ador WELDING

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Role of welding in Railways

Welding is the principal process used in the fabrication of all railway facilities which include locomotives, passenger coaches, wagons, rail tracks, platform structures and bridges and in repair and maintenance of components i.e rebuilding of worn out flanges of wheels of coaches and wagons.

Bridges :

Bridges are subject to dynamic and repetitive live loads and exposed to direct exposure to weather. These conditions make bridge design and construction more complex.

Indian construction standards such as the Indian Railway Standards (IRS), the Indian Road Congress (IRC) and the Indian Standards (IS) and RDSO are used in India. International standards such as British Standards (BS), International Union of Railways (UIC) and Euroand, Manual for Railway Engineering, of American Railway Engineering Association. are also being used based project requirements

The welded components of bridges are mainly girders, beams, stiffeners, diaphragms, floor beams and stringers.

Recently Indian Railways has undertaken the mega-project of constructing a new railway line across the Indian state of Jammu and Kashmir between the towns of Udhampur near Jammu and Baramulla on the northwestern edge of the Kashmir Valley. This project has been declared a national project in 2002. It is directed by the Konkan Railway Corporation Ltd..

The extraordinary challenge lies in a large number of tunnels (totalling 63 km in length) and bridges (7.5 km) to be implemented in highly rugged and mountainous terrain, with the difficult Himalayan geology. The most difficult part is believed to be the crossing of the deep gorge of the Chenab River, near Salal Hydro Power Dam, by the Chenab Bridge.

After many deliberations, taking into account aesthetics, economy, and availability of local expertise and construction materials, the Chenab Bridge was designed as a large span single arch steel bridge with approach viaducts on either side. The arch is two-ribbed, fabricated from large steel trusses. The chords of the trusses are sealed steel boxes, internally stiffened and filled with concrete to assist in controlling wind-induced forces on the bridge. Another advantage of concrete filling is that internal painting will not be required.

The Quality aspect has been emphasized, as the quantum of fabrication and welding is colossal. Mostly indigenous material compliant to IS codes has been planned to be used, whereas for the design, international codes have been referred,

ADOR WELDING LIMITED, is proud to be associated in this prestigious project not only in supplying welding consumables only but also establishing procedures with these welding consumables,

• SUPABASE X PLUS R :, RDSO class - A2/ B4

• AUTOMELT EM 12 K + AUTOMELT B71-:RDSO Class W2 + F2 SAW consumables

• AUTOMIG 70 S6: RDSO Class I, Solid

• AUTOMIG FC 18 M (Spl) : RDSO class III , Flux Core

Locomotives:

The manufacturing involves large number of separately fabricated and welded sub-assemblies which are finally assembled together to form locomotive. Important sub-assemblies are as per following :

a) Engine blocks

b) Underframe

c) Superstructure

d) Aluminium pistons

Engine blocks : The engine block is the principal structural member of diesel engine. The steel material of engine block has not only to meet requirement of weldability and physical properties but it should also free from defects such as laminations. The engine block fabrication employ both manual and automatic welding process. The long continuous welds which run through the entire length are mostly done by SAW and short runs are made by MMAW. The foundation plates, forged saddles and spline are clamped together on cast iron fixture mounted on roll over rings. The joints between saddles and foundation plates are tested 100 % radiographic examination. After welding engine block is stress relieved at 620 -650 Deg C.

Underframe : The underframe is welded utilising plate ranging in thickness from 6.3 mm to 25 mm. The main structure of underframe is made out of ASTM -A 441 high tensile steel. The fabrication of end section and centre section apart from manual welding, semi automatic flux cored welding is used. After these three sections are fabricated separately, these are welded together employing butt joints the welds of which must be comply with radiographic standards.

Superstructure : The superstructure comprises of short hood, driver's cab, contactor compartment hood over engine and radiator compartment. All these are light structures fabricated from 1.6 mm and 3.15 mm steel sheets. Apart from manual welding, resistance spot welding is also used on smaller components.

Railway Coaches :

The main components of coach are bogies, bogie frame and body of coach. For bogie and bogie frame fabrication manual metal arc and SAW process are used. For welding the sidewalls and roof which are made. Currently coaches are made of Stainless Steel grades capable of obtaining high strength and ductility by moderate or severe cold working .

Floor assembly : The floor assembly consists of two end underframe assemblies of high strength low -alloy steel joined by manual and semi-automatic arc welding processes. Floor assembly welded with resistance welding.

Side assembly : This is completely resistance welded unit with exception of butt joints between dead line panels which are TIG welded. The MIG process used to attach heavy stainless steel tie in members at the floor level in door areas.

End assembly : The end frame consists of end sheets, angles for connections to roof and side frames and collisions post assemblies, which connect the longitudinal roof members and the end underframe. This assembly is resistance welded.

Bogie Welding :

Passenger coaches in particular Electrical Multiple Unit (EMU) coaches, which develop fast acceleration and run at high speeds, demand designs which can be translated to fabrication by welding alone . The bogies of EMU coaches are the primary structures which bear thrashing of high intensity dynamic loading. The welding technology adopted on the bogie frame takes care to avoid premature and sudden fatigue and impact loading failure thereby ensuring passenger safety.

Generally the following processes of welding are adopted in fabrication of bogie in the following locations :

a) Manual metal arc welding -Assembly of bogie frame.

b) Automatic Submerged Arc Welding -Bolster sub assembly

c) Semi automatic submerged Arc welding - Head stock sub assembly

d) Gas Shielded metal arc welding (CO_2) -spring plank sub assembly ,tube assembly etc.

Fillet welds are mostly deposited by SAW and MIG processes.

Wagons :

The main components of railway wagon are bogies, underframe, and the body. The bogies are some what similar to those of rail coach. The underframe is all welded skeleton structure usually consisting of centre sill, side sills body bolsters and cross members that connect the centre sill to the side sills. When the wagon has to carry heavy floor loads additional longitudinal floor stringers are placed between centre and side sills.

To construct the side walls of the wagon body, a frame work consisting of series of vertical posts, end posts, and top and bottom chord members is made The framing members are assembled and tack welded in horizontal location fixture. Sheets or plates of appropriate size and thickness are then tack welded between the frame work members .The sheets and plates are then welded by automatic submerged arc or MIG /CO_2 process .

The material used for the underframe and shell was besides a few rolled products mostly plate of semi killed steel with maximum of 0.07 % C. The thickness for the underframe ranged between 5 and 15 mm and the wall and roof between 2 and 4 mm. MMAW, FCAW and SAW process were in use.

Rail Welding :

Railway tracks with welded joints possess distinct advantage over those having fish plated joints ,as welded joints offer better riding comfort with reduced joint maintenance It minimises considerably rail end failure -predominant cause of rail renewal. Welded tracks are also less susceptible to sabotage.

In India rail joints are welded in the shop by the flash butt welding or gas pressure welding process and in situ on the track by the thermit process . The thermit process is simple and does not require expensive equipment. The weld metal is produced by exothermic process is simple and does not require expensive equipment. The weld metal is produced by exothermic reaction between aluminium and iron oxide, carried out in a refractory lined crucible. Short welded panels made either by flash butt or gas pressure welding processes are further welded in situ by the thermit welding process to make continuous welded rails.

Reconditioning of worn-out Flanges coach & wagon wheels.

Reconditioning of worn out flanges of cast steel wheels and also for reconditioning of worn out flanges of rolled / forged wheels of coaches and wagons is done with submerged arc welding process. Ador welding offers SAW wire + Flux combination i.e Automelt C wire (EH 14) + Gr II (A 55) SAW flux

Welding Consumables from ADOR WELDING LIMITED

Ador welding Limited is actively involved in various Railway projects not only for the supply of welding consumables but also in establishing procedures with these consumables. AWL has currently following RDSO approved brands, which are being extensively used at various construction sites of roads and bridges and in work shops of locomotives, coaches and wagons etc.

	AWL welding consumables	RDSO class approval
1	SUPABASE X PLUS R	Class A4/ Class B2
2	TENALLOY 70A	Class B4
3	CASTEN	Class F
4	ZEDALLOY 350	Class H4B
5	AUTOMELT Gr A	Class W1
6	AUTOMELT Gr IV	Class F1
7	AUTOMELT EM12K	Class W2
8	AUTOMELT B 71	Class F2
9	AUTOMELT EA4	Class W4
10	AUTOMELT B71	Class F4
11	MIGINOX 309	Class VII
12	MIGINOX 308L	Class VI
13	SUPERINOX 1A	Class M1
14	SUPERINOX 2A	Class M3
15	AUTOMIG 1	Class 1 - Solid
16	Automig IV	Class III - Solid
17	AUTOMIG FC 120	Class 1 - Fluxore
18	AUTOMIG FC 18 M (Spl)	Class II - Flux core

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