/8 (plus reinforcement) |
| Qualification Standard | AWS QC10, *Specification for Qualification and Certification of SENSE Level I—Entry Welders* | | |

| | | |
|---|---|---|
| Acceptance Criteria: | Visual Inspection per: AWS QC-10, Table 8.1 | One Face Bend and One Root Bend for each position per: AWS QC-10 Table 8.2 |

**NOTES:**

1. The backing thickness shall be ¼″ min. to 3/8″ max; backing width shall be one inch minimum.
2. Electrode Size - Welder's choice

| | | |
|---|---|---|
| | **SENSE PROGRAM WELDER PERFORMANCE QUALIFICATION TECHNIQUE SHEET** | **SENSE TEST No:** Level I - Entry Welder, Test 9 |
| | | **REVISION No:** 1 / **DATE:** 5/15/2015 |
| | | **SUPPORTING SWPS No:** AWS B2.1-1-016 |

**MATERIAL:** ASTM A36

**PRODUCT FORM:** Plate

**DIAMETER:** NA **THICKNESS:** 3/8 in.

**POSITION:** 3G **PROGRESSION:** Uphill

**MIN. PREHEAT / MAX INTERPASS TEMP:** 50°F /NA

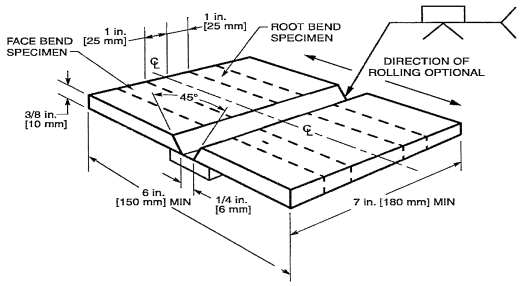
**CLEANING:** Wire Brush, Grind as Required

**BACKING:** Carbon Steel Backing Strip[1]

**BACKGOUGING:** None

**COUPON:** 3/8" x 3" min. x 7" min., 2 pieces required

**Joint Details:**

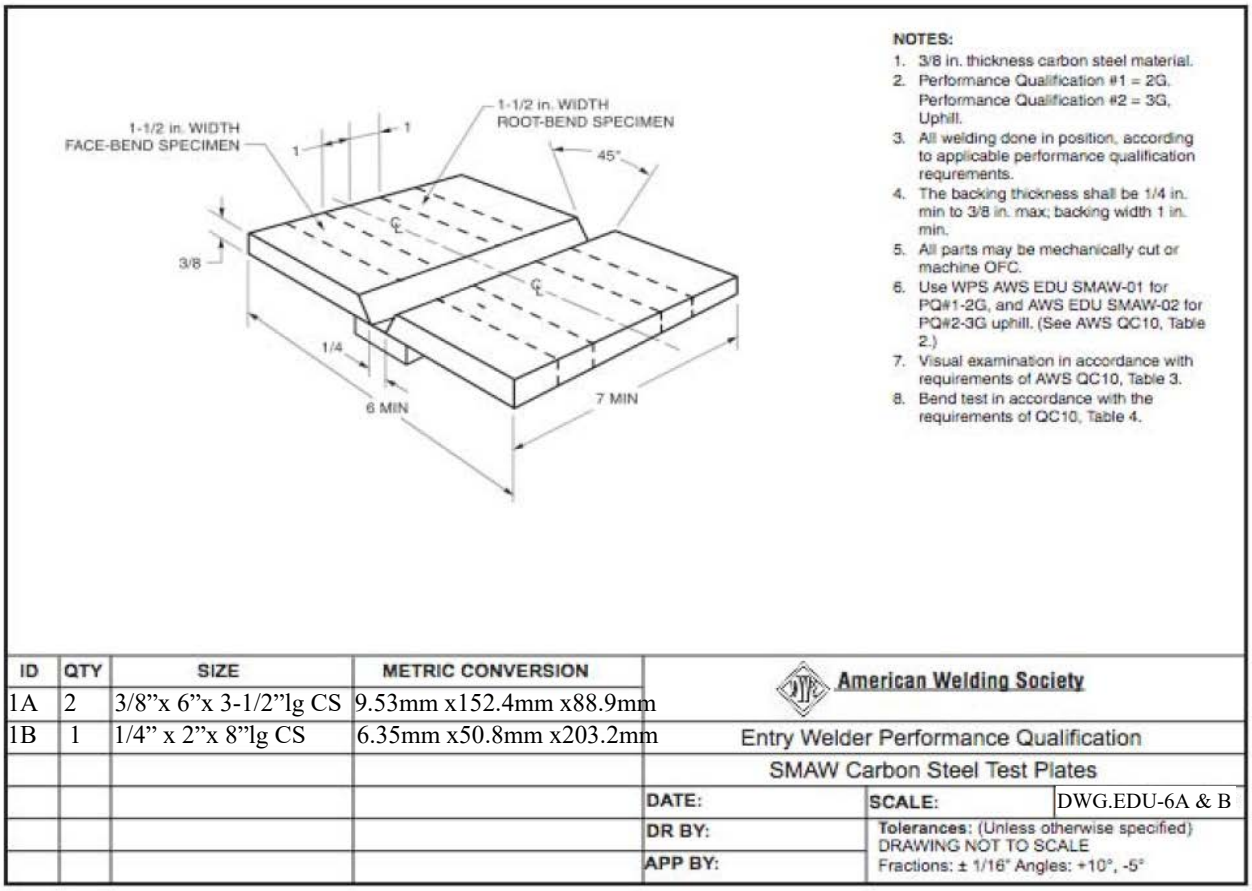



| VARIABLE | Root and Balance (3/32" Electrode) | Root and Balance (1/8" Electrode) | Root and Balance (5/32" Electrode) |
|---|---|---|---|
| Process | SMAW | SMAW | SMAW |
| Process Type | Manual | Manual | Manual |
| Electrode/Filler Classification | E7018 | E7018 | E7018 |
| Electrode/Filler Size (in.)[2] | 3/32 | 1/8 | 5/32 |
| Consumable Insert | NA | NA | NA |
| Tungsten Electrode Classification | NA | NA | NA |
| Penetration Enhancing Flux | NA | NA | NA |
| Current/Polarity | DCEP | DCEP | DCEP |
| Current Range (Amps) | 70 - 110 | 90 - 150 | 120 - 190 |
| Transfer Mode (GMAW & FCAW) | NA | NA | NA |
| Voltage Range | NA | NA | NA |
| Wire Feed Speed (ipm) | NA | NA | NA |
| Contact Tube to Work (in.) | NA | NA | NA |
| Bead Width (Stringer or Weave) | Either | Either | Either |
| Travel Speed (IPM) | NA | NA | NA |
| Torch Shielding Gas Composition | NA | NA | NA |
| Torch Shielding Gas Flow Rate (cfh) | NA | NA | NA |
| Shielding Gas Cup Size | NA | NA | NA |
| Root Shielding Gas Composition | NA | NA | NA |
| Root Shielding Gas Flow Rate (cfh) | NA | NA | NA |
| Deposit Thickness (in.) | 3/8 (plus reinforcement) | 3/8 (plus reinforcement) | 3/8 (plus reinforcement) |
| Qualification Standard | AWS QC10, *Specification for Qualification and Certification of SENSE Level I—Entry Welders* | | |

| Acceptance Criteria: | Visual Inspection per: AWS QC-10, Table 8.1 | One Face Bend and One Root Bend for each position per: AWS QC-10 Table 8.2 |
|---|---|---|

**NOTES:**

1. The backing thickness shall be ¼″ min. to 3/8″ max; backing width shall be one inch minimum.
2. Electrode Size - Welder's choice




| ID | QTY | SIZE | METRIC CONVERSION |
|---|---|---|---|
| 1A | 2 | 3/8"x 6"x 3-1/2"lg CS | 9.53mm x152.4mm x88.9mm |
| 1B | 1 | 1/4" x 2"x 8"lg CS | 6.35mm x50.8mm x203.2mm |
| | | | |
| | | | |
| | | | |
| | | | |

American Welding Society

Entry Welder Performance Qualification

SMAW Carbon Steel Test Plates

DATE: | SCALE: DWG.EDU-6A & B

DR BY:

APP BY:

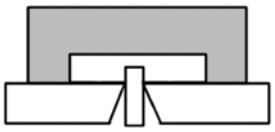
Tolerances: (Unless otherwise specified) DRAWING NOT TO SCALE
Fractions: ± 1/16" Angles: +10°, -5°

Optional Strongback: 1/4" x 2" x 5" notched as required USE SCRAP!

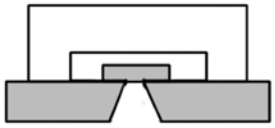
# Assembling the EDU-6 2G/3G Final Test Project

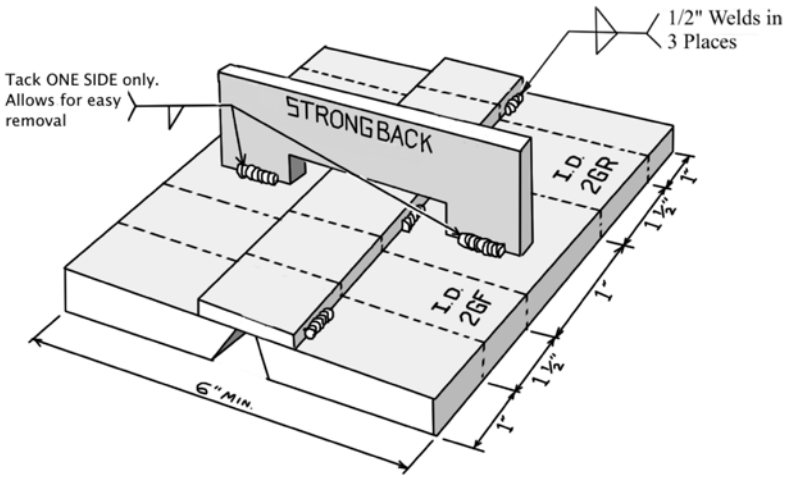
Place beveled plates, bevel side down, on a flat surface. Place the ¼" backing strap in the position shown. This maintains the ¼" gap between the plates. Place the strongback in the center of the beveled plates and place ½" welds on only one side (as shown in drawing below).

1.) Assemble coupons as shown and tack Strongback into position first.



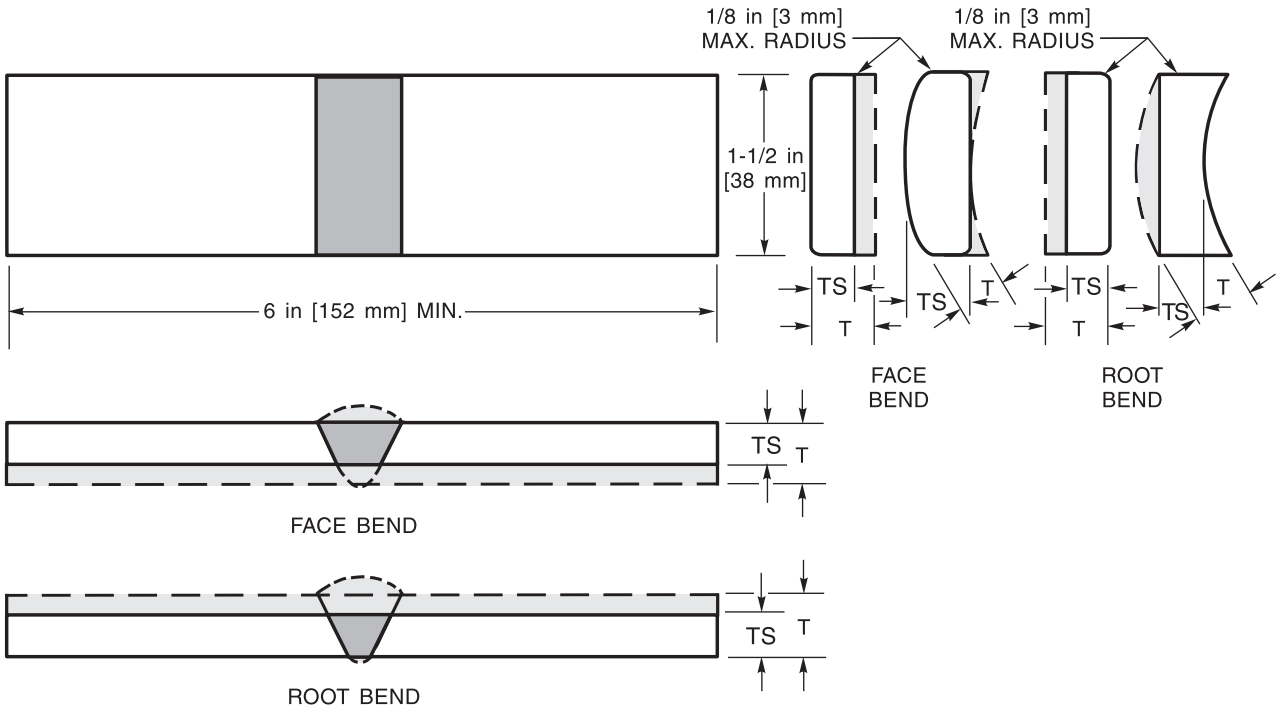
2.) Place Backstrap in position and tack in 6 places. DO NOT place tacks in Bendstrap area.






After tacking your project together mark out the bending strap areas. Stamp each strap with your "Welder's I.D." and the test position and bend test type.

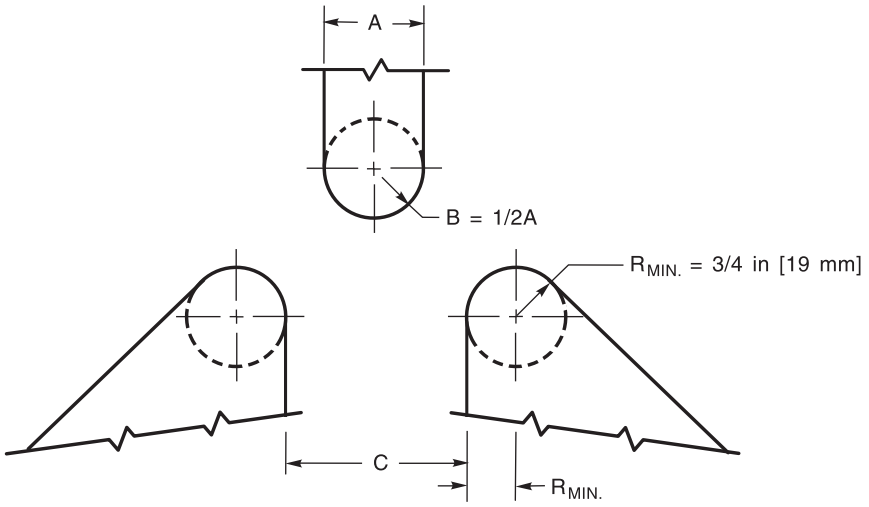
2GF means 2G (horizontal groove) Face bend
2GR means 2G (horizontal groove) Root bend
3GF means 3G (vertical groove) Face bend
3GR means 3G (vertical groove) Root bend




| INCHES | | | MILLIMETERS | | |
|---|---|---|---|---|---|
| | Specimen Thickness (TS) | | | Specimen Thickness (TS) | |
| Thickness of Base Materials (T) | All Base Metal Welded with F-23 Filler Metals | All Other Materials | Thickness of Base Materials (T) | All Base Metal Welded with F-23 Filler Metals | All Other Materials |
| 1/16 to 1/8 | T | T | 1.5 to 3 | T | T |
| 1/8 to 3/8 | 1/8 | T | 3 to 10 | 3 | T |
| Over 3/8 | 1/8 | 3/8 | Over 10 | 3 | 10 |

Notes:
1. Weld reinforcement and backing strip or backing ring, if any, shall be removed flush with the surface of the specimen.
2. If thermal cut, the edges shall be dressed by grinding, except in M-1 materials.
3. For pipe diameters of 2 in through 4 in [51 mm through 102 mm] NPS, the width of the bend specimen may be 3/4 in [19 mm] for pipe diameters of 3/8 in to 2 in [10 mm through 51 mm]. NPS, the bend specimen width may be 3/8 in [10 mm], with an alternative (permitted for pipe 1 NPS in and less) of cutting the pipe into quarter sections, in which case the weld reinforcement may be removed and no other preparation of the specimens is required.

**Figure 8.1—Transverse Face and Root Bend Specimens per AWS 2.1**

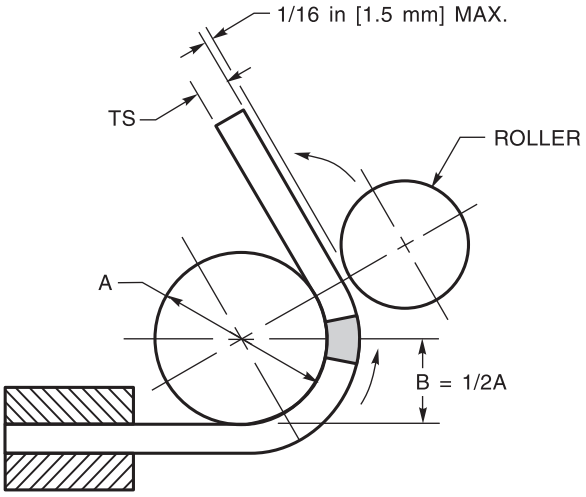



| INCHES | | | | MILLIMETERS | | | |
|---|---|---|---|---|---|---|---|
| Base Metal[b] | TS[a] | A | C | Base Metal[b] | TS[a] | A | C |
| M-23 (as welded)<br>M-35 except B148 and B271<br>All base metals welded with F-23 consumables | <1/8<br>1/8 | (16-1/2)TS<br>2-1/16 | (18-1/2)TS + 1/16<br>2-3/8 | M-23 (as welded)<br>M-35 except B148 and B271<br>All base metals welded with F-23 consumables | <3<br>3 | (16-1/2)TS<br>50 | (18-1/2)TS + 1-1/2<br>57 |
| M-11<br>M-23 (annealed)<br>M-25<br>M-35, B148, and B271 | <3/8<br>3/8 | (6-2/3)TS<br>2-1/2 | (8-2/3)TS + 1/8<br>3-3/8 | M-11<br>M-23 (annealed)<br>M-25<br>M-35, B148, and B271 | <10<br>10 | (6-2/3)TS<br>67 | (8-2/3)TS + 3<br>90 |
| M-24 (annealed)<br>M-27, M-61, and M-62 | ≤3/8 | 8TS | 10TS + 1/8 | M-24 (annealed)<br>M-27, M-61, and M-62 | ≤10 | 8TS | 10TS + 3 |
| M-52 and M-53 | ≤3/8 | 10TS | 12TS + 1/8 | M-52 and M-53 | ≤10 | 10TS | 12TS + 3 |
| M-54 | ≤3/8 | 14TS | 16TS + 1/8 | M-54 | ≤10 | 14TS | 16TS + 3 |
| All other M-Number metals | <3/8<br>3/8 | 4TS<br>1-1/2 | 6TS + 1/8<br>2-3/8 | All other M-Number metals | <10<br>10 | 4TS<br>40 | 6TS + 3<br>63 |

[a] TS = Specimen thickness.
[b] For M-26, M-81, and M-83 materials, two macroetch specimens shall be used in lieu of guided bend testing (see also Figures A.5B and A.5C).

Notes:
1. To calculate the maximum bend diameter for any thickness specimen, use the following formula: A = (100 TS/E) – TS
   Where A = bend diameter, E = minimum tensile elongation, and TS = test specimen thickness.
2. The shoulders of the test figure shall either be hardened rollers free to rotate or hardened and greased fixed shoulder.

**Figure 8.2—Guided Bend Fixture—Bottom Ejecting Type per AWS 2.1**




| INCHES | | | MILLIMETERS | | |
|---|---|---|---|---|---|
| Base Metal[b] | TS[a] | A | Base Metal[b] | TS[a] | A |
| M-23 (as welded)<br>M-35 except B148 and B271<br>All base metals welded with F-23 consumables | <1/8<br>1/8 | (16-1/2)TS<br>2-1/16 | M-23 (as welded)<br>M-35 except B148 and B271<br>All base metals welded with F-23 consumables | <3<br>3 | (16-1/2)TS<br>50 |
| M-11<br>M-23 (annealed)<br>M-25<br>M-35, B148, and B271 | <3/8<br>3/8 | (6-2/3)TS<br>2-1/2 | M-11<br>M-23 (annealed)<br>M-25<br>M-35, B148, and B271 | <10<br>10 | (6-2/3)TS<br>67 |
| M-24 (annealed)<br>M-27, M-61, and M-62 | ≤3/8 | 8TS | M-24 (annealed)<br>M-27, M-61, and M-62 | ≤10 | 8TS |
| M-52 and M-53 | ≤3/8 | 10TS | M-52 and M-53 | ≤10 | 10TS |
| M-54 | ≤3/8 | 14TS | M-54 | ≤10 | 14TS |
| All other M-Number metals | <3/8<br>3/8 | 4TS<br>1-1/2 | All other M-Number metals | <10<br>10 | 4TS<br>40 |

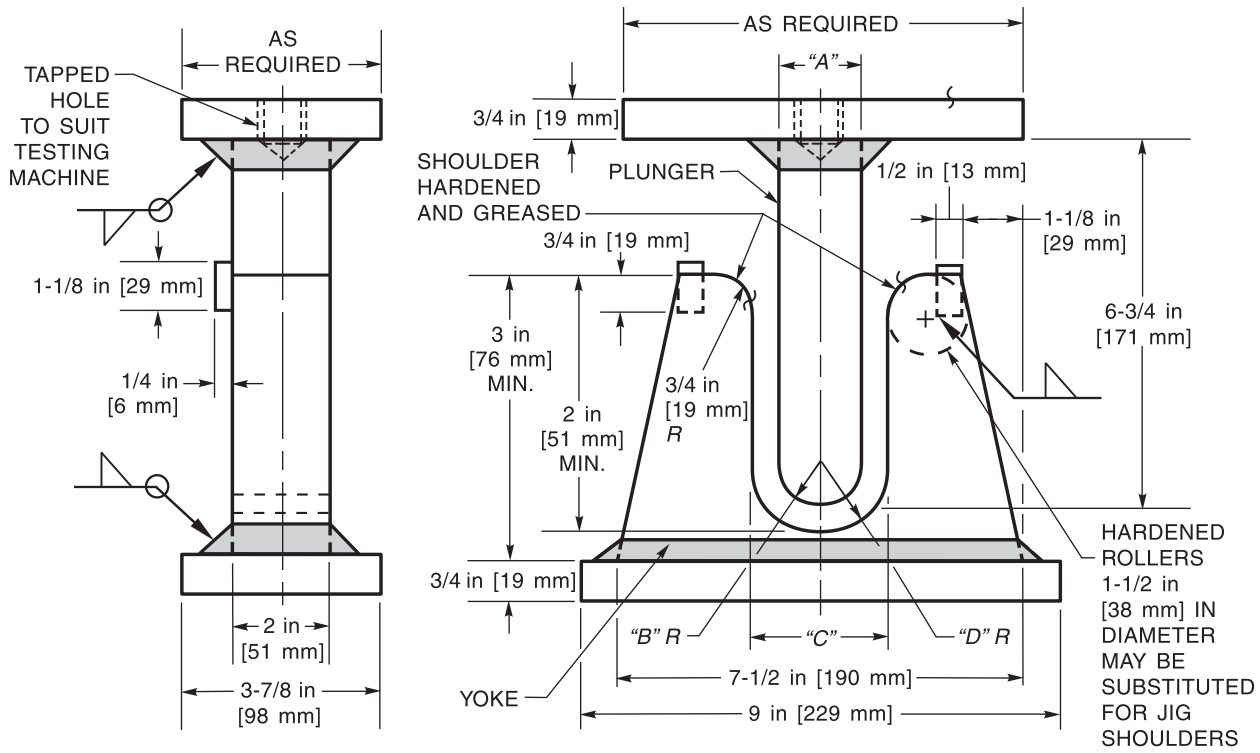
[a] TS = Specimen thickness.
[b] For M-26, M-81, and M-83 materials, two macroetch specimens shall be used in lieu of guided bend testing (see also Figures A.5A and A.5B.

Notes:
1. To calculate the maximum bend diameter for any thickness specimen, use the following formula: A = (100 TS/E) – TS
   Where A = bend diameter, E = minimum tensile elongation, and TS = test specimen thickness.
2. The shoulders of the test figure shall either be hardened rollers free to rotate or hardened and greased fixed shoulder.

**Figure 8.4—Guided Bend Fixture—Wrap-Around per AWS 2.1**

**Table 8.2**
**Acceptance Criteria for Face- and Root-Bends**

| |
|---|
| For acceptance, the convex surface of the face- and root-bend specimens shall meet both of the following requirements: |
| 1. No single indication shall exceed 1/8 in (3.2 mm), measured in any direction on the surface. |
| 2. The sum of the greatest dimensions of all indications on the surface, which exceed 1/32 in (0.8 mm), but are less than or equal to 1/8 in (3.2 mm), shall not exceed 3/8 in (9.6 mm). |
| Cracks occurring at the corner of the specimens shall not be considered unless there is definite evidence that they result from slag inclusions or other internal discontinuities. |




| INCHES | | | | MILLIMETERS | | | |
|---|---|---|---|---|---|---|---|
| Base Metal[b] | TS[a] | A | C | Base Metal[b] | TS[a] | A | C |
| M-23 (as welded) | | | | M-23 (as welded) | | | |
| M-35 except B148 and B271 | <1/8 | (16-1/2)TS | (18-1/2)TS + 1/16 | M-35 except B148 and B271 | <3 | (16-1/2)TS | (18-1/2)TS + 1-1/2 |
| All base metals welded with F-23 consumables | 1/8 | 2-1/16 | 2-3/8 | All base metals welded with F-23 consumables | 3 | 50 | 57 |
| M-11 | | | | M-11 | | | |
| M-23 (annealed) | <3/8 | (6-2/3)TS | (8-2/3)TS + 1/8 | M-23 (annealed) | <10 | (6-2/3)TS | (8-2/3)TS + 3 |
| M-25 | 3/8 | 2-1/2 | 3-3/8 | M-25 | 10 | 67 | 90 |
| M-35, B148, and B271 | | | | M-35, B148, and B271 | | | |
| M-24 (annealed) | | | | M-24 (annealed) | | | |
| M-27, M-61, and M-62 | ≤3/8 | 8TS | 10TS + 1/8 | M-27, M-61, and M-62 | ≤10 | 8TS | 10TS + 3 |
| M-52 and M-53 | ≤3/8 | 10TS | 12TS + 1/8 | M-52 and M-53 | ≤10 | 10TS | 12TS + 3 |
| M-54 | ≤3/8 | 14TS | 16TS + 1/8 | M-54 | ≤10 | 14TS | 16TS + 3 |
| All other M-Number metals | <3/8 | 4TS | 6TS + 1/8 | All other M-Number metals | <10 | 4TS | 6TS + 3 |
| | 3/8 | 1-1/2 | 2-3/8 | | 10 | 40 | 63 |

[a] TS = Specimen thickness.
[b] For M-26, M-81, and M-83 materials, two macroetch specimens shall be used in lieu of guided bend testing (see also Figures A.5A and A.5C).

Notes:
1. To calculate the maximum bend diameter for any thickness specimen, use the following formula: A = (100 TS/E) – TS
   Where A = bend diameter, E = minimum tensile elongation, and TS = test specimen thickness.
2. The shoulders of the test figure shall either be hardened rollers free to rotate or hardened and greased fixed shoulder.

**Figure 8.3—Guided Bend Fixture—Bottom Type per AWS 2.1**

# INSTRUCTOR'S WEEKLY & DAILY OUTLINE OF INSTRUCTION

The first two weeks are very hectic and demanding for Instructors. Afterwards, the following weeks becoming less demanding as students gain skills.

The "Daily Outline of Instruction" is for reference purposes only. It is designed to give the instructor a basic daily overview of lessons to be taught and aligns with all the requirements of EG2.0 QC10 certification. Refer to the 2nd column "Learning Objects." This number reference relates to the "Master Outline" where you will find the specific teaching requirements.

There is a great deal of information to be covered in the first few weeks that it may not be possible to cover all the topics in the time allowed that day. Simply cross off those topics covered that day and catch up on following days. In the far right column a check mark (✔) should be placed (in pencil) as teaching objective are completed. This may help alleviant some of the coordination issues when two or more instructors are teaching the same class. Additional notes are recommended for co-instructors.

**Demonstrations:**

When group demonstrations are required it is recommended that the class be split into multiple groups of four or five students. This means that the instructor may have to give the same demonstration up to five (5) times, with a group of 20 students. This will enable each student to fully participate in the demonstration. For simple objectives, like how to use a chisel, the full class may be involved.

Power equipment demonstrations should allow each student to physically participate in the operation. The instructor must observe each student as they safely and correctly perform all operations. It is vitally important that students operate the shear, bandsaws and all torches safely and properly! Only one-on-one training can guarantee this.

**Abbreviations Used in Instructor's Outline of Instruction:**

**Al:** Aluminum
**CS:** Carbon Steel
**CAC:** Carbon Arc Cutting
**Demo**: Instructor's hands-on demonstration
**EDU:** AWS Print numbers 1A, 1B, 2, 3A, 3B, 4, 6, 6A, 6B.
**FCAW-G:** Flux Core Arc Welding-Gas Shielded
**FCAW-S:** Flux Core Arc Welding-Self Shielded
**GMAW-S:** Gas Metal Arc Welding-Short Circuit (MIG)
**GMAW Spray:** GMAW processes occurring at voltages greater than 22V-24V.
**GTAW:** Gas Tungsten Arc Welding (TIG)
**Lecture**: Classroom lecture
**Lecture/Demo**: Shop lecture
**OAC:** Oxy-Acetylene Cutting
**OFC:** Oxy-Fuel Cutting
**PAC:** Plasma Arc Cutting
**PPT**: Powerpoint presentation
**SMAW:** Shielded Metal Arc Welding (Stick welding)
**SS:** Stainless Steel

| DAY 1 | | | | |
|---|---|---|---|---|
| **HOUR 1** | **HOUR 2** | **HOUR 3** | **HOUR 4** | **HOUR 5** |
| Syllabus | Brightspace<br>MCCC Email<br>Sense online | Create Dropbox folder<br>LastName-115-W19 | AWS scholarships<br>-Apply, workshop | Safety exam<br>Senseonline.org |
| Course Pack<br>-read through entirely | Module 1 | Share dropbox folder with instructor<br>-PQ folder & timesheets<br>-instructor will have to add shared folders | Safety ppt - brightspace<br>Safety exam review ppt | Instructor has to activate online<br>-schedule theory exam<br>-Module 2 – add group override<br>-select class<br>-set permissions<br>-save |
| Introductions<br>*break* | Create Dropbox Account<br>-Instructor send dropbox account link to student email<br>*break* | Brightspace tour<br>-MCCC home<br>-link<br>-weld course | Lab tour<br>*break* | *dismiss class* |
| HOMEWORK | | | | |

Read chapers 1, 4, 14

| DAY 2 | | | | |
|---|---|---|---|---|
| All ppt found on Brightspace under 115 tab | | | | |
| **HOUR 1** | **HOUR 2** | **HOUR 3** | **HOUR 4** | **HOUR 5** |
| Review exam – safety<br>Allow time for retakes | Prefill documents and save as | Thermal cutting video on brightspace<br>Can assign as HW | OFC ppt<br>Chapter 14, 15 | Review thermal cutting exam |
| Brightspace<br>-weld class-content-115-handouts | Organize dropbox folders<br>-PQ<br>-Timesheets | Review PPE | PAC ppt<br>Chapter 11 | Administer thermal cutting exam |
| Download<br>-timesheets-PQ-2G-3G-final grade | | Review tool crib and tools for class | CAC ppt<br>Chapter 4, 24 | |
| HOMEWORK | | | | |

Read and review chapers 1, 4, 11, 14, 15, 24

## DAY 3

| HOUR 1 | HOUR 2 | HOUR 3 | HOUR 4 | HOUR 5 |
|---|---|---|---|---|
| Material usage ppt on brightspace | OFC manual demo<br>-clean tip, set up, light, adjust, cut. 3/8” | PAC demo<br>-CS, SS, AL<br>-set up, consumables, operation, clean and check tip | Break into small groups and rotate through stations | Students cut 10ga pieces with PAC for GMAW-S project |
| Joint design ppt on brightspace | OFC mechanized demo<br>-shut down, straight, bevel, 3/8” | CAC-A demo and setup | Cylinder change and leak test demo | Cut 3/8” pieces with OFC track burner for Spray project practice |
| | | | | Clean up thermal cutting area |

## DAY 4

Spoke with 215 students and gave them their project list and told them to keep records of practice weldments

Homework- read chapters 7-8

| HOUR 1 | HOUR 2 | HOUR 3 | HOUR 4 | HOUR 5 |
|---|---|---|---|---|
| OFC tutorial video | OFC operations review<br>-procedure on OFC WSR found on BS- show students and suggest saving | Students gear up<br>Mechanized OFC (M-OFC) demo<br>Gas house demo | CAC-A demo pg 36 in workbook | OFC- 3/8x3x6” (4-6 pcs)<br>M-OFC- 3/8x3x6” with 30 degree bevel (4-6 pcs)<br>Pg 21 & 46 for GMAW spray |
| | Pages 37-40 in student workbook | M-OFC set up & down procedures- similar to that of OFC<br>PAC demo | Lab assignments | PAC- 10 ga HR x 3” x 6” (4-6 pcs)<br>Pg 19 & 46 for GMAW-S |

| DAY 5 | | | | |
|---|---|---|---|---|
| **HOUR 1** | **HOUR 2** | **HOUR 3** | **HOUR 4** | **HOUR 5** |
| Chapter 7 GMAW and FCAW ppt (skip FCAW) | Chapter 8 GMAW and FCAW welding ppt (skip FCAW)<br>-skim, assign chapter for reading | | GMAW machine set up demo<br>-liner, gun, and consumables | Review and revise steps as needed on pg 43 of workbook |
| ie- set machines to mig before powering on. With 304, set contactor switch to remote from panel to avoid potential gun/wire arcing<br>- Refer to settings on WPS pg 18<br>-170 WFS and 17.5 is a good starting point for GMAW-S<br>- Demonstrate how to determine WFS without digital read out<br>-trim wire, hold trigger for 6 secs, measure and multiply by 10 (17" = 170 ipm)<br>- Rerview material list & conversions<br>Students dismissed after completing metric conversions | | | | |

| DAY 6 | | | | |
|---|---|---|---|---|

GMAW setup:

1) Ensure electrode wire matches base material
2) If no, switch wire. If yes, set to mig. ( on 304 set output from panel to remote)
3) Connect wire feeder to positive + on power source
4) Connect remote cable – notch goes at 12:00
5) Connect ground clamp to work bench and plug into negative –
6) Power on power source and wirefeeder
7) Open gas inlet valve (AR/CO2)
8) Jog wire to ensure obstruction free
9) Purge gas to set flow – 20 cfh
10) Set wirefeed speed according to WPS – if theres no WPS, use app or electrode data sheet
11) Set volts, inductance 90, 350 MPa – set program
12) If theres no display for WFS – calculate manually

| HOUR 1 | HOUR 2 | HOUR 3 | HOUR 4 | HOUR 5 |
|---|---|---|---|---|
| Day 5 recap | Students cut straight 10ga with PAC | GMAW 10ga demo<br>-flat stringers, 1F tee, 1F lap, 1G square groove butt | Have students get a booth and follow set up procedures to begin GMAW-S PWO | Weld on 10ga plates they cut with PAC |
| | Demonstrate scotchman iron worker for cutting thin material | Use WPS settings<br>-170WFS<br>-17.5 V<br>-20 cfh | | Grind edges before preforming joint welds |

## DAY 7

| HOUR 1 | HOUR 2 | HOUR 3 | HOUR 4 | HOUR 5 |
|---|---|---|---|---|
| Review hand tools<br>-hammers & hard ended tools, chisels, wrenches, grinders and wheel applications, screwdrivers, wire brushes (SS vs CS) | Continue working on<br>-PAC straight cuts on 10ga<br>-GMAW-S PWO 10ga (hot rolled) | | | |
| Material use ppt on brightspace<br>Joint design ppt on brightspace Shop job assignments | **cold rolled is for GTAW-CS PWO and project | | | |

HOMEWORK

Read chapers 2 and 3. Watch GMAW tutorial video

## DAY 8

Homework- read chapters 2 and 3 over the weekend

| HOUR 1 | HOUR 2 | HOUR 3 | HOUR 4 | HOUR 5 |
|---|---|---|---|---|
| GMAW-S exam review | GMAW-S exam | Review goals for today | Today- cut material for GMAW-S project and continue working on project | |

TIMELINE FOR NEXT WEEK

Monday- weld, welding symbols, and blueprints. Chapter 2 and 3 powerpoint. Review GMAW-S weld applications on project. Fit and tack GMAW-S for approval

Tuesday- blue print exam- module 3 welding symbols. Review and administer. GMAW-S project demo

Wednesday- GMAW-S projects due. GMAW-spray project review with demo

Thursday- GMAW-spray PWO and project cutting, fitting, and tacking

Friday- GMAW-spray project due. HW- read next process chapter. Vote on next process- FCAW, SMAW, GTAW

## DAY 9

| HOUR 1 | HOUR 2 | HOUR 3 | HOUR 4 | HOUR 5 |
|---|---|---|---|---|
| Chapter 2 and 3 ppt | Chapter 2 and 3 ppt | Lab work-<br>-GMAW-S<br>-PAC<br>-OFC | Lab work | Lab work |

## DAY 10

Temp guns and sticks- (for SMAW project) email request sent

| HOUR 1 | HOUR 2 | HOUR 3 | HOUR 4 | HOUR 5 |
|---|---|---|---|---|
| GMAW-S WPS review | Drawing and symbols exam review | Demo GMAW-S project welding | Demonstrate layout of triangle and circle | |
| GMAW-S project print review | Take or assign exam | | Students cut, prep and fit project | |

## DAY 11

| HOUR 1 | HOUR 2 | HOUR 3 | HOUR 4 | HOUR 5 |
|---|---|---|---|---|
| GMAW-S project overview | Assemble, tack, and weld GMAW-S project | Once approved to weld, they should be encouraged to continue PWO practice and apply welds as they gain success on PWO | | |
| Triangle demo- cut, layout, and circle | Students continue fitting projects for approval to weld. | | | |

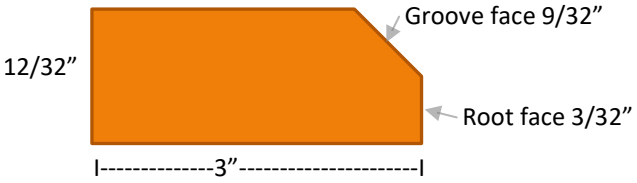
## DAY 12

Currently have one machine set up with 98/2 Ar/O2 for true spray welding

215 students may use as well as 115 as they become ready. Not all 115 students will be ready at the same time. We plan to have at least 2 toal booths set up with bottles of 98/2 for spray welding.

| HOUR 1 | HOUR 2 | HOUR 3 | HOUR 4 | HOUR 5 |
|---|---|---|---|---|
| GMAW-spray over view<br>Spray WPS and print review | Bevel cuts and prep review<br>Math to figure out plate bevel preparation. | Students welded GMAW-S projects then cut 3/8" for GMAW-spray | GMAW-spray PWO | |

## DAY 13




| HOUR 1 | HOUR 2 | HOUR 3 | HOUR 4 | HOUR 5 |
|---|---|---|---|---|
| GMAW- spray weld demo | Track burner bevel cut demo | Demonstrate how to grind and prep beveled edge to match print | | |
| | | Cut plates to 4” before beveling, then trim to 3” after bevel is prepared | | |

Homework- read chapters 5-6 SMAW

## DAY 14

| HOUR 1 | HOUR 2 | HOUR 3 | HOUR 4 | HOUR 5 |
|---|---|---|---|---|
| SMAW tutorial video on Brightspace | Chapter 5 ppt | Chapter 6 ppt- skim, can be repetitive of chapter 5 | SMAW WPS and bend test project description | SMAW exam review |
| | | | | SMAW exam unlocked |

## DAY 15

-I ended up spending all day chasing items and making repairs and other misc. tasks. We did not get to the SMAW demo

| HOUR 1 | HOUR 2 | HOUR 3 | HOUR 4 | HOUR 5 |
|---|---|---|---|---|
| Lab work to catch up on GMAW | Cut and prep plates for SMAW grooves | Work on PWO and projects | | |

## DAY 16

Students (all but 1) are still working on spray and need to rework their GMAW-S projects. Allowing them this week to finish up. Working with the 1 student on SMAW to get PWO completed. Will demo project once more students are ready. Keep a close eye on students as they have been beveling the wrong edges of plates for SMAW and not fully assembling projects prior to welding.

| HOUR 1 | HOUR 2 | HOUR 3 | HOUR 4 | HOUR 5 |
|---|---|---|---|---|
| SMAW – 7018 stringer and weave beads | 1G V-groove<br>3/8" with backer | | | |
| 1F lap and tee- single and multipass<br>(can use ¼" material) | | | | |

## DAY 17

| HOUR 1 | HOUR 2 | HOUR 3 | HOUR 4 | HOUR 5 |
|---|---|---|---|---|
| SMAW demo<br>-set up and equip.<br>-changed electrode holder | Students finish reworking GMAW-S and spray projects | Students prep plates for SMAW projects | Students do SMAW welding practice | |
| -E7018 stringer and weaves<br>-3 bead lap 2F demo | | | | |

## DAY 18

| HOUR 1 | HOUR 2 | HOUR 3 | HOUR 4 | HOUR 5 |
|---|---|---|---|---|
| E7018 Vertical up demo for students ready | 3F lap and tee | Prep 2G and 3G plates for demo | | |

## DAY 19

| HOUR 1 | HOUR 2 | HOUR 3 | HOUR 4 | HOUR 5 |
|---|---|---|---|---|
| review chapter 30 and 31 ppt | Instruct students to begin filling final grade tabulation in drop box with exam scores, this allows them to keep a running tally of their grades | Students prep and tack SMAW project plates | Instructor prepare plates for 2G SMAW weld test demo | Demo on fitting and tacking<br>Pg 12-13 in student handbook |
| review module 9 welding inspection theory exam<br>allow students time to complete exam | I have been putting scores for practical exams in the comment section of grade practical exams senseonline.org | Students perform SMAW PWO in prep for bend tests | | |

## DAY 20

| HOUR 1 | HOUR 2 | HOUR 3 | HOUR 4 | HOUR 5 |
|---|---|---|---|---|
| Demo SMAW 2G Bend test project weld out<br>-set up, tack, root, hot, fill, cover<br>-use temp stick/temp gun to monitor interpass temp | -make sure it is cool to the touch prior to saw cutting<br>-demo proper bent strap prep (cut, grind, stamp)<br>-perform bend test on cool specimens | SMAW 2G and 3G fit and tack pg 12-13 | Discuss VT criteria Pg10 | Rework GMAW projects as needed |
| -demo grinding technique for keeping sound metal between passes<br>--mark out and prep plates for cutting bend strips | Students work on SMAW PWO | Get approval to weld 2G and 3G SMAW projects | | |

## DAY 21

| HOUR 1 | HOUR 2 | HOUR 3 | HOUR 4 | HOUR 5 |
|---|---|---|---|---|
| SMAW PWO | 2G and 3G SMAW projects | Bend test projects if passing VT pg 14 | Catch up on other lab work, exams, or time sheets | |

## DAY 22

| HOUR 1 | HOUR 2 | HOUR 3 | HOUR 4 | HOUR 5 |
|---|---|---|---|---|
| SMAW PWO | 2G and 3G SMAW projects | Bend test projects if passing VT pg 14 | Catch up on other lab work, exams, or time sheets | |

## DAY 23

| HOUR 1 | HOUR 2 | HOUR 3 | HOUR 4 | HOUR 5 |
|---|---|---|---|---|
| SMAW PWO | 2G and 3G SMAW projects | Bend test projects if passing VT pg 14 | Catch up on other lab work, exams, or time sheets | |

## DAY 24

| HOUR 1 | HOUR 2 | HOUR 3 | HOUR 4 | HOUR 5 |
|---|---|---|---|---|
| SMAW project rework | Project documentation updates-<br>Make sure you have students add your drop box accts to their shared folder for completing PQ records | Update grade and attendance spreadsheet | Have students update final grade tabulation with exam scores from senseonline.org | Students- rework other projects as needed |
| Update time sheets | | Instructor- access to template is in 115 shared document folder | -I have been inputting percentages on senseonline.org in the comments bar | |

## DAY 25

** Plate prep, plate fit up, tacking

Root pass, hot pass, fill, cover

Grind as needed between steps

No grinding allowed once started on cover passes

Must meet visual criteria prior to cutting for bending

| HOUR 1 | HOUR 2 | HOUR 3 | HOUR 4 | HOUR 5 |
|---|---|---|---|---|
| SMAW projects | Work with students on each step through 2G and 3G projects ** | | | |

## DAY 26

Side Note- Students are not allowed to "try" other processes before or with out proper instruction. We installed a new tig torch in booth 5 and a student smoked it because he didn't know what he was doing. Water cooler MUST be on. The smoke will not go back in the cables.

| HOUR 1 | HOUR 2 | HOUR 3 | HOUR 4 | HOUR 5 |
|---|---|---|---|---|
| GTAW ppt- switching to welding skills ppt on dropbox shared folder and BS | GTAW exam review ppt<br>-open exam for testing | Full demo was not given, work with individual students ready for GTAW-CS | | |
| Welding skills<br>WSRG 16,17,18<br>-I think these ppts are slightly better than modern welding | | Most students are still working on SMAW 2G and 3G<br>Remind students that they can come in for extra hours to catch up | | |

## DAY 27

| HOUR 1 | HOUR 2 | HOUR 3 | HOUR 4 | HOUR 5 |
|---|---|---|---|---|
| Students who are ready may being GTAW with instructors guidance | Most students are still working on SMAW | | | |

## DAY 28

Remind students that the PWOs are skill building exercises to apply toward WQTs

If they skip the PWOs, how do they expect to be successful on the WQTs?

| HOUR 1 | HOUR 2 | HOUR 3 | HOUR 4 | HOUR 5 |
|---|---|---|---|---|
| Students continue to work on GMAW and SMAW projects WQT | Students who have passed all 4 WQT may move onto GTAW<br>-must receive instruction prior to beginning | Talk with students about class goals and realistic certifications | 2F and 3F tee joint 7018 demo sequence and stacking beads with proper tie ins | |

## DAY 29

We are in the home stretch for the students- they need to buckle down and focus on one thing at a time to complete desired certs

| HOUR 1 | HOUR 2 | HOUR 3 | HOUR 4 | HOUR 5 |
|---|---|---|---|---|
| Students continue working on projects<br>-If working on GTAW, time to work on SS, and AL next week | | | | |

## DAY 30-38

| HOUR 1 | HOUR 2 | HOUR 3 | HOUR 4 | HOUR 5 |
|---|---|---|---|---|
| Get students through GMAW and SMAW | Students get caught up<br>-continue to demo as needed | | | |

## DAY 39-44

| HOUR 1 | HOUR 2 | HOUR 3 | HOUR 4 | HOUR 5 |
|---|---|---|---|---|
| FCAW-S<br>-lecture ppt<br>-exam review ppt<br>-allow time to take test | WPS and project review | FCAW-S<br>-Demo set up and operation<br>-Project demo | | |

## DAY 45-49

| HOUR 1 | HOUR 2 | HOUR 3 | HOUR 4 | HOUR 5 |
|---|---|---|---|---|
| FCAW-G<br>WPS and project review | FCAW-G<br>-Demo set up and operation<br>-Project demo | | | |

## DAY 50

Last Day of Class

| HOUR 1 | HOUR 2 | HOUR 3 | HOUR 4 | HOUR 5 |
|---|---|---|---|---|
| Complete all workmanship qualification forms, sub text, visual inspection records, and bend test records | Complete attendance final grade matrix | Update all test results and senseonline.org | Enter grades in webpal<br>Submit final grade back up to division office | Final lab cleanup shutdown and inspection |
| | | Fill out any incomplete grade forms as applicable | | Promote other course offerings in the welding technology program |

# WEEKLY OUTLINE OF INSTRUCTION

*(Weekly topics are approximate and subject to change.)*

**Week 1: Safety, OFC/OAC, PAC, GMAW**
Lecture: Introduction, records, housekeeping
Lecture: PPT Review Safety
Administer: Exam 1 Safety (35 ques.)
Lecture: Gas House operations
Lecture: Reading a Rule, Basic Math
Lecture/Demo: Shear, Bandsaws
Lecture/Demo: OFC/OAC, PAC Cutting, Line Burner, CAC, etc.
Lecture: PPT Review Exam Thermal Cutting
Lecture/Demo: Hand tools & grinders
Skills Practice: Thermal Cutting
Lecture/Demo: EDU-1 Fabrication
Lecture: PPT Review Exam 2 Drawing & Symbols
Administer: Exam 2 Drawing & Weld Symbols
Administer: Exam 3 Thermal Cutting (55 ques)

**Week 2: GMAW-S (short circuit)**
Lecture: GMAW Set up and operations
Skills Demo/Practice: GMAW-S Stringers & Weaves, Butt, Lap, Tee All Positions
Begin Project: EDU-3A GMAW-S
Complete Project: EDU-3A GMAW-S

**Week 3: GMAW Spray**
Lecture: GMAW Spray
Lecture: Exam 5 Welding Inspection & Testing
Administer: Exam 5 Welding Inspection & Testing
Skills Practice: GMAW Spray Pad of Beads, Fillets
Begin Project: EDU-2 GMAW Spray
Complete Project: EDU-2 GMAW Spray

**Week 4: FCAW-S (self-shielded)**
Lecture: FCAW-S Setup & Operations
Skills Practice: FCAW-S Pad of Beads, Fillets
Begin Project: EDU-1B, FCAW-S, CS
Complete Project: EDU-1B, FCAW-S, CS

**Week 5: FCAW-G (gas shielded)**
Lecture: FCAW-G Setup & Operation (Review)
Lecture: PPT Exam Review 4 FCAW
Administer: Exam 4 FCAW
Assignment: Begin EDU-1A FCAW-G
Skills Practice: FCAW-G Pad of Beads, Fillets
Lecture: Exam 3 Thermal Cutting
Complete Project: EDU-1A FCAW-G

**Week 6: GTAW-CS**
Lecture: GTAW Equipment & Setup (Carbon Steel)
Lecture: PPT Review Exam 7 GTAW
Skills Practice: GTAW Pad of Beads, Tee Fillets CS
Begin Project: EDU-3B GTAW (Carbon Steel)
Complete Project: EDU-3B GTAW (Carbon Steel)

**Week 7: GTAW-SS**
Lecture: GTAW Equipment & Setup (Stainless Steel)
Skills Practice: GTAW Pad of Beads, Tee Fillets SS
Begin Project: EDU-4 GTAW (Stainless Steel)
Complete Project: EDU-4 GTAW (Stainless Steel)

**Week 8: GTAW-AL**
Lecture: GTAW Equipment & Setup (Aluminum)
Lecture: Review EDU-4 GTAW Aluminum
Skills Practice: GTAW Pad of Beads, Tee Fillets AL
Begin Project: EDU-5 GTAW (Aluminum)
Complete Project: EDU-5 GTAW (Aluminum) Skills Practice: Thermal Cutting, GTAW
Administer: Exam 7 GTAW

**Week 9: SMAW 2G carbon steel**
Lecture: SMAW Process
Lecture: PPT Review Exam 8 SMAW
Administer: Exam 8 SMAW
Skills Practice: 2F Flat Fillets, Horiz Pad of Beads
Begin Project: EDU-6A SMAW 2G (CS)
Complete Project: EDU-6A SMAW 2G (CS)

**Week 10: SMAW 3G carbon steel**
Lecture\Demo: SMAW 3G
Skills Practice: 3F Fillets, vertical Pad of Beads
Begin Project: EDU-6B SMAW 3G (CS)
Complete Project: EDU-6B SMAW 3G (CS)

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