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MANUFACTURING & QUALITY ASSURANCE PROCEDURE

CODE	:	AITE/MAQP/01	REVISION NO	: 09
PRODUCT	:	TOWERS	PAGE ISSUE NO	: 01
DATE OF ISSUE	:	18. 09. 2003	PAGE NO	: 01 of 04

PURPOSE:

This Manufacturing & Quality Assurance Procedure covers the manufacturing of Transmission Line Towers, Microwave Towers, Allied Steel Structures and other similar Steel Structures.

SCOPE:

This document covers the procedures adopted right from Procurement andReceiving Inspection of raw materials upto final inspection of galvanized parts and bundled items.

PROCEDURE DETAILS:

The procedure has been divided into four main parts – namely, ReceivingInspection, Inprocess Inspection, Galvanization Inspection and Final Inspection.

A). Receiving Inspection

1. Visual Inspection:

Steel sections are procured from various re-rollers and also from mainproducers. The basic reference documents to be considered for the acceptance of steel sections are ASTM: A36, ASTM: A53, ASTM: A588,ASTM: A366, ASTM: A500 or any other applicable International Standards as specified by the customer. Visual inspection is to be carried out to check surface defects like cracks, laminations, imperfect edges etc. This inspection is to be carried out as per the standard Manufacturing Quality Plan and the observations shall be recorded in the appropriate documents as per Quality Plan. All hardware items shall be checked against a copy of the Purchase Order issued by the Procurement Dept. along with the Quality Plan or ASTM: A 325, for the appropriate product/ project, for any kind of visual defects/ imperfections.

2. Dimensional Check:

This test shall be carried out as per the standard Manufacturing QualityPlan. Materials to be procured and brought into our plant only after the satisfactory visual and dimensional inspection of samples at supplier's mill.Records of the same shall be maintained.

3. Mill Test Certificate :

Steel sections shall be accepted only against submission of Mill Test Certificates from the various steel producers and after verification of compliance with the requisite chemical composition and mechanical properties.

Procurement shall ensure that all hardware items are procured along withCertification for galvanizing or blackening. Quality Assurance Dept. shall verify the same against the Customer's specifications given in the Quality Plan.

4. Non-Conformance:

Any non-conformance observed shall be immediately reported to concernedauthorities in the Non-Conformance Report for Disposition Action and the same shall be intimated to the supplier. If the material is rejected, it should be returned to the supplier.

B. Fabrication and Inprocess Inspection

Fabrication process starts with first fabrication and assembly of a prototype ofeach type of structure planned for production. After successful assembly, the Customers' Quality Inspectors perform their inspection and only after their approval, the production of the remaining structures is taken up.

The process of fabrication includes operations like straightening, marking, cropping/ cutting/ shearing, punching/ drilling, heel cutting, notching, bending and stamping.

1. Prototype Assembly (Notification Point):

A prototype assembly for one structure of each type, is assembled eitherhorizontally or vertically, to ensure proper fitment of all individual members, without interference of any adjoining member or legs of adjacent side. The overall configuration of the structure is also ensured by verification of major dimensions like overall height, base width, connectivity with other structures and required clearances as per the structural drawing.

2. Mass Fabrication:

After the clearance of prototype structure and recording of any modificationsduring the prototype assembly stage, the respective shop drawings are also corrected and then released for mass fabrication. All the above mentioned operations involved in the process of fabrication of final components, will undergo stage-wise inprocess inspection, to ensure tolerances within permissible limits as per the Customer's specification.

During all operations, the first piece made, is checked by the QC Inspector on duty and only after his clearance, the balance pieces would be operated upon.Normally, Job Order Sheet will be released section-wise for the full quantity of each structure to be manufactured. There would be several items of each section that are planned and the fabrication operation starts with firststraightening and then cropping the angles as per the length specified in thedrawings.

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a). Cropping/ Shearing / Marking –

The cropping of angle sections is done by CNC machines. First piece is tobe verified by the QC inspector for its correctness then balance pieces are to be cut. If quantity is more, random pieces are to be checked for correctlengths inbetween also. Similar procedure to be followed for all the items.After Cropping for full quantity of items planned as per the Job Order is done,then handed over for the next operation.

Legible and clear marking at suitable locations is done on the members by the CNC machines, which are in compliance with the marks given on the drawings. Marking is done in the initial stages of fabrication to prevent any marking/ stamping after galvanizing.

b). Punching/ Drilling –

Punching is done either by CNC or hydraulic punching machines. In case ofpunching operation, one piece is first fabricated by marking and drilling of holes. This is to be checked by the Q.C. Inspector and then to be used as amaster pcs. for the checking of balance quantity. Random checking of balance quantity is to be done by QC inspector.

c) Heel Cutting –

For a lap/ butt joint, the heel of the inner member is removed to an extent that the lapping member is fits properly. This can be done either by grinding, heel milling or gas cutting. It should be ensured that after grinding, the thickness of the member at the heel, is atleast that of the flange thickness.

d) Notching –

Wherever specified in the drawing, required notch cut is to be provided. As anotch is provided to facilitate easy fitment of members, it is not provided with a negative tolerance. Normally, a +5 tolerance is also acceptable, provided it does not violate any other statutory requirements.

e) Grinding –

In case of any minor irregular cutting or observation of any burrs, such defects shall be cleared by resorting to manual grinding.

f) Bending –

Certain members are required to be bent to suit fitment in the structure.Bending may be done by using a die on a press brake/ hydraulic bending.

Wherever hot bending is required, the bending area should be properly heated up before bending. All High Tensile members are required to be hot bend. Before bending, the bend line is to be marked on the members and a bend gauge is to be made for the degree specified. For close bends, necessary dressing will be done to remove the crease of metal accumulated near the bend line. At any stage/ operation, if the material is found to be not conforming to the requirements of the drawings/ specifications, the material is either rejected for scrapping or in case of minor reworkabledefects; the material is sent for rework.

C). Galvanizing

All the parts/ sections/ members are hot dip galvanized to ensure proper protection from corrosion. Before galvanizing, the items are subjected either to sand blasting or pre-treatment (pickling) depending upon the requirement of client. Galvanizing operation is farmed out with reputed approved Ancillary organizations. After galvanizing, the inspection is carried out to comply with specifications, by the ancillary units at their premises which are witnessed by our QC inspector and compliance certificates are issued, if the product is found to be complying with the relevant standard.

Even after receipt of galvanized material from the Ancillary units, if we noticed any defects, such defective material is returned to the ancillary galvanizing plant for stripping and re-galvanizing, as the case may be.

D). Bundling & Final Inspection

After galvanizing, when the materials are received back, they are to be properly sorted out and stacked properly. While stacking it has to be ensured that the quantity of each item is complete as per the packing list and Job Order. Bundling schedule is normally prepared in line with the customer's requirements. But, when the same is not specified, following norms are followed:

1. Domestic Bundling: For all domestic supplies the weight of individual bundleswould not exceed 1000 kgs. The bundles are made by strapping.

2. Export Bundling: For export supplies, the individual bundle/ pallet weight can be upto 2000kgs. Usually, members of approximately equal length arebundled together. In case of small components, damage to the zinc coating is avoided by ensuring proper packing/ strapping of the pallets. In case of very large members, the members are directly strapped/ tied to the container or trucks. Bolts, nuts, plain, spring washers and other hardware items are dispatched in separate cases/ bundles. Proper shipping marks are placed on the pallets before dispatch.