



# IndiaWelds

Making Technology Adoption Easy!

Learning is not attained by chance, it must be sought for with ardor and diligence.

Vol 1:2 Apr-June 2018

## From the Editor's Desk!

Dear Welding Enthusiast!

Success is not how high we have climbed, but how we make a positive difference to the world. With the first edition of our newsletter getting an encouraging response from the industry and academia alike, we have gained enthusiasm to do even more.

We have now in our panel some more eminent welding experts from the industry and the academia, thus enriching our quest and content. So, starting this issue, we have a series on Structural Welding wherein we are decoding the complex subject into simple reading. It will gradually move from the basics to the complex offshore welding, with insights that will guide the amateur and an expert alike.

We have also kept the promise to include write-ups for welding professionals from different levels. While there are some basic concept articles in English and Hindi, we have

also included one in our product update section featuring Welding App for our much evolved readers. We are sure this will be a welcome mix! Last but not the least is our uniquely written interview section. Check it out on page 12!

IndiaWelds is also conducting workshops with the students and Industry. Our readers can get in touch with us for the same. If you wish to participate in our workshops, as a participant or as the instructor, please write to us at [info@indiawelds.com](mailto:info@indiawelds.com).

As is said, success is not final, failure is not fatal: it is the courage to continue that counts! So, here we are at IndiaWelds, striving to make technology adoption easy!

Happy Reading!

*Suhay*  
Editor  
IndiaWelds

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BE THE CHANGE THAT YOU ARE LOOKING FOR



Image Courtesy: AWS

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# Welding Apps! – An Insight!

Over a period of time, welding apps has become a formidable tool for engineers. However, the sheer number of apps in this data driven world means that many of the best can often get lost, while weaker ones sometimes rise to the top. This article will give you inputs on the various apps that are really useful to produces welding calculations for you.

## WELDING PRO by Certilas Nederland BV:

WELDING PRO is the first professional welding calculator that actually produces welding calculations for you to use. This app produces all your highly complex every day welding calculations very quickly: the amount of welding wire required, the cost of welding wire and labor have never been calculated this fast and precise. It contains calculations for standing fillet welds, double-V welds, double bevel joints and single V welds. No surprises anymore! You will know your costs for labor, gas consumption and welding wire instantaneously.



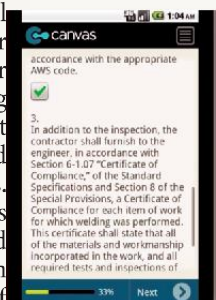
## Miller Weld Setting Calculator:

The calculator will help you tune your machine for optimal results based on a few simple questions. Weld calculators are handy references for weld parameters, electrode/wire type, basic techniques, and process information for TIG, Stick or MIG. This is available in Ipad as well as in Iphone.



## Welding Procedure Specification Mobile App by GoCanvas:

The Welding Procedure Specification mobile app details each step of the welding process, including preheating temperatures, electrodes, material specifications for base materials, filler metal, flux, welding combustibles, joint preparations and welding sequences. Keep welding jobs organized and maintain an accurate record of welding techniques and materials used with this useful app for professional welders and those enrolled in professional welding programs.



A useful tool for those who work in the

welding industry, the welding projects app makes it easy to manage the most important details of welding jobs from anywhere in the field.

Do you need a way to capture job details without having to rely on paper forms or a computer? Simply enter the details about the welding supplies, welding procedures used and other important information for each welding project with your smartphone or tablet.

Welding technology professionals can draw the joint design and outline the welding sequence with their mobile device and store all the details in an electronic format for easy access. When it comes to tracking your work, stay on top of every project with this useful welding industry app that tracks all the other critical details of your welding processes.

## Lincoln Electric launches weld parameter app for iOS:

Welders can use the app to find the correct welding parameters for their projects, welding processes, materials, and thickness. Designed for welders in the shop or in the field, the Lincoln Electric Weld Parameter Guide provides access to information that will help them set up their weld operations on the go, even when no cellphone or Wi-Fi network connection is available.

The app's key features include:

- \* Easy-to-use graphical interface, featuring icon-based menus.
- \* Dynamic look-up tables. As the user enters data, each additional



parameter range is narrowed based on the valid options remaining.

- \* U.S. and metric settings.
- \* Typical machine settings for SMAW, GMAW/FCAW and GTAW welding processes.
- \* Steel and stainless steel material

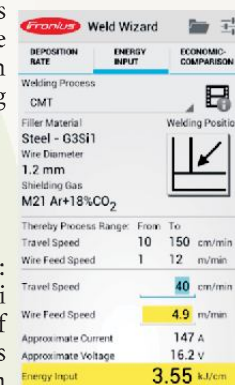
machine settings for SMAW.

- \* Aluminum, steel, and stainless steel material machine settings for GMAW/FCAW and GTAW.
- \* Notes section that allows the user to add additional weld set-up information.

The Weld Parameter Guide is available for free to smartphone and tablet users through the Apple iTunes App Store and the Google Play Store. The app is compatible with Apple's iOS 6 (and 7) as well as Android 2.2 and newer.

## Weld Wizard by Fronius:

The free Fronius Weld Wizard app for calculation of welding relevant parameters for persons which are interested in welding technology.



- \* Sheet 1: Calculation of cross section area and deposition rate. Choice between different weld geometries. Consideration of gaps, reinforcement and spatter loss
- \* Sheet 2: Energy input is calculated from interpolated parameters. Choice of welding processes. High speed videos of welding processes. Process range of travel and wirefeed speed are estimated in respect to welding process and position
- \* Sheet 3: Economic comparison for manual to automatic welding systems. Costs of investment, labor, shielding gas and filler material. Presentation of Fronius welding systems

Other features:

- \* Metric and Imperial Calculation
- \* Worksheets can be saved and sent to other Weld Wizard Users

The above apps are in the market for sometime now and many are utilizing to get out the maximum for the sound weld joints.

By: Jaspal Singh  
IWE, CWI

# All About Structural Welding - Part - 1

Richness of a civilization is often judged by the structures it built. Pyramids of Giza, Temples of India, Eiffel Tower of France are examples of famous structures. All these structures were built over tons of years. In today's time, the time available for building structures has reduced considerably. Therefore, steel structures provide us the speed of construction meeting scheduled expectations. The process which makes the steel structures is Structural Welding. Lets explore this wonderful world of structural welding in various stages where we begin with the basics and go upto complex offshore welding process in our subsequent editions.

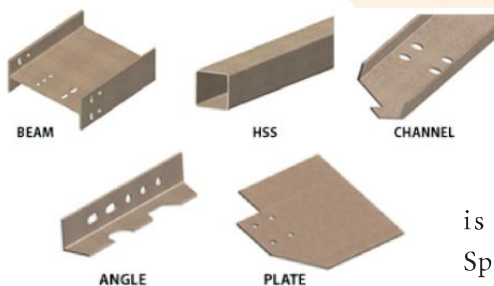


Structural Welding is a boundless subject that is perceived as a complex one. Here, we aim to make the understanding simple. Here we have put up a schematic diagram to help us in the same. In this first part of the series on structural welding, we will cover the very basic of types of welding. Then, we will progress to understand the groove weld joints of Structures.

## Types of Steel Structures and how they are connected

For the purpose of understanding, steel structures are made of two types of elements (parts).

- Structures made of flat parts like beams, channels, angles, plates and flats



- Tubular Structures made from pipes



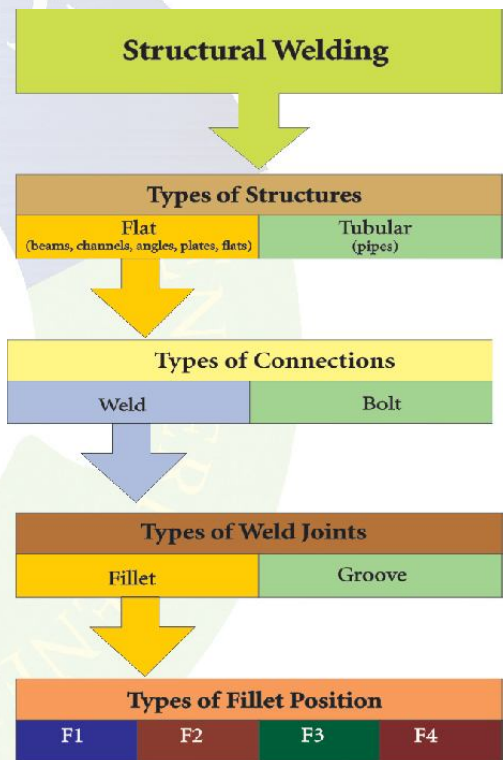
## Structural Welding

By & large, welding of structures is carried out using Manual Metal Arc Welding technically called Shielded Metal Arc Welding (SMAW) where the filler metal itself, called Electrode, carries the current and the molten weld metal is protected from oxidation by a gaseous envelope generated by burning of the coating (called flux) over a stick of carbon steel called core wire. The Arc is struck between the base metal (Steel) and the electrode. Other commonly used welding processes in structural welding are Flux Cored Arc Welding (FCAW), Submerged Arc Welding (SAW).

Before we start welding of any Structure, we need to demonstrate by way of welding a test piece that using the parameters so established we can produce sound welds repeatedly. A documented set of parameters is called Welding Procedure Specification (WPS). A Welding Procedure is a specified course of action followed in welding including a list of materials and, where necessary, tools to be used.

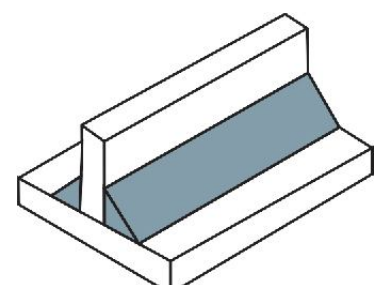
## The Joints/ Connections

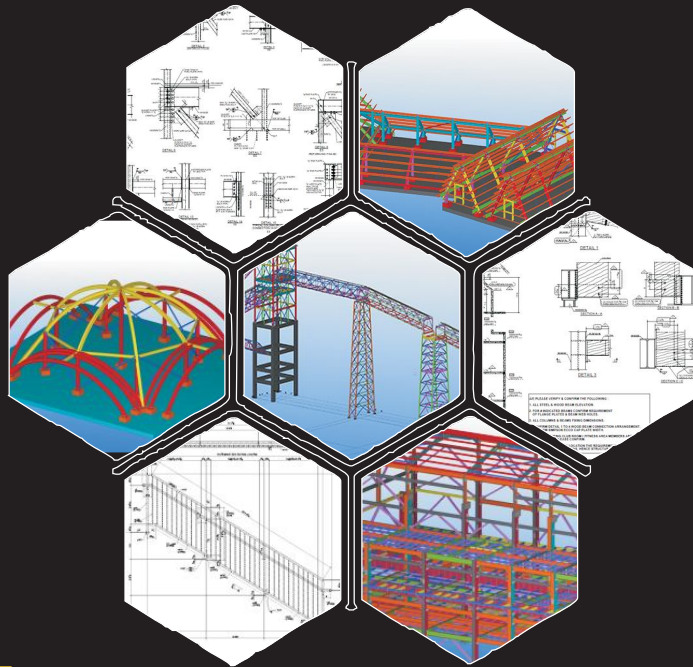
Welding connections include Fillet and Butt Welds. We in this part, have taken up only Fillet joints.



## What is a Fillet Weld?

A Fillet weld is a weld of approximately triangular cross section joining two surfaces at right angles to each other as seen in the following picture:





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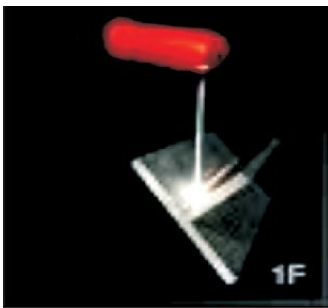
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## Weld Positions and Codes:

### Position 1F:

Flat Position for Fillet Welding is called "1F". This is the most comfortable (the weld metal easily flows down due to gravity) set up for a welder to weld and provides the fastest welding speed of all other welding positions. This position has been coded as "1F" (or Flat) position by Codes like AWS D1.1 and ASME Section IX where the "1" indicates the relative easiness for welding and "F" stands for a Fillet joint.



For plate welding or welding of flat elements, there are 3 more positions: 2F, 3F and 4F.

### Position 2F:

Horizontal Position for Fillet Welding is called "2F". Movement of the electrode can be left-to-right or right-



to-left. As we can understand it is not feasible to always weld in Flat Position.

In fact, we will find that the above Position will be encountered more often than the Flat position,

### Position 3F:

Vertical Position for Fillet Welding is called "3F". Movement of the electrode could be from bottom-to-top or top-to-bottom. Welding on a vertical surface is much more difficult than welding in the flat or horizontal position due to the force of gravity. Gravity pulls the molten metal down. Vertical down welding is faster than Vertical up welding thereby giving higher production rate. Also, its more



suitable for thin part because it avoids chances of burn through in the base metal.

### Position 4F:

The most difficult position to weld is the OVERHEAD Position or "4F"



As we can see, the welder has to not only contend with the gravity (Welders will maintain the shortest

possible arc to overcome the gravity), most of the time he is not in a comfortable stance with weld spatters falling onto his welding helmet. Weight of the welding cable is another challenge that the welder encounters.

### Welding Codes:

A welding code identifies the various aspects of the weld. This then enables to design welded connections. Following are the codes for Structural Welding Qualification requirements, issued by the Bureau Of Indian Standards:

**IS 7307 :** Approval Tests for Welding Procedures

**IS 7310:** Approval Tests for Welders Working to Approved Welding Procedures.

**AWS D1.1** (Issued by American Welding Society) is followed Internationally particularly for Offshore Structures including Tubular Structures

Structural welding is a subject that has a wide spread application. We, in this issue, have just touched the tip of the iceberg. In the subsequent issues, we will unfold the subject and learn the fundamentals and then the nuances of the other aspects in structural welding. We shall then discuss the welder safety and welder qualification requirements as well.

Any comments, suggestions and other information are welcome. Please write to us at [info@indiaiwelds.com](mailto:info@indiaiwelds.com).

By: Team IndiaWelds  
(Image Courtesy: Internet)



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# The Joy of Welding!

*Components - around 15000 for a typical automotive, more than 6 million for a Boeing 747-400 aircraft, are all unified to give the splendid shapes one is in awe of! Welcome to the wonderful world of welding! Where arts meets science with a spark that lights up the world! Let us have a general overview of this amazing skill in present context.*

**W**elding in general is described as the act of joining similar or dissimilar materials after achieving coalescence. Although its use has been found since early 20th Century, but recently it has superseded other joining process, such as riveting and bolting.

Joining of components can be found in areas such as, boilers and pressure vessels, ships, off-shore structures, railway wagon and coaches, rail tracks, bridges, nuclear reactors, fertiliser plants, chemical equipments, pipes, tubes, tools, dies, military equipments, machines, artilleries etc. To sum up, welding is now an universal joining process from chips to ships.

## Welding Basics: A Recap!

Weld processes primarily consist of two broad categories such as fusion welding and solid state welding.

### Fusion Welding

A fusion welding is the joining process where materials are in coalescence which is achieved by the heat come from an electric arc. The temperature reaches to 5500°C which is far above the melting point of any metal. Most arc welding processes add filler metal to increase the strength and the volume of the weld. Basic arc welding processes like Submerged arc welding (SAW), Shielded metal arc welding (SMAW), Gas metal arc welding (GMAW) etc are appropriate for similar and dissimilar materials. But certain disadvantages such as infeasibility for smaller thickness as well as spatter free and crack free, low HAZ are the demand for better process. Cold metal transfer (CMT) has been developed by Fronius, Austria which uses a new method of droplet detachment based on short circuit welding. It works on a low heat input thus reducing the possibility of developing crack and spatter free joints.

### Solid State Welding

A solid-state welding process is also in various uses where coalescence is achieved at recrystallization temperature of the base materials without filler and with or without pressure. Solid-state welding is widely applied in automobile,

aircraft and aerospace industries where solidification defects like porosity, crack and non-metallic inclusions do not occur. Friction welding, Friction stir welding, Resistance welding, explosion welding, ultrasonic welding are few example of solid-state welding process.

## Welding Welding Everywhere!

Almost all types of materials (metals, plastics, ceramics, composites and even wood) can be welded. Brazing, soldering and adhesive bonding are considered as part of welding process. Due to numerous materials and applications, these welding processes are also different from each other and have vast potential. This is the unique area, where knowledge and skill can be acquired from the level of certification courses to ITI, Diploma, Undergraduate and Post Graduate Program up to even PhD.

Now the state-of-the-art developments have also taken place at various places in India and abroad. The welding booths available with some reputed organisations and institutes are remarkable. The learning and practising these processes of joining is now an art and ensure cleanliness and safety. The central gas manifold system for the supply of shielding gases, fume extraction system and EN certified welding strip curtains, to mention a few among others. The customised welding trainer tables with virtual welding simulators have reduced the cost and increased efficiency and effectiveness.

### ...But where is the skill

Unfortunately, the curriculum for welding has never been given its due respect because of the misconception and lack of awareness. However, recently, due to Government's efforts, it is slowly and

slowly gaining a good momentum.

An obvious solution for lack of human resources with qualified welding operators is inclusion of the process automation. The automation in welding has found a niche in industries today. The robotic welding is no more confined in to mass production only. The companies producing small batches of different parts have been using robotic welding now days.

Defect analysis in welding, play an important role in understanding the weld quality. Destructive measurement of strength, hardness, etc. studies of microstructure and other non-destructive testings such as dye penetrants (DP), magnetic particle inspection (MPI), ultrasonic testing (UT), radiography etc. continuously contributing in the areas of test and research.

## Opportunities

Developing welding skills as a workforce along with carrying out in house developments to build upon the existing technologies is therefore the need of the hour! The process of welding is here to stay. Therefore, welding is a continuous journey and not a destination.

*By: Prof. Jayanta GhoshRoy, M.Tech (Mech. Engg.), I. I. T. Delhi 22 yrs teaching experience in Directorate of Training and Tech. Education, Delhi. Prior 2.5 years in National Test House for Mechanical Testing and Research.*





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## वेल्डिंग में सुरक्षा और सावधानी

वेल्डिंग करते समय हमें कुछ बातों का ध्यान हमेशा रखना चाहिए। इससे हम अपनी सुरक्षा के साथ साथ वेल्डिंग जैसे कला में और अधिक निपुण हो सकते हैं। आइए देखें कैसे -

### 1. वेल्डिंग में खतरे

वेल्डिंग में जलने वाली गैसों, जलने को तेज़ भड़काने वाली ऑक्सीजन, वो भी अधिक प्रेशर पर और इलेक्ट्रिक करेंट का इस्तमाल होता है।

अतः वेल्डिंग के दौरान वेल्डर को नीचे लिखे पाँच खतरों से सावधान रहने की बहुत ज़रूरत है-

- 1) एलेक्ट्रिक शॉक और जलने से।
- 2) आग से।
- 3) गैसों से।
- 4) कई प्रकार की किरणों से जैसे -
  - a) अल्ट्रावायलेट किरणें (Ultraviolet Rays)
  - b) इंफ्रारेड किरणें (Infra Red Rays)
  - c) अत्यधिक तेज प्रकाश की किरणें (Light Rays of Extremely High Intensity)



### 5) गैसों, धुआँ, धूल ( Gases, fumes and Dust)

a) आर्क द्वारा पैदा होनेवाली गैसों हैं नाइट्रस ऑक्साइड (Nitrous Oxide), नाइट्रिक ऑक्साइड (Nitric Oxide), कार्बन मोनो ऑक्साइड (Carbon Mono-oxide) और ओज़ोन (Ozone) |

b) धूँ से पैदा होने वाली गैसों जैसे कार्बन मोनो ऑक्साइड, कार्बन डाइ ऑक्साइड इत्यादि।

c) धातूओं के ऑक्साइड के कण, खनिज (Mineral) पदार्थों के कण, फ्लक्स कोटिंग के पदार्थों के कण, स्लेग के कण। इनमें सबसे ज़्यादा खतरनाक हैं, धातूओं के ओक्साइड के कण जैसे कि ज़िंक, कॉपर, क्रोमियम, मँगनीज़, सिलिकॉन इत्यादि के

ओक्साइड तथा फ्लोराइड के कण और धुआँ।

- d) यदि किसी तंग जगह में वेल्डिंग हो रही हो तो वहां के वातावरण में ऑक्सीजन की कमी का संकट पैदा हो सकता है। इससे साँस लेना मुश्किल हो जाता है। वेल्डर हाँफने लगता है।

अल्ट्रावायलेट, इन्फ्रारेड और तीव्र प्रकाश की किरणों से सुरक्षा (Safety from Ultraviolet, Infrared and High Intensity Light Rays)



अल्ट्रावायलेट और इन्फ्रारेड किरणें आँखों को दिखाई नहीं पड़ती। लेकिन जब भी हम गैस वेल्डिंग, आर्क वेल्डिंग या प्लास्मा कटिंग करते हैं, ये दोनो प्रकार की किरणें हमपर पड़ती हैं। खासकर टिग या मिग वेल्डिंग में ऑर्गन गैस की वजह से, तथा प्लास्मा कटिंग में अल्ट्रावायलेट किरणें अधिक निकलती हैं।





वेल्डर को अल्ट्रावायलेट किरणों से अपना बचाव करना चाहिए इसीलिए वेल्डिंग आर्क को सीधे आँख से बिना शील्ड का उपयोग किए कभी नहीं देखना चाहिए। अल्ट्रावायलेट किरणों से आँखों में जलन और दर्द होता है। ऐसा लगता है मानो आँखों में रेत डाल दी गई हो। यह दर्द कई घंटे तक रह सकता है। गनीमत यह है कि आँखों को कोई स्थाई नकसान पहुँचता है, ऐसी शिकायत अभी तक नहीं है।

अल्ट्रावायलेट किरणों चमड़ी पर भी अपना प्रभाव डालती हैं। चमड़ी पर जलन होती है और चमड़ी लाल हो जाती है। इसीलिए वेल्डर को सुरक्षा प्रदान करने वाले कपड़े

पहनना चाहिए। अल्ट्रावायलेट किरणें सूती कपड़ों को भी नुकसान पहुँचाती हैं - कपड़े जल्दी फट जाते हैं।

इंफ्रारेड किरणें गरमी उत्पन्न करती हैं - चमड़ी झुलस जाती है, आँखें लाल हो जाती हैं।

अत्याधिक तीव्र प्रकाश को देखने से आँखें जलती हैं, सिर दर्द होता है और आँखें जल्दी थक जाती हैं। देखने की क्षमता घट जाती है।

आर्क से यदि आँखें प्रभावित हो जाएँ तो आँखों पर बर्फ रखने से आराम मिलता है। आँखों में गुलाब जल, या अन्य आँख की दवाई डालकर आँखें बंद कर, अंधेरे कमरे में आराम करने से आँखें जल्द ठीक होती हैं।

इन किरणों से आँखों को बचाने के लिए वेल्डर को हमेशा सुरक्षा वाले चश्में, शील्ड या हेलमेट का उपयोग करना चाहिए। उसके बिना वेल्डिंग नहीं करना चाहिए। शील्ड से आँखों तथा चेहरे का बचाव होता है।

शील्ड में गहरे नीले फिल्टर ग्लास लगे रहते हैं। उनकी गहराई के हिसाब से वे 2 से 14 नंबर तक रहते हैं। जैसे जैसे नंबर बढ़ता है, फिल्टर ग्लास ज़्यादा डार्क या काला होता जाता है। गैस वेल्डिंग में 4 से 8 नंबर तक का फिल्टर ग्लास, आर्क वेल्डिंग में 10 से 12 नंबर तक का फिल्टर ग्लास, प्लास्मा कटिंग में और मिग वेल्डिंग में 12 से 14 नंबर का फिल्टर ग्लास इस्तेमाल करना चाहिए।

By: Partho P. Banerjee  
A Welding Enthusiast with  
15 years experience



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

**S**killveri is a Chennai, based startup founded in 2012. It offers its simulators to training institutes and industrial players as a quicker, simpler and cost-effective instrument for training people.

**T**he startup has built welding and spray painting simulators, which helps accurately train and measure the skills which otherwise is difficult. The simulators lead to measurable improvements in performance of the trainees,



**S**killveri is backed by reputed Venture Capital firms, Michael & Susan Dell Foundation and Ankur Capital. The company has won awards at the Indian Innovation Initiative 2012, Skills Innovation Initiative by the National Skill Development Authority, and National Innovations Skill Challenge 2014.



THE INDIAN WELDING SOCIETY

IWS is organising the next International Welding Symposium - IWS 2K18 during 27-29 November 2018 at Bombay Convention & Exhibition Centre (BCEC), Mumbai. The event is scheduled concurrent to the 8th International Trade Fair "INDIA ESSEN WELDING & CUTTING FAIR" in the same venue which will encompass Metallurgy India, Tube India International and wire and cable India 2018 fairs.

## Career in Welding : Training & Certification

### Professional Certifications by AWS



AWS offers eight individual certification categories

- ✦ Certified Welding Inspector Program
- ✦ Certified Welding Educator Program
- ✦ Certified Radiographic Interpreter
- ✦ Certified Welding Supervisor
- ✦ Certified Welding Sales Representative
- ✦ Certified Welding Engineer
- ✦ Certified Welder Program
- ✦ Certified Robotic Arc Welding

### Professional Certifications CSWIP



The categories of certification available are:

- ✦ Inspection (welding and plant inspectors)
- ✦ Underwater inspectors
- ✦ Plastic welders
- ✦ Welding instructors (including rail, plastics)
- ✦ Welding supervisors
- ✦ Welders, including the National Welder Training Standard
- ✦ General inspection of offshore facilities
- ✦ Non-destructive testing (NDT)
- ✦ Integrity management of bolted joints
- ✦ Cathodic protection personnel
- ✦ Welding coordination personnel
- ✦ Heat treatment operatives

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## SS Welder Speaks Up.....!

Ever wondered how our jobs would react if they could speak? In this uniquely crafted interview by Jaspal Singh, where we have the SS speaking up on statements that we often make while discussing the Stainless Steel Welding. Are they true, true with twist, or false? Are they an opinion, or factual data to substantiate? Lets read this interesting conversation between JS and SS!

**JS: Please introduce yourself.**

**SS:** Fact or Fiction, I am Qualified and Certified SS welder as per ASME section IX/AWS/ISO/&IBR.

**JS: Could you be welded like carbon steel?**

**SS:** Yes, I am not much different then carbon steel welding but there are some exemptions, I am not that quick in dissipating the heat like my old friend CS due to my low thermal conductivity. This distorts me more.

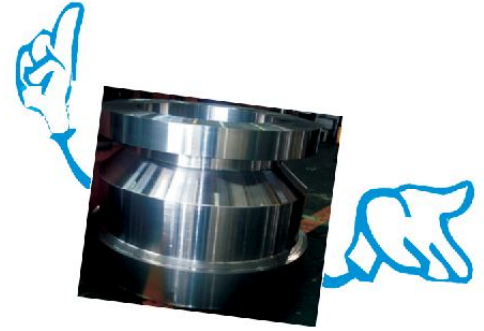
Times change and so do welders but mother nature does not. My this nature limits the length of my welding electrode also.(you know it's length is 350mm only). This is painful for my welder as he is always less productive while working with me, he has to wait for



interpasstemprature which is very low in my case (Hold for the moment..check your WPS it is around 175 C only).

**JS: Do you prefer to be neighbour then staying in same house with CS?**

**SS:** Yes, I do prefer to stay in separate area, inherent nature of carbon richness of my versatile CS friend does not suits me. It kills me slowly during service. My welder do prefer to have different weld aids. This is because trace amounts of carbon steel can



become embedded in me, causing me to rust at local spots while my user loves me because I am stain free.

**JS: Do you prefer preheat?**

**SS:** Not at all. Again this is because of my nature, I am always austenite in structure whatever the speed of heating or cooling is.

**JS: Lastly, what is that 1 very important thing that we must take care when handling you?**

**SS:** I'm very sensitive like SS material, never share my cleaning brush, grinder, hammer with my carbon steel fellow welders. Also feeling upset when someone's carbon steel grinding sparks hit my SS Surface and welds!

**JS:** Thanks SS for making us aware.

**SS:** Thanks!



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