

Personal Entrepreneurial Competencies (PECs)

Content Standards	Performance Standards
The learner demonstrates understanding of one's PECs in Shielded Metal Arc Welding (SMAW) .	The learner independently creates a plan of action that strengthens/ further develops his/her PECs in Shielded Metal Arc Welding (SMAW) .

Time Allotment: 4 Hours

Personal Entrepreneurial Competencies

Introduction:

In this module you will learn more about entrepreneurship and the entrepreneurial competencies related to **Shielded Metal Arc Welding (SMAW)**. You will have a first-hand experience in educational activities leading to personal assessment of your entrepreneurial competencies and assessment of entrepreneurial competencies of a successful **Welder** within your town/municipality. You will also have some activities to align your competencies with the competencies of successful practitioners. Moreover, this module is designed to stimulate your mind to think about entrepreneurship, its role in the business community in particular and to the economic and social development in general.

Entrepreneurs are people with skills and capabilities to see and evaluate business opportunities. They are individuals that can strategically identify products or services needed by the community and they deliver these at the right time and the right place.

Entrepreneurs are agents of economic change. They organize, manage and assume risks of a business. Some of the good qualities of an entrepreneur are opportunity seeker, risk taker, goal setter, excellent planner, a confident problem solver, hardworking, persistent and a committed worker.

Entrepreneurship, on the other hand, is not just a simple business activity. It is a strategic process of innovation and new venture creation. Basically, entrepreneurship is both an art and science of converting business ideas into marketable products or services to improve the quality of living.

Now that you have a little background knowledge about entrepreneur and entrepreneurship, you can now walk through in assessing your Personal Entrepreneurial Competencies (PECs). Always remember that "**Successful entrepreneurs continuously develop and improve their PECs.**"

To begin with, let us try to find out the competencies you will master after finishing this module.

OBJECTIVES:

At the end of this module, you are expected to:

- identify areas for improvement, development and growth;
- align your PECs according to your business/career choice; and
- create a plan of action that ensures success in your business/career choice

Now that you have an idea about the enabling knowledge and skill that you will develop/achieve and master, try to take the first challenge in this module -- the pre assessment.

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Pre-assessment

As part of your initial activity, you will be challenged to dig deeper into your knowledge and previous experiences on the topic. Try to diagnose/assess what you already know about personal entrepreneurial competencies by answering the Task 1.

Task 1

Match the **entrepreneurial competencies** in column **A** with their **meaning** in column **B**. Write the letter of the best answer on the space provided before each number.

A	B
___ 1. Creative	a. make a wise decision towards the set objectives
___ 2. Profit Oriented	b. strategic thinking and setting of goals
___ 3. Discipline	c. trust in one's ability
___ 4. Decision Making	d. adaptable to change
___ 5. People Skill	e. innovative to have edge over other competitors
___ 6. Planner	f. solid dedication
___ 7. Self-confidence	g. skillful in record keeping
___ 8. Hardworking	h. always stick to the plan
___ 9. Ability to accept change	i. working diligently
___ 10. Committed	j. effective and efficient communication and relation to people
	k. always looking for income

Task 2

These are guide questions which encapsulate the entire module. Write your answers on your assignment notebook, then share these to class.

- A. Explain why entrepreneurship are activities important to social development and progress of the economy.
- B. Name entrepreneurial activities that you know and capable of doing which are related to Shielded Metal Arc Welding (SMAW).
- C. Given the opportunity to own a business that relates with **Shielded Metal Arc Welding (SMAW)**, are you confident to manage it? Explain your answer.
- D. Give the most important competencies you must possess in order to be successful in running your chosen business.
- E. Name successful entrepreneurs from your province whose business is related to **Shielded Metal Arc Welding (SMAW)**. Be able to share to the class their PECs that made them successful.

After all the guide questions have been answered to the best of your knowledge and skills, share these with your classmates. You too, may compare your insights, personal knowledge, and relevant experiences on the topic to make it more exciting and engaging.

Learning Goals and Targets

After reading and understanding the objectives of this module and having gone through pre-assessment and the guide questions, you will be asked to set your own personal goals. These goals will trigger you to further achieve the ultimate objectives of this module. In the end, these goals would motivate you to learn more about PECs.



Figure 1. Strategic process to achieve the objectives of this module.

Reading Resources and Instructional Activities

After setting your own personal goals and targets to achieve the objectives of this module, check your inherent knowledge of PECs. Try to answer these guide questions with the help of your classmates.

Task 3: Group Activity

Answer these guide questions on a separate sheet of paper. Share your answer to the class.

1. Explain the importance of assessing one's PECs before engaging in a particular entrepreneurial activity.

2. Are there other strategies or approaches when you can assess your PECs? Explain how these would become more useful in selecting a viable business venture.

3. What are the desirable personal characteristics, attributes, lifestyles, skills and traits of a prospective entrepreneur? Why do you think these are important?

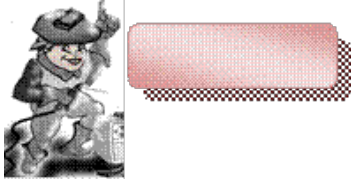
4. Why is there a need to assess one's PECs in terms of characteristics, attributes, lifestyles, skills and traits before starting a particular business?

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5. What is the significance of evaluating PECs of a successful entrepreneur? What helpful insights can you get from this activity?

How was your experience in answering the guide questions with your classmates? Were you able to benefit from them? What were the insights you have realized?

Now, this time you are going to study the different topics that will enrich your knowledge of PECs. Read carefully all the important details about the succeeding topic.



Assessment of Personal Entrepreneurial Competencies (PECs) and Skills vis-à-vis a Practicing Entrepreneur/ Employee in a province.

Entrepreneurial competencies refer to the important characteristics that should be possessed by an individual in order to perform entrepreneurial functions effectively. In this module, you will learn some of the most important characteristics, attributes, lifestyle, skills, and traits of a successful entrepreneur in order to be successful in a chosen career.

Below are few important characteristics/traits/attributes of a good entrepreneur:

- **Hardworking:** One of the important characteristics of a good entrepreneur is hardworking, which means habitually working diligently for long period of hours. Hardworking people keep on improving their performance to produce good products and/ or provide good services.
- **Self-confident:** Entrepreneurs have confidence in one's ability and own judgment. They exhibit self-confidence in order to cope with all the risks of operating their own business.
- **Discipline:** Successful entrepreneurs always stick to the plan and fight the temptation to do what is unimportant.
- **Committed:** A good entrepreneur accepts full responsibility of everything in his/her business. He/she gives full commitment and solid dedication to make the business successful.
- **Ability to accept change:** Nothing is permanent but change. Change occurs frequently. When you own a business, you should cope up and thrive on changes. Capitalize on positive changes to make your business grow.
- **Creative:** An entrepreneur should be creative and innovative to stay in the business to have an edge over the other competitors.
- **Has the Initiative:** An entrepreneur takes the initiative. You must put yourself in a position where you personally are responsible for the failure or success of your business.
- **Profit-Oriented:** You enter into the world of business to generate profit or additional income. This shall become your bread and butter for the family. Therefore, you must see to it that the business can generate

income.

Listed below are the important skills of a successful entrepreneur.

- **Planner:** Planning is a strategic thinking and setting of goals to achieve objectives by carefully maximizing all the available resources. A good entrepreneur develops and applies step-by-step plans to realize goals. A good entrepreneur knows that planning is an effective skill only when combined with action.
- **People Skills:** This is a skill which is very important in order to be successful in any kind of business. People skills refer to an effective and efficient communication and relation to people working in and out of your business. In day-to-day business transactions, you need to deal with people. A well- developed people skills can spell out the difference between success and failure of the business.
- **Decision Making:** Successful entrepreneurs have the ability to think quickly and make a wise decision towards the pre-determined set objectives. No one can deny that the ability to make decision is an important skill that an entrepreneur should possess. Sound decision should spring out from given facts/information and should be towards the pre-determined objectives.



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In order to firm up what you have learned and to have a better appreciation of the different entrepreneurial competencies, try to read the PECs checklist presented below, then answer the same.

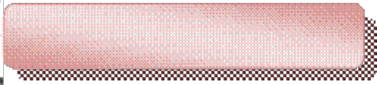
Task 4: PECs Checklist

Using the PECs Checklist, assess yourself by indicating a check (/) mark in either strengths and or development areas column. Interpret the results by counting the total number of check marks in each of the columns. After accomplishing the checklist, form a group and share your insights and experiences on why you came up with that personal assessment.

Table 1: PECs Checklist

Personal Entrepreneurial Competencies of an Entrepreneur	Personal Assessment in terms of:	
	Strength	Development Areas
Hardworking <ul style="list-style-type: none"> Working diligently 		
Self-confident <ul style="list-style-type: none"> Confidence in one's ability 		
Disciplined <ul style="list-style-type: none"> Always sticks to the plan 		
Committed <ul style="list-style-type: none"> Solid dedication 		
Ability to accept change <ul style="list-style-type: none"> Adaptable to change 		
Creative <ul style="list-style-type: none"> Innovative to have edge over other competitors 		
Profit-oriented <ul style="list-style-type: none"> Always looking for income 		
Planner <ul style="list-style-type: none"> Strategic thinking and setting of goals 		
People Skill <ul style="list-style-type: none"> Effective and efficient communication and relation to people 		
Decision Making <ul style="list-style-type: none"> Make a wise decision towards the set objectives 		
TOTAL		

Interpretation/Insights:



How was your experience in discovering your strengths and the areas to be developed? Did you gain valuable experience in exchanging insights with your classmates? To learn more and deepen your understanding of PECs, do Task 5.

Task 5: Interview

Interview successful welder or entrepreneurs in your town/municipality whose type of business is related with **Shielded Metal Arc Welding**. Focus your interview on PECs and other business-related attributes that helped them become successful. Analyze the result of the interview and reflect on the similarities and/or differences. Write your answer on a separate sheet of paper.

Sample Interview Guide

Name of Proprietor/Practitioner: _____

Age: _____

Number of Years in Business: _____

Business Name: _____

Business Address: _____

1. What are your preparations before you engaged in this type of business/job?
2. What are your special skills/characteristics that are related with your business/job?
3. How did you solve business-related problems during the early years of your business operation?
4. Did you follow the tips from a successful businessman/practitioner before you engaged in your business?
5. What are your best business practices that you can share with aspiring students?
6. What are the salient characteristics, attributes, lifestyle, skills, and traits that made you successful in your business/job?

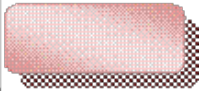
Note: Cull the needed information from the interview to supply answer/s to Row 1 in the table below. Fill out the second row with your PECs.

Personal Entrepreneurial Competencies	Characteristics	Attributes	Lifestyles	Skills	Traits
Successful Entrepreneur in the province					
My PECs					

Using the information on the table above, analyze, and reflect on the similarities and differences in your answers. Put your reflection on the table below. Write your conclusion on the space provided.

Personal Entrepreneurial Competencies	Similarities	Differences
Characteristics	<div style="font-size: 4em; color: lightblue; opacity: 0.5;">DRAFT</div>	
Attributes		
Lifestyles		
Skills		
Traits		

Conclusion:



After performing the activities on the importance of PECs, let us determine how much you have learned. Perform Task 6 to determine how well you have understood the lesson.

Task 6: Preparation of a Plan of Action

Using the table below and the information generated from Task 5 (Interview), prepare an action plan that will indicate how you would align your PECs to the PECs of the successful entrepreneur on ***Shielded Metal Arc Welding (SMAW)*** in your town/ municipality.

Objective	Area	Activities	Strategies	Time Frame	Expected Outcome
To align my PECs with the PECs of a successful entrepreneur in Shielded Metal Arc Welding.	Charac- teristics				
	Skills				
	Attribute				
	Traits				

Task 7: Essential Questions

Read and study these questions. You may use a separate sheet of paper or your notebook to write your answers.

1. Why is there a need to compare and align your PECs with the PECs of a successful entrepreneur?

2. How does your action plan help sustain your strong PECs and/or address your development areas?

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3. What plan of action would you do to address your development areas?

ENVIRONMENT AND MARKET (EM)

Content Standards	Performance Standards
The learner demonstrates understanding of environment and market in Shielded Metal Arc Welding in one's town/municipality.	The learner independently creates a business vicinity map reflective of a potential market in Shielded Metal Arc Welding in a town/municipality.

Time Allotment: 4 hours

Environment and Market

Introduction:

People who aspire to start a business need to explore the economic, cultural and social conditions prevailing in the area. Needs and wants of the people in a certain area that are not met may be considered as business opportunities. Identifying the needs of the community, its resources, available raw materials, skills, and appropriate technology can help a new entrepreneur in seizing a business opportunity.

To be successful in any kind of business venture, potential entrepreneurs should always look closely at the environment and market. They should always be watchful of the existing opportunities and constraints. The opportunities in the business environment are those factors that provide possibilities for a business to expand and make more profits. Constraints, on the other hand, are those factors that limit the ability to grow, hence reduces the chance of generating profit. One of the best ways to evaluate the opportunities and constraints is to conduct (Strengths, Weaknesses, Opportunities and Threats) SWOT Analysis.

SWOT analysis is a managerial tool to assess the environment. This gathers important information, which in turn, is used in strategic planning. Strengths and Weaknesses are internal in an organization. Basically they relate to resources owned by organization, things that you have control over, and as well as the extent of its marketing.

Opportunities and threats exist in the external environment. Opportunities relate to the market, to the development of new technologies, and external factors such as government policies, climate, and trends. Threats relate to what the competition is doing as well as legal and other constraints.

Now that you have read some of the important considerations to look into to be successful in any business, you are now ready to explore more about the environment and market.

To begin with, let us try to find out the competencies that you will master after finishing this module.

OBJECTIVES:

At the end of this module, you are expected to:

- identify what is of “Value” to the customer;
- identify the customer to sell to;
- explain what makes a product unique and competitive;
- apply creativity and innovative techniques to develop marketable product; and
- employ a Unique Selling Proposition (USP) to the product/service.

Now that you have an idea about the things you will learn, try to take the first challenge in this module-- the pre assessment.

Pre Assessment

Task I

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Choose the letter of the best answer. Write your answer on a separate sheet of paper.

1. This is generated by examining the goods and services are sold outside by the community.
A. Business Creation
B. Business Pricing
C. Business Concept
D. Business Idea
2. A process of making a new product to be sold to the customers.
A. Product Analysis
B. Product Conceptualization
C. Product Development
D. Product Implementation
3. These are luxuries, advantages and desires that every individual considers beyond necessary.
A. Wants
B. Desires
C. Requirements
D. Needs
4. This is the factor or consideration presented by a seller as the reason that one product or service is different from and better than that of the competition.
A. Unique Selling Plan
B. Unique Selling Proposition
C. Unique Pricing Policy
D. Finding Value-Added

5. In this stage, the needs of the target market are identified, reviewed, and evaluated.

A. Concept Development	C. Project Development
B. Economic Analysis	D. Refine Specification
6. This is the introduction of new idea to make the product and services more attractive and saleable to the target customers.

A. New Idea	C. Product Development
B. Creativity	D. Innovation
7. A managerial tool used to assess the environment to gather important information used for strategic planning.

A. Environmental Scanning	C. WOTS Analysis
B. SWOT Analysis	D. Survey Analysis
8. A marketing practice of creating name, symbol or designs that identifies and differentiate a product from the other products.

A. Product Naming	C. Branding
B. Unique Selling Proposition	D. Tagline
9. This is a meaningful and unforgettable statement that captures the essence of your brand.

A. Product Naming	C. Branding
B. Unique Selling Proposition	D. Tagline
10. These are the things that people cannot live without.

A. Wants	C. Requirements
B. Desires	D. Needs

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Task 2: Guide Questions:

Read and study the guide questions. You may use a separate sheet of paper to write your responses to the guide questions.

1. How does one determine the product or services to be produced and/or to be offered/delivered to the target customers?
2. How does one select an entrepreneurial activity?
3. When can one say that a certain product has a “value”?
4. Is innovation and creativity to your product/services important? Explain.
5. How can one effectively respond to the needs of the target customer?
6. Express from the viewpoint of business owner the importance of scanning the environment and market in generating business idea.
7. Using self-assessment, explain your level of confidence in formulating a business idea.

After all the guide questions have been answered and skills have been mastered, share those with your classmates. Discuss your insights, personal knowledge and relevant experiences on the topic to make it more exciting and engaging.

Learning Goals and Targets

After reading and understanding the objectives of this module and having gone through pre-assessment and the guide questions, you will be asked to set your own personal goals. These goals will trigger you to further achieve the ultimate objective of this module. In the end, these goals would motivate you to learn more about Environment and Market.



Figure 2: Strategic process to reach the objectives of this module

READING RESOURCES AND INSTRUCTIONAL ACTIVITIES

After setting your own personal goals and targets to achieve the objectives of this module, you will have the opportunity to read and learn more about environment and market. You too, will also be given a chance to do practical exercises and activities to deepen your understanding of the topic.



Product Development

When we talk of product development, we are referring to a process of making a new product to be sold by a business or enterprise to its customers. The product development may involve modification of an existing product or its presentation, or formulation of an entirely new product that satisfies a newly defined customer's needs and/or want and/or a market place.

The term development in this module refers collectively to the entire process of identifying a market opportunity, creating a product to appeal to the identified market, and finally, testing, modifying and refining the product until this will be ready for production. This product can be any item to be sold to the consumers.

There are basic, yet vital questions that you can ask yourself. When you find acceptable answers to these, you may now say that you are ready to develop a product and/or render service.

1. For whom are the product/services aimed at?
2. What benefit will the customers expect from it?
3. How will the product differ from the existing brand? Or from their competitor?

Likewise, needs and wants of the people within the area should also be taken into big consideration. Everyone has his or her own needs and wants. However, people have different concepts of needs and wants. Needs in business are important things that every individual cannot do without in a society. These include:

1. Basic commodities for consumption
2. Clothing and other personal belongings
3. Shelter, sanitation and health
4. Education

Basic needs are essential to every individual so he/she may be able to live with dignity and pride in the community of people. These needs can obviously help you generate business ideas and subsequently to product development.

Wants are desires, luxury and extravagance that signify wealth and an expensive way of living. Wants or desires are considered above all the basic necessities of life. Some examples are the eagerness or the passion of every individual which are non-basic needs like; fashion accessories, shoes, clothes, travelling around the world, eating in exclusive restaurant, watching movies, concerts, plays, having luxurious cars, wearing expensive jewelry, perfume, living in impressive homes, and others.

Needs and wants of people are the basic indicators of the kind of business that you may engage in because it can serve as the measure of your success. Some other good points that you might consider in business undertakings are the kind of people, their needs, wants, lifestyle, culture and tradition, and social orientation.

To summarize, product development entirely depends on the needs and wants of the customers. Another important issue to deal with is the key concepts of developing a product. The succeeding topic shall enlighten you about the procedure in coming up with a product.

Concepts of Developing a Product

Concept development is a very critical phase in the development of a product. From this stage, the needs of the target market are identified and competitive products are reviewed before the product specifications are defined. The product concept is selected along with an economic analysis to come up with an outline of how a product is being developed. Below is a figure that shows the stages of concept development of a product.

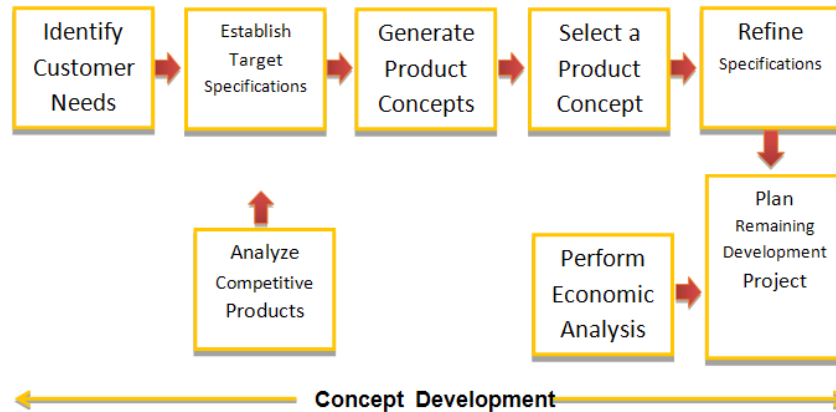


Figure 3: Concept Development

The process of product development follows these steps:

- A. Identify Customer Needs** - Using a survey form, interviews, researches, focus group discussions, and observations, an entrepreneur can easily identify customers' needs and wants. In this stage, the information that can be possibly gathered are product specifications (performance, taste, size, color, shape, life span of the product, etc.). This stage is very important because this would determine the product to be produced or provided.
- B. Establish Target Specifications** - Based on customers' needs and reviews of competitive products, you may now establish target specifications of the prospective new product and/or services. Target specifications are essentially a wish-list.
- C. Analyze Competitive Products** - It is imperative to analyze existing competitive products to provide important information in establishing product/services specifications. Other products may exhibit successful design attributes that should be emulated or improved in the new product/service.
- D. Generate Product Concepts** - After having gone through the previous processes, you may now develop a number of product concepts to illustrate the types of product/service that are both technically feasible and would best meet the requirements of the target specifications.
- E. Select a Product Concept** - Through the process of evaluation between attributes, a final concept is selected. After the final selection, additional market research can be applied to obtain feedback from certain key customers.
- F. Refine Product Specifications** - In this stage, product/service specifications are refined on the basis of input from the foregoing activities. Final specifications are the result of extensive study, expected service life, and projected selling

price, among others and are being considered in this stage.

G. *Perform Economic Analysis* - Throughout the process of product development, it is very important to always review and estimate the economic implications regarding development expenses, manufacturing costs, and selling price of the product/services to be offered/provided.

H. *Plan the Remaining Development Project* - In this final stage of concept development, you may prepare a detailed development plan which includes a list of activities, the necessary resources and expenses, and a development schedule with milestones for tracking progress.

Finding Value

People buy for a reason. There should be something in your product/services that would give consumers a good reason to go back and buy more. There must be something that has to make you the best option for your target customers; otherwise they have no reason to buy what you are selling. This implies further, that you offer something to your customers that will make them value or treasure your product/services.

The value that you incorporate to your product is called value proposition. Value proposition is “a believable collection of the most persuasive reasons that people should notice you and take the action you are asking for.” Value is created by fulfilling deep desires and solving deep problems. This gets the people moving and spending for your product/service.

Innovation

Innovation is the introduction of something new in your product/services. This may be a new idea, a new method or a device. If you want to increase your sales and profit, you must innovate. Some of the possible innovations in your products are change of packaging, improved taste, color, size, shape and perhaps price. Some of the possible innovations in providing services are application of new improved methods, additional featured services, and possibly freebies.

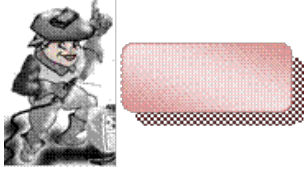
Unique Selling Proposition (USP)

Unique Selling Proposition is the factor or consideration presented by a seller as the reason that one product or service is different from and better than that of the competition. Before you can begin to sell your product or service to your target customers, you have to sell yourself on it. This is especially important when your product or service is similar to those around you.

USP would require careful analysis of other businesses' ads and marketing messages. If you analyze what they say or what they sell, not just their product or service characteristics, you can learn a great deal about how companies distinguish themselves from competitors.

Here is how to discover your USP and use it to increase your sales and profit:

- **Use empathy: Put yourself in the shoes of your customers.** Always focus on the needs of the target customers and forget falling in love with your own product or services. Always remember, you are making this product or providing for the target customers to eventually increase sales and earn profit and not make this product or services for yourself. Essential question such as what could make them come back again and again and ignore competition? Most possible answers will be focused on the quality, availability, convenience, cleanliness, reliability, and friendliness.
- **Identify what motivates your customers.** It is very important for you to understand and find out what drives and motivates your customers to buy your product/service. Make some efforts to find out, analyze, and utilize the information on what motivates the customers in their decisions to purchase the product/services.
- **Discover the actual and genuine reasons why customers buy your product instead of a competitor.** Information is very important in decision making. A competitive entrepreneur always improve their products/services to provide satisfaction and retention of customers. As your business grows, you should always consider the process of asking your customers important information and question that you can use to improve your product/services.



In order to firm up your understanding of the topic previously presented, you will be tasked to form a group and conduct an interview with a successful entrepreneur/practitioner. You have to document this interview and present this to the whole class for reflection and appreciation.

Task 3: Interview

Select a successful entrepreneur/practitioner. Conduct an interview by utilizing the sets of questions below. Document the interview and present this to the class.

1. How did you identify your customers?
2. What were your considerations in selecting your customers?
3. Explain how your product/services become unique to other product/s.
4. Did you consult somebody before you engage in this business? Cite sample insights that you gained from the consultation.
5. What were your preparations before you started the actual business?
6. What creative and innovative techniques did you adopt to your product/services? What was the effect of the innovative techniques to the sales and profits of your business?
7. What strategy did you consider to have a unique selling proposition to your product/service?

Task 4: Video Viewing

In order to deepen your understanding of the lesson, perform these tasks:

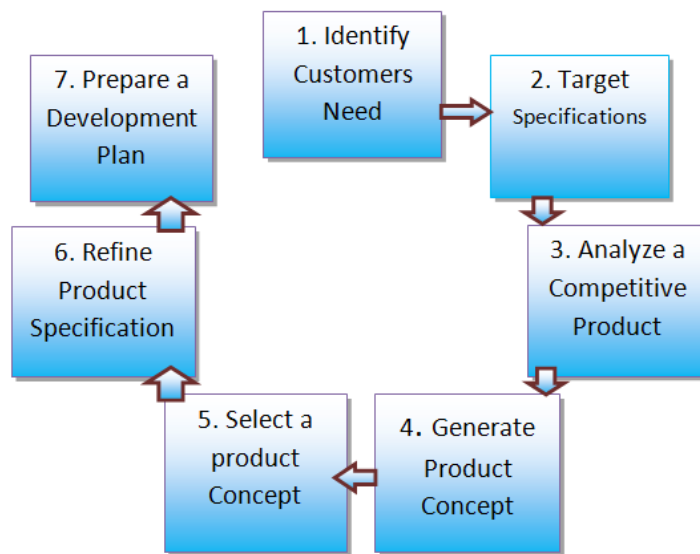
1. Browse the internet on topics related to:
 - a. Customers' needs and wants;
 - b. Techniques in identifying customers' needs and wants;
 - c. Creativity/innovations in products and services;

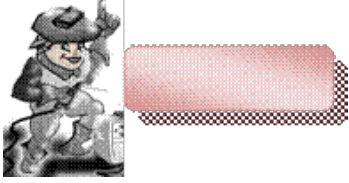
- d. Unique selling proposition; and
 - e. Product development.
2. Prepare a short narrative report about the aforementioned topics. You may highlight the “aspect” that intensifies your knowledge of product development.



Task 5: Product Conceptualization

Using the figures below, develop your own concept for your product/services.





Generating Ideas for Business

The process of developing/generating business idea is not a simple process. Some people just think of a bunch of business ideas, but some really are without ideas. There are two problems that arise; **first** is the excessive generation of ideas that can make them forever to remain in the dreaming stage and **second** is when they do not have ideas and want to become entrepreneurs.

The most optimal way is to have a systematic approach in generating and selecting a business idea that will be transferred to real business. Here are some basic yet very important considerations you may use to generate possible ideas for business:

- 1. Examine the existing goods and services.** Are you satisfied with the product? What do other people who use the product say about it? How can it be improved? There are many ways of improving a product from the way it is made to the way it is packed and sold. You can also improve the materials used in crafting the product. In addition, you introduce new ways of using the product, making it more useful and adaptable to the customers' many needs. When you are improving the product or enhancing it, you are doing an *innovation*. You can also do an *invention* by introducing an entirely new product to replace the old one.

Business ideas may also be generated by examining the goods and services that are sold outside by the community. Very often, these products are sold in a form that can still be enhanced or improved.

- 2. Examine the present and future needs.** Look and listen to what the customers, institutions, and communities are missing in terms of goods and services. Sometimes, these needs are already obvious and felt at the moment. Other needs are not that obvious because they can only be felt in the future, in the event of certain developments in the community. For example, a province will have its electrification facility in the next six months. Only by that time will the entrepreneur could think of electrically-powered or generated business such as photo copier, computer service, digital printing, etc.
- 3. Examine how the needs are being satisfied.** Needs for the products and services are referred to as market demand. To satisfy these needs is to supply the products and services that meet the demands of the market. The term market refers to whoever will use or buy the products or service, and these may be people or institutions such as other businesses, establishments, organizations, or government agencies.

There is a very good business opportunity when there is absolutely no supply to a pressing market demand.

Businesses or industries in the locality also have needs for goods and services. Their needs for raw materials, maintenance, and other services such as selling and distribution are good sources of ideas for business.

- 4. Examine the available resources around you.** Observe what materials or skills are available in abundance in your area. A business can be started out of available raw materials by selling them in raw form and by processing and manufacturing them into finished products. For example, in a copra-producing town, there will be many coconut husks and shells available as “waste” products. These can be collected and made into coco rags/ doormat and charcoal bricks and sold profitably outside the community.

A group of people in your neighborhood may have some special skills that can be harnessed for business. For example, women in the Mountain Province possess loom weaving skills that have been passed on from one generation to the next generation. Some communities set up weaving businesses to produce blankets, as well as decorative items and various souvenir items for sale to tourists and lowland communities.

Business ideas can come from your own skills. The work and experience you may have in agricultural arts, industrial arts, home economics, and ICT classes will provide you with business opportunities to acquire the needed skills which will earn for you extra income, should you decide to engage in income-generating activities. With your skills, you may also tinker around with various things in your spare time. Many products were invented this way.

- 5. Read magazines, news articles, and other publications on new products and techniques or advances in technology.** You can pick up new business ideas from Newsweek, Reader’s Digest, Business Magazines, “Go Negosyo”, KAB materials, Small-Industry Journal. The Internet serves as a library where you may browse and surf on possible businesses. It will also guide you on how to put the right product in the right place, at the right price, at the right time.

Listing of possible businesses to set up in an area may also be available from banks or local non-government organizations.

Key Concepts in Selecting a Business Idea

Once you have embarked on identifying the business opportunities, you will eventually see that there are many possibilities that are available for you. It is very unlikely that you will have enough resources to pursue all of them at once. Which one will you choose?

You have to select the most promising one from among a hundred and one ideas. It will be good to do this in stages. In the first stage, you screen your ideas to narrow them down to about five choices. In the next stage, trim down the five choices to two options. In the final stage, choose between the two and decide which business idea is worth pursuing.

In screening your ideas, examine each one in terms of these factors:

1. How much capital is needed to put up the business?
2. How big is the demand for the product? Do many people need this product and will continue to need it for a long time?
3. How is the demand met? Who are processing the products to meet the need (competition or demand)? How much of the need is now being met (supply)?
4. Do you have the background and experience needed to run this particular business?
5. Will the business be legal, not going against any existing or foreseeable government regulation?
6. Is the business in line with your interest and expertise?

Your answers to these questions will be helpful in screening which ones from among your many ideas are worth examining and worth pursuing.

Branding

Branding is a marketing practice of creating name, symbol or designs that identifies and differentiates product/services from other products/services. It is also a promise to your customers. It tells them what they can expect from your product/services and it differentiates your offerings from other competitors. Your brand is derived from who you are, who you want to be and who people perceive you to be.

Branding is one of the most important aspects of any business. An effective brand strategy gives you a major edge in increasingly competitive markets

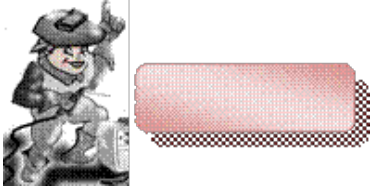
The features of a good product brand are as follows:

- Delivers the message clearly
- Confirms your credibility
- Connects your target prospects emotionally
- Motivates the buyer
- Concretizes user loyalty

Here are some simple tips to publicize your brand.

- **Develop a tagline.** Write a meaningful, unforgettable, and easy to remember statement that captures the essence of your brand.
- **Get a great logo.** Create a logo suitable to your business and consistent with your tagline and display prominently.

- **Write down your brand messaging.** Select key messages you want to communicate about your brand.
- **Be true to your brand.** Deliver your brand promise.
- **Be consistent.** Be reliable and consistent every time.



In generating business idea, you should identify the type of business that is suited to your business idea. You should analyze and scan the potential environment, study the marketing practices and strategies of your competitors, analyze the **Strengths, Weaknesses, Opportunities**, and the **Threats** in your environment to ensure that the products/goods and services you are planning to offer will be patronized within the easy reach of your target markets/consumers.

Bear in mind these simple rules for successful SWOT analysis.

- Be realistic about the strengths and weaknesses of your business when conducting **SWOT** analysis.
- SWOT analysis should distinguish between where your business is today, and where it could be in the future.
- SWOT should always be specific. Avoid any gray areas.
- Always apply SWOT in relation to your competition i.e. better than or worse than your competition.
- Keep your SWOT short and simple. Avoid complexity and over analysis
- SWOT is subjective.

Task 6: SWOT Analysis

In generating a business idea, environmental scanning is very important. Utilize the SWOT analysis table below to list up all your observations. Consider the strategies to select the best business idea.

Strength (S)	Weaknesses (W)
<ul style="list-style-type: none"> • • • • • 	<ul style="list-style-type: none"> • • • • •
Opportunities (O)	Threats (T)
<ul style="list-style-type: none"> • • • • • 	<ul style="list-style-type: none"> • • • • •

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Strategize:

- **SW** – Utilize the strengths to overcome the weakness
- **OS** - Capitalize on the opportunities to eliminate the weakness
- **ST** – Maximize on your strengths to eliminate the external threats
- **OT** – Take advantage of the available opportunities to eliminate the external threats.

Strategies/Activities:

Analysis:

My Best Business Idea:



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In order to deepen your understanding of the topics previously discussed, you will be asked to perform these activities:

Task 7: Extra Readings and Video Viewing

Reading books and watching videos have been considered as one of the most effective educational activities that help learners deepen their understanding of certain topic. In this particular circumstance, you will be asked to conduct an extra readings and video viewing on these topics.

- A. Steps in selecting business idea
- B. Criteria of a viable business idea
- C. Benefits of a good brand
- D. Ways on developing a brand

After successfully performing the assigned task, make a narrative report about this and share it to the class.



Task 9: Making my Own Logo

Generate a clear appealing product brand with logo and tagline.

Logo

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Tagline

PROCESS AND DELIVERY

CONTENT STANDARD	PERFORMANCE STANDARD
The learner demonstrates understanding of basic concepts and underlying theories in welding fillet on carbon steel plates. (1F)	The learner independently demonstrates competency in welding fillet on carbon steel plates needed for the job.(1F)

QUARTER I

TIME ALLOTMENT: 36 HOURS

WELDING FILLET ON CARBON STEEL PLATES (1F)

INTRODUCTION:

This module contains information and suggested learning activities on Welding fillet on carbon steel plates particularly in Flat position (1F). It includes instruction and procedure on how to weld fillet on carbon steel plates (1F).

This module consists of one (1) learning outcome. This learning outcome contains learning activities supported by instruction sheets. Read the information sheets. Before you perform the instruction, answer the self-check and perform the activities provided. To ascertain your competence, your teacher will assess/check if you have acquired the knowledge necessary to perform the skill portion of the particular learning outcome.

Upon completing this module, report to your teacher for assessment to check your achievement of knowledge and skills requirements of the learning competency. If you pass the assessment, you will be given a certificate of completion.

WELDING CARBON/MILD STEEL PLATES IN FLAT POSITION (1F)

1. Perform stringer or layered beads in accordance with welding standards.
2. Observe uniformity of bead ripples in accordance with welding standards.
3. Observe weld capping/ final pass not exceeding allowable tolerances specified by welding codes/ standards on:
 - Concavity
 - Convexity
 - height of reinforcement
 - underfill
 - porosities
 - undercut
 - cracks
 - cold laps

4. Conduct visual inspection on the finished weldment in accordance with welding standards for:
 - Spatters
 - arc strikes
 - slag inclusion
 - uniformity of beads
5. Use appropriate Personal Protective Equipment (PPE)
6. Perform proper housekeeping (5S)

PRE/DIAGNOSTIC TEST

A. Write the letter of the best answer in every item. Provide a separate answer sheet.

- _____ 1) It is the area where filler metal intersects the base metal opposite face.
- | | |
|-------------|-------------|
| a. Weld toe | c Weld root |
| b. Weld leg | d Weld face |
- _____ 2) It is the surface of the basemetal that is melted during welding.
- | | |
|-------------------|---------------|
| a. Fusion welding | c Fusion face |
| b. Weld root | d Weld Toe |
- _____ 3) It is the shortest distance from the face of a fillet weld to the weld root after welding.
- | | |
|---------------------|----------------------|
| a. Actual Throat | c Theoretical Throat |
| b. Effective Throat | d Weld Toe |
- _____ 4) The work angle used for thin metal to thick metal plate fillet weld.
- | | |
|--------------|-------------|
| a. 40 degree | c 45 degree |
| b. 55 degree | d 60 degree |
- _____ 5) A fillet weld is a weld type in the cross-sectional shape of a _____.
- | | |
|--------------|------------|
| a. Square | c Circle |
| b. Rectangle | d Triangle |

B. Write TRUE if the statement is correct and FALSE if the statement is wrong. Provide a separate answer sheet.

- _____ 6) A fillet weld requires little or no edge preparation.
- _____ 7) Fillet weld length and pitch dimension may be indicated by notes on print.

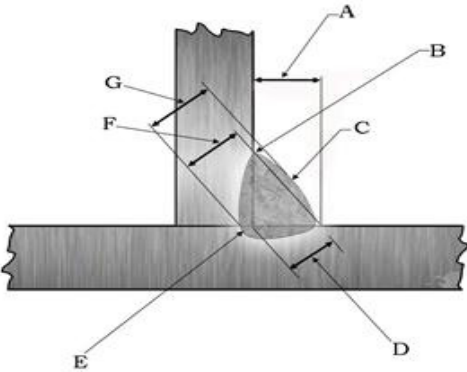
C. Enumerate the 3 Types of Fillet joints.

8. _____

9. _____

10. _____

D. Identify these fillet weld parts in Column A by choosing the letter of your answer in Column B. Use a separate answer sheet

Column A	Column B
<p>_____ 1) Weld Face</p> <p>_____ 2) Weld Root</p> <p>_____ 3) Weld Toe</p> <p>_____ 4) Weld Leg</p> <p>_____ 5) Theoretical Throat</p>	

INFORMATION SHEET NO. 1.1

WELDING CARBON/MILD STEEL PLATES (1F)

Fillet Weld

The fillet weld is the most popular and commonly used weld in industry. It requires little or no edge preparation. *Single-fillet welds* are fillet welds that have filler metal deposited on one side. They are limited to smaller loads than double fillet welds. *Double fillet welds* are fillet welds that have filler metal deposited on both sides to provide additional strength. It may be equal or unequal fillet. See Figure 1.

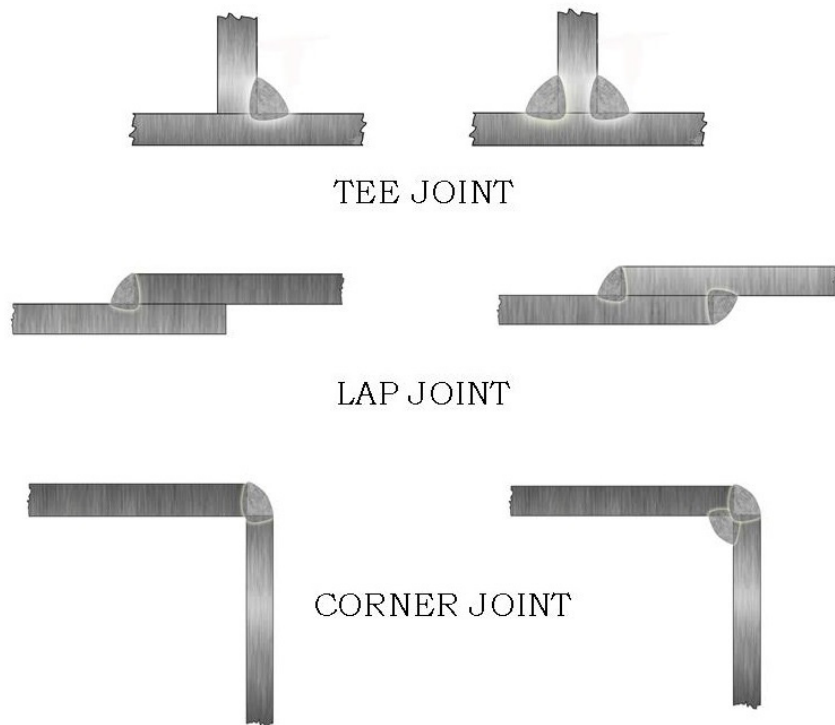


Figure 1. Types of Welds on Fillet Joints



Figure 2. Types of Fillet Weld profiles

TYPES OF FILLET JOINTS

Lap joint is frequently used in all kinds of work, which may be single- fillet lap joint or double fillet lap joint. The single fillet lap joint is not as strong as the double fillet lap joint which is more often used on ordinary work. Single fillet lap joint should not be used if root of joint is to be subjected to bending. This type of joint should never replace the butt joint on works under severe load. See Figure 3.

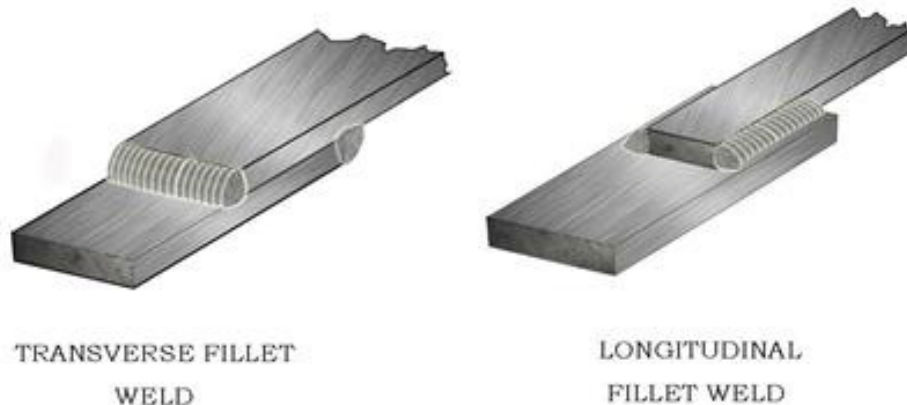


Figure 3. Lap Joints

Corner joint is a weld joint formed when two joint members are positioned at an approximate 90 degrees angle with the weld joint at the outside of the joint members. Heavier plate can be welded if the load is not severe and there is no bending action at the root of the weld. No preparation is needed and fit up is usually simple. Half open corner joint may be used on 12 gauge up to 4.5mm. Full open joint can be cut absolutely square and suitable clamping and holding devices are needed to facilitate fit up. See Figure 4.



Figure 4. Corner Joint

Tee Joint is a welding joint at the junction of two parts located approximately at right angles to each other in the form of a T. In terms of welding, thicker metals at the edge to be joined should be beveled. There are many forms of beveling edges for T-joint such as single bevel, double bevel, single J bevel, and double J bevel (refer to Figure 5). No preparation of edges is necessary for thinner plates and fit up can be fast and economical.

See Figure 5, showing different Tee joint/welds edge preparation

- Plain tee joint is used on ordinary plate thickness up to 0.5mm. If it is possible to weld from both sides, the joint will withstand high load conditions. The single fillet welded tee joint will not withstand bending action at the root of the weld and should be used with caution. There is no preparation cost.
- Single bevel tee joint can withstand more severe load than plain tee joint. It can be used on plate thickness from 9.5mm to 16mm. If it is possible to weld from one side only, care must be taken so that full penetration to the root weld is obtained and bending action will not result in failure. Cost of preparation is greater than plain tee joint.
- Double bevel tee joint is used for heavy plate thickness up to 25.40mm. Welding is done from both sides of the plate. It is used for severe loads. Good root penetration is necessary. Joint preparation is expensive.
- Single J tee joint is used for more severe load condition. Generally used on plate 25.40mm or heavier if welding is to be done from one side. Efficiency of joint can be increased materially by putting in bead in opposite J. This will reduce the tendency of failure at the root as a result of load at this point.

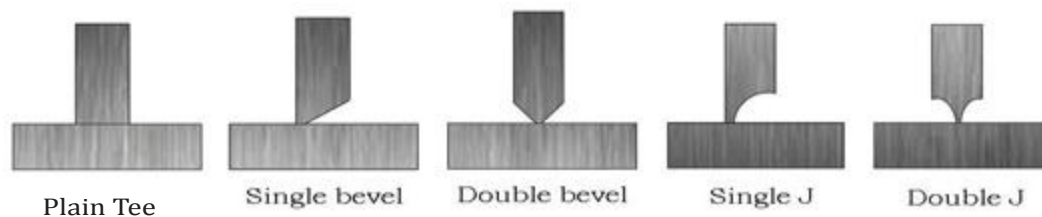


Figure 5. Different Tee joint/welds edge preparation

Parts of Fillet Weld

- Weld root** is the area where the filler metal intersects the base metal opposite the face.
- Weld face** is the exposed surface of a weld, bounded by the weld toes of the side on which welding was done. The weld face of a fillet weld maybe concave or convex.
- Weld toe** is the intersection of the base metal and the weld face. It is the point at which the weld face meets the base metal.
- Fillet weld leg** is the distance from the joint root to the weld toe. The joint root is the part of a joint to be welded where the members are closest to each other.
- The fillet weld throat** may refer to the actual throat, effective throat, or theoretical throat.
 - **Actual throat** is the shortest distance from the face of a fillet weld to the weld root after welding.
 - **Effective throat** is the shortest distance from the face of a fillet weld to the weld root, minus any convexity after welding.

- **Theoretical throat** is the distance from the face of a fillet weld to the weld root before welding.
- f. **Weld interface** is the area where the filler metal and the base metal are mixed together.
- g. **Fusion face** is the surface of the base metal that is melted during welding.
- h. **Depth of fusion** is the distance from the fusion face to the weld interface.

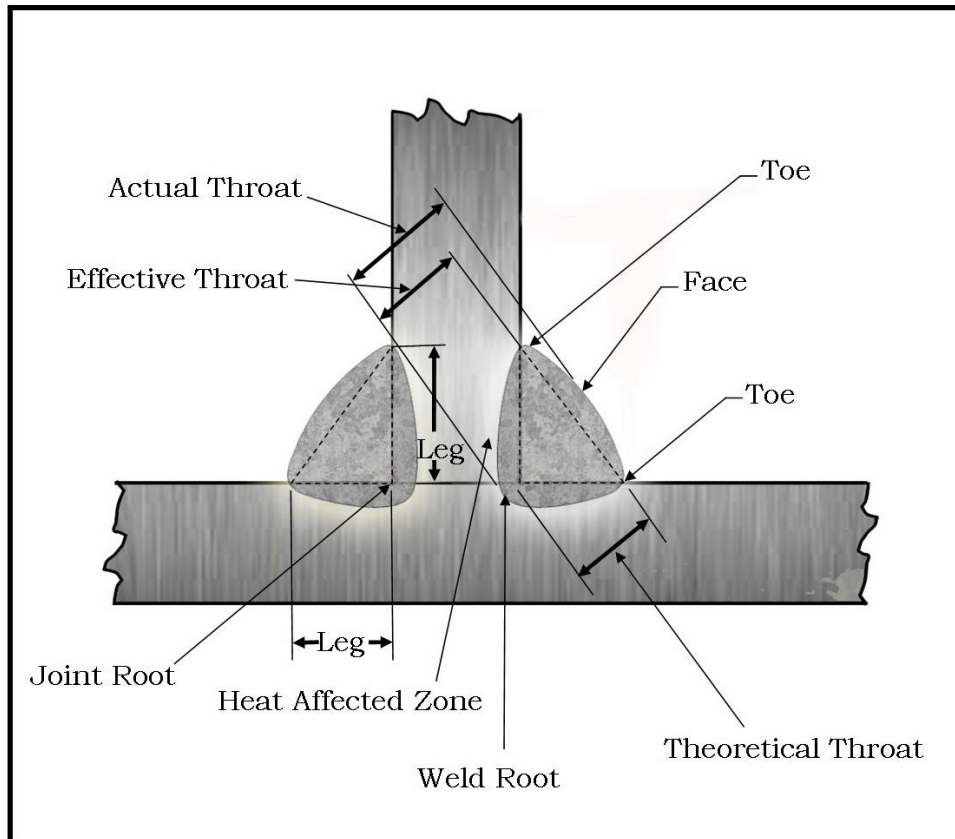
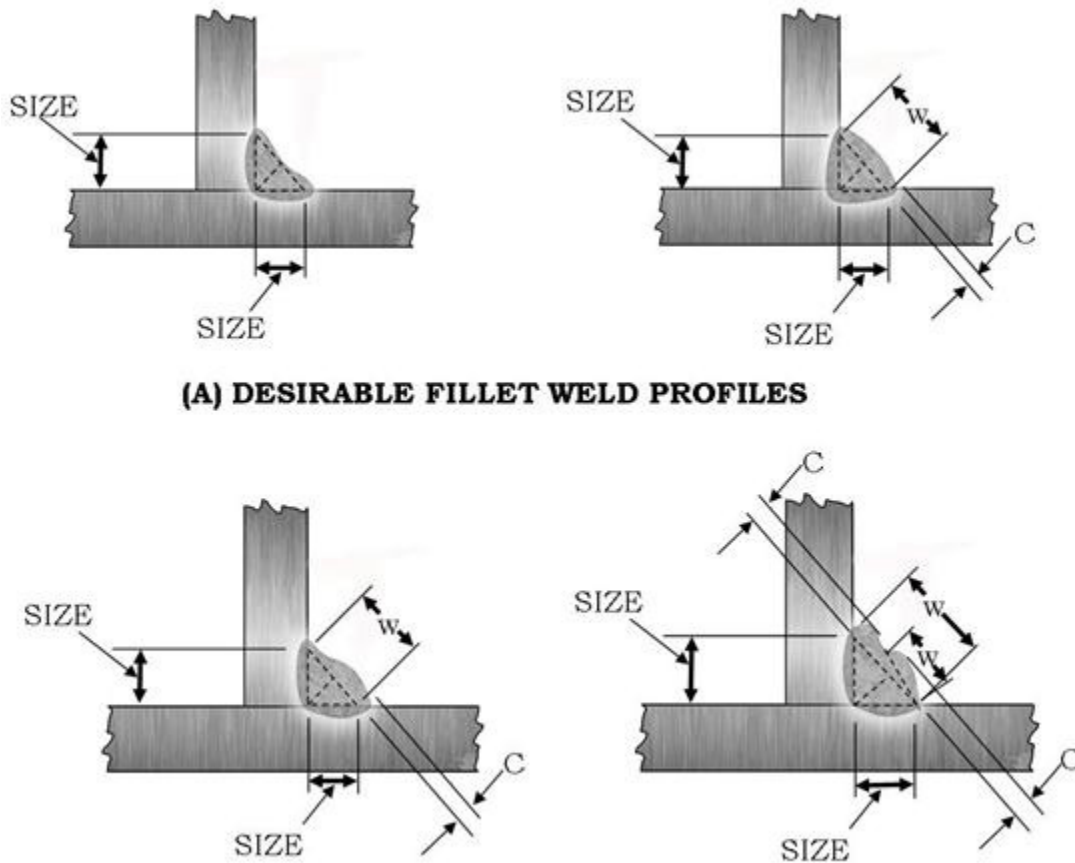


Figure 6. Parts of Fillet Weld

Acceptable Weld Profiles

The profile of a completed weld could have considerable effect for the performance of the weld operation. It is the welding inspector's function to distinguish these discontinuities by way of visual inspection and quite often, to evaluate the acceptance, or negativity. See Figure 7, showing different fillet weld profile.



(A) DESIRABLE FILLET WELD PROFILES

Figure 7. Different Fillet Weld Profile

Note: Convexity C of a weld or individual surface bead with dimension W shall not exceed the values of the following table.

WIDTH OF WELD FACE OR INDIVIDUAL SURFACE BEAD, W	MAX CONVEXITY, C
$W \leq 5/16$ in. (8mm)	1/16 in. (1.6 mm)
$W > 5/16$ in. TO $W < 1$ in. (25mm)	1/8 in. (3 mm)
$W \geq 1$ in.	3/16 in. (5 mm)

Table 1. Allowable Tolerance of Weld Profile

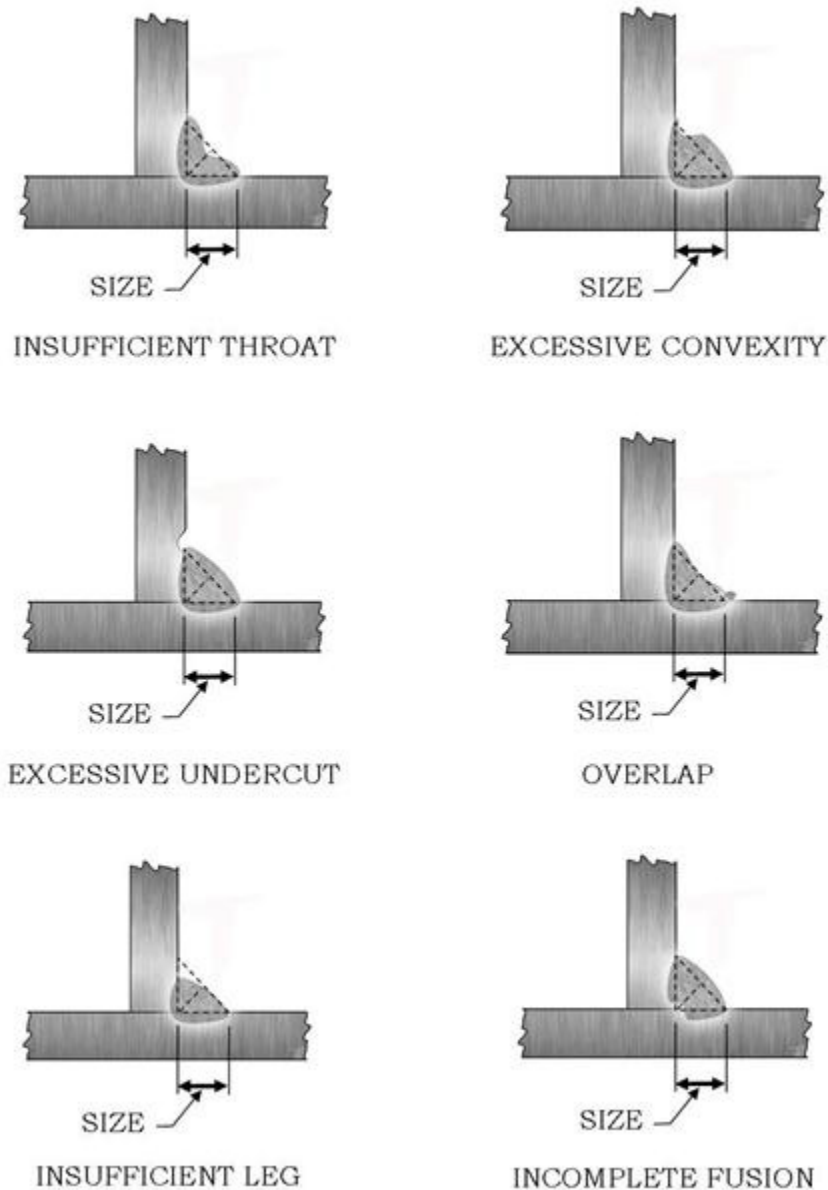


Figure 8. Unacceptable Weld Profiles

ESSENTIAL FOR WELDING CARBON/MILD STEEL PLATES (1F-4F)

I. Work Safety

Safety requirements are needed prior to welding.

- Wear appropriate Personal Protective Equipment (PPE as prescribed to the welders)
- Do not clean weld surface of metals, through grinding, brushing and chipping without eye and body protection;
- Use tools, equipment and materials properly in welding fillets.

Welding Set-up Safety

1. The arc welding should be properly placed on the worksite and should be free from falling sparks.
2. The machine should be stacked to save space, but there must be enough room between the machine for the air to circulate, thus preventing overheating. The air should be free from oil, dust, and metal fillings.
3. The power should be turned off periodically and the machine should be cleaned after using.
4. The machine should be placed away on cleaning tank and any other source of corrosive fumes that can be blown through it.
5. The work station should be free from combustible materials.
6. Check the surroundings before starting welds.

II. Shielded Metal Arc Welding (SMAW) for Welding Carbon/Mild Steel.

Choosing the right electrodes

- Use electrode type according to its classification and specification
- Determine welding current available for your welding machine (SMAW) and match with the electrode requirements.
- Heavy materials in SMAW must require electrodes with high current.
- Deep penetration electrodes required for edges not beveled and the preparation with no gap fit up.
- Deep penetrating electrode is used for welding close butt joints.
- Some electrodes are designed for specific position welding
- Some job specifications may indicate class of electrodes to be used and based on the service requirements. (e.g. cost limit, desired tensile strength.)
- Use low heat input electrodes for welding joint that requires pre-heat/post heat procedures.
- Use ordinary class of electrodes for non-critical welds and quality electrodes for critical weld joints.

Electrode requirements

The following will help in selecting the proper electrodes:

- **E6010** is an all-position electrode for deep penetrating digging arc. It produces good mechanical properties and is widely used for structural welding and pipe welding. It is best operated with DCEP.
- **E6011** is essentially the same as an E6010 but is designed for AC or DCEP welding.
- **E6013** is an all-position electrode for sheet metal welding. It has medium penetration and is used on all three current AC, DCEP and DCEN.

- **E7018** is an all position electrode that consists of iron powder low hydrogen coating and operates on DC electrode positive (DCEP) or on AC.

III. Correct Size of Electrodes

Size and diameter of electrode is determined in core diameter and in weld position of the electrode. Some factors to consider in using correct diameter size are as follows:

- Service condition
- Thickness and properties of the base metal
- Joint design/details
- Welding position

IV. Correct Current Setting and Adjustment

Current setting and adjustment for welding could be referred to specified welding procedure specification. Another option is the manufacturers recommended current based on the electrode diameter. Undercutting and overlapping is an example of weld defects common on fillet welds, and it must be avoided during welding operation.

- If the current setting is too high, undercutting occurs on the base metal.
- If the current setting is too low, overlapping occurs.

V. Arc Length

Arc length is an essential factor in producing a sound weld. Too long arc dissipates the arc for the result is less concentration of heat in the work. The arc tends to be wobbly and difficult to maintain. The weld deposit causes:

- Excessive spattering
- Crater porosities
- Harmful effect from nitrogen and oxygen in the air

VI. Travel Speed

Once the arc length and current is maintained, the speed at which electrode moves will now determine the soundness and appearance of the weld bead. Too fast speed will result in incomplete fusion (less time to melt the base metal) with slag inclusions and gas holes, especially in fillet welds, as there is not enough peddling time to allow these impurities to escape to the surface. Too slow speed is a waste of time and electrodes, the metal piles up and the slag may crowd the arc and smother it.

VII. Electrode Angle

Angle of electrode varies in different degrees when welding metals. The electrode manufacturers have recommended the appropriate angle of the electrode for position welding such as:

Flat Position	10° - 15°
Horizontal Position	20° - 25°
Vertical Position (uphill)	10° - 20°
Overhead Position	10° - 15°
Vertical (Downward)	30°

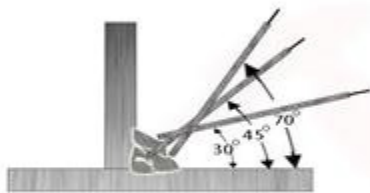
Work angle or transverse angle is directed toward the middle of the joint. Proper work angle directs heat to both sides of the plates, usually set at an angle of 45 degrees for the same thickness plates. In case of different plate thickness, 60 degrees is preferably used.



METAL WELDED FORMING "I"



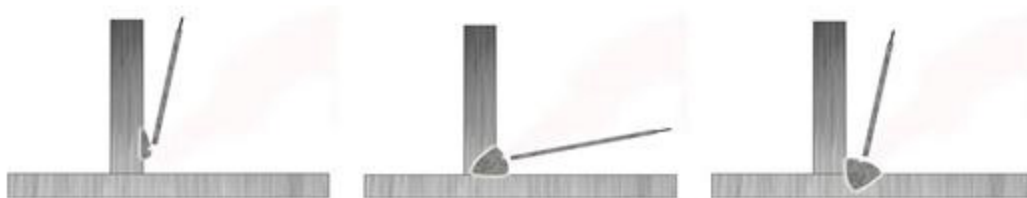
THIN METAL WELDED TO THICK METAL



DIFFERENT WORK ANGLE FOR MULTIPASS FILLET WELD



WORK ANGLE FOR SINGLE PASS FILLET WELD



IMPROPER WORK ANGLE MAY LEAD TO WELD DEFECTS SUCH AS:

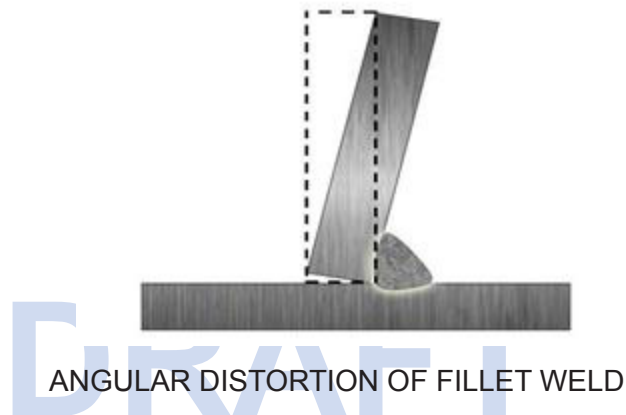
- Undercut
- Underfill
- Overheat the joint
- Incomplete fusion
- Poor bead contour

Plate and Joint Preparation

In plate preparation, the following should be done to avoid weld defects:

1. Joints should be free from rust, paints, grease, and other foreign materials prior to fit up or tacking.
2. Alignment of work piece is checked in accordance with welding standard.
3. Included angle is checked in accordance with Welding Procedure Specification.
4. Tack welding is performed in accordance with welding procedure requirement.

Note: Improper tack weld or wrong electrode manipulation will generate heat build up in the workpiece and eventually lead to distortion.



Welding Safety

1. Always wear Personal Protective Equipment (PPE) such as:
 - Welding jacket (leather)
 - Welding gloves (leather)
 - Welding helmet/mask
 - Leather spats
2. Steel toe leather shoes during the welding activity
3. Read, understand and follow the appropriate manufacturers instructions and safety precautions for the welding activity.
4. Use welding tong or pliers for handling hot metal/s.
5. Use face shield, earmuffs and dust mask for grinding operations.
6. Use enough ventilation and exhaust at the work, to keep fumes and gases away from your breathing zone and general work area.
7. Avoid contact of flux.
8. Apply immediate First Aid for the following:
 - If there is chest pain, shortness of breath, cough, or fever develops after welding, obtain medical help immediately.
 - If the flux, slag and small metal bit directly contact the eyes, flush it immediately with clean water for at least 15 minutes.

SELF CHECK 1.1
WELDING CARBON STEEL PLATES (1F)

A. Write the letter of the best answer in every item. Provide a separate answer sheet.

_____ 1) It is the area where filler metal intersects the base metal opposite face.

- | | |
|-------------|--------------|
| a. Weld toe | c. Weld root |
| b. Weld leg | d. Weld face |

_____ 2) It is the surface of the base metal that melts during welding.

- | | |
|-------------------|----------------|
| a. Fusion welding | c. Fusion face |
| b. Weld root | d. Weld Toe |

_____ 3) It is the shortest distance from the face of a fillet weld to the weld root after welding.

- | | |
|---------------------|-----------------------|
| a. Actual Throat | c. Theoretical Throat |
| b. Effectice Throat | d. Weld Toe |

_____ 4) It is the work angle used for thin metal welded to thick metal plate fillet weld.

- | | |
|--------------|--------------|
| a. 40 degree | c. 45 degree |
| b. 55 degree | d. 60 degree |

_____ 5) A fillet weld is a weld type in the cross-sectional shape of a _____.

- | | |
|--------------|-------------|
| a. Square | c. Circle |
| b. Rectangle | d. Triangle |

B. Write TRUE if the statement is correct, and FALSE if the statement is wrong. Provide a separate answer sheet.

_____ 6. A fillet weld requires little or no edge preparation.

_____ 7. Fillet weld length and pitch dimension may be indicated by notes on print.

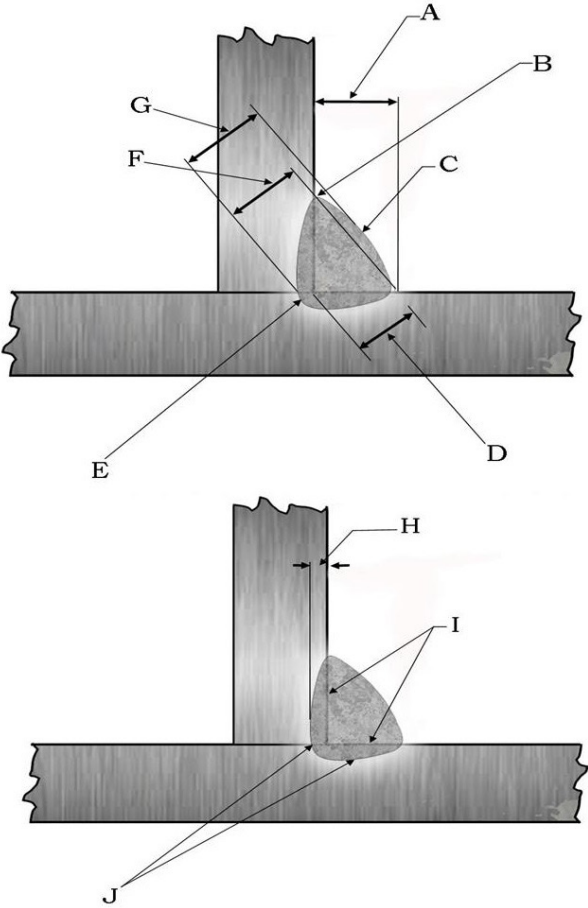
C. Enumerate the 3 types of fillet joints.

8. _____

9. _____

10. _____

D. Identify these fillet weld symbols on Column A by choosing the letter of your answer in Column B. Use a separate answer sheet.

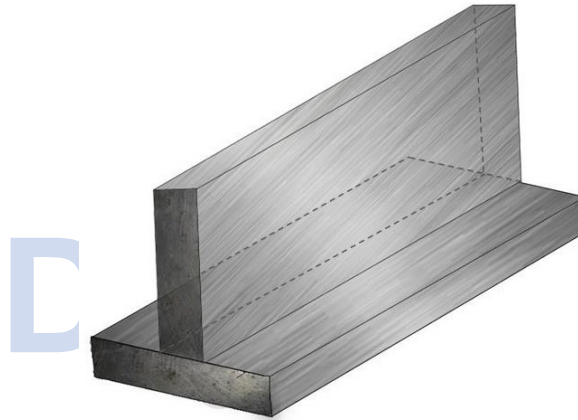
COLUMN A	COLUMN B
<p>_____ 1) Weld toe</p> <p>_____ 2) Theoretical throat</p> <p>_____ 3) Depth of fusion</p> <p>_____ 4) Weld interface</p> <p>_____ 5) Weld leg</p> <p>_____ 6) Effective throat</p> <p>_____ 7) Fusion face</p> <p>_____ 8) Weld root</p> <p>_____ 9) Weld face</p> <p>_____ 10) Actual throat</p>	

INFORMATION SHEET 1.2

SINGLE PASS FILLET WELD IN FLAT POSITION

Steps in welding Carbon/Mild steel plates (1F)

1. Prepare the workpiece. (2pcs. 10mm X 50mm X 200mm Mild steel plates)
The plate should be clean and is ready for welding.
2. Use the E6013 welding rod and put it in the electrode holder.
3. Properly fasten the ground clamp from the welding table.
4. Adjust Welding Machine for correct current and amperage settings. (95 amps.)
Note: (85-100 range of adjustment)
5. Lay the plate on the welding table and assemble the plates to form a T-Joint.



Note: Two sides (surface) in contact must be clean and fitted properly.

6. Tack two ends at the center.



Note:The tacking of at least 10mm long and with acceptable weld is necessary.

7. Clamp firmly the workpiece in a welding positioner.



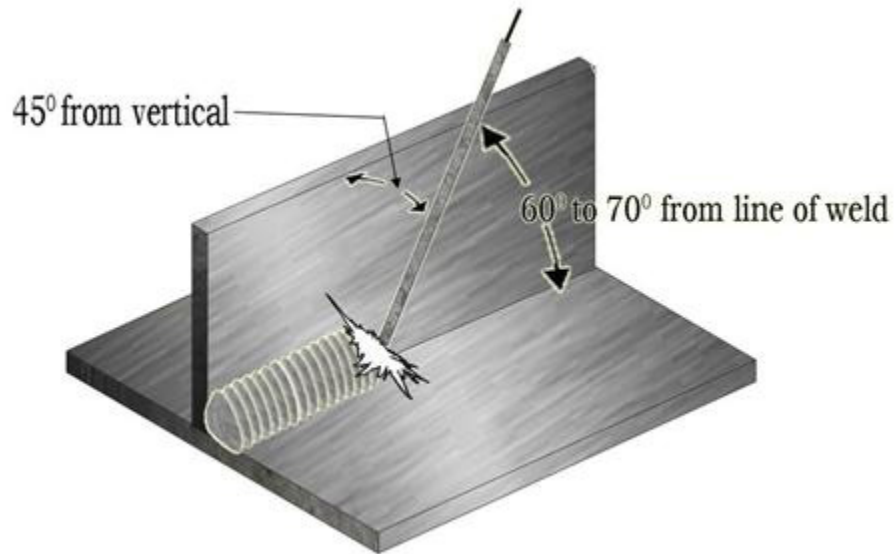
Figure 9. Welding positioner and a sample workpiece

Some tack weld the workpiece on the welding table if the welding positioner is not available.

8. Strike the arc at the starting point and hold the rod at correct angles then shorten the arc at the finishing points and fill the crater with molten metal. You may use *whipping* or *dragging* techniques.

Note:

- Weld at this position (flat).
- Use 3.25mm AE electrode
- Weld at 70° travel angle and 45° work angle



9. Remove the slag with the chipping hammer and clean the bead using the steel brush. Use face shield for eye protection.
10. Visually check the following: weld appearance, plate squareness/alignment, bead weave pattern, weld defects such as undercut or overlaps, starting/finishing points and bead connection (if applicable). Measure the leg length with the fillet gauge (it should be 6mm.)





Figure 10. Fillet gauge and its use for measuring leg length

Helpful Tips in Welding

- Longer arc lengths will result to increased puddle heat, flattens weld, deep penetration.
- Shorter arc lengths will result to less puddle heat, less penetration.
- Use correct arc length to control puddle size, penetration and burn through.
- Normal arc length is 1/16-1/8 inch.
- Use a slightly longer arc length during a start or restart.
- Strike the rod to the corner of the plates to avoid arc strikes.
- Clean your welding hood lens.
- Do not drape the electrode cable over your shoulder or knees. It may cause electric shock to you.
- Position yourself to be comfortable in any welding activity.
- Watch the puddle and the arc.
- Concentrate on steady travel speed and arc length.

ACTIVITY SHEET 1.2

SINGLE PASS FILLET WELD IN FLAT POSITION

Objective:

To weld a single pass fillet weld in flat position. The bead should not exceed the required size and of equal leg lengths, profile not concave nor convex, with fine ripples and welded plates perpendicular to each other .

Material/supplies:

- 2pcs.Mild Steel plates 10mm X 50mm X200mm
- 4pcs. E-6013- 3.25mmÆ

Tools and Equipment:

- AC or DC welding machine with accessories
- Chipping hammer
- Steel brush
- Welding gloves
- Welding apron
- Welding helmet/shield
- Fillet gauge
- Portable grinder

Procedures:

1. Wear the appropriate Personal Protective Equipment (PPE) before welding.
2. Prepare the tools, equipment and materials needed.
3. Set up the welding machine and adjust the correct current amperage settings. 95 amps.
 - 85-100 amperes (range of adjustments)
4. Use E6013 electrode and tackweld the metal to form a T- joint.
5. Clamp firmly the workpiece to the welding positioner, and clean the joint to be welded.
6. Strike the arc at the starting point and hold the rod at correct angles then shorten the arc at the finishing points and fill the crater with molten metal.
7. Remove the slag with a chipping hammer and clean the bead using steel brush.

Note: Use clear goggles/face shield when chipping. The direction of chipping should be away from you.

8. Properly clean the metal for inspection.
9. Visually check the following:
 - Plate alignment and squareness
 - Bead weave pattern
 - Weld defects such as porosity, undercut, overlaps
 - Bead connection

WORKING DRAWING



Figure 11. Fillet weld in flat position (1F)

SELF-CHECK 1.2

SINGLE PASS FILLET WELD IN FLAT POSITION

Rate the quality of your weld using the performance rubrics to determine your score and equivalent rating.

Category/ Dimensions	5 Points	4 Points	3 Points	1 point
Plate alignment and squareness	0-1 degree angle deflected from 90 degrees	2-3 degrees angle deflected from 90 degrees	4-5 degrees angle deflected from 90 degrees	6-10 degrees angle deflected from 90 degrees
Smoothness and Uniformity of Beads	All beads were smooth and uniform	Most beads were smooth and uniform	Some beads were not smooth and uniform	Almost all beads were not smooth and uniform
Proper use of Tools and Equipment	Used tools and equipment with confidence	Used tools and equipment with less confidence	Used tools and equipment with the help of others	Unable to use tools and equipment properly
Application of Procedures	Effective application of procedures was evident	Application of procedures was acceptable	Application of procedures was inconsistent	Application of procedures was unacceptable
Safety Work Habits	Observed safety practices at all times	Observed safety practices most of the time	Observed safety practices sometimes	Observed safety practice once
Time Management	Activity tasks completed ahead of time	Activity tasks completed just on time	Activity tasks completed after time limit	Activity tasks completed after extended time

Rating Scale:

Points Earned	Numerical Rating	Descriptive Rating
25-30	91-100	Advanced
19-24	86 - 90	Proficient
13-18	81 - 85	Approaching Proficiency
7-12	76 - 80	Developing
1- 6	71 - 75	Beginning

SUMMATIVE ASSESSMENT TEST QUARTER I

A. Write the letter of the best answer in every item. Provide a separate answer sheet.

1. It is the area where filler metal intersects the base metal opposite face.
 - a. Weld toe
 - b. Weld leg
 - c. Weld root
 - d. Weld face
2. It is the surface of the base metal that is melted during welding.
 - a. Fusion welding
 - b. Weld root
 - c. Fusion face
 - d. Weld Toe
3. It is the shortest distance from the face of a fillet weld to the weld root after welding.
 - a. Actual Throat
 - b. Effectice Throat
 - c. Theoretical Throat
 - d. Weld Toe
4. Lap Joint is commonly welded on _____ to provide additional strength.
 - a. One side of the plate
 - b. Both sides of the plate
 - c. Edge of the plate
 - d. None of the above
5. A fillet weld is a weld type in the cross-sectional shape of a _____.
 - a. Square
 - b. Rectangle
 - c. Circle
 - d. Triangle
6. In performing Stringer beads, which of the following techniques is used?
 - a. Crescent weave
 - b. Oscillating weave
 - c. Square weave
 - d. Whipping
7. Metal to be welded should be tack welded in
 - a. Both edge of the plate
 - b. Center of the joint
 - c. Both end and center of the joint
 - d. None of the above
8. What is the specified length of tack welds on fillet welds?
 - a. 20 mm
 - b. 5mm
 - c. 15 mm
 - d. 10 mm
9. What is the acceptable weld length if you are using 1/8 E6013 electrode in single pass fillet weld?
 - a. 6 mm
 - b. 12 mm
 - c. 10 mm
 - d. 14 mm
10. In stringer bead in flat fillet weld of the same thickness plate, the work angle is always
 - a. 30 degree
 - b. 60 degree
 - c. 45 degree
 - d. 70 degree
11. Travel angle for single pass fillet weld is usually set at an angle of
 - a. 45 degrees
 - b. 60 degrees
 - c. 75 degrees
 - d. 85 degrees
12. In welding fillet, the normal arc length is
 - a. 1/16 – 1/8 inch
 - b. 1/8 – 3/16 inch
 - c. 1/4 - 3/8 inch
 - d. 5/16 – 1/2 inch

B. Enumerate the three (3) types of fillet joints.

1. _____
2. _____
3. _____

C. Performance Test (10 points)

SINGLE PASS FILLET WELD IN FLAT POSITION

Weld a single pass fillet weld in flat position. The bead should not exceed the required size and of equal leg lengths profile not concave nor convex with fine ripples and welded plates perpendicular to each other, following safety procedures.

Materials/supplies:

- 2pcs. Mild Steel plates 10mm X 50mm X200mm
- 4pcs. E-6013- 3.25mmÆ

Tools and Equipment:

- AC or DC welding machine with accessories
- Chipping hammer
- Steel brush
- Welding gloves
- Welding apron
- Welding helmet/mask
- Fillet gauge
- Portable grinder

Procedures: Refer to Activity sheet 1.2 “Single Pass Fillet Weld in Flat Position”.

PERFORMANCE RUBRICS

a. Plate Alignment and Squareness

Plate alignment and squareness	Points Earned
0- 1 degree angle deflected from 90 degrees	10
2- 3 degrees angle deflected from 90 degrees	8
4- 5 degrees angle deflected from 90 degrees	6
6- 7 degrees angle deflected from 90 degrees	4
8-10 degrees angle deflected from 90 degrees	2
11-15 degrees angle deflected from 90 degrees	0

b. Weld Defects

CATEGORY/DIMENSION	POINT/S DEDUCTIONS	POINT/S EARNED
Uniformity and smoothness of bead.	NO defects	10
Convexity/concavity	1 defect	8
Underfill	2 defects	6
Undercut	3 defects	4
Cracks	4 defects	2
Cold laps	5 defects	0
Slag inclusion		
Excessive reinforcement		
Spatters		
Arc Strikes		

RATING SCALE

POINTS EARNED	NUMERICAL RATING	DESCRIPTIVE RATING
17-20	96-100	Outstanding
13-16	90- 95	Very Satisfactory
9-12	85- 89	Satisfactory
5 - 8	80- 84	Fair
1- 4	75- 79	Needs Improvement
0	70- 74	Poor

DRAFT

WELDING FILLET ON CARBON/MILD STEEL PLATES (1F)

CONTENT STANDARD	PERFORMANCE STANDARD
The learner demonstrates understanding of basic concepts and underlying theories in welding fillet on carbon steel plates. (1F)	The learner independently demonstrates competency in welding fillet on carbon steel plates needed for the job.(1F)

QUARTER II

TIME ALLOTMENT: 36 HOURS

INTRODUCTION:

This module contains information and suggested learning activities on Welding fillet on carbon steel plates particularly in Flat position (1F). It includes instruction and procedure on how to weld fillet on carbon steel plates (1F).

The learning outcome contains learning activities supported by instruction sheets. Read the information sheets before you perform the instruction, answer the self-check, and perform the activities provided. To ascertain your competence, your teacher will assess/check if you have acquired the knowledge necessary to perform the skill portion of the particular learning outcome.

Upon completing this module, report to your teacher for assessment to check your achievement of knowledge and skills requirements of the learning competency. If you pass the assessment, you will be given a certificate of completion.

WELDING CARBON/MILD STEEL PLATES IN FLAT-FILLET POSITION (1F)

Assessment criteria

1. Perform stringer or layered beads in accordance with welding standards.
2. Observe uniformity of bead ripples in accordance with welding standards.
3. Observe weld capping/ final pass not exceeding allowable tolerances specified by welding codes/ standards on:
 - Concavity
 - Convexity
 - Height of reinforcement
 - Underfill
 - Porosities
 - Undercut
 - Cracks
 - Cold laps
4. Conduct visual inspection on the finished weldment in accordance with welding standards for
 - Spatters
 - arc strikes
 - slag inclusion
 - uniformity of beads
5. Use appropriate Personal Protective Equipment (PPE).
6. Perform proper housekeeping (5S).

PRE DIAGNOSTIC TEST

A. Fill in the missing word/words to complete the sentence. Write your answer on a separate answer sheet.

1. _____ are notes that apply to a given specification to all items on a set of prints.
2. Specific weld length are indicated by a number to the _____ of the weld symbol on the welding symbol.
3. The weld-all-around symbol is a supplementary symbol indicated by a(n) _____ at the intersection of the arrow and reference line, which specifies that the weld extend completely around the joint.
4. Intermittent fillet welds are indicated on the welding symbol by length and _____.
5. Weld _____ is the cross-sectional shape of the completed weld face.
6. Weld _____ is the method used to achieve the surface finish.
7. For combined weld symbols, the fillet weld is most commonly used in conjunction with _____ welds.

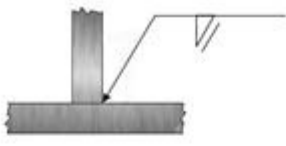
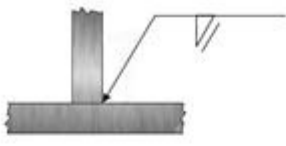
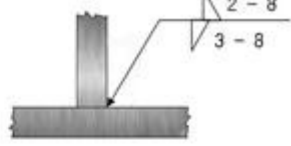
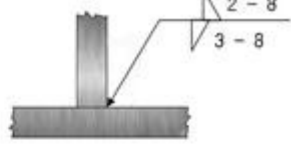
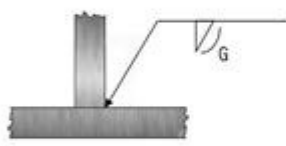
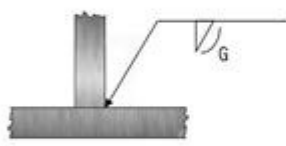
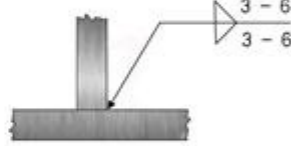
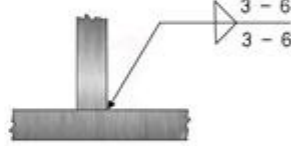
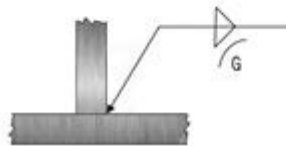
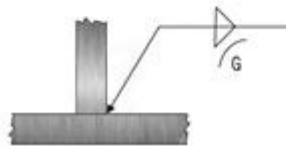
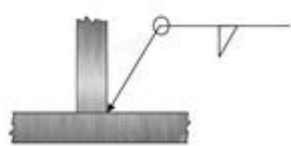
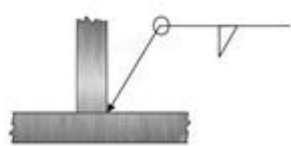
B. Write TRUE if the statement is correct, and FALSE if the statement is wrong. Provide a separate answer sheet.

_____ 8. A single dimension left of the weld symbol indicates that fillet weld leg sizes are equal.

_____ 9. No dimension to the right of a fillet weld symbol indicates that the welder may determine the length of the weld.

_____ 10. Chain intermittent fillet welds are spaced symmetrically on the opposite sides unless otherwise noted on the print.

C. Identify the fillet weld symbols in Column A by choosing the letter of your answer in Column B. Use a separate answer sheet

COLUMN A	COLUMN B	
_____ 1) Concave; grinding _____ 2) Staggered; Intermittent _____ 3) Flat contour _____ 4) Chain intermittent _____ 5) Convex; Grinding	 <p>A) </p>	 <p>D) </p>
	 <p>B) </p>	 <p>E) </p>
	 <p>C) </p>	 <p>F) </p>

DRAFT

INFORMATION SHEET 1.3

FILLET WELD SYMBOL

A *fillet weld* is a type of weld in the cross-sectional shape of a triangle. The fillet weld is indicated by a triangle placed on the reference line of the welding symbol. The vertical member of the fillet weld is always placed to the left. Fillet weld specification may require welding symbols with dimension, notes in prints, and graphic representation. See Figure 11.

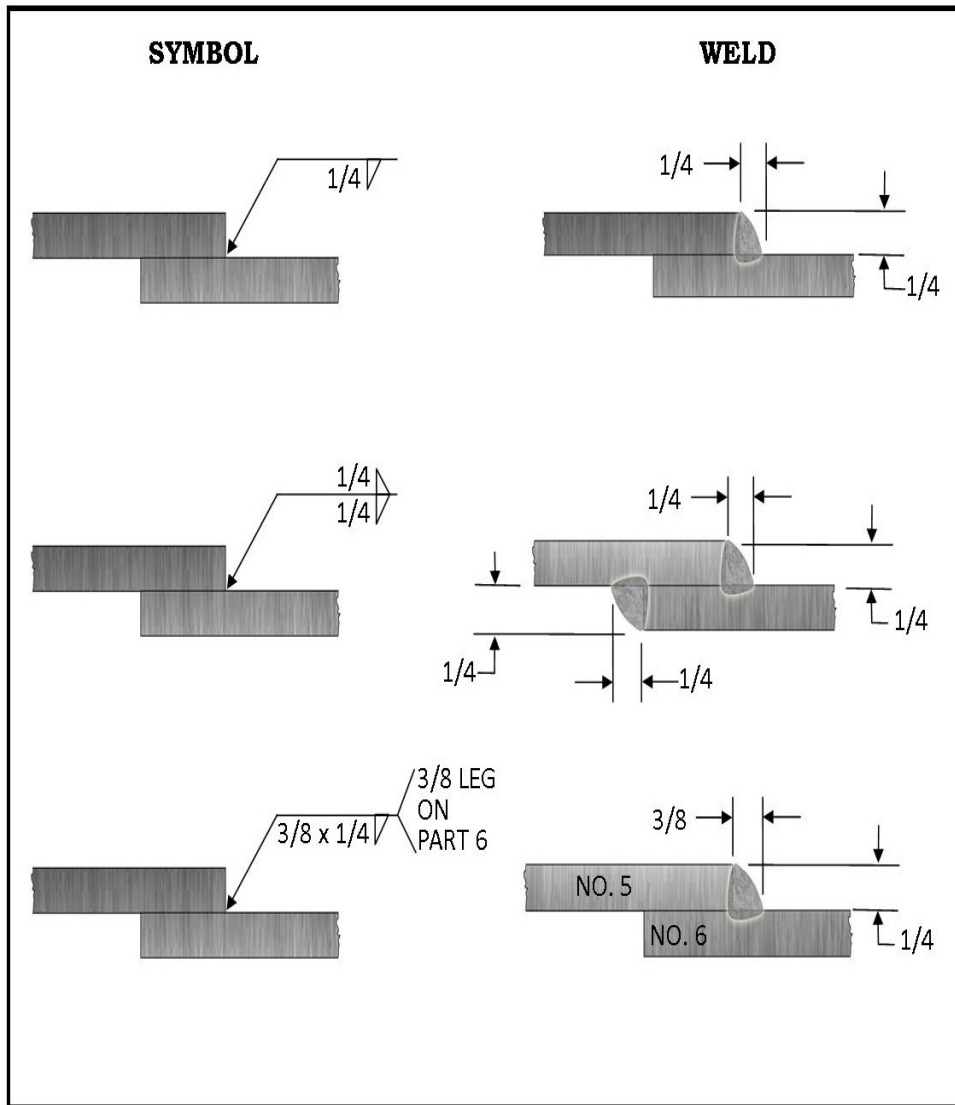


Figure 11. Fillet Weld Symbols

WELD ALL AROUND SYMBOL

The weld-all-around symbol is a supplementary symbol indicated by a *circle* at the intersection of the arrow and reference line, which specifies that the weld extends completely around the joint. Changes in direction of the weld require multiple arrows on the welding symbol to indicate the location of the weld. Multiple arrow on the welding symbols are not required if the weld-all-around symbol can be used. See Figure 12, which shows a sample of weld all around welds.

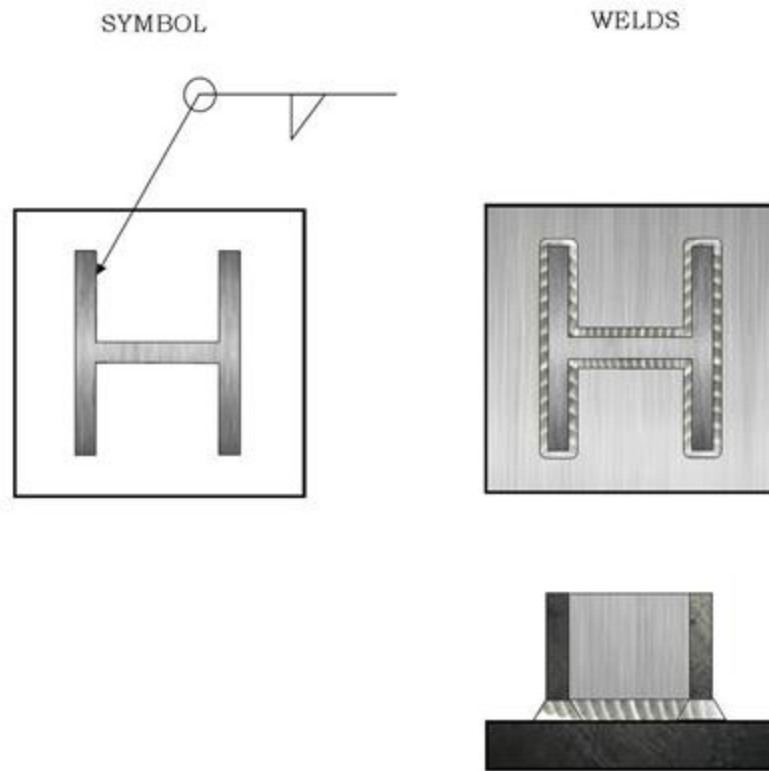
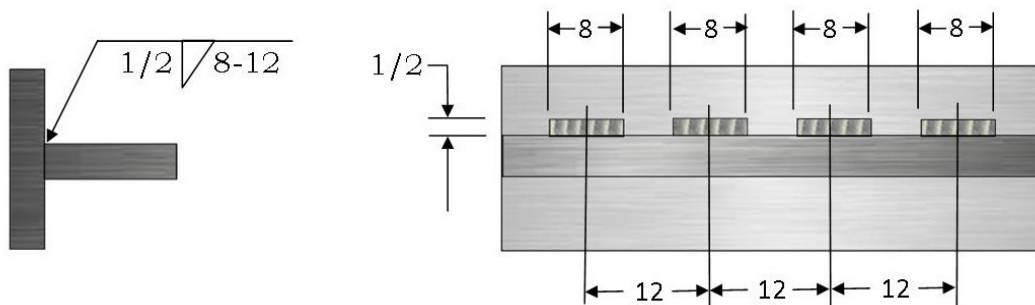


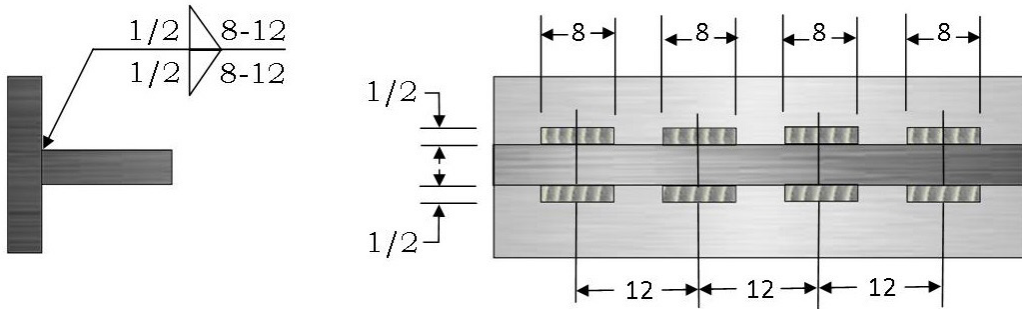
Figure 12. Weld-all-Around Welds

INTERMITTENT FILLET WELDS

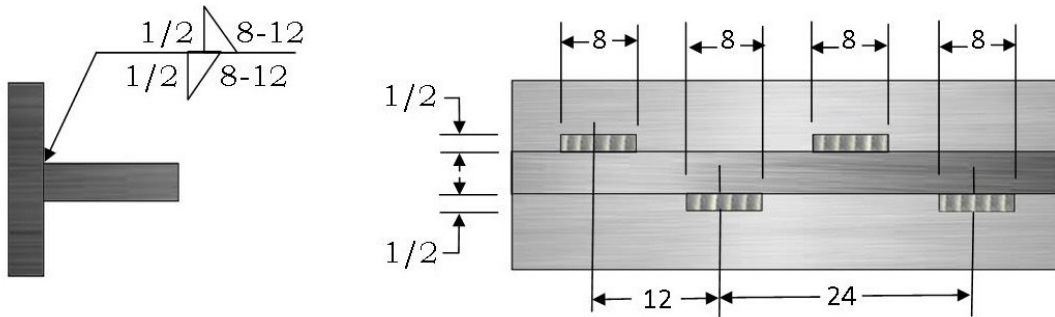
Intermittent fillet welds are short section of fillet welds applied at specified intervals on the weld parts. Intermittent fillet welds are indicated on the welding symbol by length and pitch. The length specified is the length of each weld section applied. The pitch specified is the center of each weld section. For example , an intermittent fillet weld with the dimension 8-12 specifies that 8" weld section are to be centered on 12" intervals. The figure below shows sample of intermittent welds.



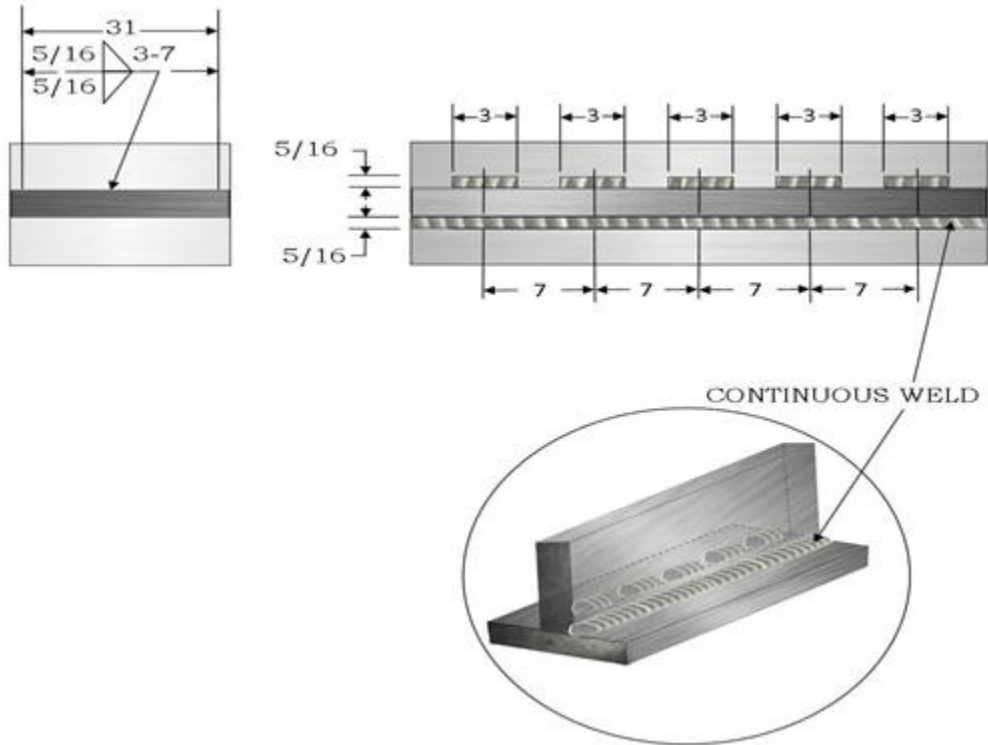
- **Chain intermittent fillet welds** are intermittent fillet welds that have the same specified length and pitch and are applied to both sides of the weld joint. Chain intermittent fillet welds are spaced symmetrically unless otherwise noted on print.



- Staggered Intermittent fillet welds** are intermittent fillet welds that have a staggered pitch and are applied to both sides of the weld joint. Staggered intermittent fillet welds are indicated on the welding symbol by a double-fillet weld symbol placed out of alignment on the reference line of the welding symbol. The leg and pitch for staggered intermittent fillet weld are indicated in the same way as intermittent fillet welds.

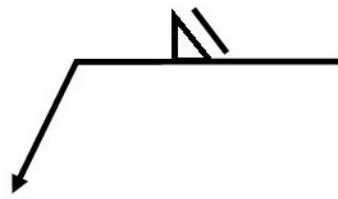


- Intermittent and continuous fillet welds** applied on the same side of the weld part require separate welding symbols.

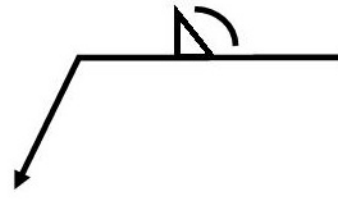


WELD CONTOUR AND WELD FINISH

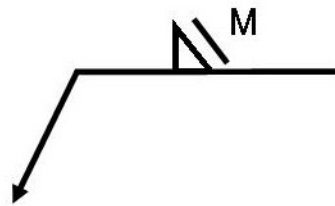
Weld contour is the cross-sectional shape of the completed weld face. **Weld finish** is the method used to achieve the surface finish. For example a flat contour is obtained by *grinding* the weld. See Figure 13.



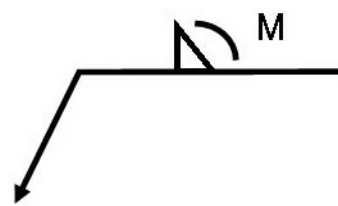
FLAT CONTOUR



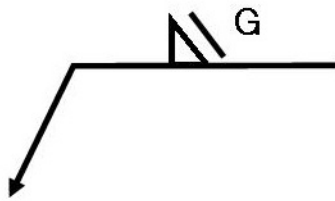
CONVEX CONTOUR



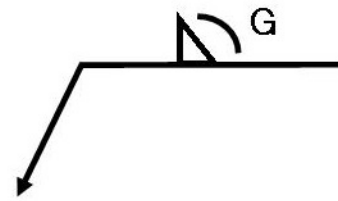
FLAT BY MACHINING



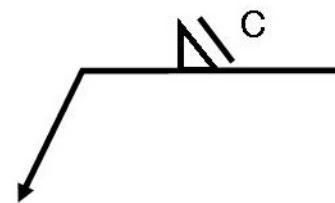
CONVEX BY MACHINING



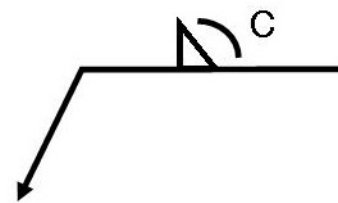
FLAT BY GRINDING



CONVEX BY GRINDING



FLAT BY CHIPPING



CONVEX BY CHIPPING

Figure 13. Fillet Weld Symbol for Weld Contour and Weld Finish

SELF CHECK 1.3

FILLET WELD SYMBOLS

A. Fill in the missing word/words to complete the sentence. Write your answer on a separate answer sheet.

1. _____ are notes that apply to a given specification to all items on a set of prints.
2. Specific weld length are indicated by a number to the _____ of the weld symbol on the welding symbol.
3. The weld-all-around symbol is a supplementary symbol indicated by a(n) _____ at the intersection of the arrow and reference line, which specifies that the weld extend completely around the joint.
4. Intermittent fillet welds are indicated on the welding symbol by length and _____.
5. Weld _____ is the cross-sectional shape of the completed weld face.
6. Weld _____ is the method used to achieve the surface finish.
7. For combined weld symbols, the fillet weld is most commonly used in conjunction with _____ welds.

B. Write TRUE if the statement is correct, and FALSE if the statement is wrong. Provide a separate answer sheet.

_____ 8) A single dimension left of the weld symbol indicates that fillet weld leg sizes are equal.

_____ 9) No dimension to the right of a fillet weld symbol indicates that the welder may determine the length of the weld.

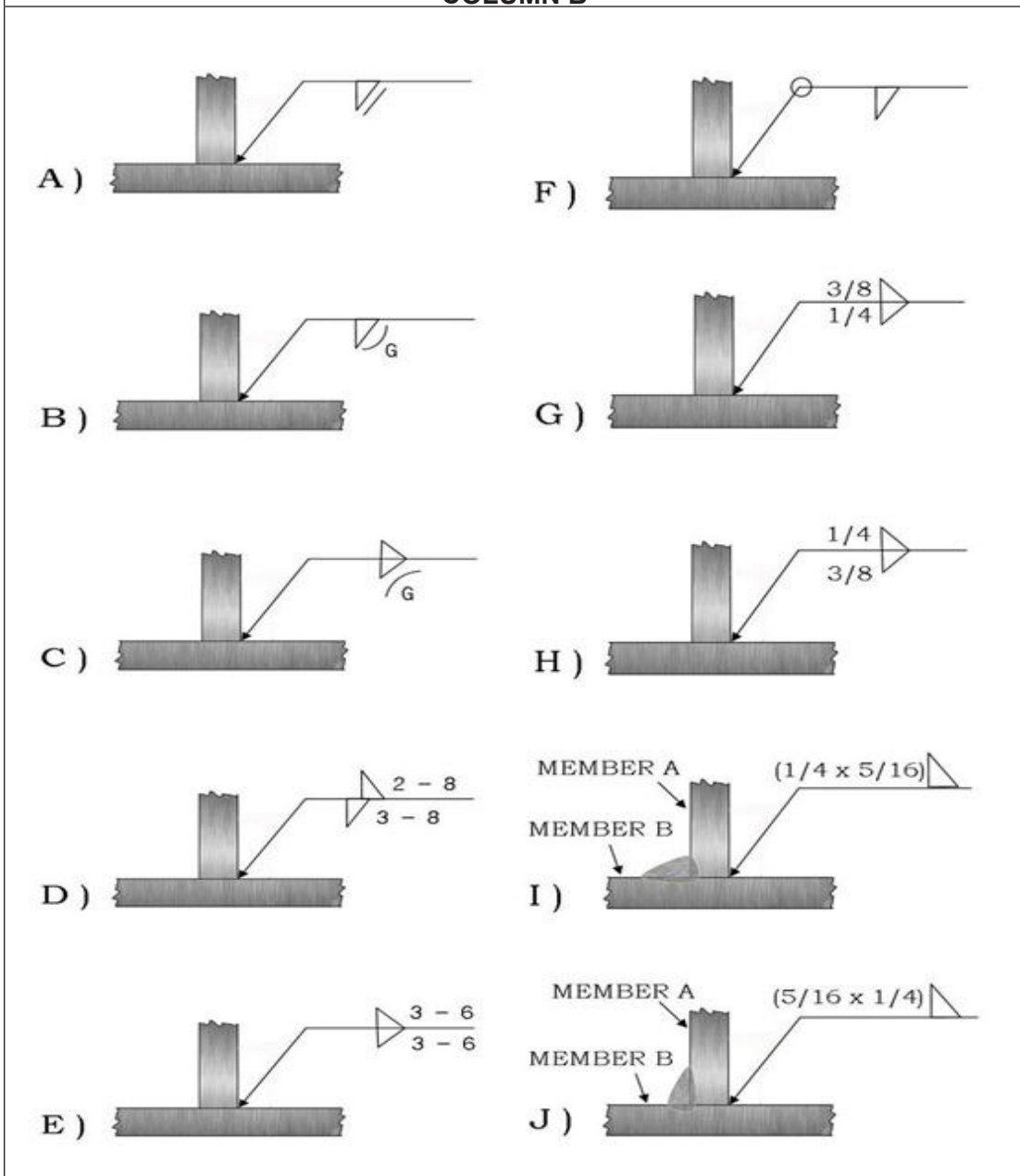
_____ 10) Chain intermittent fillet welds are spaced symmetrically on opposite sides unless otherwise noted on the print.

C. Identify the fillet weld symbols in Column A by choosing the letter of your answer in Column B. Use a separate answer sheet.

COLUMN A

- | | |
|---|---|
| _____ 1) Weld-all-around | _____ 6) Flat contour |
| _____ 2) 1/4" leg on Member A;
5/16" leg on Member B | _____ 7) Convex; grinding |
| _____ 3) Concave; grinding | _____ 8) Chain intermittent |
| _____ 4) Staggered; intermittent | _____ 9) 1/4" leg length near side |
| _____ 5) 3/8" leg length near side; | _____ 10) 5/16" leg on Member A
1/4" leg on Member B |

COLUMN B



INFORMATION SHEET 1.4

MULTI PASS WELD IN FLAT POSITION

Steps in multi pass weld in flat position.

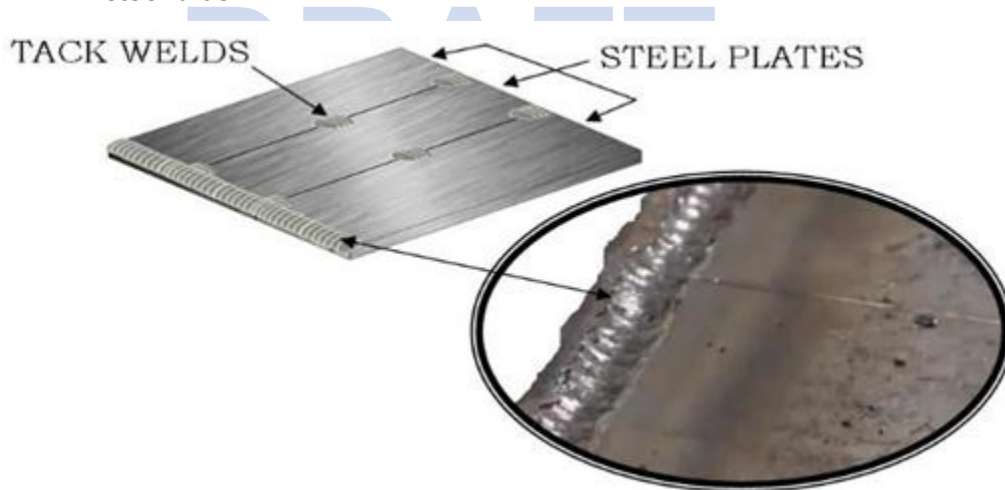
1. Prepare the workpiece. (3 pcs. 10mm X 50mm X 200mm Mild Steel Plates)
The plate should be clean and ready for welding.
2. Use the E 6013 welding rod and put it in the electrode holder.
3. Properly fasten the ground clamp from the welding table.
4. Adjust Welding Machine for correct current and amperage settings. (95 amps.)

Note: (85-100 range of adjustment)

5. Lay the plate on the welding table, and tackweld the plate.
6. Deposit the first bead right below the bottom edge of the plate. You may use *whipping* or *dragging* techniques.

Note:

- Weld at this position (flat).
 - Use 3.25mm AE electrode
 - Weld at 70° travel angle and 90° work angle
7. Remove the slag with the chipping hammer and clean the bead using the steel brush.



8. Strike the second bead to overlap the first bead by half to $2/3$ overlap. It must completely fuse the plate and the first bead.
9. Deposit all the remaining bead until you fill the entire plate.

Note:

- Try to overlap each previous bead by half.
- The slag must be chipped off each weld before the next weld bead is put in place.



Helpful Tips in welding

- Longer arc lengths will result to increased puddle heat, flattens weld, deep penetration.
- Shorter arc lengths will result to less puddle heat, less penetration.
- Use arc length to control puddle size, penetration and burn through.
- Normal arc length is 1/16-1/8 inch.
- Use a slightly longer arc length during a start or restart.
- Strike the rod to the corner of the plates to avoid arc strikes.
- Clean your welding hood lens.
- Position yourself to be comfortable in any welding activity.
- Watch the puddle and the arc.
- Concentrate on steady travel speed and arc length.

10. Remove the slag using a chipping hammer and clean it with a steel brush.

11. Visually inspect the bead and check for any weld defect afterward

Note:

- Size of weld
- Uniformity of bead
- Appearance of ripples
- Bead overlap and straightness

ACTIVITY SHEET1.4

MULTI PASS WELD IN FLAT POSITION

Objective:

To perform a multi pass weld in flat position. The bead should not exceed the required weld profile, not concave nor convex with fine ripples. The bead should be uniform, straight, and should be half to 2/3 overlap from one another.

Material/supplies:

- 3 pcs. Mild Steel plates 10mm X 50mm X 200mm
- 10 pcs. E-6013- 3.25mmÆ

Tools and Equipment:

- AC or DC welding machine with accessories
- Chipping Hammer
- Steel brush
- Welding gloves (leather)
- Welding apron (leather)
- Welding helmet/mask
- Portable grinder

Procedures:

- DRAFT
- Wear the appropriate Personal Protective Equipment (PPE) before welding.
 - Prepare tools, equipment and materials needed.
 - Set up the welding machine and adjust the correct current amperage settings to 95 amperes.
 - 85-100 amperes (range of adjustments)
 - Lay the plates on the welding table, and tackweld each part- one at the middle and at the end of the joint.
 - Deposit the first bead right below the bottom edge of the plate. You may use whipping or dragging techniques.
 - Remove the slag with a chipping hammer and clean the bead using the steel brush.

Note: Use clear goggles or face shield when chipping. The direction of chipping should be away from you.

- Strike the second bead to overlap the first bead by half to 2/3 overlap. It must completely fuse the plate and the first bead.
- Deposit all the remaining beads until you fill the entire plate.

Note: The slag must be chipped off before the next weld bead is put in place.

- Visually check the following:

Note: The weld should be correctly overlapped, straight, of even thickness and width with fine ripples.

WORKING DRAWING

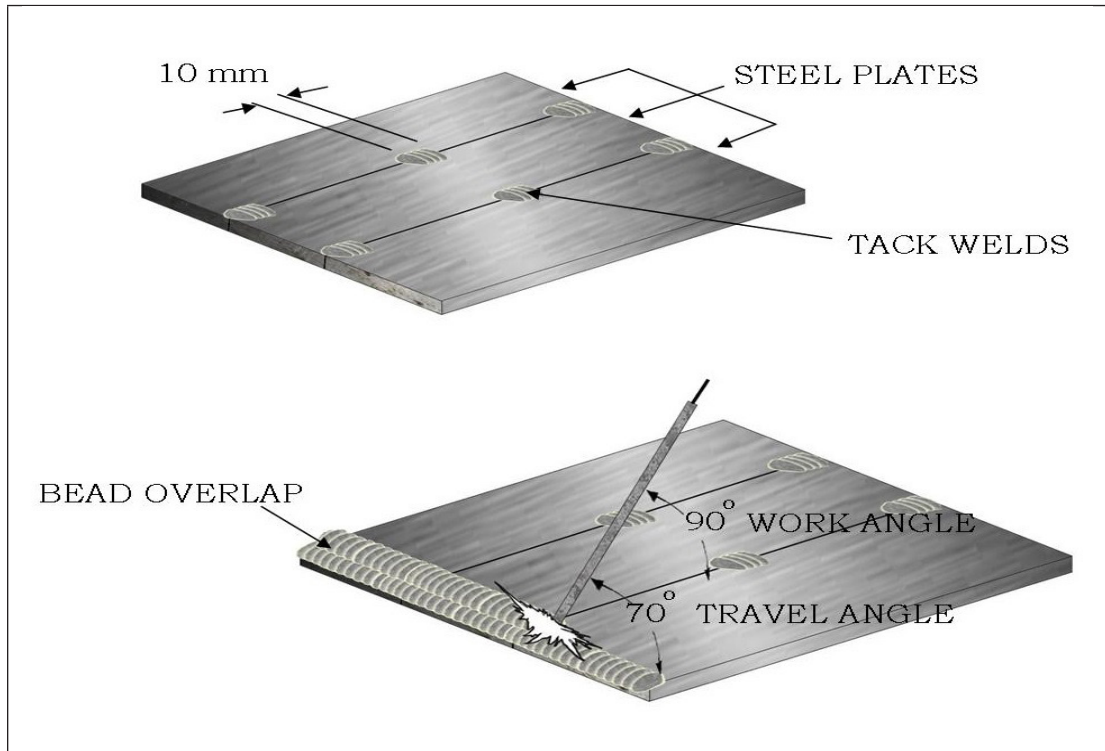


Figure 14. Welding processes for multipass in Flat position

SELF CHECK 1.4

MULTI PASS WELD IN FLAT POSITION

Rate the quality of your weld using the performance rubrics below to determine your score and equivalent rating.

Category/ Dimensions	5 Points	4 Points	3 Points	1 point
Plate alignment and squareness	0-1 degree angle deflected from 90 degrees	2-3 degrees angle deflected from 90 degrees	4-5 degrees angle deflected from 90 degrees	6-10 degrees angle deflected from 90 degrees
Smoothness and Uniformity of beads	All beads were smooth and uniform	Most beads were smooth and uniform	Some beads were not smooth and uniform	Almost all beads were not smooth and uniform
Proper use of tools and equipment	Used tools and equipment with confidence	Used tools and equipment with less confidence	Used tools and equipment with the help of others	Unable to use tools and equipment properly
Application of Procedures	Effective application of procedures was evident	Application of procedures was acceptable	Application of procedures was inconsistent	Application of procedures was unacceptable
Safety Work Habits	Observed safety practices at all times	Observed safety practices most of the time	Observed safety practices sometimes	Observed safety practice once
Time Management	Activity tasks completed ahead of time	Activity tasks completed just on time	Activity tasks completed after time limit	Activity tasks completed after extended time

Rating Scale:

Points Earned	Numerical Rating	Descriptive Rating
25-30	91-100	Advanced
19-24	86- 90	Proficient
13-18	81- 85	Approaching Proficiency
7-12	76- 80	Developing
1- 6	71- 75	Beginning

INFORMATION SHEET 1.5

MULTILAYER FILLET WELD IN FLAT POSITION

Steps in welding carbon/mild steel plates (1F):

1. Prepare the workpiece. (2pcs. 10mm X 50mm X 200mm Mild Steel Plates)
The plate should be clean and ready for welding.
2. Use the E6013 welding rod and put it in the electrode holder.
3. Properly fasten the ground clamp from the welding table.
4. Adjust Welding Machine for correct current and amperage setting of 95 amperes.

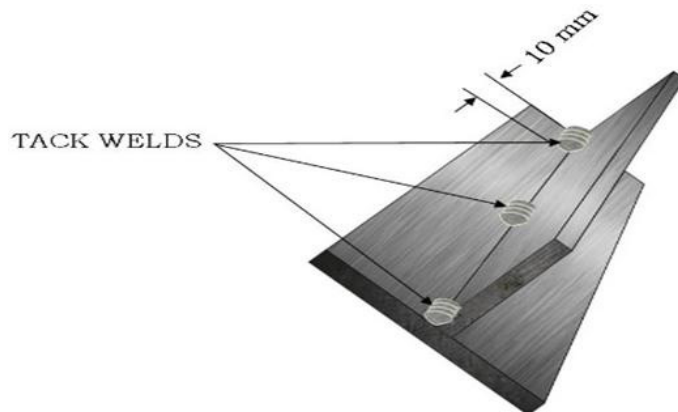
Note: 85-100 amperes- range of adjustment

5. Lay the plate on the welding table and assemble the plates to form a T-Joint.



Note: Two sides (surface) in contact must be clean and fitted properly.

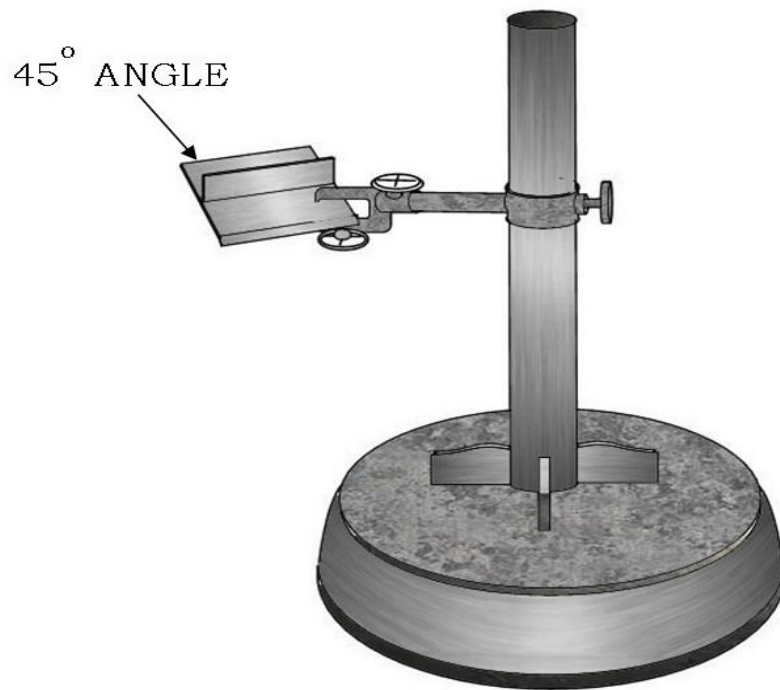
6. Tack two ends first at the center.



Note:

- The tacking of at least 10mm long.
- Tack weld with acceptable welding
- Tack weld is done to hold the plates in alignment.

7. Clamp firmly the workpiece in a welding positioner.



WELDING POSITIONER

Some tackweld the workpiece on the welding table if the welding positioner is not available.

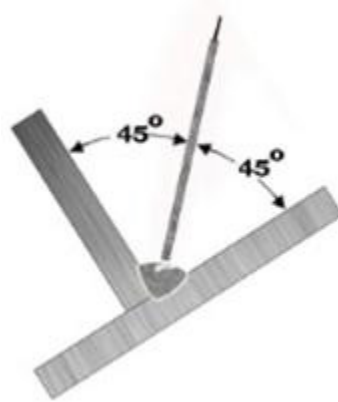
8. Strike the arc at the starting point (edge) and deposit the root pass. Hold the rod at correct angles then shorten the arc at the finishing points and fill the crater with molten metal. You may use *whipping* or *dragging* techniques.

Note:

- Weld at this position (flat).
- Use 3.25mm AE electrode.
- Weld at 70° travel angle and 45° work angle
- When an electrode is used up, and it is necessary to replace it with a new electrode, a proper termination of the weld must be made. This should be carried out as follows:
 - when the length of the electrode is about 40-50mm, go back along the weld about 15-20mm
 - deposit the bead not too fast, the molten pool must be maintained.
 - hold the electrode still for a second and break the arc. By following this procedure, you will have a good crater to start from again.

Restarting the arc

- using a new electrode, restart the arc near the end of the weld back to the leading edge of the crater, then maintain a normal arc until it reaches the end of the work piece.

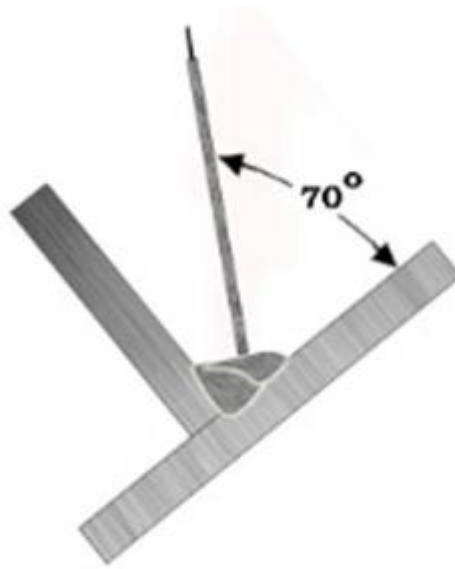


Number of passes	Electrode	Amperage settings	Welding technique
1st pass	E6013/6011	90- 95	Dragging/whipping
2nd pass	E6013/7018	95-105	Dragging/whipping
3rd pass	E6013/7018	105-115	Dragging/whipping

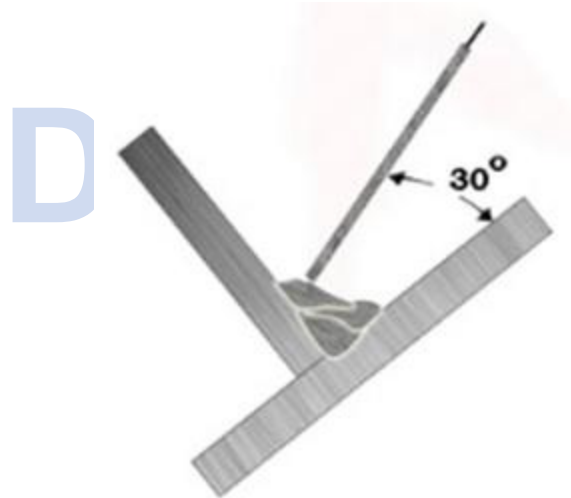
Table 2. Welding passes, types of electrode, required current and welding techniques for multilayer fillet weld.

Note: Grinding is not allowed for the subsequent passes. You can only use this method before and after the root pass is deposited.

9. Remove the slag with the chipping hammer and clean the bead using the steel brush. Use face shield or goggles for eye protection.
10. Deposit the hot pass/filler pass. It should overlap the first bead by half or 2/3 as in the illustration.



11. Deposit the cover pass/capping pass. It should overlap the second bead by half or 2/3 as in the illustration.



12. Visually check the following: weld appearance, bead weave pattern, weld defects such as undercut or overlaps, starting/finishing points and bead connection. If applicable, measure the leg length with the fillet gauge. It should be 10-12mm.

ACTIVITY SHEET 1.5

MULTI LAYER BEAD IN FLAT FILLET WELD

Objective:

To perform a multi layer weld in flat fillet position. The bead should not exceed the required weld profile, not concave nor convex with fine ripples. The bead should be uniform, straight, and should be half to 2/3 overlap from one another.

Materials/supplies:

- 2pcs. mild steel plates 10mm X 50mm X 200mm
- 8 pcs. E6013- 3.25mmÆ

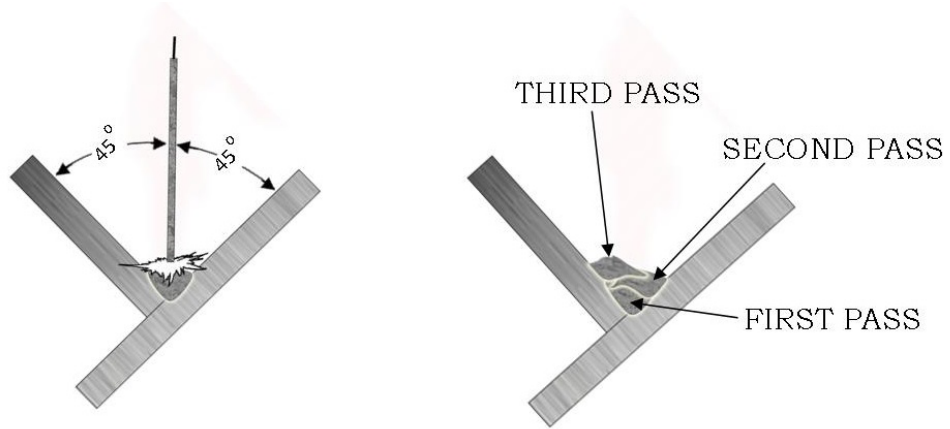
Tools and Equipment:

- AC or DC welding machine with accessories
- Chipping hammer
- Steel brush
- Welding gloves (leather)
- Welding apron (leather)
- Welding helmet/mask
- Portable grinder

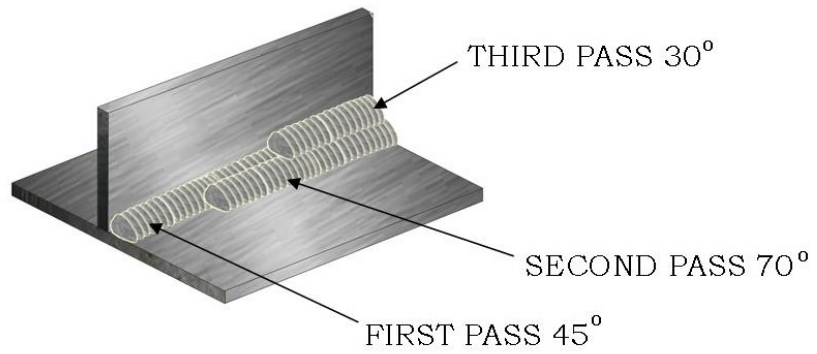
Procedures:

1. Wear the appropriate Personal Protective Equipment (PPE) before welding.
 2. Prepare the tools, equipment and materials needed.
 3. Set up the welding machine and adjust the correct current amperage settings at 95 amps.
 - 85-100 amperes (range of adjustments)
 4. Use E6013 electrode and tackweld the metal to form a T- joint.
 5. Clamp firmly the workpiece to the welding positioner, and clean the joint to be welded.
 6. Strike the arc at the starting point and hold the rod at correct angles then shorten the arc at the finishing points and fill the crater with molten metal
 7. Remove the slag with a chipping hammer and clean the bead using steel brush.
- Note:** Use clear goggles/face shield when chipping. The direction of chipping should be away from you.
8. Deposit the second pass. It should overlap the first bead by half or 2/3.
 9. Deposit the third pass. It should overlap the second bead by half or 2/3.
 10. Properly clean the metal for inspection.
 11. Visually check the following:
 - Plate alignment and squareness
 - Bead weave pattern
 - Weld defects such as porosity, undercut, overlaps
 - Bead connection

WORKING DRAWING



“V” WELD POSITION



POSITION OF ELECTRODE

Figure 15. Multi layer fillet welds

SELF CHECK 1.5

MULTILAYER FILLET WELD IN FLAT POSITION

Rate the quality of your weld using the performance rubrics to determine your score and equivalent rating.

Category/ Dimensions	5 Points	4 Points	3 Points	1 point
Plate Alignment and Squareness	0-1 degree angle deflected from 90 degrees	2-3 degrees angle deflected from 90 degrees	4-5 degrees angle deflected from 90 degrees	6-10 degrees angle deflected from 90 degrees
Smoothness and Uniformity of Beads	All beads were smooth and uniform	Most beads were smooth and uniform	Some beads were not smooth and uniform	Almost all beads were not smooth and uniform
Proper use of Tools and Equipment	Used tools and equipment with confidence	Used tools and equipment with less confidence	Used tools and equipment with the help of others	Unable to use tools and equipment properly
Application of Procedures	Effective application of procedures was evident	Application of procedures was acceptable	Application of procedures was inconsistent	Application of procedures was unacceptable
Safety Work Habits	Observed safety practices at all times	Observed safety practices most of the time	Observed safety practices sometimes	Observed safety practice once
Time Management	Activity tasks completed ahead of time	Activity tasks completed just on time	Activity tasks completed after time limit	Activity tasks completed after extended time

Rating Scale:

Points Earned	Numerical Rating	Descriptive Rating
25-30	91-100	Advanced
19-24	86- 90	Proficient
13-18	81- 85	Approaching Proficiency
7-12	76- 80	Developing
1- 6	71- 75	Beginning

SUMMATIVE ASSESSMENT TEST QUARTER II

A. Fill in the missing word/words to complete the sentence. Write your answer on a separate answer sheet.

1. _____ are notes that apply to a given specification to all items on a set of prints.
2. Specific weld lengths are indicated by a number to the _____ of the weld symbol on the welding symbol.
3. The weld-all-around symbol is a supplementary symbol indicated by a(n) _____ at the intersection of the arrow and reference line, which specifies that the weld extend completely around the joint.
4. Intermittent fillet welds are indicated on the welding symbol by length and _____.
5. Weld _____ is the method used to achieve the surface finish.
6. Weld _____ is the cross-sectional shape of the completed weld face.
7. For combined weld symbols, the fillet weld is most commonly used junction with _____ welds.

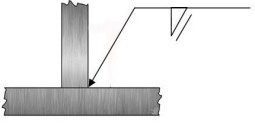
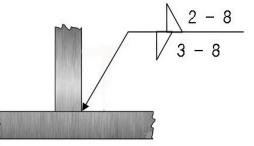
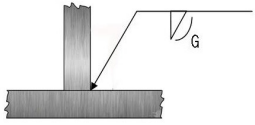
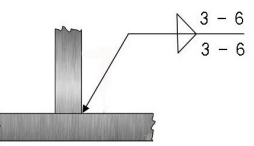
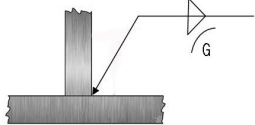
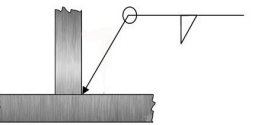
B. Write TRUE if the statement is correct and FALSE if the statement is wrong. Provide additional answer sheet.

_____ 8) A single dimension left of the weld symbol indicates that fillet weld leg sizes are equal.

_____ 9) No dimension to the right of a fillet weld symbol indicates that the welder may determine the length of the weld.

_____ 10) Chain intermittent fillet welds are spaced symmetrically on the opposite sides unless otherwise noted on the print.

C. Identify the fillet weld symbols in Column A by choosing the letter of your answer in Column B. Use a separate answer sheet.

COLUMN A	COLUMN B
<p>_____ 1) Staggered; Intermittent</p> <p>_____ 2) Chain Intermittent</p> <p>_____ 3) Concave; Grinding</p> <p>_____ 4) Convex; Grinding</p> <p>_____ 5) Flat contour</p>	<div style="display: flex; flex-wrap: wrap;"> <div style="width: 50%; text-align: center;">  <p>A)</p> </div> <div style="width: 50%; text-align: center;">  <p>D)</p> </div> <div style="width: 50%; text-align: center;">  <p>B)</p> </div> <div style="width: 50%; text-align: center;">  <p>E)</p> </div> <div style="width: 50%; text-align: center;">  <p>C)</p> </div> <div style="width: 50%; text-align: center;">  <p>F)</p> </div> </div>

D. Choose the best answer in each item. Provide a separate answer sheet.

1. In depositing root pass, the arc should be struck right to the _____ of the fillet joint to avoid arc strikes.
 - a. Lower corner part of the joint
 - b. Upper corner part of the joint
 - c. Corner edge of the joint
 - d. Middle of the joint
2. Longer arc length will result to:
 - a. Increased puddle time
 - b. Flattens weld
 - c. Deep penetration
 - d. All of the above
3. In multi layered beads, the number of weld pass can be determined by
 - a. Thickness of the plate
 - b. Diameter of the electrode
 - c. Joint preparation
 - d. All of the above
4. In multi pass weld, grinding is only allowed at

a. Capping	c. Hot pass
b. Root pass	d. Filler pass
5. A type of electrode typically used for root pass.

a. E6011	c. E7018
b. E6013	d. E9016

E. Performance Test (10 points)

Perform a multi layer weld in flat position. The bead should not exceed the required weld profile, not concave nor convex with fine ripples. The Bead should be uniform, straight and should be half to 2/3 overlap from one another, following safety procedures.

Materials/Supplies:

- 2pcs. mild steel plates 10mm X 50mm X 200mm
- 8 pcs. E-6013- 3.25mmÆ

Procedures:

1. Prepare tools and materials needed.
2. Tackweld steel plates following specified measurements.
3. Fasten tacked steel plates in a bench vise.
4. Deposit root pass, making sure that good penetration of beads is obtained.
5. Deposit second and third layers of beads.

PERFORMANCE RUBRICS

A. Plate Alignment and Squareness

Plate alignment and squareness	Points Earned
0- 1 degree angle deflected from 90 degrees	10
2- 3 degrees angle deflected from 90 degrees	8
4- 5 degrees angle deflected from 90 degrees	6
6- 7 degrees angle deflected from 90 degrees	4
8-10 degrees angle deflected from 90 degrees	2
0 degrees angle deflected from 90 degrees	0

B. Weld Defects

CATEGORY/DIMENSION	POINT/S DEDUCTIONS	POINT/S EARNED
Uniformity and smoothness of bead.	NO defects	10
Convexity/concavity	1 defect	8
Underfill	2 defects	6
Undercut	3 defects	4
Cracks	4 defects	2
Cold laps	5 defects	0
Slag inclusion		
Excessive reinforcement		
Spatters		
Arc Strikes		

RATING SCALE

POINTS EARNED	NUMERICAL RATING	DESCRIPTIVE RATING
17- 20	96-100	Outstanding
13-16	90 - 95	Very Satisfactory
9-12	85 - 89	Satisfactory
5- 8	80 - 84	Fair
1- 4	75 - 79	Needs Improvement
0	70 - 74	Poor

WELDING CARBON/MILD STEEL PLATES IN HORIZONTAL POSITION (2F)

CONTENT STANDARD	PERFORMANCE STANDARD
The learner demonstrates understanding of basic concepts and underlying theories of welding carbon steel plates in horizontal position (2F).	The learner independently demonstrates competency in welding carbon steel plates in horizontal position (2F).

QUARTER III

TIME ALLOTMENT: 36 HOURS

INTRODUCTION:

This module contains information and suggested learning activities on Welding Carbon/Mild Steel Plates in Horizontal Position (2F). It consists of one (1) learning outcome that contains learning activities supported by information sheets. Before you perform the activity, read the information/instruction sheet (s) provided, answer the self-check and other tests. Rate your output using the performance rubrics to determine whether you have acquired the necessary knowledge and skills expected of the learning outcome (LO).

Upon completion of this module, report to your teacher for assessment to check the accomplishment rating of your knowledge and skills required in this module. If you pass the assessment, you will be given a certificate of completion.

PERFORM WELDING CARBON/MILD STEEL PLATES IN HORIZONTAL POSITION (2F)

- Perform fillet weld based on acceptable welding requirements
- Ensure safety and health of welders

Carbon steel is a ferrous metal and is the most common metal used in fabrication and manufacturing. It can be classified into three (3) types 1.Low, 2.medium, and 3. high carbon steel classification, depending on the percentage of carbon content. (Low- .10 to .25 % carbon, Medium- .26 to .50 % carbon and High- .51 to 1. 03 carbon). The addition of carbon increases the tensile strength of iron.

Welding procedure information can be determined by means of the carbon equivalent formula. Carbon equivalent should be calculated for the exact composition. When the carbon equivalent is 40% or lower, the material is already weldable. Above 40%, special controls are required.

The fillet weld is the most common weld used in the industry. It is triangular in its cross-sectional shape, indicated by a triangle placed on the reference line of the welding symbol. It may require a little or no edge preparations.

Some welding tasks are not possible in the flat position particularly in fixed or heavy structures which will require welding in the horizontal position. Horizontal position refers to the welding position wherein the joint is on a vertical plane and the line of weld runs parallel with the horizon.

PRE/DIAGNOSTIC TEST

Write the letter of the best answer in every item. Provide a separate answer sheet.

1. A welding position where the joint is on a vertical plane and the line of weld runs parallel with the horizon.
 - a. Flat position
 - b. Horizontal position
 - c. Vertical position
 - d. Overhead position
2. In making lap joint using horizontal position, the electrode position is slanted in the direction of weld about
 - a. 5 to 20 degrees

- b. 10 to 25 degrees
 - c. 15 to 30 degrees
 - d. d. 45 to 75 degrees
3. The required electrode for depositing root pass.
- a. E- 6011
 - b. E- 6012
 - c. E- 6013
 - d. E- 6015
4. In tacking the plates to be welded, the gap to maintain between plates should be
- a. 2 mm
 - b. 3 mm
 - c. 4 mm
 - d. 5 mm
5. A weld type in a cross-sectional shape of a triangle is called
- a. Fillet weld
 - b. Groove weld
 - c. Backing weld
 - d. Spot weld

DRAFT

Fill in the blanks with the best answer.

1. The area where the filler metal intersects with the base metal opposite the weld face is _____.
2. In fillet welding, _____ occurs when the base metal and the filler metal are melted together.
3. Fillet weld sizes are indicated by notes on prints, dimensions on the left side of weld symbol and _____.
4. _____ means the cross-sectional shape of the completed weld face.
5. The area where the filler metal and the base metal mix together is called _____.

INFORMATION SHEET 2.1

PERFORM FILLET WELDING

Introduction:

The fillet weld is the most common weld used in the industry. It is a type of weld in the cross-sectional shape of a triangle. It joins two surfaces at approximately at right angle, to form a lap joint, t-joint or corner joint. Parts of fillet weld includes the following: weld root, weld face, weld toe, fillet weld leg, and fillet weld throat. See figure 15 (Parts of Fillet weld).

- Weld Root – the area where the filler metal intersects the metal opposite the weld face. It is shown in cross-sectional shape and is the deepest point of the fillet weld triangle.
- Weld Face – the exposed surface of a weld bonded by the weld toes of the side on which welding was done. It may be concave or convex. A concave weld face is curved inward. A convex weld face is curved outward.
- Weld Toe – the intersection of the base metal and the weld face. It is the point at which weld meets the base metal.
- Fillet Weld Leg – the distance from the joint root to the weld toe.
- Joint Root – the point of a joint to be welded where members are closest to each other.
- Fillet Weld Throat – throat and theatrical throat refers to the actual throat, effective throat and theoretical throat.
 - ◇ Actual throat – the shortest distance from the face.
 - ◇ Effective Throat – the shortest distance from the face to weld root.
 - ◇ Theoretical Throat – the distance from the face to the weld root before welding.
- Fusion – the condition that occurs where the base metal and filler metal are melted together.
- Weld Interface – the area where the filler metal and the base metal are mixed together.
- Fusion Face- the surface of the base metal that is melted during welding process.
- Depth of fusion – the distance from the fusion face to the weld interface.

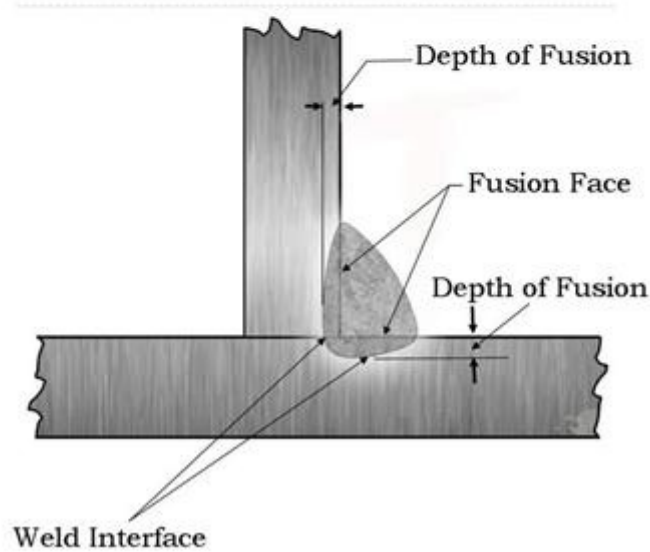
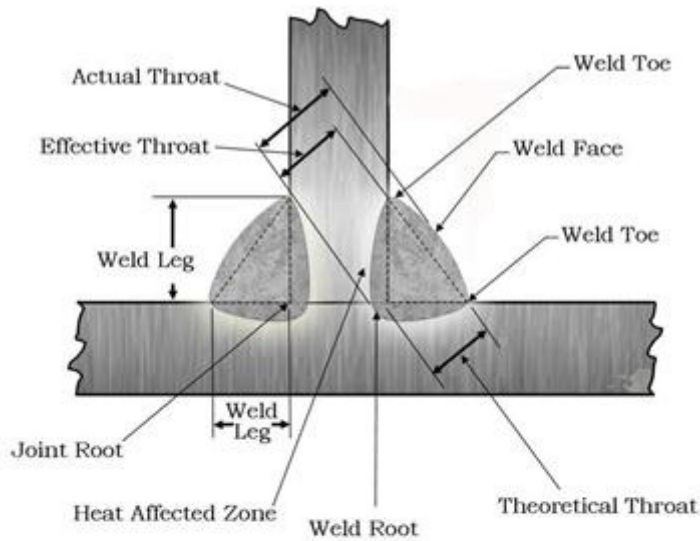


Figure 15. Parts of Fillet Weld

SIZE

The fillet weld size is determined by the leg size of weld. The fillet weld leg size is the dimension from the root of the weld to the toe after welding. Fillet weld sizes are indicated by notes on prints, dimensions included on the left side of the weld symbol, and graphic representations.

Notes on prints maybe general or specific. General notes are those that apply to a given specification to all items on the prints. Example, a note such as BRUSH ALL FILLET WELD TO REMOVE SLAG is a general note that applies to all fillet weld. (Specific notes on the other hand are those that apply to a given specification to such item). Example, a note such as $\frac{1}{4}$ " Leg on MEMBER A. See figure 16 which shows

notes on sizes and dimension of fillet welds.

SPECIFIC NOTE:

NOTE A: 1/4" LEG ON MEMBER A

GENERAL NOTE:

BRUSH ALL FILLET WELDS TO REMOVE SLAG

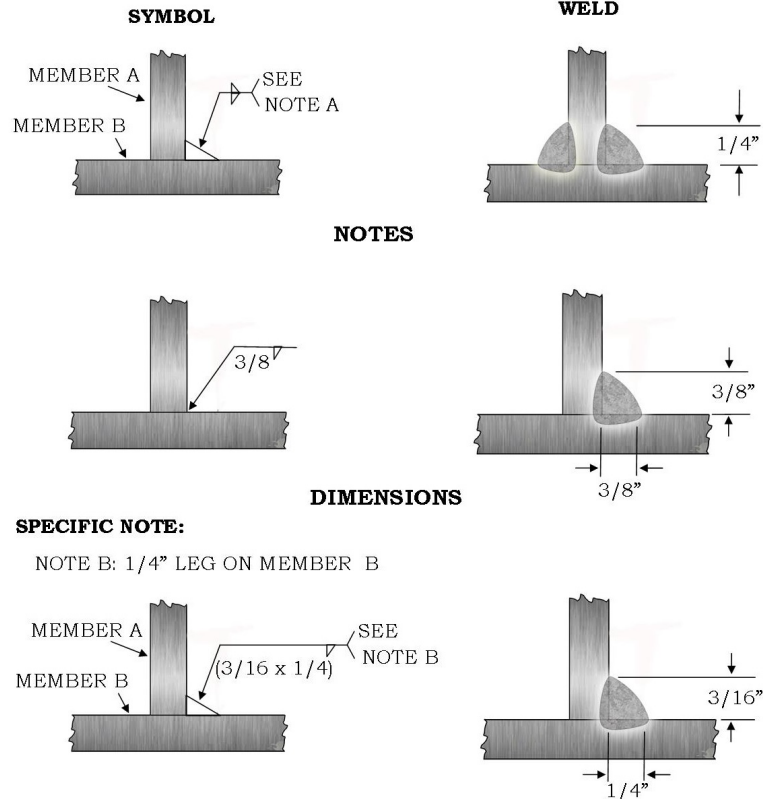


Figure 16. Notes on print showing sizes and dimension of fillet welds

CONTOUR AND FINISH

Weld Contour is the cross-sectional shape of the completed weld face. Weld finish is the method used to achieve the required surface finish. Both the fillet weld contour and finish are specified on the welding symbols. The contour symbol is placed next to the angled line of the fillet weld symbol to indicate a flat, convex or concave contour. See figure 17.

Fillet welds requiring mechanical finishing after welding to obtain the desired contour have a letter next to the weld contour symbol to show the finishing method needed. The finishing methods that maybe specified are the following: C for Chipping, H for Hammering, G for Grinding, M for Machining, R for Rolling, or U for Unspecified. See Figure 19.

WELD CONTOUR

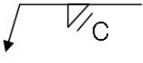
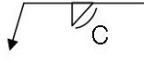
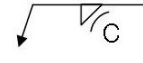


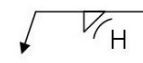
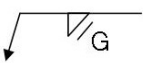
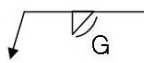

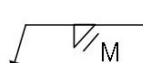


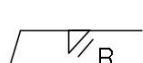


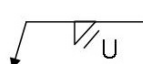
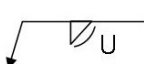

CONTOUR	SYMBOL	WELDING SYMBOL
FLAT	—	
CONVEX	⌒	
CONCAVE	⌒	

SYMBOL	WELD
	FLAT
	CONVEX
	CONCAVE

Figure 17. Weld contour and finish on fillet welds

COMBINED WELD SYMBOLS	
SYMBOL	WELD
FILLET AND DOUBLE - BEVEL - GROOVE	
FILLET AND BEVEL - GROOVE	
FILLET AND SQUARE - GROOVE	

Figure 18. Combined weld symbols

FINISHING METHODS				
LETTER	MECHANICAL METHOD	SYMBOL		
		FLAT	CONVEX	CONCAVE
C	CHIPPING			
H	HAMMERING			
G	GRINDING			
M	MACHINING			
R	ROLLING			
U	UNSPECIFIED			

EXAMPLE:

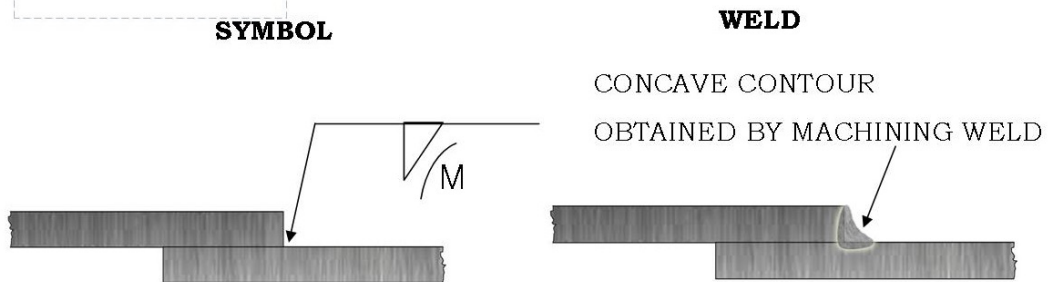


Figure 19. Finishing methods and contour symbols

SELF CHECK 2.1

PERFORM FILLET WELDING (2F)

- A. Write the letter of the best answer. Use a separate answer sheet.
1. The exposed surface of fillet weld bounded by the weld toes of the side on which welding was done is
 - a. Weld root
 - b. Weld face
 - c. Weld leg
 - d. Weld joint
 2. Fillet weld leg is the distance from the joint root to
 - a. Weld toe
 - b. Weld bead
 - c. Weld face
 - d. Weld root
 3. The surface of the base metal that is melted during the welding process
 - a. Depth of fusion
 - b. Fusion face
 - c. Fusion area
 - d. Length of fusion
 4. The fillet weld sizes are indicated by
 - a. Notes on print
 - b. Dimensions included on the weld symbol
 - c. Graphic representation
 - d. Specific instruction
 5. To obtain the desired contour in fillet welding, it requires
 - a. Surface finishing
 - b. Mechanical finishing
 - c. Weld finishing
 - d. All the above
- B. Enumerate the different finishing methods that maybe specified to obtain desired contour after welding.
1. _____
 2. _____
 3. _____
 4. _____
 5. _____

INFORMATION SHEET 2.2

SAFETY AND HEALTH OF WELDERS

Welder's safety and health is extremely important. All workers engaged in production and construction are continually exposed to potential hazards. There are a number of safety and health problems associated with welding. When correct precautionary measures are followed, welding is a safe occupation. Health officials state that welding, as an occupation, is no more hazardous or injurious to health than other metalworking operations.

The government has become increasingly active concerning the safety and health of workers. Laws prescribing safety regulations and the publication of safety warnings to ensure the safety of workers, have been implemented.

DIFFERENT HAZARDS RELATED TO WELDING

- Electrical shock
- Arc radiation
- Air contamination
- Fire and explosion
- Compressed gases
- Other hazards related to specific processes
 - ◇ Accident from falling
 - ◇ Hit by falling objects/debris
 - ◇ Exposure to hot metal

WELDING WORKPLACE SAFETY

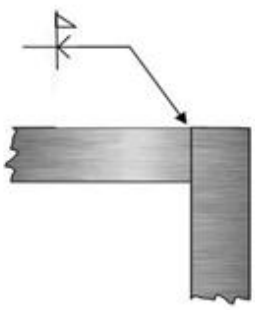

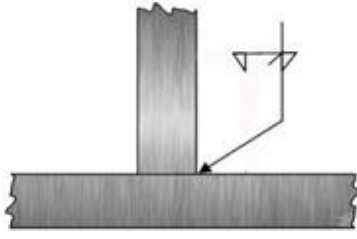

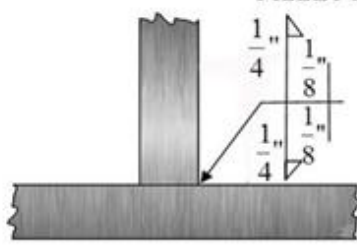
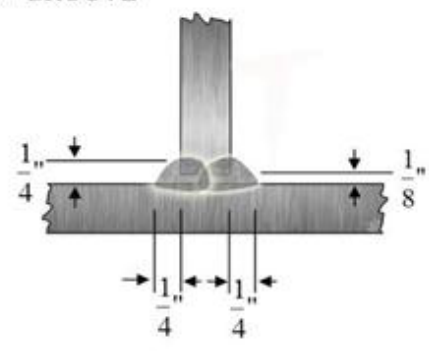
The welding shop management and its supervisors are responsible for providing training for workers in the safe conduct of their day to day activities. Employees must be informed and trained to detect hazards as well as protect themselves.

The welders and other employees have an obligation to learn and observe safe practices by obeying safety rules and regulations. They are responsible for the use of safe equipment and materials. It is the responsibility of supervisors to enforce the implementation of safety rules and regulations.

Good housekeeping practices should always be employed inside the welding shop. Adequate safety devices should be provided, such as fire extinguishers, life saving and support equipment, first aid kit plus training of personnel to utilize the appropriate equipment properly.

PROTECTIVE CLOTHING

Welders should wear appropriate work clothes without openings or gaps to prevent the arc rays from contacting skin. If the arc rays contact the skin for a period of time, it will result to painful "sunburn" or "arc burns". Wool fabric is much more satisfactory than cotton since it will not disintegrate from arc radiation. A welder's garb

COMBINED WELD SYMBOLS	
SYMBOL	WELD
FILLET AND DOUBLE - BEVEL - GROOVE	
	
FILLET AND BEVEL - GROOVE	
	
FILLET AND SQUARE - GROOVE	
	

SELF-CHECK 2.2

SAFETY AND HEALTH OF WELDERS

A. Write the letter of the best answer. Use separate answer sheet.

- _____ 1. To show concern about safety and health of welders, the government has
- a. Enacted laws prescribing safety regulations
 - b. Publish safety regulations and control
 - c. Ensure safety and health of workers
 - d. All of the above
- _____ 2. These are hazards related to welding, except
- a. Electric shock
 - b. Arc radiation
 - c. Water contamination
 - d. Fire and explosion
- _____ 3. To prevent arc rays from skin contact, welders should wear clothes without
- a. Collar
 - b. Openings or gap
 - c. Buttons
 - d. Sleeves
- _____ 4. Here are safety devices that welding workplace must have except
- a. Circuit breaker
 - b. Fire extinguisher
 - c. Life saving and support equipment
 - d. First aid kit
- _____ 5. The type of clothing that will not disintegrate from arc radiation or will not catch fire quickly is
- a. Leather
 - b. Linen
 - c. Woolen
 - d. Cotton

B. Enumerate five best safety precautions that must be posted inside welding workplace.

1. _____
2. _____
3. _____
4. _____
5. _____

ACTIVITY SHEET 2.1

PERFORM DEPOSITING STRAIGHT BEADS IN HORIZONTAL POSITION (2F)

The students should be able to perform depositing straight beads using horizontal position.

Materials/Supplies:

- 2 pcs. 10mm x 50 mm x 200mm, mild steel plate
- 5 pcs. E-6013 electrode, 3.2mm diameter

Tools and Equipment:

- Welding machine with complete accessories
- Head/Hand shield
- Chipping hammer
- Steel brush
- Welding Apron /jacket (leather)
- Welding gloves (leather)
- Working Bench
- Bench vise
- Steel rule

Procedures:

1. Wear appropriate Personal Protective Equipment (PPE).
2. Prepare materials and tools needed.
3. Draw four (4) parallel lines to the plate, 12mm apart.
4. Fasten the base metal/plate with the laid out lines in a bench vise
5. Adjust welding machine to correct current setting.
6. Deposit beads on the lines provided, maintaining 20 degrees electrode position, slanted in the direction of the weld.

WORKING DRAWING

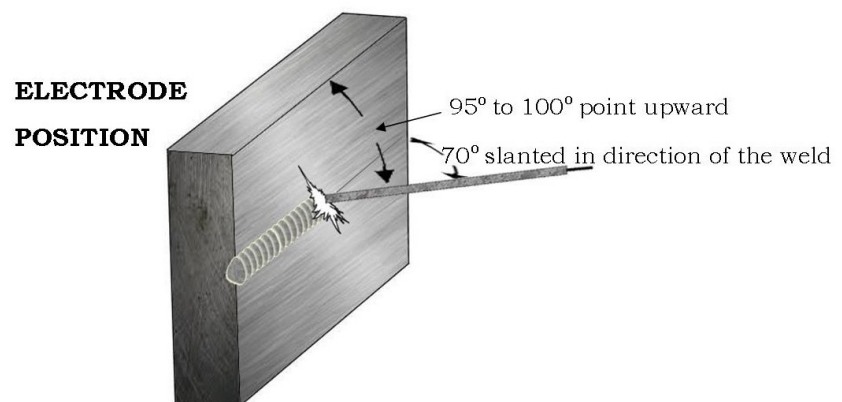
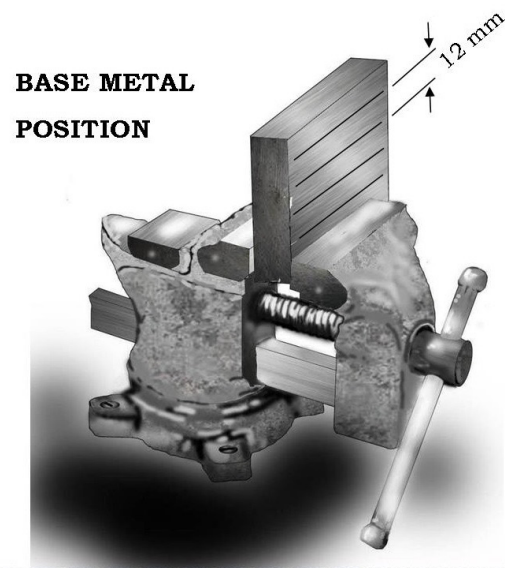


Figure 20. Depositing Straight Beads in Horizontal Position

SELF-CHECK 2.1a

PERFORM DEPOSITING STRAIGHT BEADS IN HORIZONTAL POSITION (2F)

Rate the quality of your weld using the performance rubrics to determine your score and equivalent rating.

Category/ Dimensions	5 Points	4 Points	3 Points	1 point
Smoothness and Uniformity of Beads	All beads were smooth and uniform	Most beads were smooth and uniform	Some beads were not smooth and uniform	Almost all beads were not smooth and uniform
Proper use of Tools and Equipment	Utilized tools and equipment with confidence	Utilized tools and equipment with less confidence	Utilized tools and equipment with the help of others	Unable to utilize tools and equipment properly
Application of Procedures	Effective application of procedures was evident	Application of procedures was acceptable	Application of procedures was inconsistent	Application of procedures was unacceptable
Safety Work Habits	Observed safety practices at all times	Observed safety practices most of the time	Observed safety practices sometimes	Observed safety practice once
Time Management	Activity tasks completed ahead of time	Activity tasks completed just on time	Activity tasks completed after time limit	Activity tasks completed after extended time

Rating Scale:

Points Earned	Numerical Rating	Descriptive Rating
21-25	91-100	Advanced
16-20	86- 90	Proficient
11-15	81- 85	Approaching Proficiency
6-10	76- 80	Developing
1- 5	71- 75	Beginning

SELF-CHECK 2.1b
PERFORM DEPOSITING STRAIGHT BEADS IN HORIZONTAL POSITION

PERFORMANCE CHECKLIST

Check either the YES or NO column to determine your performance while depositing straight beads in horizontal position (2F).

YES	NO	QUESTIONS
		1. Did you adjust the welding machine according to the required current setting?
		2. Was bead straight and properly deposited?
		3. Did you maintain the position of electrode?
		4. Did you maintain the correct arc length, bead size?
		5. Did you change direction of welding from one line to the other?

Rating Scale:

- 5 YES - Outstanding
- 4 YES - Very Satisfactory
- 3 YES - Satisfactory
- 2 YES - Moderately Satisfactory
- 1 YES - Needs Improvement
- 0 YES - Repeat the activity

DRAFT

ACTIVITY SHEET 2.2

PERFORM LAP JOINT IN HORIZONTAL POSITION (2F)

Objective: Student should be able to perform lap joint using horizontal position (2F).

Materials/Supplies:

- 2 pcs. 10mm x 50mm x 200mm mild steel plates
- 6 pcs. E6013 electrode, 3.2mm diameter

Tools and Equipment:

- Welding machine with complete accessories
- Welding gloves (leather)
- Welding helmet
- Chipping hammer
- Steel brush
- Welding apron/ jacket (leather)
- Bench vise
- Working bench

Procedures:

1. Wear appropriate Personal Protective Equipment (PPE).
2. Prepare materials and tools needed.
3. Tack weld two plates following procedure in tacking.
4. Fasten the tacked plates in a bench vise.
5. Deposit root pass. Make sure that penetration of beads obtained.
6. Deposit second and third layer of beads by holding electrode closer to the first layer.
7. Check appearance of weld after the activity.

Working Drawing

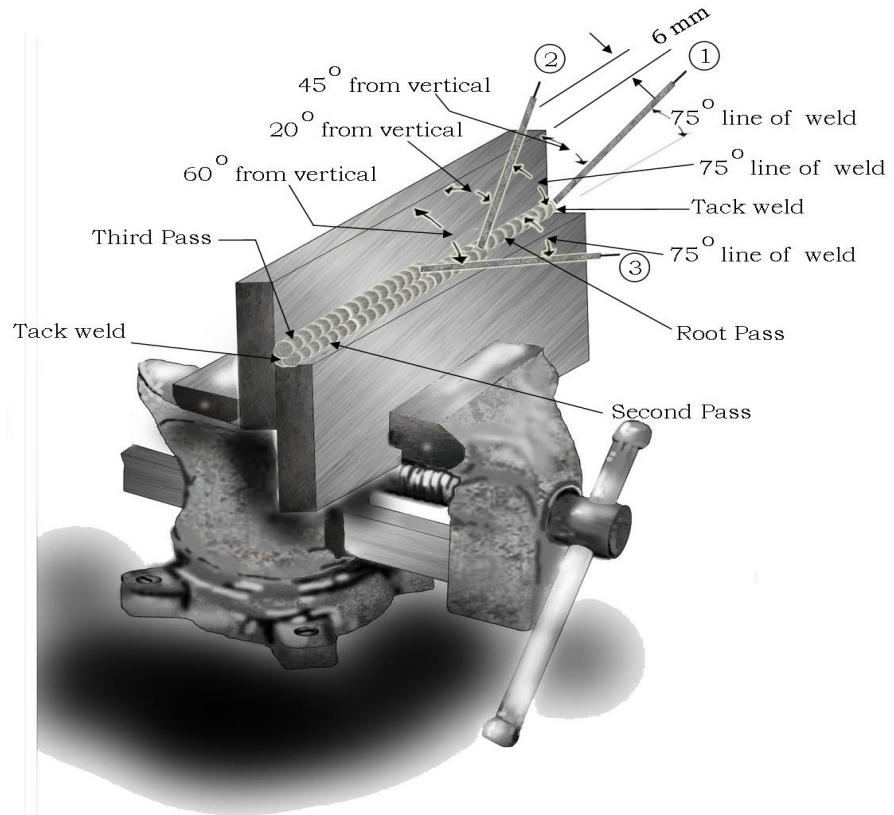


Figure 21. Lap joint in horizontal position (2F)

SELF-CHECK 2.2a

PERFORM LAP JOINT IN HORIZONTAL POSITION (2F)

Rate the quality of your weld using the performance rubrics to determine your score and equivalent rating.

Category/ Dimensions	5 Points	4 Points	3 Points	1 point
Smoothness and Uniformity of Beads	All beads were smooth and uniform	Most beads were smooth and uniform	Some beads were not smooth and uniform	Almost all beads were not smooth and uniform
Proper use of Tools and Equipment	Used tools and equipment with confidence	Used tools and equipment with less confidence	Used tools and equipment with the help of others	Unable to use tools and equipment properly
Application of Procedures	Effective application of procedures was evident	Application of procedures was acceptable	Application of procedures was inconsistent	Application of procedures was unacceptable
Safety Work Habits	Observed safety practices at all times	Observed safety practices most of the time	Observed safety practices sometimes	Observed safety practice once
Time Management	Activity tasks completed ahead of time	Activity tasks completed just on time	Activity tasks completed after time limit	Activity tasks completed after extended time

Rating Scale:

Points Earned	Numerical Rating	Descriptive Rating
21-25	91-100	Advance
16-20	86- 90	Proficient
11-15	81- 85	Approaching Proficiency
6-10	76- 80	Developing
1- 5	71- 75	Beginning

SELF-CHECK 2.2b
PERFORM LAP JOINT IN HORIZONTAL POSITION (2F)

PERFORMANCE CHECKLIST

Check either the YES or NO column to determine your performance while depositing straight beads in horizontal position (2F).

YES	NO	QUESTIONS
		1. Did you adjust the welding machine according to the required current setting?
		2. Was bead properly deposited and straight?
		3. Did you maintain the position of electrode?
		4. Did you maintain the correct arc length, bead size?
		5. Did you change direction of welding from one line to the other?

Rating Scale:

- 5 YES - Outstanding
- 4 YES - Very Satisfactory
- 3 YES - Satisfactory
- 2 YES - Moderately Satisfactory
- 1 YES - Needs Improvement
- 0 YES - Repeat the activity

SUMMATIVE ASSESSMENT TEST QUARTER III

Test I

Write the letter of the best answer. Use separate answer sheet.

- _____ 1. The common weld used in metalworks industry.
- Groove welds
 - Fillet welds
 - Plug and slot welds
 - Spot welds
- _____ 2. The area where the filler metal intersects with the base metal opposite the weld face is
- Weld toe
 - Weld joint
 - Weld root
 - Weld leg
- _____ 3. It is the condition that occurs when the base metal and the filler metal are melted together.
- Union
 - Fusion
 - Joint
 - Connection
- _____ 4. Fillet weld sizes are indicated by
- Note on prints
 - Dimension on the left side of symbol
 - Graphic representations
 - All of the above
- _____ 5. The cross-sectional shape of a completed weld face is
- Weld contour
 - Weld finish
 - Weld toe
 - Weld bead

Test II

Fill in the blanks with the best answer.

- The most common type of electrode used in performing lap joint using horizontal position is the _____.
- A welding position where in the joint is on a vertical plane and the line of weld runs parallel with the horizon is _____.
- Before depositing weld beads, it is important that the welding machine be adjusted to the correct _____.
- For easy deposition of weld beads in performing lap joint in horizontal

- position, steel plates should be fastened to a _____.
5. The electrode angle in depositing weld beads for lap joint using horizontal position is _____.

Test III

Answer these questions and write your answer on a separate answer sheet.

- A. Explain why mechanical finishing is required in fillet output.
- B. Why is observance of health and safety measures necessary in welding?
- C. Arrange the horizontal position-lap joint procedures in its proper order.
- Tack weld steel plates following specified measurement.
 - Deposit second and third layer of beads.
 - Prepare materials and tools needed.
 - Deposit root pass making sure that good penetration is obtained.
 - Fasten tacked steel plates in a bench vise.

Test IV

Let students perform Lap joint using horizontal position, following the correct procedures.

Materials/Supplies:

- 2 pcs. 6mm x 50mm x 200mm mild steel plates
- 6 pcs. E6013 electrode, 3.2mm in diameter

PERFORMANCE RUBRICS

CATEGORY/DIMENSION	POINT/S DEDUCTIONS	POINT/S EARNED
Uniformity and smoothness of bead.	NO defects	10
Convexity/concavity	1 defect	8
Underfill	2 defects	6
Undercut	3 defects	4
Cracks	4 defects	2
Cold laps	5 defects	0
Slag inclusion		
Excessive reinforcement		
Spatters		
Arc Strikes		

RATING SCALE

POINTS EARNED	NUMERICAL RATING	DESCRIPTIVE RATING
10	96-100	Outstanding
8	90 - 95	Very Satisfactory
6	85 - 89	Satisfactory
4	80 - 84	Fair
2	75 - 79	Needs Improvement
0	70 - 74	Poor

WELDING CARBON STEEL PLATES IN HORIZONTAL POSITION (2F)

CONTENT STANDARD	PERFORMANCE STANDARD
The learner demonstrates understanding of basic concepts and underlying theories in welding carbon steel plates in horizontal position (2 F).	The learner independently demonstrates competency in welding carbon steel plates in horizontal position (2F).

QUARTER IV

TIME ALLOTMENT: 36 HOURS

Introduction

This module contains information and suggested learning activities on Welding Carbon Steel Plates in Horizontal Position (2F). The learning outcome contains learning activities supported by information sheets. Before you perform the activity, read the information/ instruction sheets provided, answer the self-check and other tests, then perform the activities and rate your output using the performance rubrics or check-list to determine whether you have acquired the necessary knowledge and skills expected of the learning outcome (LO).

After completing this module, report to your teacher for assessment to check your accomplishment on knowledge and skills required of this module. If you pass the assessment, you will be given a certificate of completion.

PERFORM WELDING CARBON STEEL PLATES IN HORIZONTAL POSITION (2F)

- Conduct Visual Inspection on finished weldment in accordance with existing welding standards

Carbon steel is a ferrous metal and is the most common metal used in fabrication and manufacturing. It can be grouped into three types depending on the percentage of carbon content: 1. Low, (.10- .25 %) 2. Medium (.26 -.50 %) and 3. High (.51 – 1.03 %). The addition of carbon increases the tensile strength of iron.

Welding procedure information can be determined by means of the carbon equivalent formula. Carbon equivalent should be calculated for the exact composition. When the carbon equivalent is 40% or lower the material is readily weldable. Above 40%, special controls are required.

The fillet weld is the most common weld used in the industry. It is triangular in its cross-sectional shape, indicated by a triangle placed on the reference line of the welding symbol. It may require little or no edge preparations.

Some welding tasks are not possible in the flat position particularly in fixed or heavy structures which will require welding in the horizontal position. Horizontal position refers to the welding position wherein the joint is on a vertical plane and the line of weld runs parallel with the horizon.

PRE-DIAGNOSTIC TEST

Choose the best answer. Provide a separate sheet of paper.

Labeling

Label these events of visual inspection, if it is done **BEFORE, DURING** or **AFTER** welding.

- _____ 1) All welds are inspected for weld defect.
- _____ 2) Determine that pre heat requirements are adhered at the time of welding.
- _____ 3) Determine designated electrode for the base metal.
- _____ 4) Check all applicable drawings, specifications, procedures, and welders qualifications.
- _____ 5) Materials specification of parts comprising the weldment to determine if it follows required specifications.
- _____ 6) Size of all welds are checked using appropriate weld gauges.
- _____ 7) Compare weld preparation of each joint with the drawings.
- _____ 8) Check assembly dimension and fit up.
- _____ 9) Determine that correct welding current and proper polarity are being used.
- _____ 10) Determine that interpass cleaning by chipping, grinding, and gouging are being done in accordance with procedures.

INFORMATION SHEET 2.3

CONDUCTING VISUAL INSPECTION

Visual examination is the most widely used non-destructive testing technique. It is extremely effective and is the less expensive inspection method. The welding inspector can utilize visual inspection throughout the entire production cycle of a weldment. It is an effective quality control method that will ensure procedure conformity and will find errors at early stages. Visual inspection can be subdivided into three (3) divisions such as ;

1. Visual examination prior to welding
2. Visual examination during welding and
3. Visual examination of the finished weldment.

VISUAL EXAMINATION PRIOR TO WELDING

These items that must be reviewed and checked prior to welding:

1. All applicable drawings, specifications, procedures, welder qualification, and others.
2. Material specification of parts comprising the weldment to determine if it follows required specifications.
3. Compare edge preparation of each joint with the drawings.
4. Check dimensions of each item since they will affect weldment fit up.
5. At the fit up operation, check up assembly dimensions and fitup.
6. At the fit up, check the cleanliness of welding joint and condition of tack weld.

VISUAL EXAMINATION DURING WELDING

When welding begins, there are several items that should be checked, including welding procedures. Make sure that they are in order, applicable to the weldment, and available to the people doing the welding.

Here are the important items that must be checked:

1. Determine that the designated welding process and method of application are in accordance with the procedure.
2. Determine designated electrode for the base metal.
3. Inspect/Check welding equipment to make sure that it is in good operating condition.
4. Determine that correct welding current and proper polarity are being used.
5. Determine that pre-heat requirements are adhered to at the time of welding.
6. Identify all welders assigned to the weldment, job or joint in question.
7. Observe welders making welds. This has a rather starting effect on welders, especially when they know that their welds are being watched as they are being made.
8. Determine if interpass temperatures are being maintained. If welding operations are discontinued for a while, interpass temperatures must be

- obtained before welding is resumed.
9. Determine that interpass cleaning by chipping, grinding and gouging are being done in accordance with procedure.
 10. Watch out for slugging. (Example: adding rod or metal to a weld groove that weakens the joints)

VISUAL EXAMINATION AFTER WELDING- COMPLETED WELDMENT

The inspector is expected to determine that weldment conforms to the working drawing and specifications for which it is designed and constructed. The weld must all be made to the size specified.

Here are some items that must be considered:

1. It is important to check the size of all welds. The size of fillet welds can easily be determined by means of using weld gauges, such as: Fillet weld gauge, U.S. Navy weld gauge, and British welding gauge.
2. All welds should be inspected to see that they do not have any of the following defects:
 - a. Surface cracks
 - b. Crater cracks or underfill
 - c. Surface porosity
 - d. Incomplete root penetration
 - e. Undercoat
 - f. Underfill on face, groove or fillet (concave)
 - g. Excessive face reinforcement, groove or fillet (convex)
 - h. Overlap
 - i. Misalignment (high-low)
 - j. Arc strikes
 - k. Excessive spatter
3. Other weldment defects that must be checked:
 - a. Warpage – Beyond allowable or acceptable limits.
 - b. Base metal defect – Scabs or seams in the base metal.
 - c. Backing welds – A question about quality of root fusion.

SELF-CHECK 2.3

CONDUCTING VISUAL INSPECTION

Here are some important items in Visual Inspection of weldment before, during and after welding. Write B if the item is observed Before, D if During and A if After. Use a separate answer sheet.

1. All applicable drawings, specifications and procedures.
2. Assembly dimensions and fit-up.
3. Correct welding current and polarity are being used.
4. Interpass temperature are being maintained.
5. Sizes of all welds.
6. Incomplete root penetration.
7. Dimension of each item.
8. Make sure that welding equipment are in good operating condition.
9. Warp
10. Crater cracks or underfill.

ACTIVITY SHEET 2.3

PERFORM T-FILLET JOINT IN HORIZONTAL POSITION(2F)

Objective: The students should be able to perform T-Fillet joint using horizontal position (2F).

Materials/Supplies:

- 2 pcs. 10mm x 50mm x 200mm, mild steel plates
- 6 pcs. E-6013 electrode, 3.2 mm diameter

Tools and Equipment:

- Welding machine with complete accessories
- Welding helmet
- Welding apron/jacket (leather)
- Welding gloves (leather)
- Chipping hammer
- Steel brush
- Steel rule
- Try square
- Bench vise
- Working bench
- Fillet gauge

Procedures:

1. Prepare tools and materials needed.
2. Tack weld the two plates to form t-fillet joint.
3. Fasten the tacked plates in a bench vise.
4. Start a short arc at the beginning of the joint, then make a single pass up to the end.
5. Repeat operation on the other side of the joint.
6. Refer to the working drawing as guide.

Working Drawing:

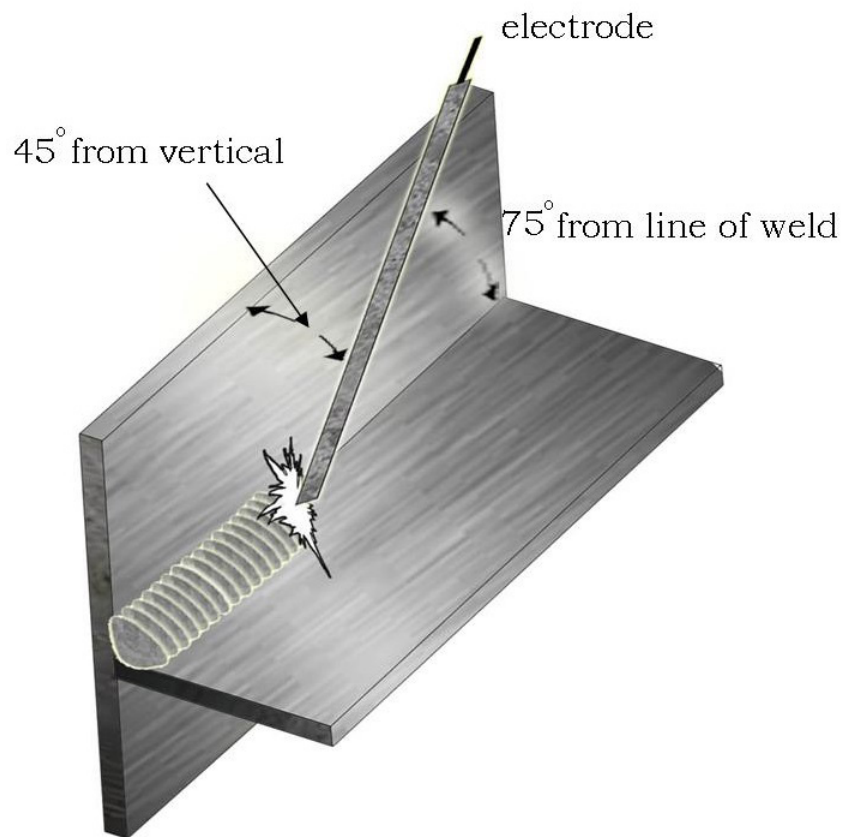


Figure 21. Tee Joint in Horizontal Position (2F)

SELF-CHECK 2.3a

PERFORM T-FILLET JOINT IN HORIZONTAL POSITION(2F)

Rate the quality of your weld using the performance rubrics below to determine your score and equivalent rating.

Category/ Dimensions	5 Points	4 Points	3 Points	1 point
Smoothness and Uniformity of Beads	All beads were smooth and uniform	Most beads were smooth and uniform	Some beads were not smooth and uniform	Almost all beads were not smooth and uniform
Proper use of Tools and Equipment	Used tools and equipment with confidence	Used tools and equipment with less confidence	Used tools and equipment with the help of others	Unable to use tools and equipment properly
Application of Procedures	Effective application of procedures was evident	Application of procedures was acceptable	Application of procedures was inconsistent	Application of procedures was unacceptable
Safety Work Habits	Observed safety practices at all times	Observed safety practices most of the time	Observed safety practices sometimes	Observed safety practice once
Time Management	Activity tasks completed ahead of time	Activity tasks completed just on time	Activity tasks completed after time limit	Activity tasks completed after extended time

Rating Scale:

Points Earned	Numerical Rating	Descriptive Rating
21-25	91-100	Advance
16-20	86- 90	Proficient
11-15	81- 85	Approaching Proficiency
6-10	76- 80	Developing
1- 5	71- 75	Beginning

SELF-CHECK 2.3b

PERFORM T-FILLET JOINT IN HORIZONTAL POSITION(2F)

PERFORMANCE CHECKLIST

Check either the YES or NO column to determine your performance while depositing straight beads in horizontal position (2F).

YES	NO	QUESTIONS
		1. Did you adjust the welding machine according to the required current setting?
		2. Was bead properly deposited and straight?
		3. Did you maintain the position of electrode?
		4. Did you maintain the correct arc length, bead size?
		5. Did you change direction of welding from one line to the other.

Rating Scale:

5 YES - Outstanding

4 YES - Very Satisfactory

3 YES - Satisfactory

2 YES - Moderately Satisfactory

1 YES - Needs Improvement

0 YES - Repeat the activity

SUMMATIVE ASSESSMENT TEST QUARTER IV

Test I- Knowledge/Process

Write the letter of the best answer. Use separate answer sheet.

- _____ 1. Before welding, metal plates need to be
- Measured
 - Cleaned
 - Chipped
 - Grinded
- _____ 2. The simplest and the easiest position to master in welding is
- Flat
 - Horizontal
 - Vertical
 - Overhead
- _____ 3. Before electrode is discarded, length in millimeter must be
- 3 – 3.5mm
 - 3.5 – 4mm
 - 3.8 – 5mm
 - 5.5 – 6mm
- _____ 4. The ideal electrode for depositing root pass in horizontal position is
- E-6011
 - E-6012
 - E-6013
 - E-6015
- _____ 5. Which of these characteristics describes the best electrode?
- Low deposition
 - Minimum deposition
 - Unstable deposition
 - Fast deposition
- _____ 6. In performing stringer beads, which of these techniques is best?
- Oscillating weave
 - Chipping weave
 - Crescent weave
 - Square weave
- _____ 7. In fillet welding, what is the specified length of tack welds?
- 5mm
 - 10mm
 - 15mm
 - 20mm
- _____ 8. Longer arc length will result to
- Lower corner part of joint

- b. Upper corner part of joint
 - c. Lower edge of joint
 - d. All of the above
- _____ 9. In a multi-pass weld, grinding is only allowed at the
- a. Capping
 - b. Root pass
 - c. Gate pass
 - d. Filler pass
- _____ 10. In the multi-layered beads, the number of weld pass can be determined by
- a. Thickness of plate
 - b. Diameter of electrode
 - c. Joint preparation
 - d. All of the above

Test II

- A. Explain the importance of tack welding the steel plates used in T-fillet joint in horizontal position before depositing root pass.
- B. Here are important items to be checked in conducting visual inspection in welding. Write when it is done - Before, During or After.

- _____ 1. Check all applicable drawings, specifications and procedure.
- _____ 2. Determine correct welding current and polarity being used.
- _____ 3. Determine designated electrode if appropriate for the base metal.
- _____ 4. Check weld sizes of all welds.
- _____ 5. Check dimensions of each item since they will affect weldment fit-up.

Test III- Performance Test

Let the students perform a T-fillet joint in horizontal position (2F) following the correct welding procedures.

Materials/Supplies:

- 2 pcs. 10mm x 50mm x 200mm mild steel plates
- 6 pcs. E-6013 electrode, 3.2mm diameter

PERFORMANCE RUBRICS

CATEGORY/DIMENSION	POINT/S DEDUCTIONS	POINT/S EARNED
Uniformity and smoothness of bead.	NO defects	10
Convexity/concavity	1 defect	8
Underfill	2 defects	6
Undercut	3 defects	4
Cracks	4 defects	2
Cold laps	5 defects	0
Slag inclusion		
Excessive reinforcement		
Spatters		
Arc Strikes		

RATING SCALE

POINTS EARNED	NUMERICAL RATING	DESCRIPTIVE RATING
10	96-100	Outstanding
8	90 - 95	Very Satisfactory
6	85 - 89	Satisfactory
4	80 - 84	Fair
2	75 - 79	Needs Improvement
0	70 - 74	Poor

GLOSSARY OF TERMS

Unit of Competency: WELDING FILLET ON CARBON STEEL PLATES

Bead	a narrow layer or layers of metal deposited on the base metal when it melts
Convex weld	a weld with protruding capping appearance.
Crater	a depression at the termination of a weld bead.
Face of weld	the exposed surface of a weld on the side from which welding was done.
Fillet weld	a weld of approximately triangular cross section joining two surfaces approximately at right angles to each other.
Overfill	excessive reinforcement
Overlap	the protrusion of weld metal beyond the toe, face, or root of weld.
Puddle	part of the weld that is melted (molten) due to heat of welding.
Pass	a single longitudinal progression of a welding operation along a joint or weld deposit. The result of a pass is a weld bead.
Ripple	the shape/appearance of the beads which results from the movement of the electrode.
Stringer Bead/ Straight Weld Bead	a type of weld bead with appreciable transverse oscillation or side to side movement.
Single Pass	pertain to one pass weld from the joint.
Travel Angle	the angle of the electrode in relation to the axis of weld when the electrode is perpendicular to the axis of weld.
Weave bead	a type of weld bead made with transverse oscillation.
Weaving	a technique of depositing weld metal in which the electrode is oscillated. a method or technique used to increase the width and volume of bead.
Weld puddle	a nonstandard term for weld pool.
Weld root	the points, as shown in cross section, at which the back of the weld intersects the base metal surfaces.
Weld Bead	a deposit of filler metal from a single welding pass.
Work Angle	the angle of an electrode in relation to the surface or surfaces of a work piece when the electrode is perpendicular to the axis of weld.
Weld pass	a single progression of welding along a joint. The result of a pass is a weld bead or layer.
Weld toe	the junction of the weld face and the basemetal.
1F	Welding Fillet in Flat Position
2F	Welding Fillet in Horizontal Position

REFERENCE

STVEP CBLM on SHIELDED METAL ARC WELDING 2008

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