# India Welds

*Making Technology Adoption Easy!*


*Its not about ideas, its about making ideas happen*

Vol 2:1 Jan-Mar 2019

## From the Editor's Desk!

*Dear Welding Enthusiast!*

*As we start our journey into the second year of publication, we are excited to introduce some very important developments.*

*We are happy to announce that eminent professionals like Mr. M.P.Jain, Former ED, Engineers India Ltd., has taken up the reins to impart his knowledge and experience in the structural welding series. We are sure the readers will immensely benefit from his insights.*

*Also, we have a very interesting article on how to select gases for that perfect welding.*

*For our Hindi section, we have continued our efforts to cover the basics of welding in a lucid language and presentation.*

*Further, we have forayed into one of the core area of our work, Enterprising Innovations, wherein we find products that can work as a game changer in the industry. In this edition, we have a solar power e-Vehicle cum grass cutter looking forward to scale up!*

*SMICPL has also teamed up with eminent Testing Labs to provide the technical help and service. Also, we have now started providing on site welders' training to help sustainable adoption of technology.*
*At SMICPL, we have picked up a broad theme of the year as 'Making Ideas Happen!' Hence at IndiaWelds, we strive to make the ideas turn into reality in the world of welding.*

*Besides, IndiaWelds is now in the process of creating the biggest repository of welding professionals. We are adding up welding professionals from all ranks and places in India everyday. We thank all for entrusting faith in us.*

*If you also want to be a part of this dynamism, please write to us at info@indiawelds.com and join us to make technology adoption easy!*

*Happy Reading!*

*Sahay*
*Editor*
*IndiaWelds*

Join the biggest group of welding professionals. Write to us at info@indiawelds.com with your name and email address.

Who can join:
***Any individual*** who is qualified in terms of education qualification or experience ***in the field of welding can join us.***

## WHAT'S INSIDE

# Cutting (H)edge – The Solar Way!

*When a bunch of enthusiastic students along with an equally passionate guru set do some brainstorming together, it can lead to a breakthrough innovation! But can this be a game changer? Let us find out!*

In our quest to find the enterprising innovations, IndiaWelds team set out to the otherwise obscure looking group who has huddled to participate in the National Innovation Talent Contest for Polytechnic, in Kolkata.

The group from New Delhi seems excited and also nervous to showcase their product.

**Solar goes green!**

With the little grey-black coloured chips finding their home in almost every utility thing today, will another solar powered gadget stand out?

These Photo-Voltaic cells are sure to rule the future, but how it is utilized is the main aspect that will prove its mettle.

When asked, the team from Aryabhatt Institute of Technology, Delhi, proudly said they have made a solar powered e-vehicle grass cutter.

To elucidate, an e-vehicle is connected or coupled with a grass cutting equipment. Solar energy stored in the battery gives power to drive the motor. It can also be charged electrically, in the absence of sun.

**Mobility off field!**

The team has however not stopped at this. They have understood that only grass cutting cannot be the selling point. So, they looked beyond this primary activity that it intends to do.

When the cutting of grass is not required, the cutting equipment can be replaced by front wheel and the same vehicle can be used for transportation.

"It is time and energy efficient and reduces the hardship of manpower. It is also economic, as there is no use of fuel", stated their mentor, Prof. GhoshRoy.

"The design of the solar powered e-vehicle grass cutter is adoptable and manufactured for multipurpose working.

An electric motor is chosen to save high fuel cost and to create an eco-friendly environment. While the first aspect of the design is addressed for grass cutting operation the second is geared for transportation."

**Eyeing the market!**

The many problems addressed by the single vehicle can surely be a boon to the users.

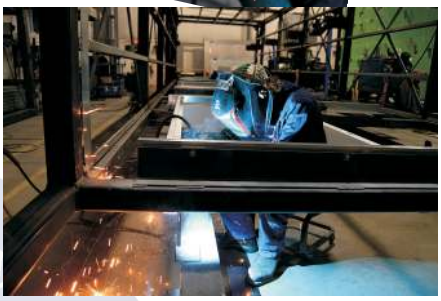
Since the inventors have combined two very basic needs, it can be stated as suitable for both rural and urban areas. A large scale manufacturing of this e-vehicle can be looked into.

With eMobility picking up the pace in India, such developments are definitely welcome. The whole concept might need some refining looking at the market dynamics, but it surely looks promising.

IndiaWelds gives the winning team a thumbs up and appeal to the industry to help such inventions create a market and grow. For further infomation, write to us at info@indiawelds.com.

# All About Structural Welding - Part -4

*As we progress in our understanding of structural welding, we will understand the next most important method of welding in this edition. In the past editions, we started by discussing the basics of structural welding. Further, we moved on to understanding the flat structures within which we discussed fillet welding, their positions, methods and the defects involved. In this issue, we will understand in detail the other type of welding in flat structures, called the groove welding (also called butt welding).*



There are basically three aspects that we need to understand for structural welding.

- The placing of components to be welded
- The type of joint/ groove needed
- The welding positions

Just as we interpreted each of these for fillet welding, we will understand these facets for butt or groove welding.

**Joints and Groove**

As discussed, there are four main types of joints in structural welding: the Lap joint( overlapped plates), the Tee Joint (forming a letter T), the Butt Joint (plates placed next to each other) and Corner Joint (Forming an L). Groove welding is usually done for the Butt and Corner Joint.

One important aspect for groove or butt welding is the preparation of the edge or joint or groove. In general, for thick plates, the edge is prepared for achieving the best results as per requirement. These edge preparation leads to different types of butt joints like square, V, U, J or bevel.

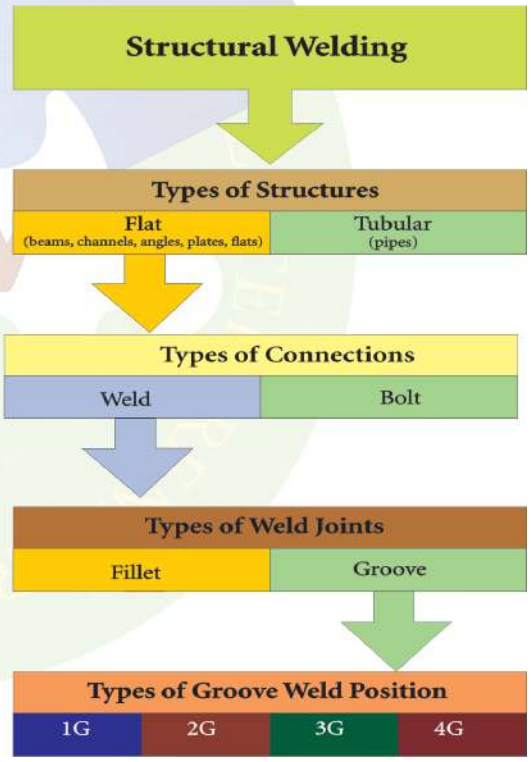
In this edition, we will only introduce these joints in the figures. These will be explained in detail in our next issue.

**Welding Positions**

As with the fillet welding, where we had 1F, 2F, 3F and 4F positions, we have similar nomenclature for groove welding.

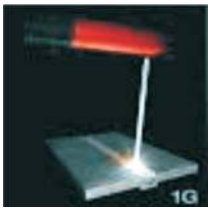
With the letter 'G' denoting Groove, we have

i) Flat Position (1G)
ii) Horizintal Position (2G)
iii) Vertical Position (3G) and
iv) Overhead Position (4G)




**1G Position (Flat Welding)**

We had seen in the earlier edition, for the 1F position, the welding electrode is facing downward.




Same is the case with in 1G position, which is flat welding position.

As is obvious, this position is the easiest of all positions for Groove Welding. We can visualize, the welder's head remains above the job, in this position.

This is also called the downhand position and involves welding on the top side of the joint.

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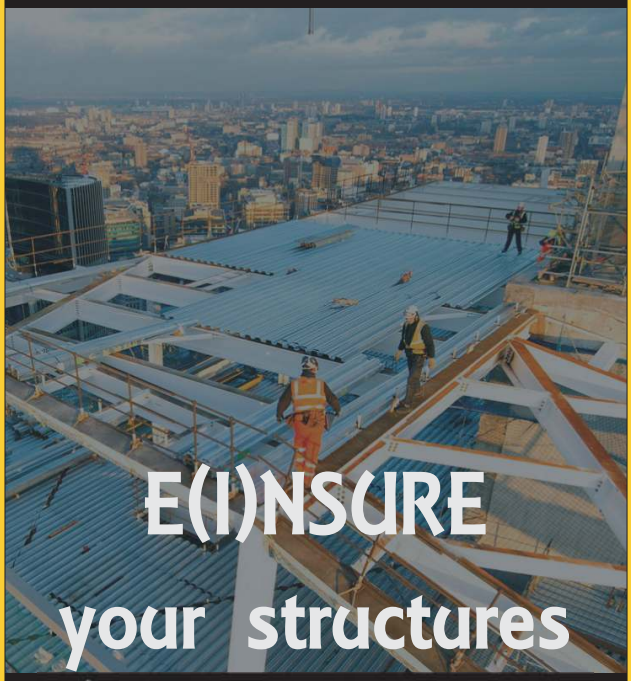


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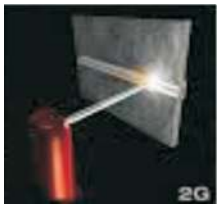
## 2G Position (Horizontal Welding)

In horizontal weld position, movement of electrode is in horizontal plane. There are two welding techniques in horizontal welding;




a) Rightward or forward technique
b) Leftward or backward technique

## 3G Position (Vertical welding)

In vertical weld position, movement of electrode shall be in vertical plane. We have two welding methods in vertical welding, these are


a) Uphill
b) Downhill

## 4G Position(Overhead welding)

Overhead position is one of the most difficult positions because welder has to work against the gravity.

In overhead welding, the workpiece remains above the head of the welder.

The welder is quite uncomfortably placed is the highest qualification as far as plate welding goes.

Now, the question is if 4G is the most difficult position to weld then does a qualification in 4G position qualifies you to weld in all previous positions?

| Qualification Test | | Production Plate Welding Qualification | |
|---|---|---|---|
| Weld Type | Positions | Groove | Fillet |
| PLATE | | | |
| Groove | 1G | F | F |
| | 2G | F, H | F, H |
| | 3G | F, H, V | F, H, V |
| | 4G | F, OH | F, H, OH |
| | 3G + 4G | All | All |
| Fillet | 1F | | F |
| | 2F | | F, H |
| | 3F | | F, H, V |
| | 4F | | F, H, OH |
| | 3F + 4F | | All |

AWS Table on qualifications

Well, nearly so but not entirely! nearly so but not entirely!


The Structural Welding Code published by the American Welding Society : AWS D1.1 permits a 4G qualified welder to do fillet welds in the 1F, 2F, and 4F positions plus groove welds in the 1G, 2G, and 4G positions but it does not certify you to weld in the 3F and 3G positions.

In our next issue, we will look into details of the different types of weld joints and their preparation. Further, we will progress into the next aspect of structural welding, namely tubular welding.

*By: M.P. Jain*
*Former Executive Director, Engineers India Ltd., New Delhi*
*(A structural welding stalwart with more than 35 years of hands on experience including offshore welding.)*

*^Pic Credit: Ugur Gьrcьoglu and Russ Wardon*

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# Crack the Code of Shielding Gas

*Shielding gas in welding is like that invisible yet indispensable protective shield that usually does not become a subject of discussion. While we all talk of the developments in other areas of welding, in the following article, we will discuss how and what constitutes the*

In 1920, automatic welding was invented by P.O.Nobel of General Electric. It was more of a predecessor of GMAW that we see today. In this he used a bare electrode wire and direct current and used arc voltage to regulate the feed rate. The introduction of this technology necessitated the usage of shielding gas that would protect the welds from surrounding notorious atmosphere. The only solution was to have an inert gas surrounding the electrode that has very poor reactivity with other substances and would push the unwanted air away.

**Why Shielding Gas?**

The primary purpose of shielding gas is to prevent exposure of the molten weld pool to oxygen, nitrogen and hydrogen contained in the atmosphere.

The reaction of these elements with the weld pool can create a variety of problems, including porosity (holes within the weld bead) and excessive spatter.

The welding gas flow through the welding gun, surround the electrode and forms a layer of gas around the arc and the weld. This prevents any contact of the weld pool with the air and gives us a good deposition rate without any defect.

Hence the nozzle of the gun also plays an important part in the flow of the gas.

**The nozzle trouble**

If we choose a nozzle that is too narrow for the application or if the diffuser becomes clogged with spatter, for example, there might be too little shielding gas getting to the weld pool.

Likewise, a poorly designed diffuser might not channel the shielding gas properly, resulting in turbulent, unbalanced gas flow.

In the both cases surrounding air cause excessive spatter, porosity and weld contamination.

**Shielding from Weld Defects**

Pre-Flow setting of shielding avoids a large gas flow and an increased height to gas coverage at start of the weld & helps to prevent weld defects at start point.

Further, the occurrence of hot cracks usually can be related to the alloy content of the electrode filler metal and can be eliminated by selection of the proper combination of filler metal and shielding gas.

It is understood well that a filler metal should be similar to the base metal in composition, tensile strength, and elongation.

Selection of the shielding gas too depends somewhat on the composition of the base metal.

Since hydrogen usually is the biggest spoiler in welding, care should be taken to minimize hydrogen pickup during fabrication.

Fig. 1: Clogged weld torch causes weld defects.

To ease this, welding operations generally love inert gas shielding to minimize hydrogen from surrounding.

**The care for the cover**

While it is easy to determine why to use shielding gas, there is a check list that demands attention before we use a shielding gas.

There are three basic things that we must check

- Leakage of moist air into the shielding gas, usually through defective hoses
- Use of a shielding gas with a high dew point
- Inadequate gas shielding or excessive wind drafts, which result in oxidation

**Gases in use for Shielding**

In MIG welding, shielding was done with argon gas. It offered a high deposition rate, but the high cost of inert gases limited its use to non-ferrous materials and cost savings were not obtained.

Hence a combination of Argon with Carbon Dioxide and Argon with Oxygen and finally Argon with Helium was created in various proportions to get the desired results in a cost effective manner.

Hence today, we have a multitude of gas combinations that are doing the right job in the specific welding types, which we will discuss next.

**The Argon-Carbon dioxide Mix**

- **C-50 (50% argon/50% $Co_2$):**

This combination of gases is used for short arc welding of pipes.

**C-40 (60% argon/40% $Co_2$):**

This mix is used for some flux-cored arc welding cases. It has better weld penetration than C-25.

**C-25 (75% argon/25% $Co_2$):**

This is commonly used by hobbyists and in small-scale production. This combination is limited to short circuit and globular transfer welding. C-25 is common for short-circuit gas metal arc welding of low carbon steel.

**C-20 (80% argon/20% $Co_2$):**

This gas mix is used for short-circuiting and spray transfer of carbon steel.

**C-15 (85% argon/15% $Co_2$):**

This is most common in production environment for carbon and low alloy steels. It has lower spatter and good weld penetration and is suitable for thicker plates and steel significantly covered with mill scale.

**C-10 (90% argon/10% $Co_2$):**

This is also common in production environment. It generates low spatter and gives good weld penetration. Though lower than C-15, it is suitable for many steels. The application is same as 85/15 mix.

**The Argon-Oxygen Mix**

**O-5 (95% argon/5% oxygen):**

This is the most common gas for general carbon steel welding.

Fig. 2 Gas flow through (a)Clean Nozzle and (b)Clogged Nozzle

Higher oxygen content allows higher speed of welding. More than 5% oxygen makes the shielding gas oxidize the electrode, which can lead to porosity in the deposit if the electrode does not contain enough deoxidizers.

**O-2 (98% argon/2% oxygen):**

This is used for spray arc on stainless steel, carbon steels, and low alloy steels.

Better wetting than O-1. Weld is darker and more oxidized than with O-1.

The addition of 2% oxygen encourages spray transfer, which is critical for spray-arc and pulsed spray-arc GMAW.

**O-1 (99% argon/1% oxygen):**

This is used for stainless steels. Oxygen stabilizes the arc.

**The Argon-Helium Mix**

**A-25 (75%argon/25% helium):**

This is used for nonferrous base when higher heat input and good weld appearance are needed.

**A-50 (50%argon/50% helium):**

This is used for nonferrous metals thinner than 0.75 inch for high-speed mechanized welding.

**A-75 (25%argon/75% helium):**

This is used for mechanized welding of thick aluminum. Reduces weld porosity in copper.

**The Conclusion**

An understanding of shielding gases and its correct selection goes a long way in ensuring the quality of weld.

In many cases, cost cannot always be the determining factor to choose a shielding gas. There we need to strike a balance between the usability and the cost effective solution.

And the discussion above is just a preface in getting an insight into the understanding about the shielding gases.

*By: Prashant Shigwan M.*
*IWT - IIW*
*A Welding Quality Expert with an experience of more than 18 years.*


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# वेल्ड जोइंट – क्यों और कैसे

*अबतक हमने वेल्डिंग प्रक्रिया से जुड़ी कुछ बुनियादी बातों पर चर्चा कि। जैसे वेल्डिंग के दौरान सुरक्षा, वेल्डिंग में खामियाँ और वेल्डिंग करते समय करेंट और वोल्टेज का महत्व। इस भाग में हम एक और ऐसे विषय के बारे में चर्चा करेंगे जिसे वेल्डिंग का मुलाधार कहा जा सकता है। वह है वेल्ड जॉइंट्स या जोड़।*

## वेल्डिंग जॉइंट कि तैयारी

वेल्डिंग जॉइंट कैसा और किस प्रकार का होगा यह निर्भर करता है बेस मेटल के प्रकार और HAZ यानि हीट एफेक्टेड ज़ोन का भार प्रतिरोध करने कि क्षमता पर।

खराब जोइंट डिज़ाइन कोम्पोनेंट के विकृति और वेल्ड के टूटने का कारण बन सकता है।

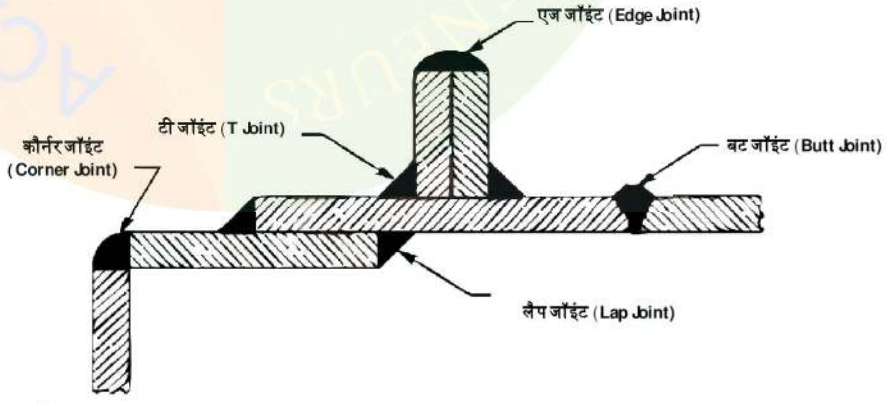
इसलिए हमें अलग अलग तरीकों से कोम्पोनेंट के उपयोग के अनुसार जॉइंट को तैयार करना चाहिए।

इसमें किनारे (एज/ edge) कि तैयारी, जोइंट का डिज़ाइन, वेल्ड कि प्रक्रिया, passes यानि कितनि बार वेल्डिंग किया जाएगा, वेल्डिंग के बाद कि प्रक्रिया समेत अन्य वेल्डिंग से जुड़ी चीज़ें जैसे करेंट और वोल्टेज इत्यादि पर जॉइंट कि मज़बूती निर्भर करता है।

## वेल्ड जॉइंट के प्रकार

आम तौर पे हमे पाँच तरह के वेल्ड जॉइंट देखने को मिलते है। जॉइंट कैसा होगा यह तय करता है कोम्पोनेंट्स के वेल्डिंग होने वाले प्लेटों के दिशा पर।

दिए गए चित्र से हमें पता चलता है यह सारी जॉइंट्स किस प्रकार दिखते हैं।




**बट जॉइंट (Butt Joint)** : इसमें दोनों वेल्डिंग प्लेटें एक क्षैतिज समक्षेत्र या horizontal plane पर होता है। दोनों प्लेटों में अधिकतम फासला 5 डिग्री तक होता है।

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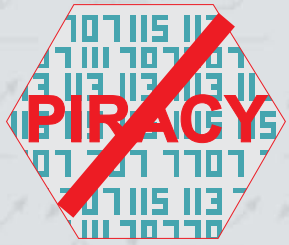
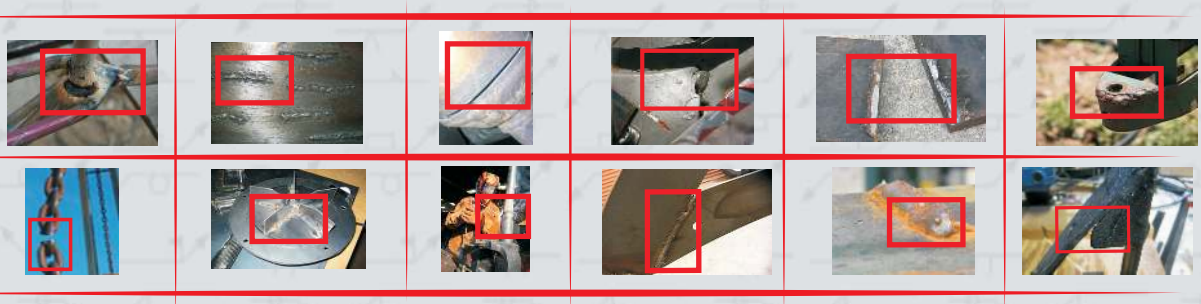



## Do NOT encourage duplicates.
## STOP compromising on welding safety, Today!



*Probably success of an innovation can be measured by looking at the its many duplicates in the market!*

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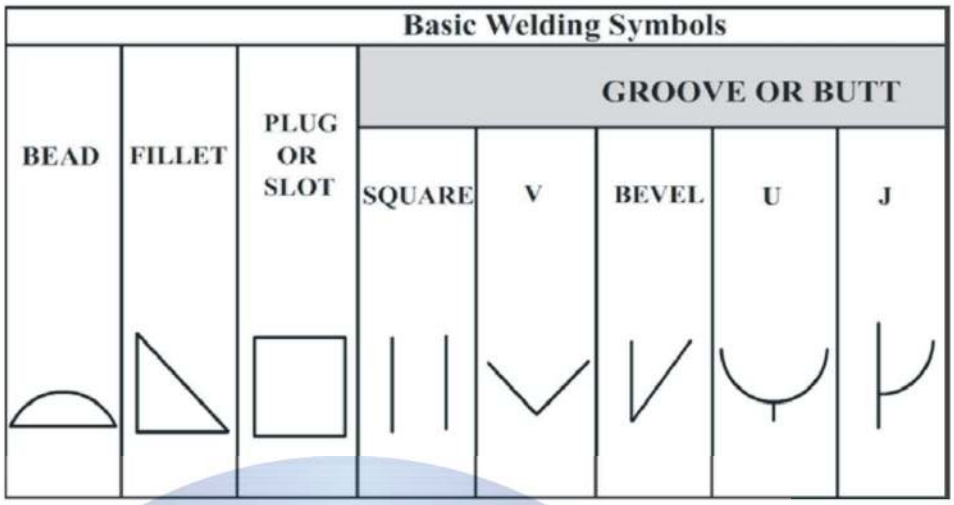
**लैप जॉइंट (Lap Joint)** : इसमें प्लेटें परस्पर व्याप्त या ओवरलैप होता है। यह एक तरफ अथवा दोनों तरफ से ओवरलैप हो सकता है।




**कौर्नर जॉइंट (Corner Joint)** : यह जॉइंट दोनों प्लेटों कि किनारे गलाकर बनती है। इस वजह से दोनों प्लेटों में लगभग 75 से 90 डिग्री का फासला होता है।

**एज जॉइंट (Edge Joint)** : यह जॉइंट दोनों प्लेटों की किनारों को पिघलाके बनाया जाता है। यानि दोनों प्लेटों एक दूसरे के समानांतर (parallel) होता है।

**टी जॉइंट (T Joint)** : इसमे एक प्लेट दूसरे प्लेट से लम्बवत या सीधा होता है। दोनों प्लेटों के बीच फासला क़रीब 85 से 90 डिग्री का होता है।

**वेल्डिंग सिम्बॉल**

वेल्डिंग जॉइंट्स के प्रकार, वेल्ड का आकार, स्थान, वेल्डिंग कि प्रक्रिया, बीड की डिज़ाइन इत्यादि समझाने के लिए वेल्डिंग सिम्बॉल का उपयोग किया जाता है। कुछ आम तौर पर इस्तेमाल होने वाली सिम्बॉल्स चित्र 2 में दिखाया गया है।

अबतक हमने वेल्डिंग से जुड़ी कुछ ऐसे विषयो के बारे में जाना जो हमारे वेल्डिंग का नींव होता है। वेल्डिंग कैसा होगा यह समझने के लिए इनका जानना ज़रूरी है।

*By: Partho P. Banerjee, A Welding Enthusiast with 15 years experience*
*Image Courtesy: Internet*

# WHY INNOVATIONS FAIL?
## - AN INTROSPECTION

The Global Innovation Index (GII) has ranked India as the 57th most innovative nation in the world, an improvement from 60th position the year before. And also as per report, India has been improving steadily since it was ranked 81st in 2015. This is good news!

Now consider another figure. A report by IBM Institute for Business Value and Oxford Economics found that 90 percent Indian startups fail within the first five years! They have stated lack of innovation as the main reason.

Let us now connect the two and try to find out why this is happening - from a different perspective.

**Numbers Speak!**

Google about how innovation is understood and you will be surprised with the trend.

Let us begin by finding the number of times people have searched about "innovations" over internet. In a scale of 0-100, while the number hovered around 80 few years back, it has considerably come down to 37 as I write this article.

Now why are we looking at this shift in trend? Or why we should be looking at this in the first place?

Consider another search term: "Marketable Innovations". When we google this, we do not have enough data or figures to show the trend, implying a very very low search percentage. And probably, the problem lies there.

While people are investing so much in innovations, they fail to look at the market that will make it successful!

**Marketable (?) Innovations**

There are good innovative products built every day. But not all seem to be successful. What we fail to ask and answer is 'are they marketable?'

The term 'marketable' does not denote only the ability to create the market, but providing a sustainable solution.

For a sustained growth, we need to innovate and then further tweak according to the consumer behavior and practical demands.

So, how do we move ahead from simply innovations to sustained innovations? For that we need an in depth understanding of the targeted customers/ consumer of our product and how we can create the 'need' for our solution.

Creating the need requires immense understanding of the consumer behavior. This go beyond just statistical numbers and help judge and leverage the potential of an innovation or an intended innovation.

Mostly as it is happening, enterprising individuals either bypass this market analysis in pursuit of innovation or for lack of funds. What sadly is not known is that you too can do this yourself in an efficient, cost effective manner.

So, if you have a product or an idea and want to find ways to make it successful, write to us at ei@indiawelds.com.