

WELDING IV

JANUARY 2007

WELDING III

NEW JERSEY CORE CURRICULA CONTENT STANDARDS

Throughout this vocational/technical program the NJ Core Curricula Content Standards for Career Education and Consumer, Family and Life Skills are regularly reinforced. This includes addressing the standards in throughout all phases of the course outline. The specific standards addressed and the goals for their application include, but are not necessarily limited to, the following as defined by the State of NJ, Department of Education.

Career Education and Consumer, Family and Life Skills

STANDARD 9.1 (CAREER AND TECHNICAL EDUCATION) ALL STUDENTS WILL DEVELOP CAREER AWARENESS AND PLANNING, EMPLOYABILITY SKILLS, AND FOUNDATIONAL KNOWLEDGE NECESSARY FOR SUCCESS IN THE WORKPLACE.

All students will explore career opportunities and make informed choices based on aptitudes and interests. Students will identify and pursue career goals, apply communications skills in work-relevant situations, demonstrate the ability to combine ideas or information in new ways, make connections between unrelated ideas, organize and present information, and allocate financial and other resources efficiently and effectively. Students will identify and use various print and non-print resources in the home, school, and community to seek and plan for employment. They will be able to use the job application process, including resumes, forms, and interviews.

Building upon knowledge and skills gained in preceding grades, by the end of **Grade 12**, students will:

A. Career Awareness/Preparation

1. Re-evaluate personal interests, abilities, and skills through various measures including self assessments.
2. Evaluate academic and career skills needed in various career clusters.
3. Analyze factors that can impact an individual's career.
4. Review and update their career plan and include the plan in a portfolio.
5. Research current advances in technology that apply to a selected occupational career cluster.

B. Employability Skills

1. Assess personal qualities that are needed to obtain and retain a job related to career clusters.
2. Communicate and comprehend written and verbal thoughts, ideas, directions, and information relative to educational and occupational settings.
3. Select and utilize appropriate technology in the design and implementation of teacher-approved projects relevant to occupations and/or higher educational settings.
4. Evaluate the following academic and career skills as they relate to home, school, community, and employment:
 - Communication
 - Punctuality
 - Time management
 - Organization
 - Decision making
 - Goal setting
 - Resources allocation
 - Fair and equitable competition
 - Safety
 - Employment application skills
 - Teamwork
5. Demonstrate teamwork and leadership skills that include student participation in real world applications of career and technical education skills.

All students electing further study in career and technical education will also:

1. Participate in a structured learning experience that demonstrates interpersonal communication, teamwork, and leadership skills.
2. Participate in simulated industry assessments, when and where appropriate.
3. Prepare industry-specific technical reports/projects that incorporate graphic aids, when and where appropriate.
4. Demonstrate occupational health and safety skills related to industry-specific activities.

Career Education and Consumer, Family and Life Skills

STANDARD 9.2 (CONSUMER, FAMILY, AND LIFE SKILLS) ALL STUDENTS WILL DEMONSTRATE CRITICAL LIFE SKILLS IN ORDER TO BE FUNCTIONAL MEMBERS OF SOCIETY.

All students will develop original thoughts and ideas, think creatively, develop habits of inquiry, and take intellectual and performance risks. They will recognize problems, devise a variety of ways to solve these problems, analyze the potential advantages and disadvantages of each alternative, and evaluate the

effectiveness of the method ultimately selected. Students will understand the components of financial education and make economic choices. Students will demonstrate self-awareness and the ability to respond constructively to criticism and potential conflict. In addition, students will work collaboratively with a variety of groups and demonstrate the essential components of character development and ethics, including trustworthiness, responsibility, respect, fairness, caring, and citizenship. Students apply principles of resource management and skills that promote personal and professional well-being. Wellness, nutrition, child development, and human relationships are an important part of consumer, family, and life skills. However, wellness, nutrition, and human relationship cumulative progress indicators are not listed here as it would duplicate those in Comprehensive Health and Physical Education Standards.

Building upon knowledge and skills gained in preceding grades, by the end of **Grade 12**, students will:

A. Critical Thinking

1. Apply communications and data analysis to the problem-solving and decision making processes in a variety of life situations.
2. Describe and apply constructive responses to criticism.
3. Apply the use of symbols, pictures, graphs, objects, and other visual information to a selected project in academic and/or occupational settings.
4. Recognize bias, vested interest, stereotyping, and the manipulation and misuse of information while formulating solutions to problems that interfere with attaining goals.
5. Apply knowledge and skills needed to use various means of transportation within a community.

B. Self-Management

1. Revise and update the personal growth plan to address multiple life roles.
2. Apply project planning and management skills in academic and/or occupational settings.
3. Compare and contrast methods for maximizing personal productivity.

C. Interpersonal Communication

1. Model interpersonal and effective conflict resolution skills.
2. Communicate effectively in a variety of settings with a diverse group of people.

D. Character Development and Ethics

1. Analyze how character influences work performance.
2. Identify and research privileges and duties of citizens in a democratic society.
3. Discuss consequences and sanctions when on-the-job rules and laws are not followed.
4. Compare and contrast a professional code of ethics or code of conduct from various work fields and discuss similarities and differences.
5. Apply a professional code of ethics to a workplace problem or issue.

E. Consumer and Personal Finance

1. Analyze factors that influence gross and net income.
2. Design, implement, and critique a personal financial plan.
3. Discuss how to obtain and maintain credit.
4. Prepare and use skills for budget preparation, making predictions about income and expenditures, income tax preparation, and adjusting spending or expectations based on analysis.
5. Use comparative shopping techniques for the acquisition of goods and services.
6. Analyze the impact of advertising, peer pressure, and living arrangements on personal purchasing decisions.
7. Evaluate the actions a consumer might take in response to excess debt and personal financial status.
8. Analyze the interrelationships between the economic system and consumer actions in a chosen career cluster.

F. Safety

1. Engage in an informed discussion about rules and laws designed to promote safety and health.
2. Describe and demonstrate basic first aid and safety procedures.

3. Analyze the occurrence of workplace hazards.
4. Practice the safe use of tools and equipment.
5. Implement safety procedures in the classroom and workplace, where appropriate.
6. Discuss motor vehicle safety, including but not limited to, New Jersey motor vehicle laws and regulations, methods of defensive driving, and the importance of personal responsibility on public roads/streets.

I. COURSE DESCRIPTION

Welding III is the culmination of instruction in the American Welding Society Entry Level Welder curriculum. Each core welding and cutting process will include advanced instruction in equipment maintenance, weld joint preparation, all position welding/cutting techniques and weld testing to certifying standards.

All of the required training modules of welding curriculum will be developed in depth to prepare the student for the Entry Level Welder general knowledge written examination. Students are required to achieve a score above 75% in the general welding knowledge section and a 90% on the safety section.

Each student will interpret the AWS Workmanship Performance Qualification engineering blueprints for each of the required welding processes. Students will prepare all of parts, assemble and tack weld the sample weldments within the tolerances specified on each drawing. Final welding techniques will be performed in the positions denoted on the drawing and in accordance with the AWS welding procedure specification for each welding process. Each of the student's workmanship samples must pass a visual welding inspection and exceed the AWS minimum standards of acceptance criteria for visual weld inspection.

Successful completion of the ELW training curriculum, written examination and the required workmanship samples will satisfy the requirements for the Entry Level Welder certification. The students training record, examination scores and workmanship sample results will be submitted to the AWS. Each qualified student will receive the AWS certification and be entered into the AWS National Registry for a period of one year.

II. COURSE OBJECTIVE/OUTLINE

A. HEALTH AND SAFETY PRACTICES AND PROCEDURES

The student will be able to:

1. Identify, explain and report the causes of accidents.
2. Explain the limits of First Aid and administer First Aid procedures.
3. Demonstrate the correct methods of lifting and material handling.
4. Demonstrate the safe and proper use of all shop personal safety equipment.
5. Demonstrate the emergency evacuation procedures.
6. Demonstrate the safe and proper procedures for the use of fire fighting equipment.
7. Demonstrate the safe and proper procedures for the use of fire fighting equipment.

8. Demonstrate proper housekeeping procedures for storage, cleanliness and maintenance.
9. Identify safety zones by color-coding, tags, signs and labels.
10. Identify electrical shock hazards and demonstrate the proper use of electrical emergency stop devices.
11. Demonstrate the safe and proper use of general hand tools and tools of the welding trade.
12. Demonstrate the safe and proper use of power tools.
13. Demonstrate the safe and proper use of welding electrical power supplies and equipment.
14. Explain the methods of prevention of arc flashing and arc burn.
15. Demonstrate the safe and proper handling of compressed gas cylinders.
16. Demonstrate the safe and proper use of oxygen and acetylene cylinders, torches and equipment.

B. RELATED SKILLS AND KNOWLEDGE

The student will be able to:

1. Locate and develop knowledge of employment opportunities in the welding industry through career information research, lessons, presentations, multi-media events and field trips.
2. Demonstrate the ability to correctly complete an employment application.
3. Demonstrate proficiency in communication skills for employment interviews.

C. BLUEPRINT INTERPRETATION

Student will be able to:

1. Accurately interpret all part dimensions and develop a material cutting list for each Workmanship Performance Qualification sample project blueprint.
2. Accurately perform all preparation operations for all parts specified on each WPS sample project blueprint.
3. Accurately assemble and tack weld all the parts illustrated on each WPS sample project blueprint in accordance with the dimensions and dimensional tolerances specified.
4. Comprehend the specifications provided in the AWS Welding Procedure

Specification referenced in each WPQ sample project blueprint and accurately follow instructions to accomplish fabrication of each test weldment.

D. WELD INSPECTION AND TESTING

The student will be able to:

1. Produce welds on each workmanship performance qualification sample weldment that are within the dimensional size tolerances specified on each sample project blueprint (see AWS EDU Drawings No. 1-6).
2. Produce welds of sufficient quality to achieve the minimum level of acceptance for weld metal discontinuities as per AWS QC10 visual examination criteria (see Table 3).
3. Accurately follow the AWS SMAW workmanship performance qualification test specimen preparation procedures and specifications as per AWS QC10 to accomplish the multiple sample bend tests required (see AWS EDU Drawing No.6, Table 3, Table 4).

E. OXYFUEL CUTTING

The student will be able to:

1. Perform the manual OFC straight, square edge cutting techniques required to prepare the parts for each workmanship performance qualification test sample weldment, that are of acceptable flatness, roughness, angularity and within dimensional tolerance as per AWS QC10 and AWS C4.1.
2. Perform the manual OFC curved, square edge cutting techniques required to prepare the parts for each workmanship performance qualification test sample weldment, that are of acceptable flatness, roughness, angularity and within dimensional tolerance as per AWS QC10 and AWS C4.1.
3. Perform the manual OFC beveled edge cutting techniques required to prepare the parts for each workmanship performance qualification test sample weldment, that are of acceptable flatness, roughness, angularity and within dimensional tolerance as per AWS QC10 and AWS C4.1.

F. AIR CARBON ARC CUTTING

The student will be able to:

1. Demonstrate the safe and proper procedure for assembly, set up and safety testing of manual Air Carbon Arc Cutting equipment.
2. Demonstrate the safe and proper handling of compressed air supplies for CAC-A cutting.
3. Recall, relate and communicate CAC-A terminology and definitions.
4. Explain the fundamental principles and process variables of CAC-A operation.
5. Identify CAC-A equipment components and the specific functions.
6. Identify CAC-A electrodes and select electrodes for various applications.
7. Demonstrate the safe and proper operation of the CAC-A cutting torch.

8. Demonstrate the correct technique for starting and maintaining a CAC-A cutting torch arc on carbon steel.
9. Demonstrate the correct techniques for performing 1G and 2G position scarfs and gouges on carbon steel.
10. Perform the manual CAC-A scarfing technique required to remove the backing material from the SMAW workmanship performance qualification test sample weldment as per AWS QC10 and AWS C5.3.

G. PLASMA ARC CUTTING

The student will be able to:

1. Perform the manual PAC straight, square edge, cutting techniques required to prepare the parts for each workmanship performance qualification test sample weldment, that are of acceptable roughness, angularity and within dimensional tolerance as per AWS QC10 and AWS C5.2.
2. Perform the manual PAC curved, square edge, cutting techniques required to prepare the parts for each workmanship performance qualification test sample weldment, that are of acceptable roughness, angularity and within dimensional tolerance as per AWS QC10 and AWS C5.2.

H. GAS TUNGSTEN ARC WELDING

The student will be able to:

1. Perform the correct fabrication procedures and accurately apply the correct welding techniques as per the AWS Standard Welding Procedure Specification for Gas Tungsten Arc Welding on carbon steel, to accomplish the WPQ test sample weldment and exceed the visual examination acceptance criteria (see AWS EDU Drawing No. AWS- 3, AWS QC10-Table 3).
2. Perform the correct fabrication procedures and accurately apply the correct welding techniques as per the AWS Standard Welding Procedure Specification for Gas Tungsten Arc Welding of Austenitic Stainless Steel, to accomplish the WPQ test sample weldment and exceed the visual examination acceptance criteria (see AWS EDU Drawing No. AWS-4, AWS QC10-Table 3).
3. Perform the correct fabrication procedures and accurately apply the correct welding techniques as per the AWS Standard Welding Procedure Specification for Gas Tungsten Arc Welding of Aluminum, to accomplish the WPQ test sample weldment and exceed the visual examination acceptance criteria (see AWS EDU Drawing No. AWS-5, AWS QC10-Table 3).

I. SHIELDED METAL ARC WELDING

The student will be able to:

1. Perform the correct fabrication procedures and apply the correct welding techniques as per the AWS Standard Welding Procedure Specification for Shielded Metal Arc Welding on carbon steel in the 2G position, with backing, to

accomplish the WPQ test plate weldment and exceed the visual examination and bend test acceptance criteria (see AWS EDU Drawing No. AWS-6, AWS QC10-Table 3, Table 4).

2. Perform the correct fabrication procedures and apply the correct welding techniques as per the AWS Standard Welding Procedure Specification for Shielded Metal Arc Welding on carbon steel in the 3G position, Uphill, with backing, to accomplish the WPQ test plate weldment and exceed the visual examination and bend test acceptance criteria (see AWS EDU Drawing No. AWS-6, AWS QC10-Table 3, Table 4).

J. GAS METAL ARC WELDING/GMAW SPRAY

The student will be able to:

1. Perform the correct fabrication procedures and apply the correct welding techniques as per the AWS Standard Welding Procedure Specification for Gas Metal Arc Welding –Short Circuit Transfer on carbon steel, to accomplish the WPQ test sample weldment and exceed the visual examination acceptance criteria (see AWS EDU Drawing No. AWS-3, AWS QC10-Table 3).
2. Perform the correct fabrication procedures and apply the correct welding techniques as per the AWS Standard Welding Procedure Specification for Gas Metal Arc Welding – Spray on carbon steel, to accomplish the WPQ test sample weldment and exceed the visual examination acceptance criteria (see AWS EDU Drawing No. AWS-2, AWS QC10-Table 3).

K. FLUX CORED ARC WELDING/FCAW with GAS

The student will be able to:

1. Perform the correct fabrication procedures and apply the correct welding techniques as per the AWS Standard Welding Procedure Specification for Self Shielded Flux Cored Arc Welding on carbon steel, to accomplish the WPQ test sample weldment and exceed the visual examination acceptance criteria (see AWS EDU Drawing No. AWS-1, AWS QC10-Table 3).
2. Perform the correct fabrication procedures and apply the correct welding techniques as per the AWS Standard Welding Procedure Specification for Gas Shielded Flux Cored Arc Welding on carbon steel, to accomplish the WPQ test sample weldment and exceed the visual examination acceptance Criteria (see AWS EDU Drawing No. AWS-1, AWS QC10-Table 3).

III. TEXTBOOKS AND INSTRUCTIONAL MATERIALS

American Welding Society, S.E.N.S.E., reference publications:

AWS EG2.0: Curriculum Guide for the Training of Welding Personnel:
2006 Level 1-Entry Level Welder.

ANSI Z39.1 Safety in Welding , Cutting and Allied Processes.

AWS A2.4	Standard Symbols for Welding, Brazing and Nondestructive Examination.
AWS A3.0	Standard Welding Terms and Definitions.
AWS B1.10	Guide for the Nondestructive Inspection of Welds.
AWS B1.11	Guide for the Visual Inspection of Welds.
AWS B2.1	Standard for Welding Procedure and Performance Qualification.
AWS B4.0	Standard Methods for Mechanical Testing of Welds.
AWS C4.1	Criteria for Describing Oxygen-Cut Surfaces.
AWS C4.2	Recommended Practices for Safe Oxyfuel Gas Cutting Torch Operation.
AWS C5.2	Recommended Practices for Plasma Arc Cutting and Gouging.
AWS C5.3	Recommended Practices for Air Carbon Arc Gouging and Cutting.
AWS C5.5	Recommended Practices for Gas Tungsten Arc Welding.
AWS C5.6	Recommended Practices for Gas Metal Arc Welding.
WHB-2.X	Welding Handbook Volume Two, Welding Processes-Part 1.
WHB-3.X	Welding Handbook Volume Three, Welding Processes-Part 2.
WHB-4.X	Welding Handbook Volume Four, Materials and Applications-Part 1.
WHB-5.X	Welding Handbook Volume Five, Materials and Applications-Part 2.
AWS C5.2	Specification for Training and Registration of Level I – Entry Welders.
AWS QC10	Specification for Qualification and Certification for Entry Level Welders.
AWS EDU-FCAW-02	Standard Welding Procedure Specification for Gas Shielded Flux Cored Arc Welding on carbon steel, As-Welded Condition.
AWS EDU-FCAW-03	Standard Welding Procedure Specification for Self Shielded Flux Cored Arc Welding on carbon steel, As-Welded Condition.
AWS EDU-GMAW-01	Standard Welding Procedure Specification for Gas Metal Arc Welding – Short Circuit Transfer on carbon steel, As-Welded Condition.
AWS EDU-GMAW-02	Standard Welding Procedure Specification for Gas Metal Arc Welding – Spray on carbon steel, As-Welded Condition.
AWS EDU-GTAW-01	Standard Welding Procedure Specification for Gas Tungsten Arc Welding on carbon steel, As-Welded Condition, with or without backing.
AWS EDU-GTAW-02	Standard Welding Procedure Specification for Gas Tungsten Arc Welding of Austenitic Stainless Steel, As-Welded Condition, with or without backing.
AWS EDU-GTAW-03	Standard Welding Procedure Specification for Gas Tungsten Arc Welding of Aluminum, As-Welded Condition, with or without backing.
AWS EDU-	Standard Welding Procedure Specification for Shielded Metal Arc

Welding on carbon steel, Position 2G, As-Welded Condition, with Backing.

AWS EDU- Standard Welding Procedure Specification for Shielded Metal Arc
SMAW-01 Welding on carbon steel, Position 3G, As-Welded Condition, with Backing.

Hobart Institute of Welding Technology Curriculum Video Training Modules:
Blueprint Reading for Welders and Fitters.
Weld Quality Assurance and Quality Control Section 4 Discontinuities and Defects.
Symbols for Welding.
Shielded Metal Arc Welding Basic.
Gas Metal Arc Welding Basic.
Flux-Cored Arc Welding.
Gas Tungsten Arc Welding Basic.

Instruction Manual for the Plasma Cam Cutting System, Plasma Cam Inc., Colorado City, CO, 2002.
Ornamental Iron idea and design book, Marshall Bulle, Rye, Colorado, 2002.

IV. INSTRUCTIONAL STRATEGIES

In order to meet the individual needs of our students, differentiated instruction is utilized in every class. This involves the use of a variety of instructional strategies, including but not necessarily limited to: readings and exercises from the approved text(s) and related supplemental materials; hands-on practical projects; cooperative group activities; teacher generated handouts; lecture in conjunction with class discussion and notes; debates; role playing activities; oral and written reports; simulations; multimedia presentations; related field trips; related technology based projects, Internet and ITV presentations and conferences.

V. EVALUATION

Students will be evaluated objectively in accordance with state and local guidelines. It is our goal to afford students every opportunity to succeed and to include both formative and summative methods of assessment. A wide variety of evaluation methods will be utilized in order to accommodate the multiple intelligences of our students, and incorporate the variety of learning styles and diversification of instructional methods.

Evaluation methods will include, but are not necessarily limited to, the following:

1. Tests and Quizzes (questioning strategies include essay, multiple choice, true and false, matching, fill in the blank, and short answer);
2. Projects;
3. Classroom activities;
4. Research;
5. Reports;
6. Notebook maintenance;

7. Class participation;
8. Rubrics;
9. Portfolios;
10. Teacher observation.
11. Entry Level Welder Closed Book Examination (see AWS EG2.0:2006).
12. Entry Level Welder Workmanship Performance Qualification sample weldments (see AWS EG2.0:2006-AWS EDU Drawing No. AWS-1 through 5, AWS QC10).
13. Entry Level Welder Standard Performance Qualification, visual examination and bend test criteria (see AWS EG2.0:2006-AWS EDU Drawing No. AWS-6, AWS QC10).

Evaluations may be oral, written or otherwise expressed depending on the direction of the instructor. Evaluation criteria will address the 2004 New Jersey Core Curriculum Content Standards.

VI. SCOPE AND SEQUENCE CHART

Key I=Introduced

D=Developed in Depth

R=Reinforced

SKILL TO BE LEARNED	10	11	12
<u>Demonstrate knowledge of welding shop safety practices.</u>			IDR
<u>Demonstrate an understanding of employment opportunities in the welding industry.</u>			IDR
<u>Demonstrate an understanding of the construction and interpretation of detailed engineering drawings.</u>			IDR
<u>Demonstrate an understanding of the AWS welding symbol system.</u>			IDR
<u>Demonstrate an understanding of welding quality assurance and quality control procedures and standards.</u>			IDR
<u>Demonstrate an understanding of welding metallurgy and the welding characteristics of metals.</u>			IDR
<u>Demonstrate advanced skills performing manual air carbon arc cutting techniques.</u>			IDR
<u>Demonstrate advanced skills performing manual oxyacetylene cutting techniques.</u>			IDR
<u>Demonstrate advanced skills performing manual plasma arc cutting techniques.</u>			IDR
<u>Demonstrate an understanding of plasma computer assisted machine cutting equipment and computer assisted drafting software.</u>			IDR
<u>Demonstrate advanced skills performing plasma computer assisted machine cutting techniques.</u>			IDR
<u>Demonstrate advanced skills performing gas tungsten arc welding techniques.</u>			IDR
<u>Demonstrate advanced skills performing shielded metal arc welding techniques.</u>			IDR
<u>Demonstrate advanced skills performing gas metal arc welding techniques.</u>			IDR
<u>Demonstrate advanced skills performing self shielded flux cored arc welding techniques.</u>			IDR
<u>Demonstrate skills performing gas shielded flux cored arc</u>			

welding techniques.

IDR

Demonstrate advanced skills performing metal fabrication techniques.

IDR

PASSIAC COUNTY TECHNICAL INSTITUTE

X. STUDENT HANDOUT

WELDING III

COURSE OVERVIEW

Welding III is the culmination of instruction in the American Welding Society Entry Level Welder curriculum. Each core welding and cutting process will include advanced instruction in equipment maintenance, weld joint preparation, all position welding/cutting techniques and weld testing to certifying standards.

All of the required training modules of welding curriculum will be developed in depth to prepare the student for the Entry Level Welder general knowledge written examination. Students are required to achieve a score above 75% in the general welding knowledge section and a 90% on the safety section.

Each student will interpret the AWS Workmanship Performance Qualification engineering blueprints for each of the required welding processes. Students will prepare all of parts, assemble and tack weld the sample weldments within the tolerances specified on each drawing. Final welding techniques will be performed in the positions denoted on the drawing and in accordance with the AWS welding procedure specification for each welding process. Each of the student's workmanship samples must pass a visual welding inspection and exceed the AWS minimum standards of acceptance criteria for visual weld inspection.

Successful completion of the ELW training curriculum, written examination and the required workmanship samples will satisfy the requirements for the Entry Level Welder certification. The students training record, examination scores and workmanship sample results will be submitted to the AWS. Each qualified student will receive the AWS certification and be entered into the AWS National Registry for a period of one year.

PROFICIENCIES

1. Demonstrate knowledge of welding shop health and safety practices.
2. Make employment decisions about opportunities in the welding industry.
3. Demonstrate an attitude of quality, accuracy and pride in workmanship.
4. Demonstrate the use and maintenance of all shop tools and equipment.
5. Accurately interpret and fabricate from engineering drawings.

6. Demonstrate advanced knowledge of welding metallurgy.
7. Demonstrate advanced welding techniques in all positions with the SMAW, GMAW, GTAW and FCAW processes.
8. Demonstrate the ability to achieve all of the certification standards for the AWS Entry Level Welder Certification Training Program.
9. Use knowledge of School to Careers job opportunities to obtain employment.

AWS QC10

Table 3

Visual Inspection Criteria for Entry Level 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.

AWS QC10

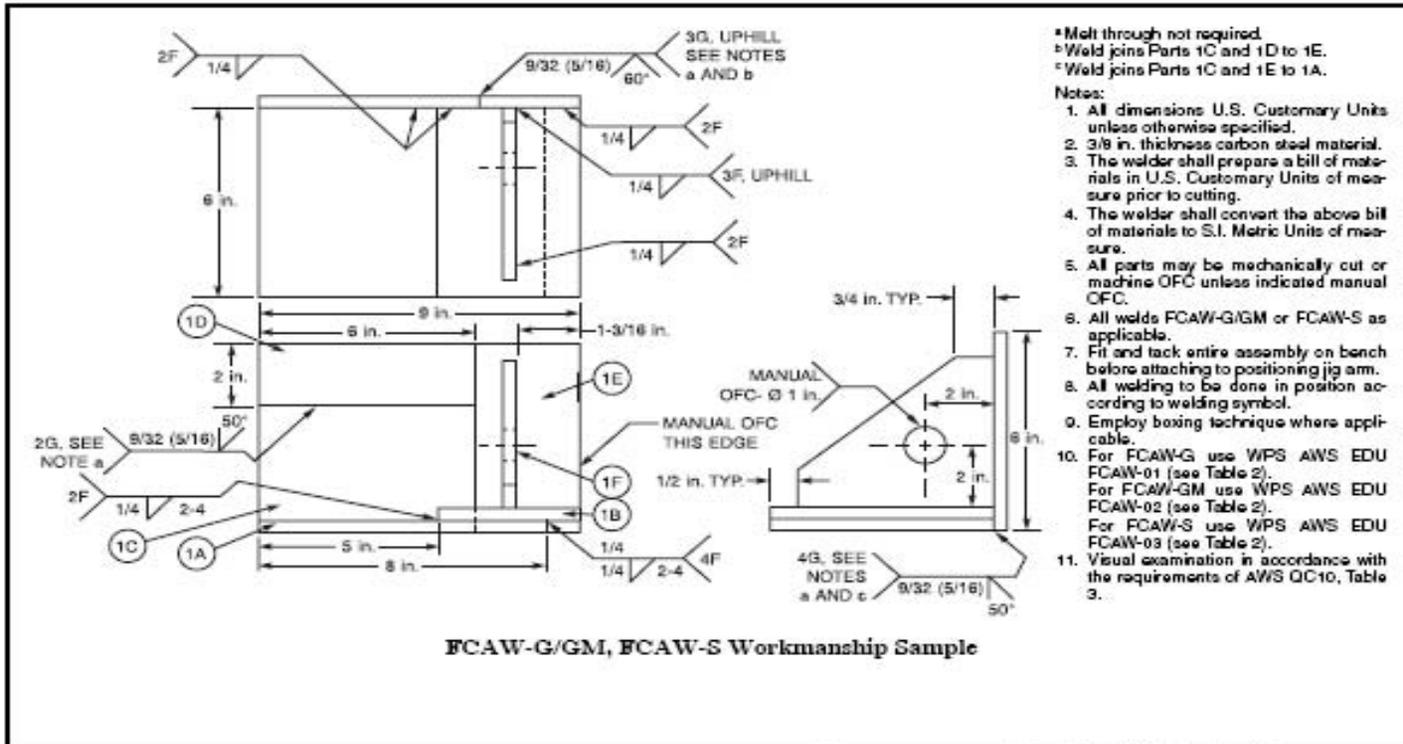
Table 4

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" (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" (0.8 mm), but are less than or equal to 1/8" (3.2 mm), shall not exceed 3/8" (9.6 mm).

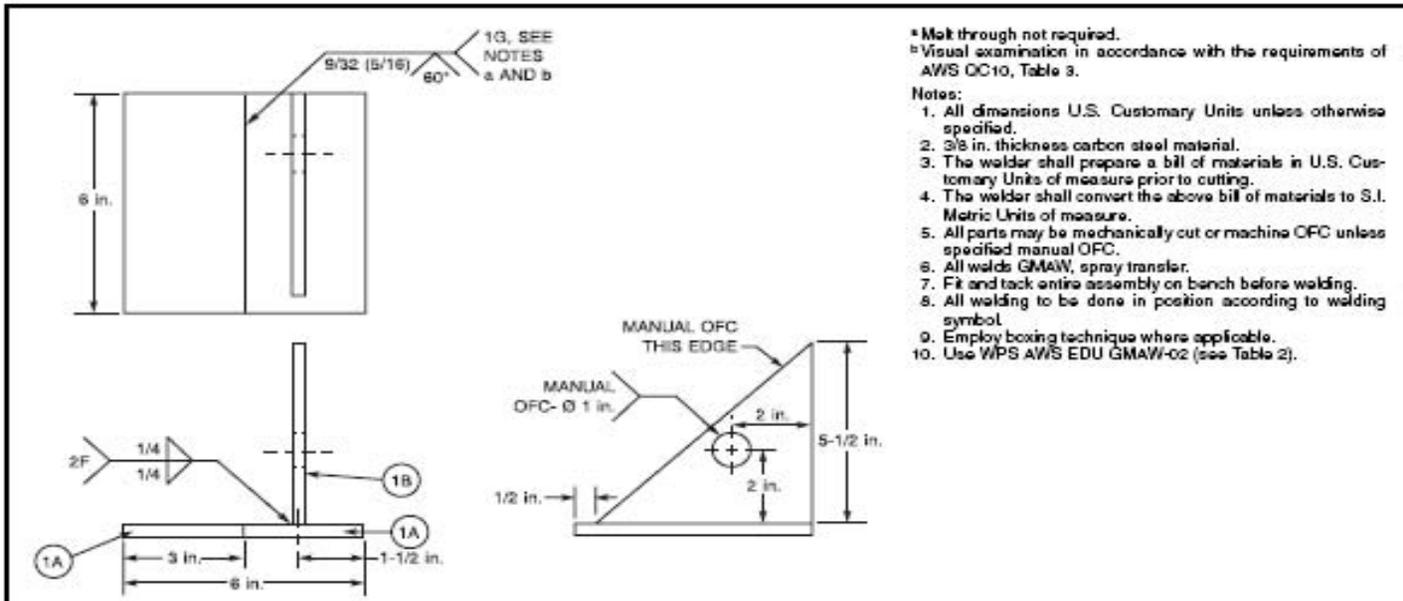
Cracks occurring at the corner of the specimens shall not be considered unless there is definite evidence that they result from slag inclusions or other internal discontinuities.



- *Melt through not required.
 - ^aWeld joins Parts 1C and 1D to 1E.
 - ^cWeld joins Parts 1C and 1E to 1A.
- Notes:
1. All dimensions U.S. Customary Units unless otherwise specified.
 2. 3/8 in. thickness carbon steel material.
 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 indicated 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 jig arm.
 8. All welding to be done in position according to welding symbol.
 9. Employ boxing technique where applicable.
 10. For FCAW-G use WPS AWS EDU FCAW-01 (see Table 2).
For FCAW-GM use WPS AWS EDU FCAW-02 (see Table 2).
For FCAW-S use WPS AWS EDU FCAW-03 (see Table 2).
 11. Visual examination in accordance with the requirements of AWS QC10, Table 3.

FCAW-G/GM, FCAW-S Workmanship Sample

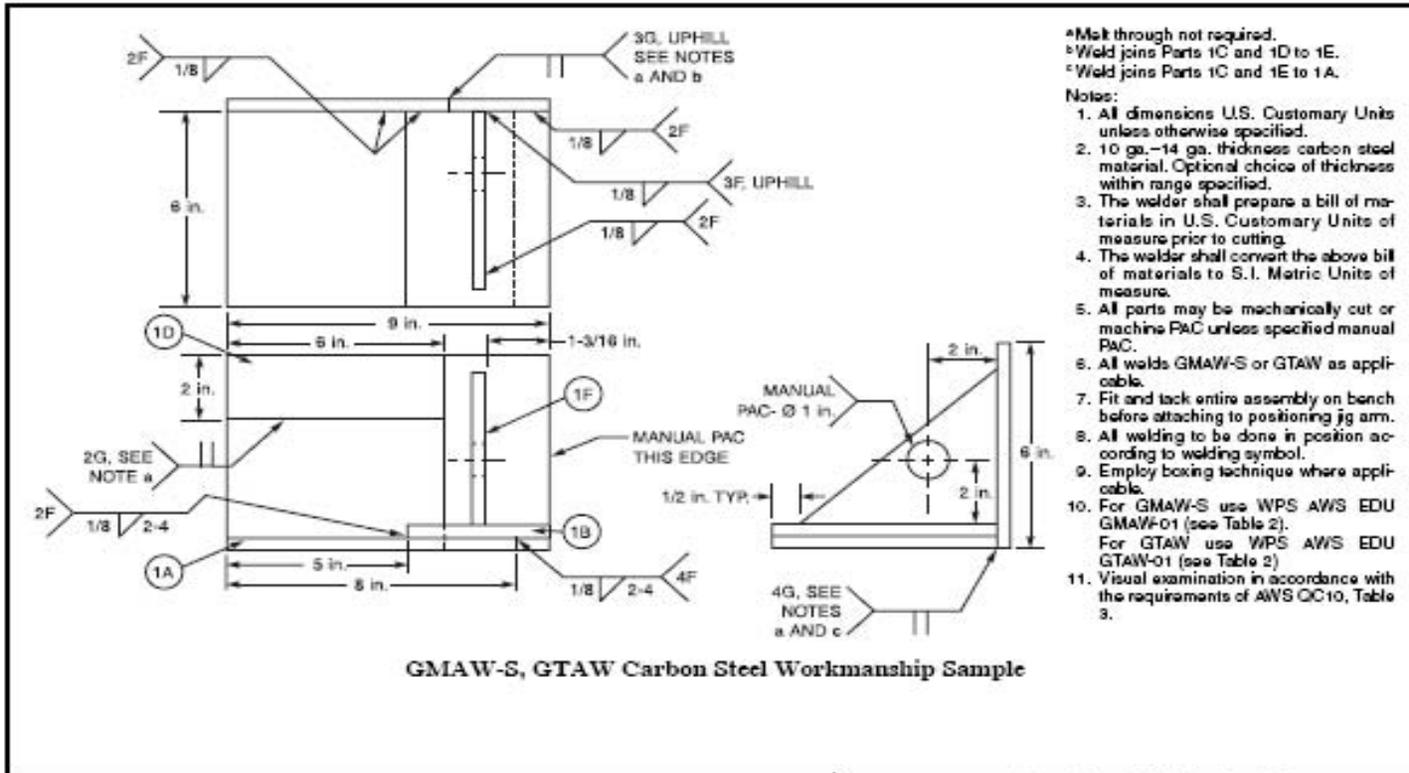
REVISIONS					 American Welding Society		
ZONE	REV	DESCRIPTION	DATE	APPROVED	ENTRY WELDER—FCAW-G/GM, FCAW-S		
					DATE	SCALE	DRAWING NUMBER
					DB	AWS EDU-1	
				APP			



- *Mark through not required.
 - ^bVisual examination in accordance with the requirements of AWS OC-10, Table 3.
- Notes:
1. All dimensions U.S. Customary Units unless otherwise specified.
 2. 3/8 in. thickness carbon steel material.
 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. Use WPS AWS EDU GMAW-02 (see Table 2).

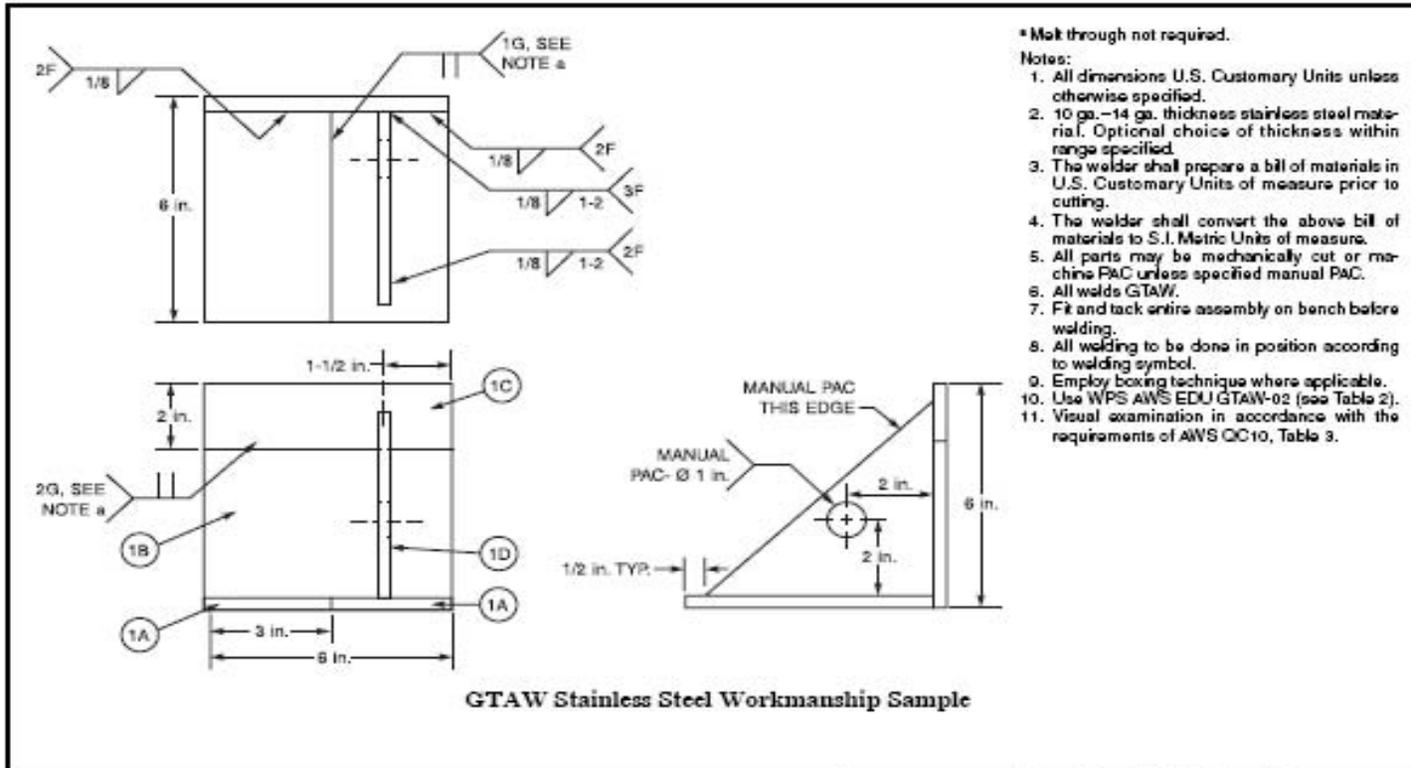
GMAW Spray Transfer Carbon Steel Workmanship Sample

REVISIONS					 American Welding Society		
ZONE	REV	DESCRIPTION	DATE	APPROVED	ENTRY WELDER—GMAW		
					DATE	SCALE	DRAWING NUMBER
					DB	AWS EDU-2	
					APP		



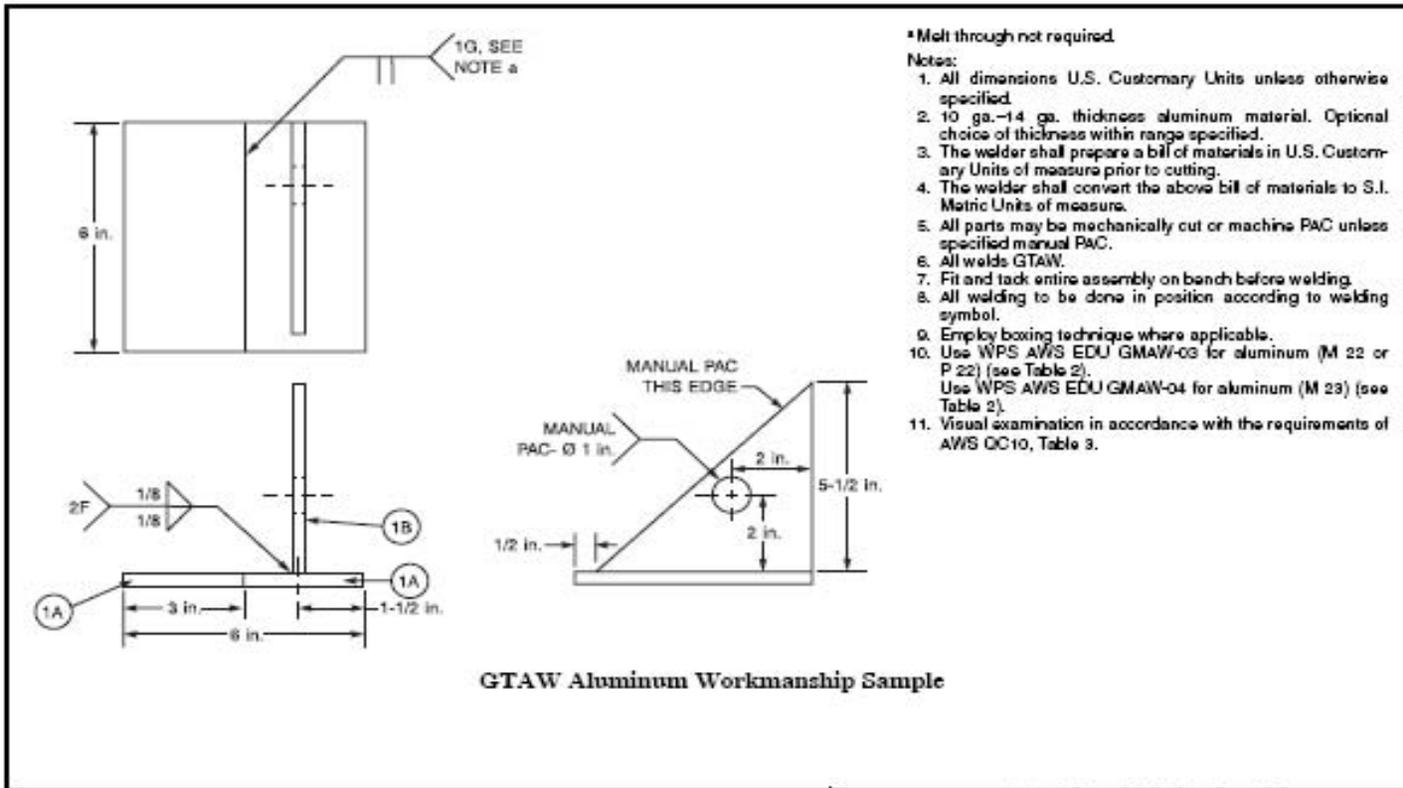
GMAW-S, GTAW Carbon Steel Workmanship Sample

REVISIONS					American Welding Society		
ZONE	REV	DESCRIPTION	DATE	APPROVED	ENTRY WELDER—GMAW-S, GTAW		
					DATE	SCALE	DRAWING NUMBER
					DB	AWS EDU-3	
					APP		



GTAW Stainless Steel Workmanship Sample

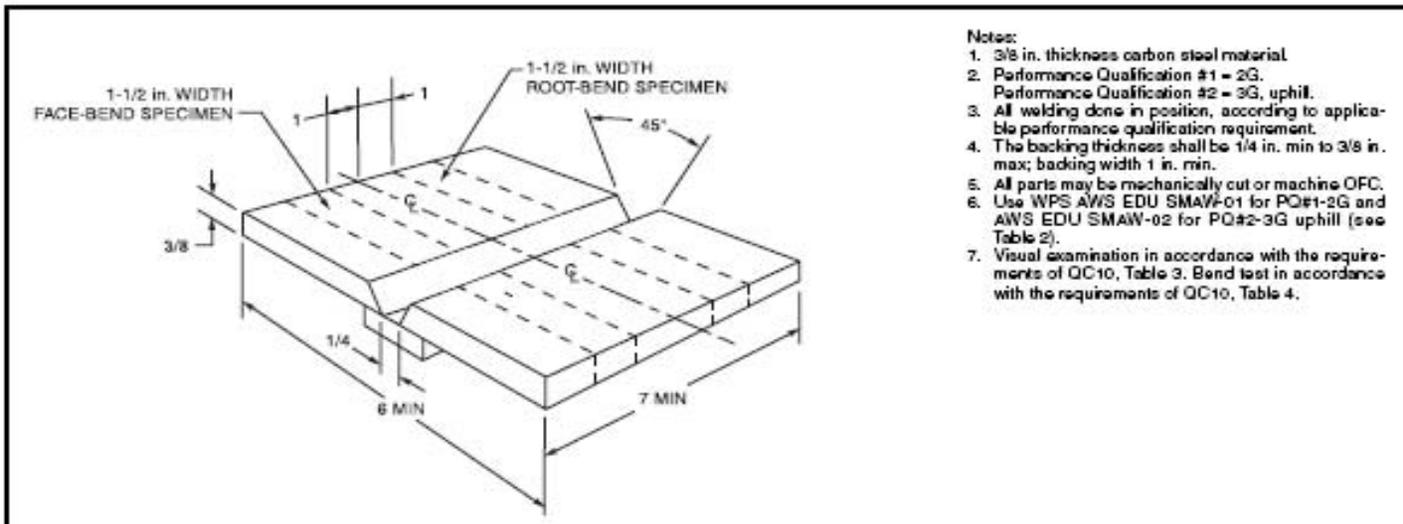
REVISIONS					American Welding Society		
ZONE	REV	DESCRIPTION	DATE	APPROVED	ENTRY WELDER—GTAW		
					DATE	SCALE	DRAWING NUMBER
					DB	AWS EDU-4	
					APP		



- *Melt through not required.
- Notes:
1. All dimensions U.S. Customary Units unless otherwise specified.
 2. 10 ga.-14 ga. thickness aluminum material. Optional choice of thickness within range specified.
 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 PAC unless specified manual PAC.
 6. All welds GTAW.
 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. Use WPS AWS EDU GMAW-03 for aluminum (M 22 or P 22) (see Table 2).
Use WPS AWS EDU GMAW-04 for aluminum (M 23) (see Table 2).
 11. Visual examination in accordance with the requirements of AWS OC10, Table 3.

GTAW Aluminum Workmanship Sample

REVISIONS					American Welding Society		
ZONE	REV	DESCRIPTION	DATE	APPROVED	ENTRY WELDER—GTAW		
					DATE	SCALE	DRAWING NUMBER
					DB	AWS EDU-5	
				APP			



SMAW Test Plates

- Notes:
- 3/8 in. thickness carbon steel material
 - Performance Qualification #1 = 2G.
Performance Qualification #2 = 3G, uphill.
 - All welding done in position, according to applicable performance qualification requirement.
 - The backing thickness shall be 1/4 in. min to 3/8 in. max; backing width 1 in. min.
 - All parts may be mechanically cut or machine OFC.
 - Use WPS AWS EDU SMAW-01 for PQ#1-2G and AWS EDU SMAW-02 for PQ#2-3G uphill (see Table 2).
 - Visual examination in accordance with the requirements of QC10, Table 3. Bend test in accordance with the requirements of QC10, Table 4.

AWS ES2.0/2008

REVISIONS					 American Welding Society		
ZONE	REV	DESCRIPTION	DATE	APPROVED	ENTRY WELDER—SMAW		
					DATE	SCALE	DRAWING NUMBER
					DB	AWS EDU-6	
				APP			

