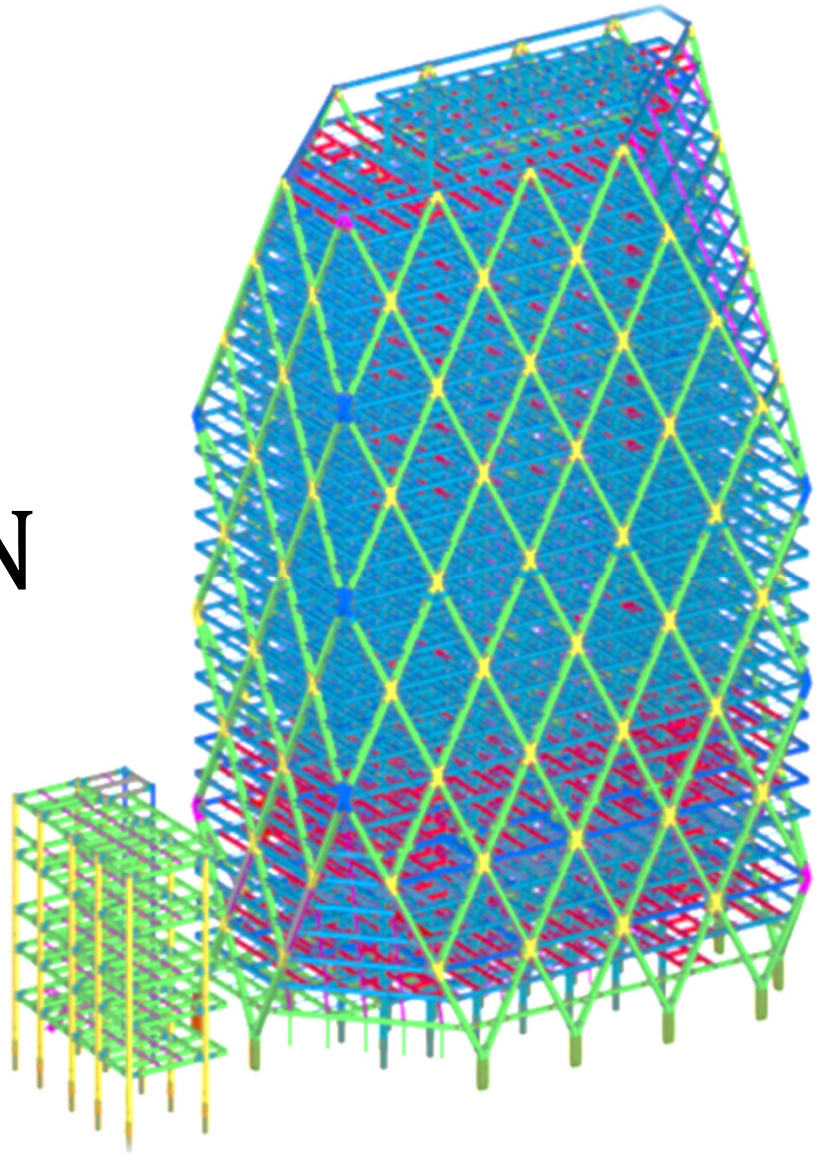
Min Dhama
Steel Structures Co., Ltd.

M TOWER

M TOWER : THE FABRICATION PROCESS

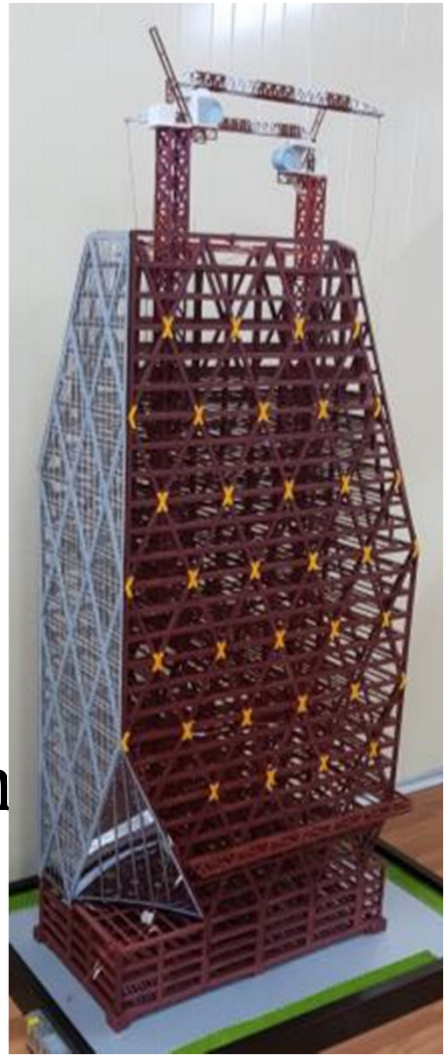


INNOVATION THROUGH **EXPERIENCE**

Min Dhama
Steel Structures Co., Ltd.

M TOWER Requirements

- 8,256 tons of fabricated steel
- 9,688 pcs of steel members
- 539 truck loads of delivery
- Max member weight: 14 tons
- Max member length: 14.5 metres
- No of bolts: 179,254 nos
- 7 months of continuous production
- > 700,000 man-hours



Min Dhama
Steel Structures Co., Ltd.

Challenges

- Complex nodes and connection joints that require detailed preparation, methodology, process and sequencing;
- Getting the correct positions and orientations;
- Controlling weld distortions and weld sequencing of assemblies;
- Traceability of assemblies.

Min Dhama
Steel Structures Co., Ltd.

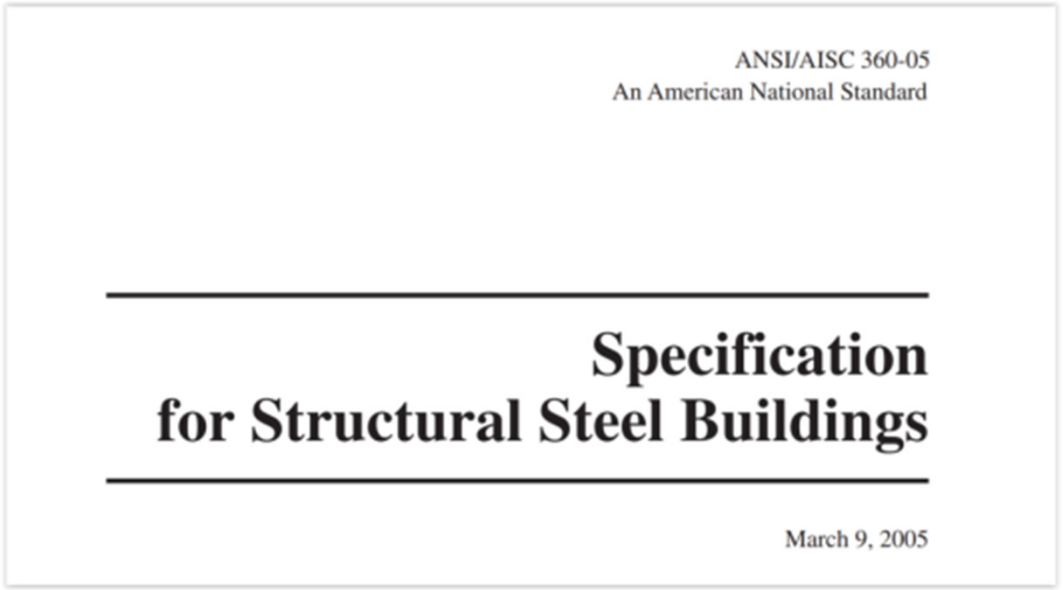
Fabrication Facility

- Fabrication Area: 55,458m2
- Production Capacity: 5,000 tons per month
- Machinery: >50 specialized machines
- Logistics: 71 Overhead & Gantry Cranes
- Located @ Shwe Pyi That Industrial Zone (13km away by road)
- 80 Engineers +

  520 Staff & Workers

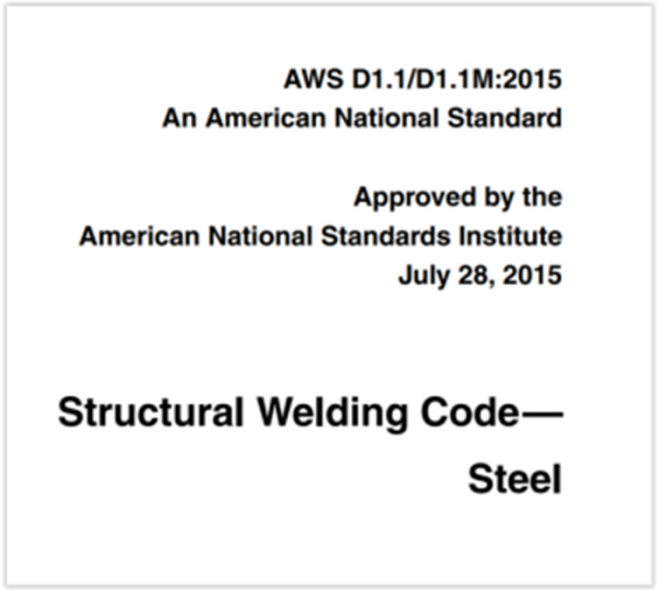
Min Dhama
Steel Structures Co., Ltd.

Fabrication Works


ANSI/AISC 360-05
An American National Standard

Specification
for Structural Steel Buildings

March 9, 2005


AWS D1.1/D1.1M:2015
An American National Standard

Approved by the
American National Standards Institute
July 28, 2015

Structural Welding Code—
Steel

AISC 360-05 : 2005

AWS D1.1: 2015

American Welding Society

INNOVATION THROUGH **EXPERIENCE**

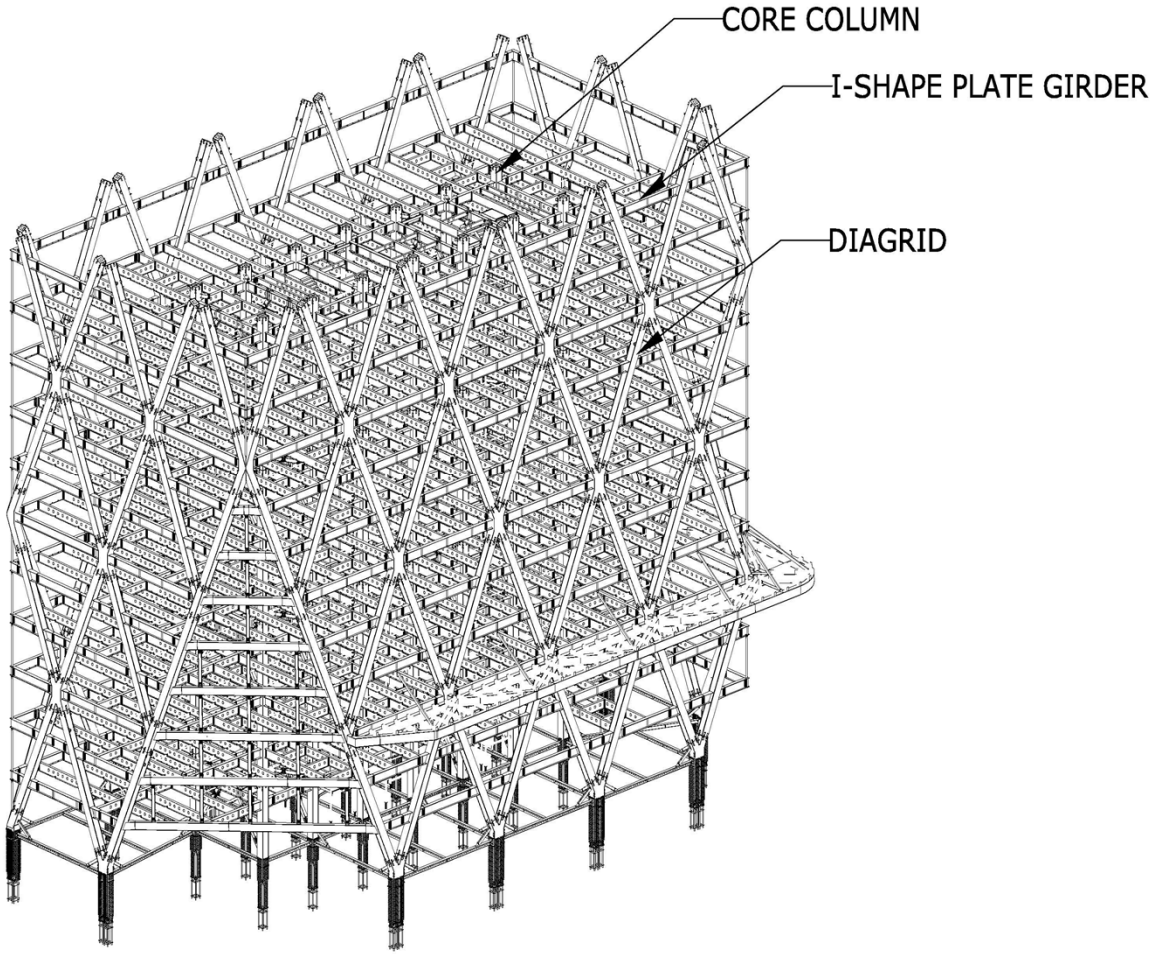
Min Dhama
Steel Structures Co., Ltd.

Structure

- Box Column Core
- Box Diagrid Structure and Nodes (K, V, X, Y)
- “I”-shaped Plate Girder and Beam

- Total Number of Members: 9688 Nos.

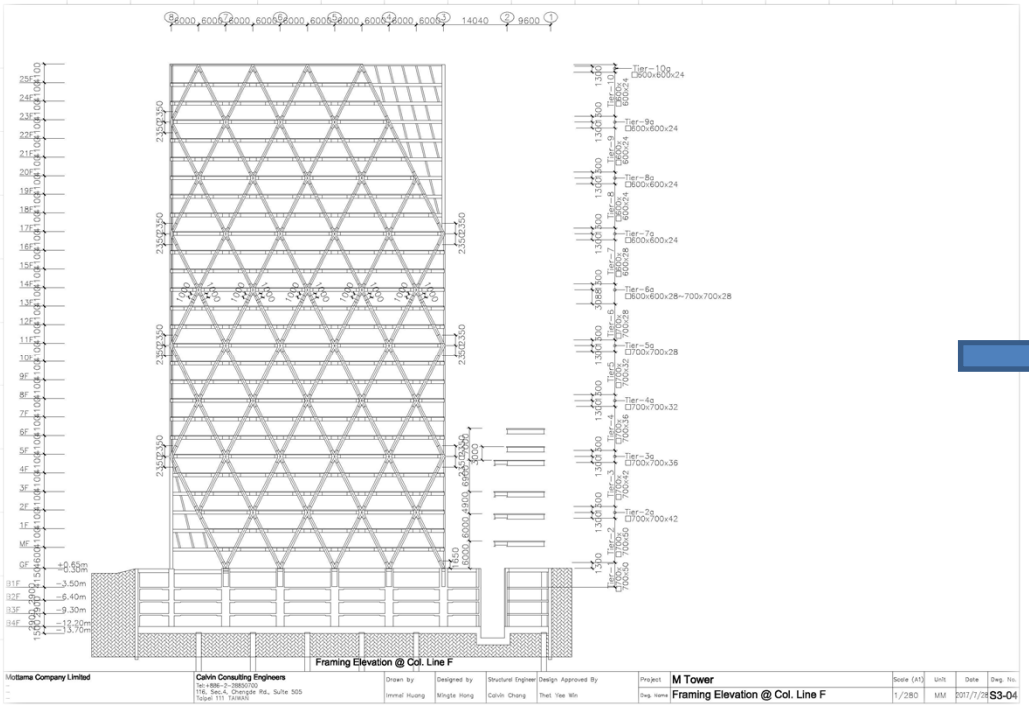
- No of Bolts: 179,254



Min Dhama
Steel Structures Co., Ltd.

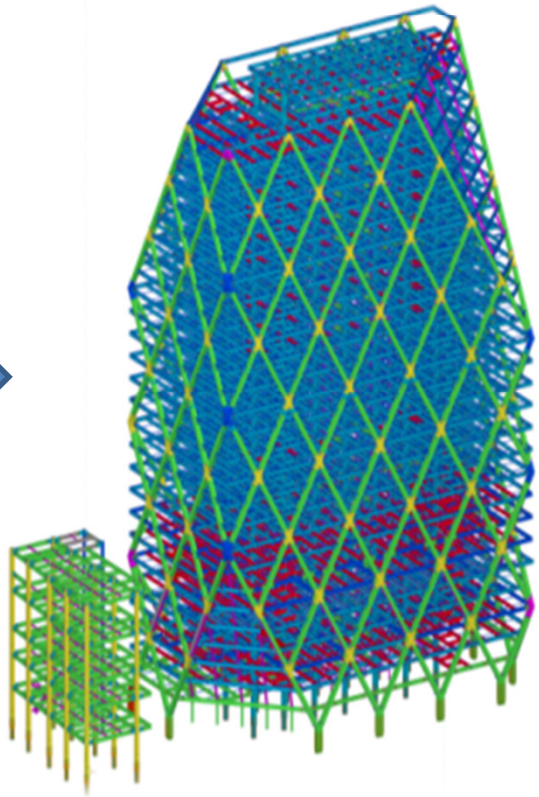
Drawings

Design Drawing (AutoCAD)



3D Modeling

Tekla



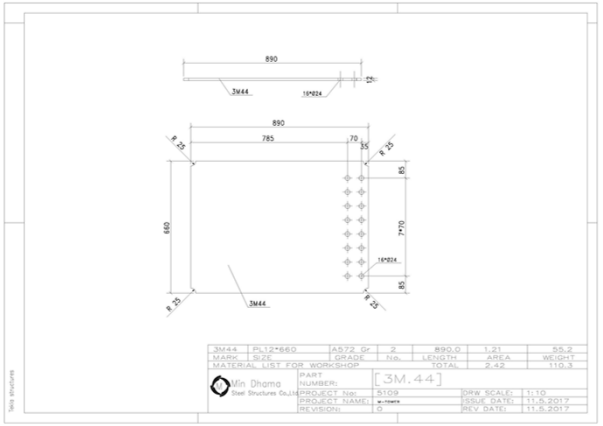
INNOVATION THROUGH **EXPERIENCE**

Min Dhama
Steel Structures Co., Ltd.

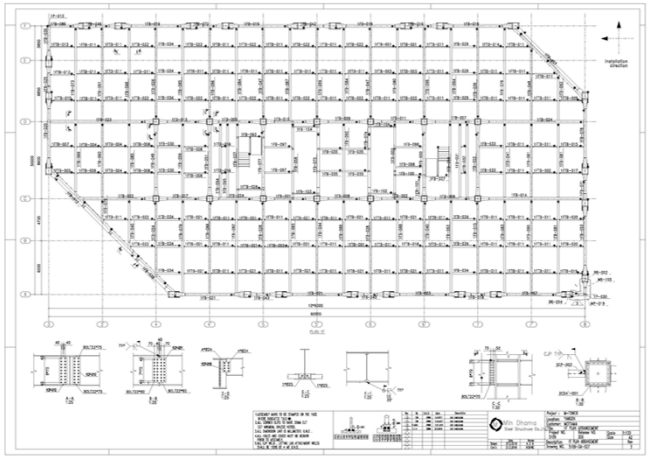
Shop Drawings

Tekla®

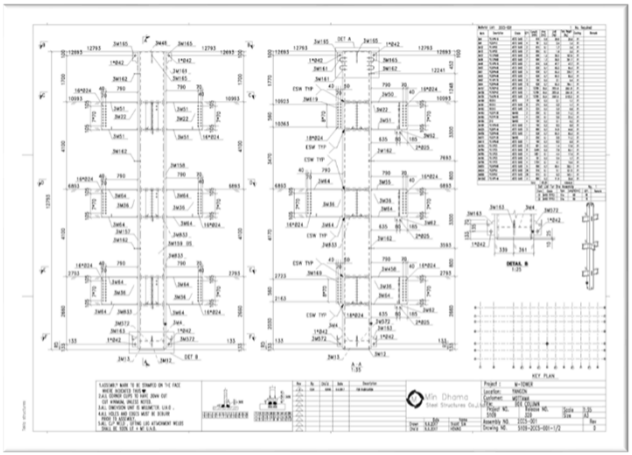
Single-Part Drawing



* General Arrangement
* (Erection Drawing)



Assembly Drawing



Min Dhama
Steel Structures Co., Ltd.

Materials

- Steel : ASTM A572 Grade 50 (High-Strength Low-Alloy Columbium-Vanadium Structural Steel) Yield strength ≥ 450MPa
- Manufacturer: Inner Mongolia Baotou Steel Union Co., Ltd, Yinshan Section Steel Coporation of Laiwu Steel Group Ltd, China
- Net Weight: 8,265 tons

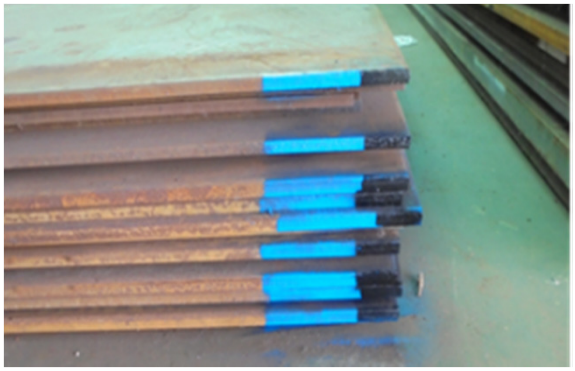
- Welding Consumables: AWS A5.1; AWS A5.17; AWS A5.18; AWS A5.20; AWS A5.25
- Manufacturer: Tientai Electrode Co., Ltd., Taiwan

Min Dhama
Steel Structures Co., Ltd.

Incoming Material

Inspection and Preparations (> 9,000 tons)

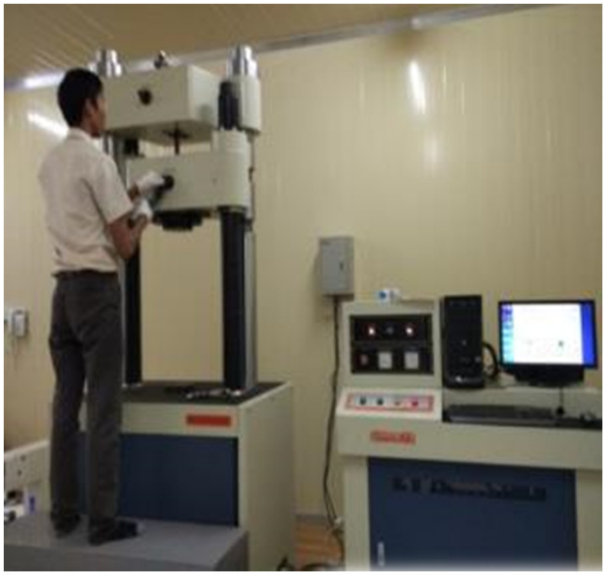
Visual Inspection: General Appearance, Corrosion, Dimension, Thickness
Document Review: Mill certs, Material Info (Heat Number, etc.)



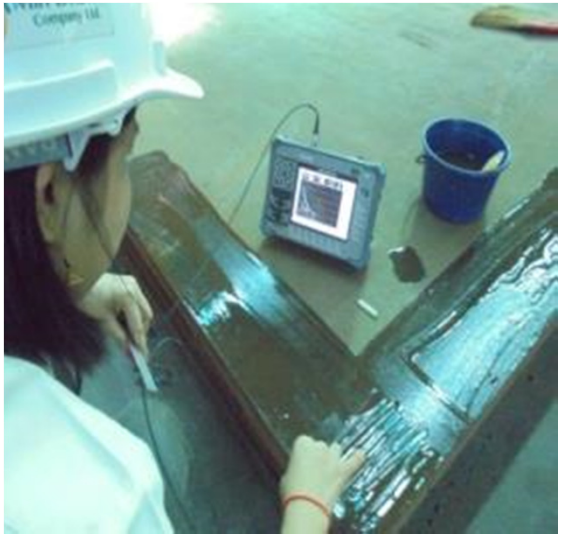
Sorting & Colour Coding according to Material Grades

Min Dhama
Steel Structures Co., Ltd.

Incoming Material



Ultrasonic Test (UT) to check for flaws on plates



Testing to verify mechanical properties (Tensile, bend, hardness tests)

Control (FIFO) and check for welding materials

Min Dhama
Steel Structures Co., Ltd.

Quality Requirements

- Welders & Welding Operators: Qualified as per approved WPS + 3rd party endorsements

Qualitech Lloyd's Register

- NDT (UT/MT/PT) Inspectors: Qualified as per ASNT NDT Level II

ASNT The American Society for Nondestructive Testing

- Welding Inspectors: Qualified as per AWS and JWES

AWS American Welding Society JWES The Japan Welding Engineering Society

Min Dhama
Steel Structures Co., Ltd.

Lloyd's Register

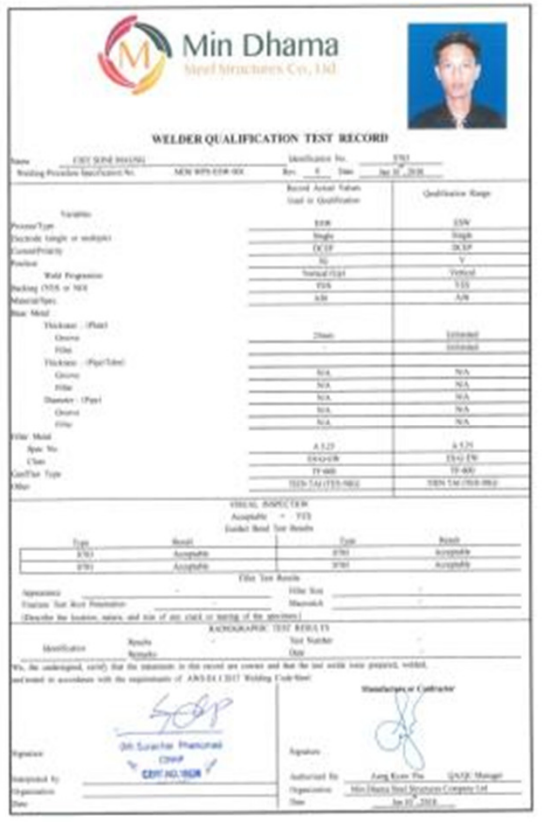
Welding Procedures (AWS D1.1)

Qualitech

Welding Procedure Specification (WPS)/Procedure Qualification Record (PQR)	Welder Qualification Test (WQT)


Min Dhama
Welding Procedure Specification (WPS)


Min Dhama
Welding Procedure Specification (WPS)
Qualitech
RADIOGRAPHIC TESTING REPORT

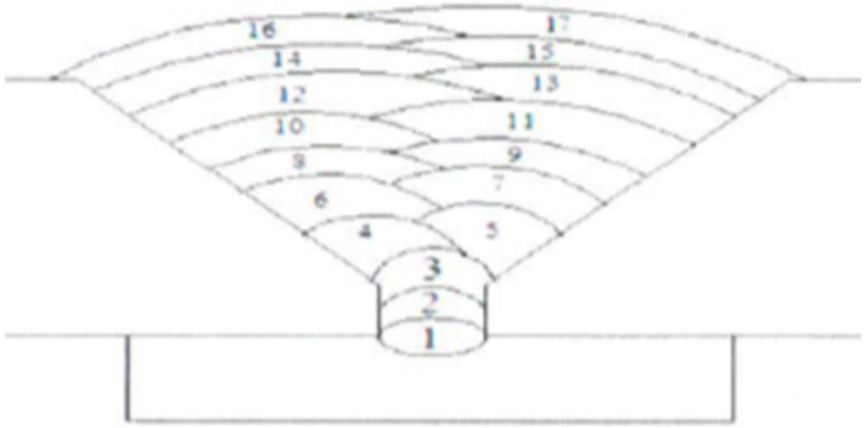

Min Dhama
WELDER QUALIFICATION TEST RECORD

Witnessed & Approved by 3rd Party Certification Agency (Qualitech / Lloyd's Register)

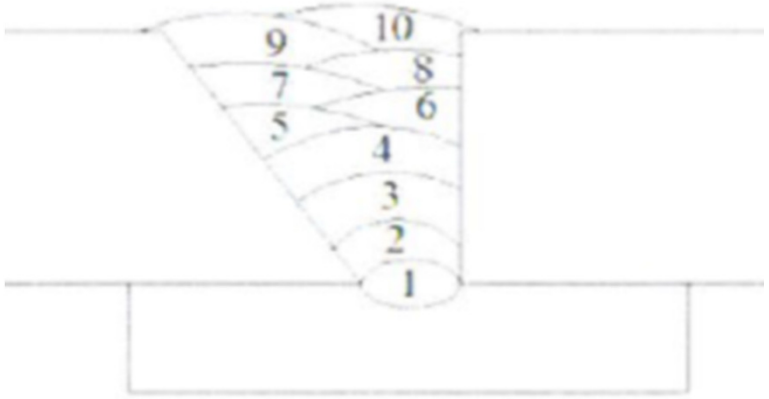
INNOVATION THROUGH **EXPERIENCE**

Min Dhama
Steel Structures Co., Ltd.

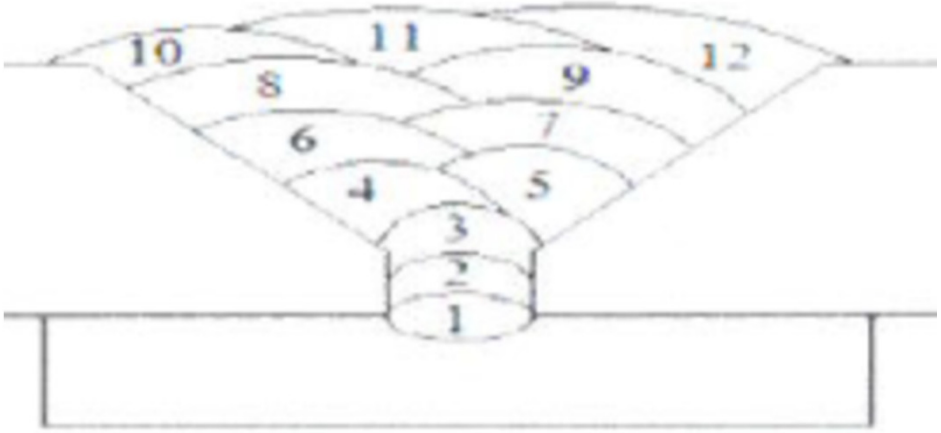
WPS for Different Welds



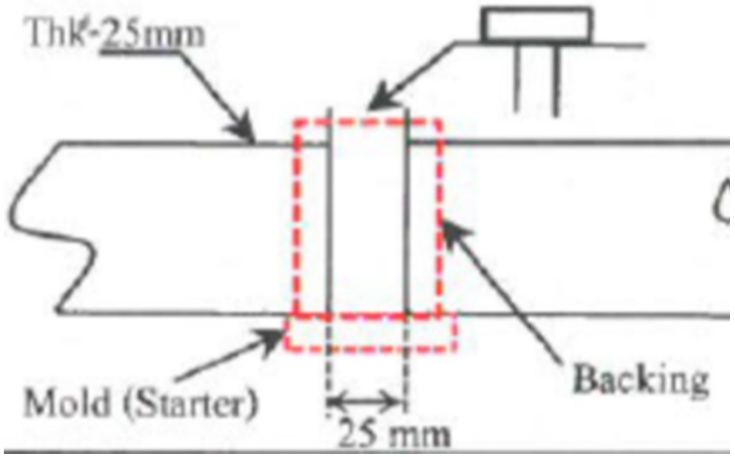
FCAW (1.4mm dia)



SAW (4.8mm dia)



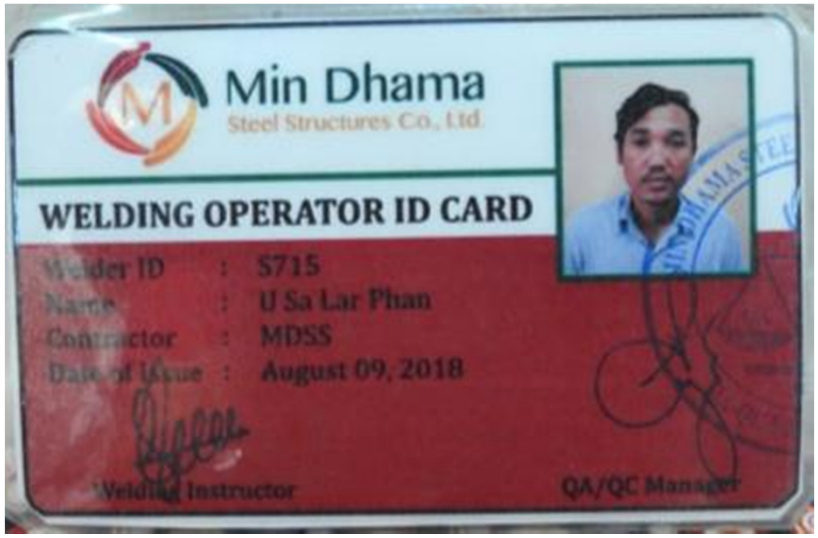
SMAW (3.2 / 4.0mm dia)

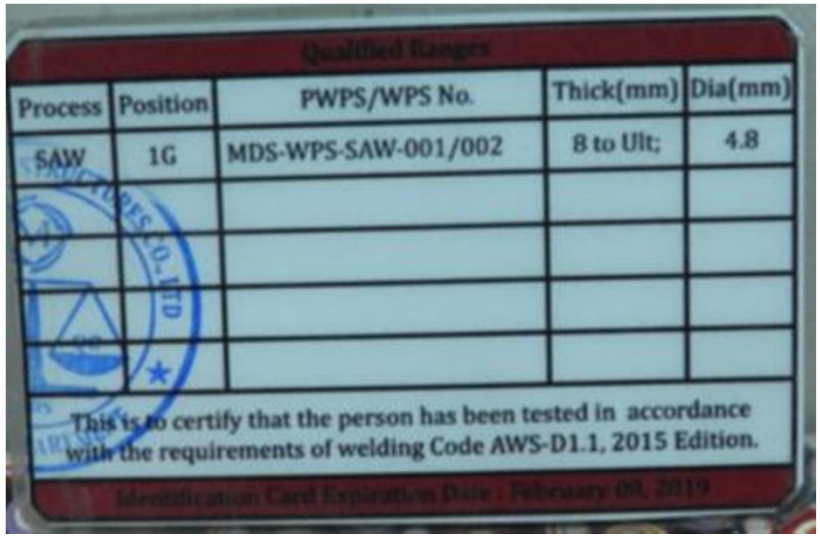


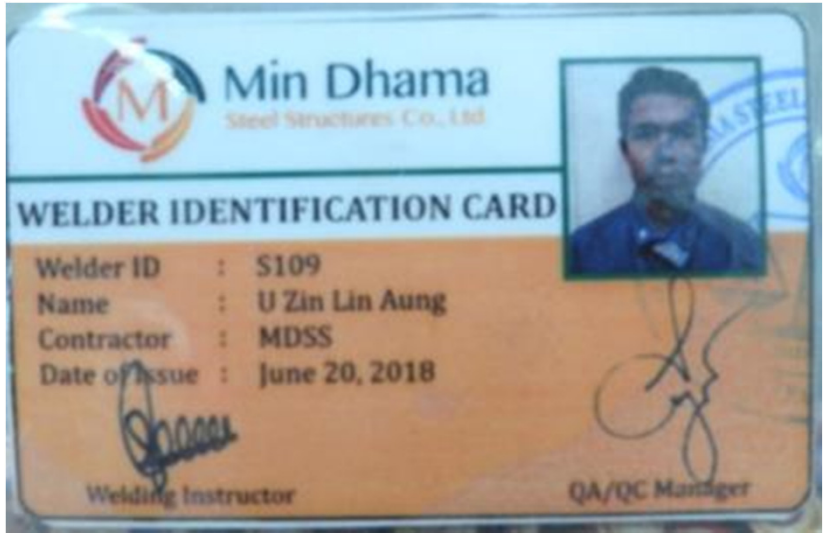
ESW (1.6mm dia)

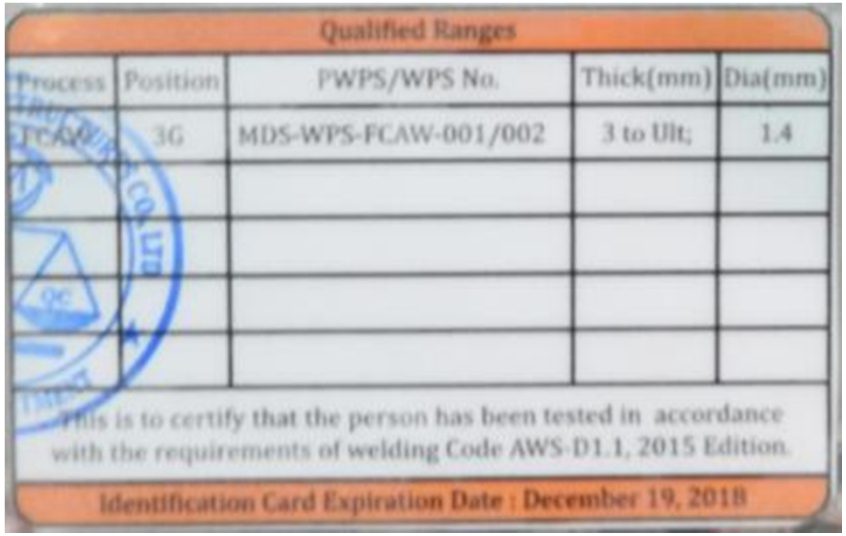
Min Dhama
Steel Structures Co., Ltd.

Qualified Personnel







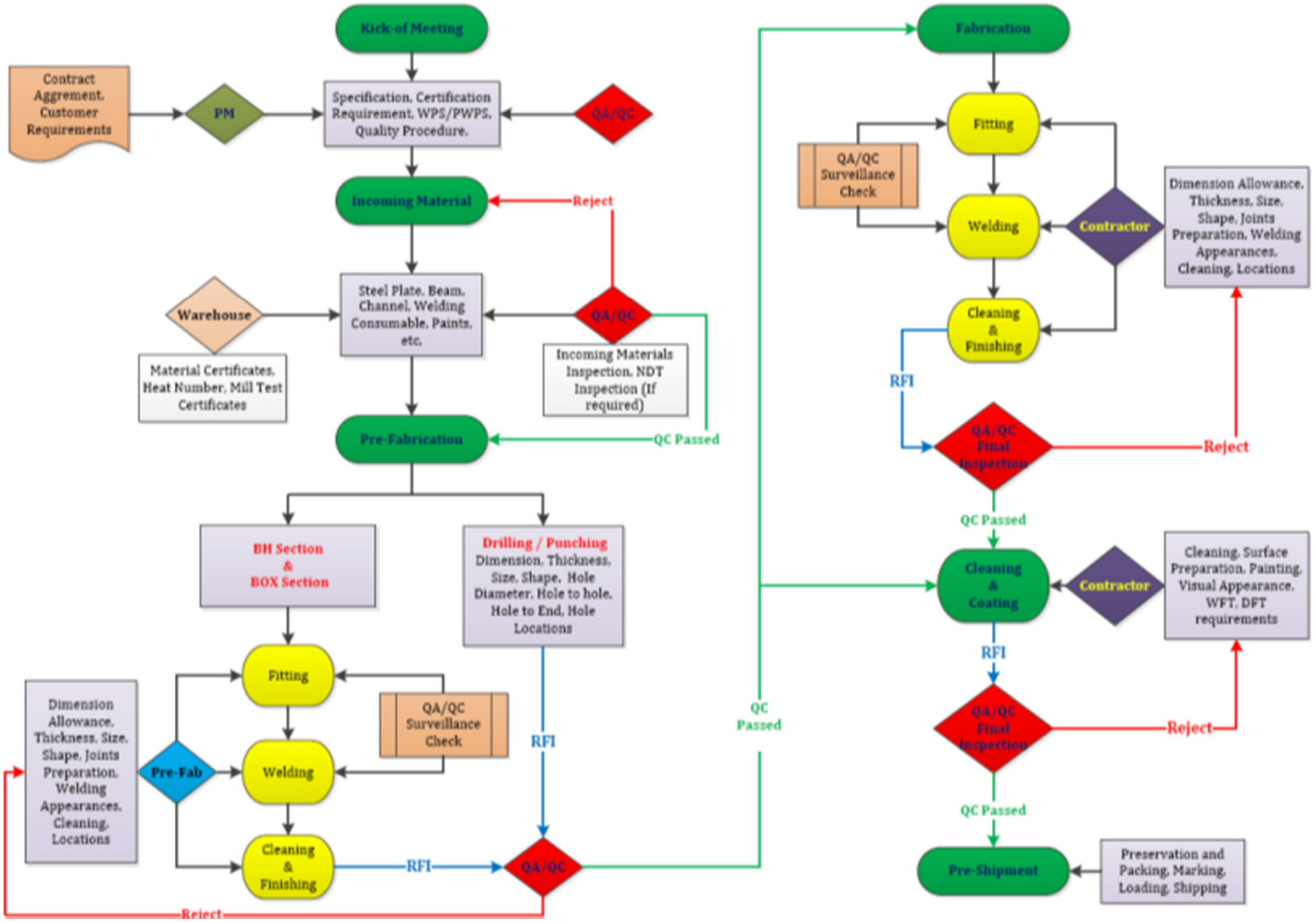


Min Dhama
Steel Structures Co., Ltd.

Machine Operations

Min Dhama
Steel Structures Co., Ltd.

Fabrication & Inspection Process Flow



Min Dhama
Steel Structures Co., Ltd.

BOX COLUMN PRODUCTION

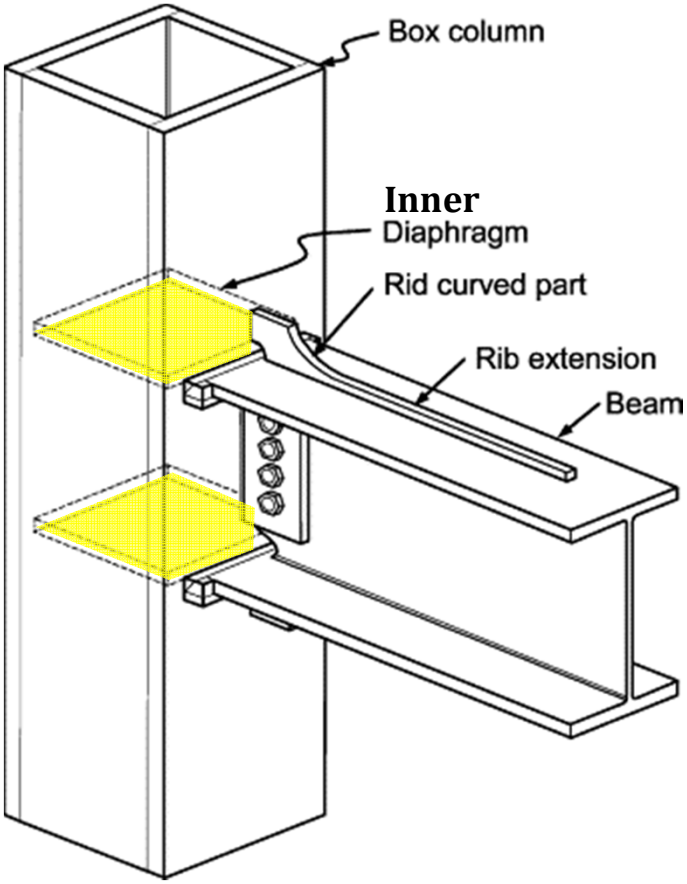
Capability: 300mm ~ 1,500mm Box Column

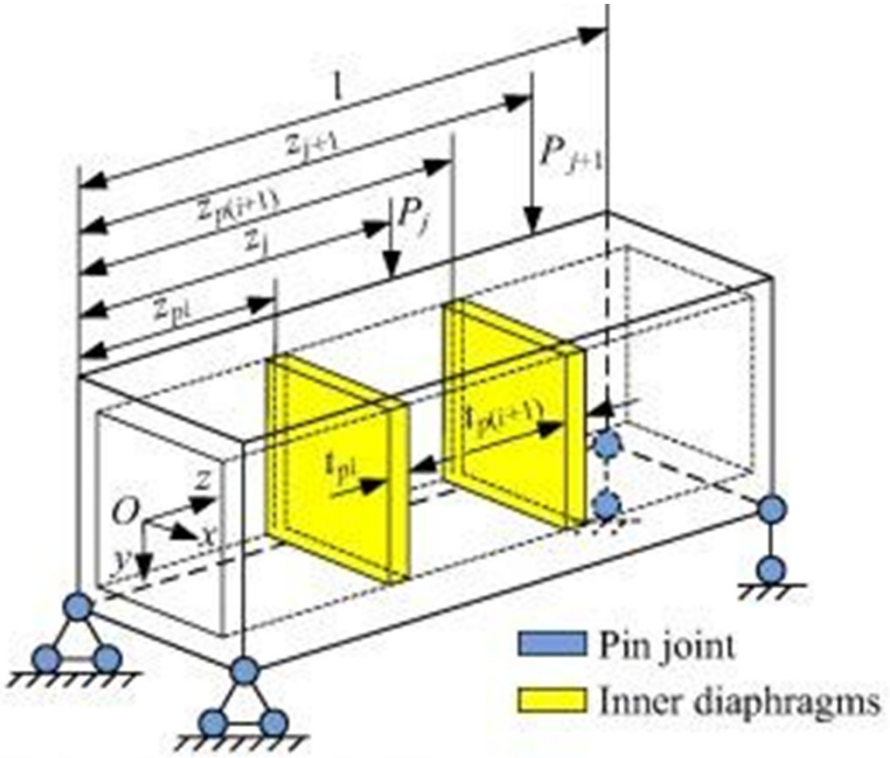
M Tower: 600 X 600 X 24mm thick

~ 700 X 700 X 50mm thick

Min Dhama
Steel Structures Co., Ltd.

Built-Up Box Column





Welding 4 plates to form a box column is relatively easy but the challenge is to weld the inner diaphragm plates

Min Dhama
Steel Structures Co., Ltd.

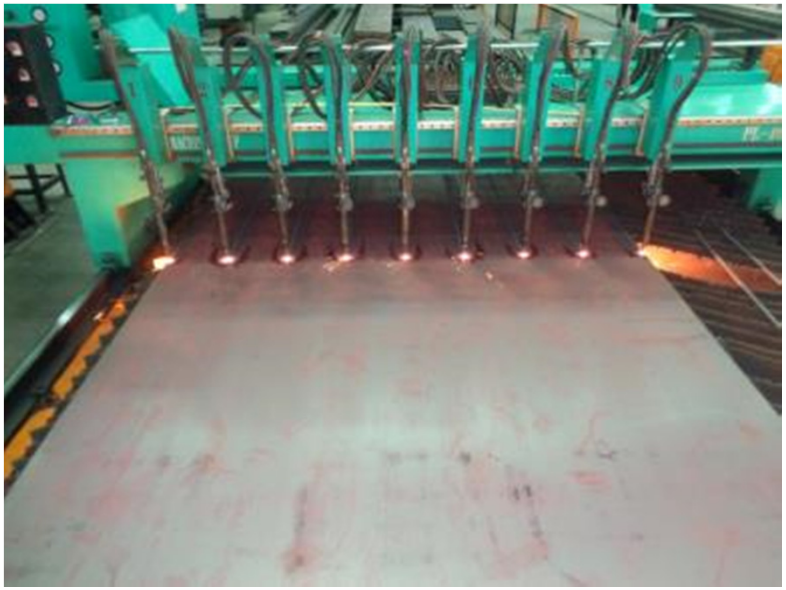
Lifting Operations

Electromagnetic Lifting Beam – Safe, quick, minimal damage/distortion to plates and components

Min Dhama
Steel Structures Co., Ltd.

Plate Cutting Process

By Flame Cutting Machine



- The steel is heated locally by a pressurized mixture of oxygen and a combustible as such as propane, which passes through a ring of small holes in a cutting nozzle.
- Plate is cut to desired dimension and shape as per drawing. Cutting is very important to get fine edge and not to be distorted.
- Cut-off tolerance to be considered.

Min Dhama
Steel Structures Co., Ltd.

Irregular Plate & Diaphragm Cutting

By CNC Plasma Cutting Machine

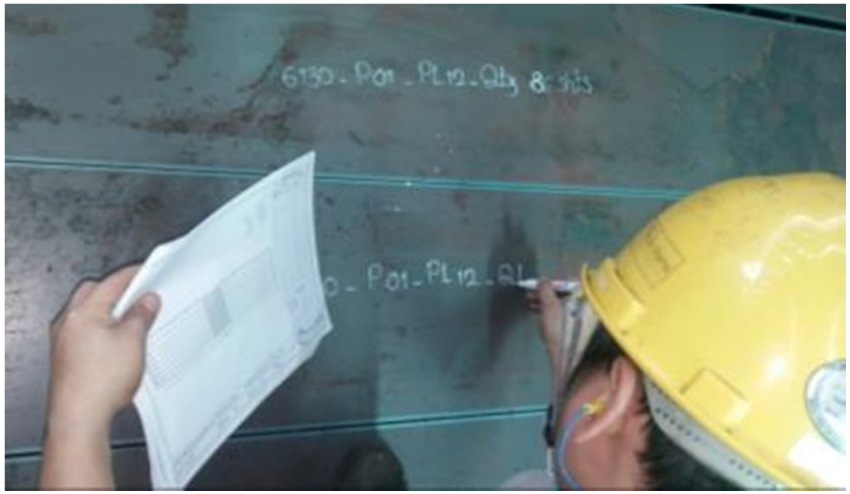
Cutting energy is produced electrically by heating a gas in an electric arc produced between a tungsten electrode and the workpiece.

Min Dhama
Steel Structures Co., Ltd.

Marking & Identification

Nesting Drawing

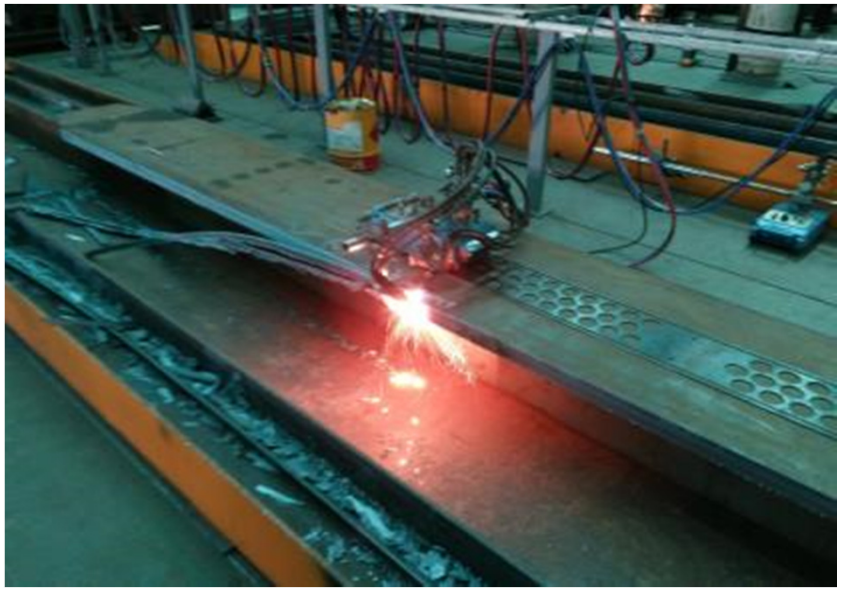
Parts Marking according to ID in Nesting Drawing



Min Dhama
Steel Structures Co., Ltd.

Plate Bevelling

By Auto Cutter Machine



Bevel Surface Preparation by semi-auto oxy-fuel cutting machine

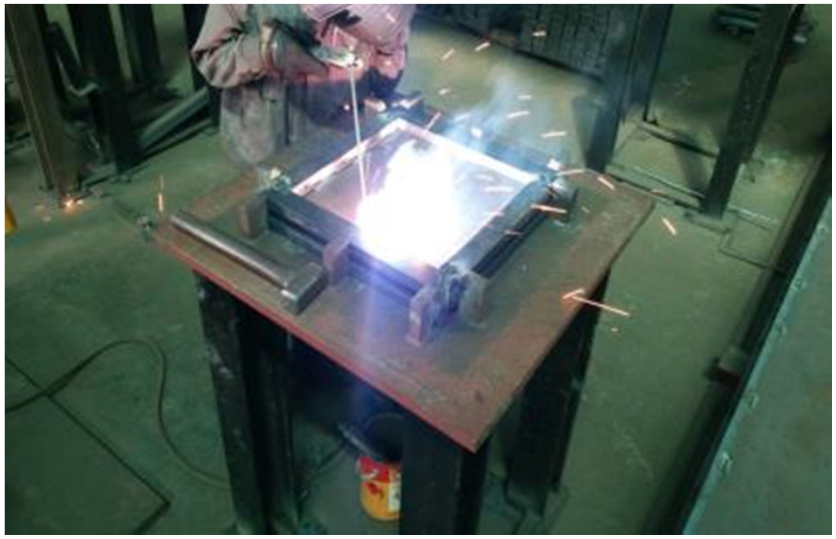
Min Dhama
Steel Structures Co., Ltd.

Fitting of Backing Plate

Backing plates are fitted against bevelled edges

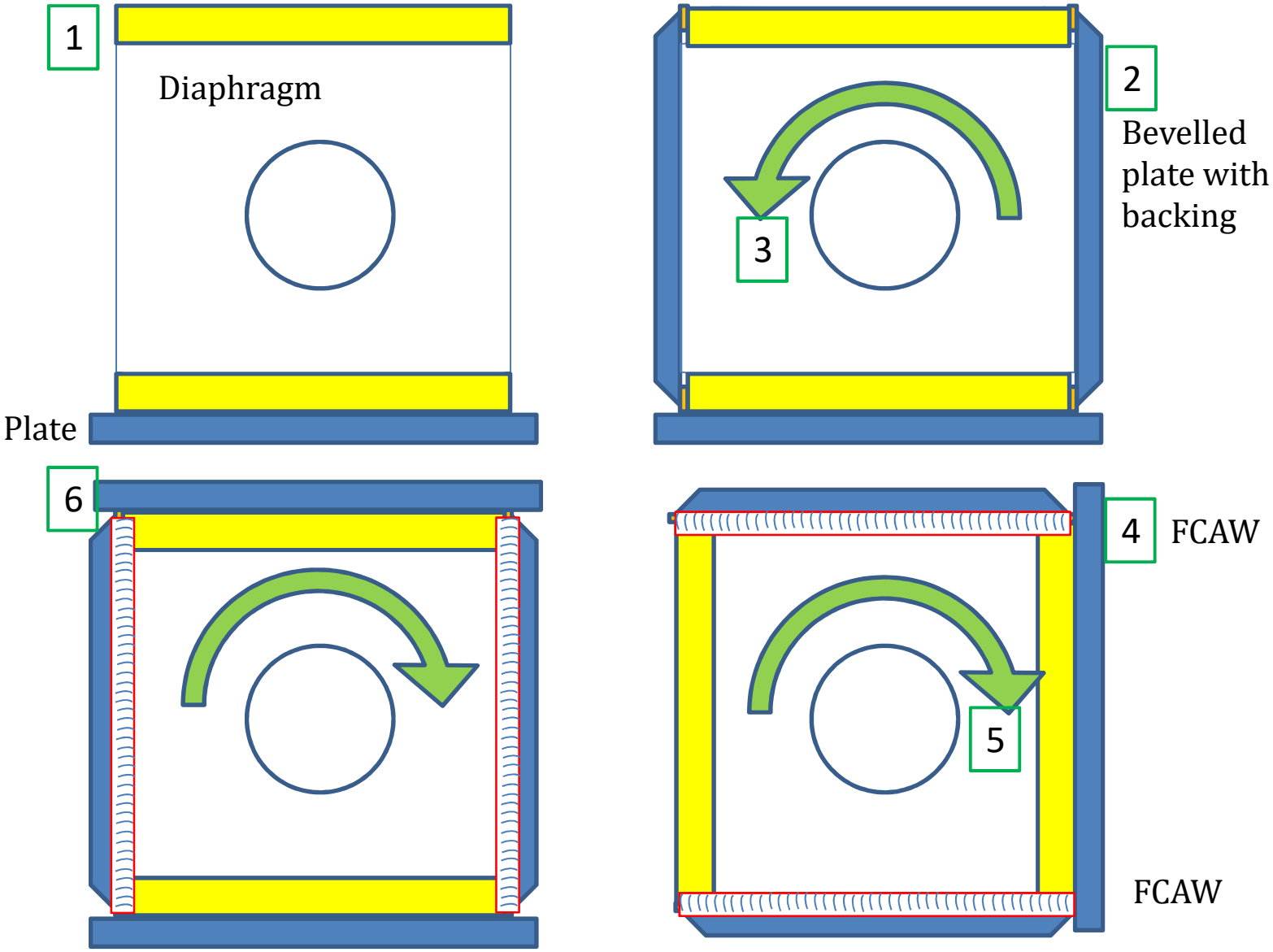
Min Dhama
Steel Structures Co., Ltd.

Diaphragm Plate Preparation



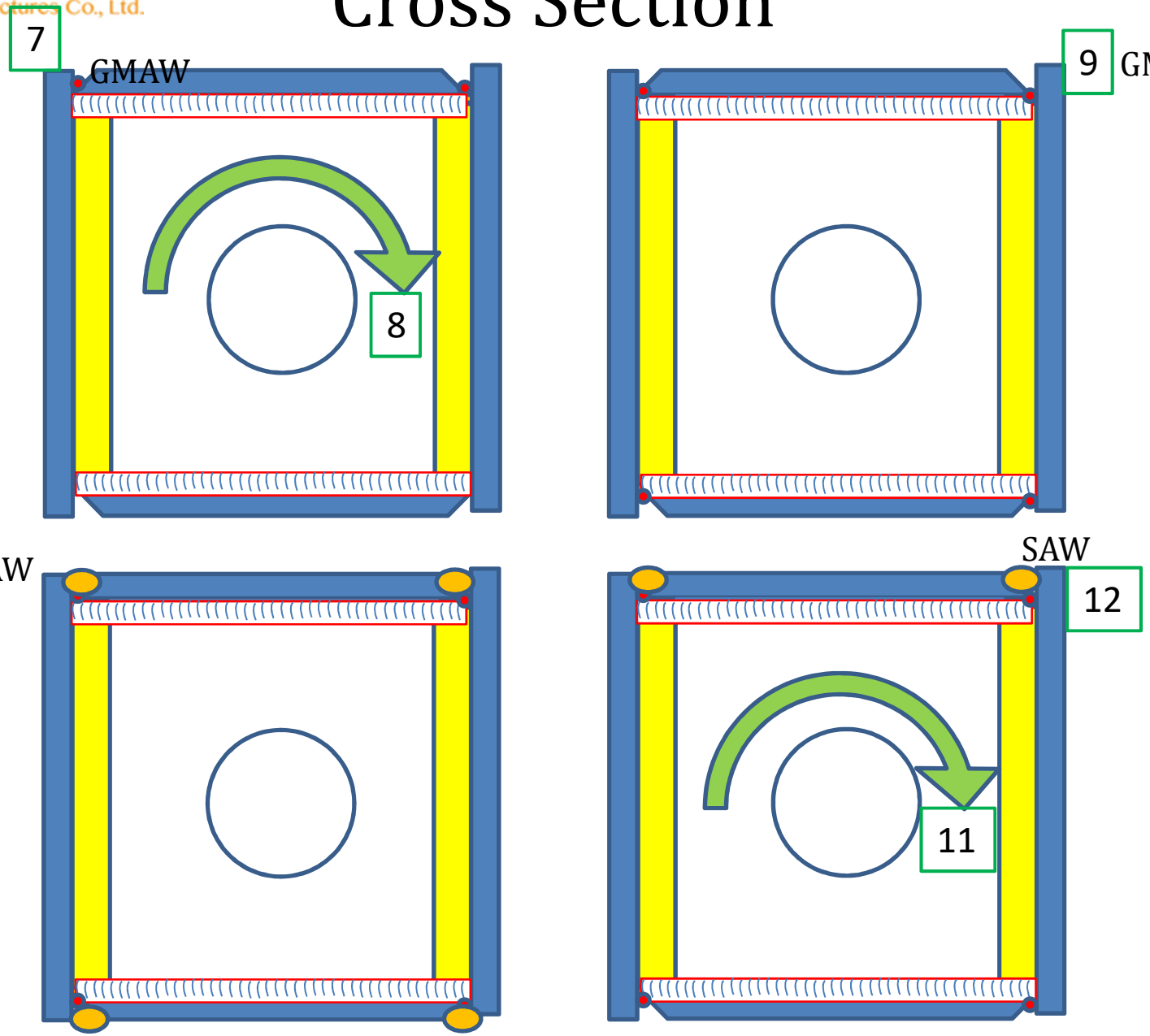
Min Dhama
Steel Structures Co., Ltd.

Cross Section



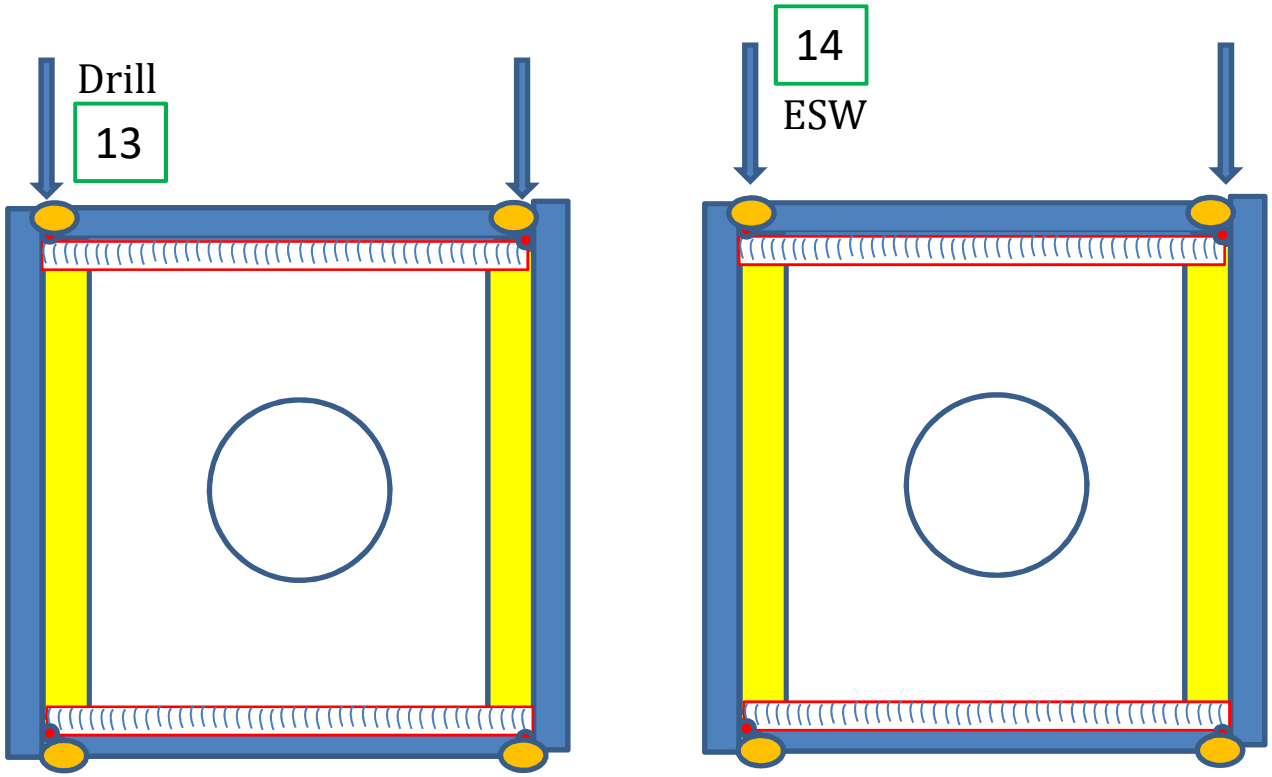
Min Dhama
Steel Structures Co., Ltd.

Cross Section



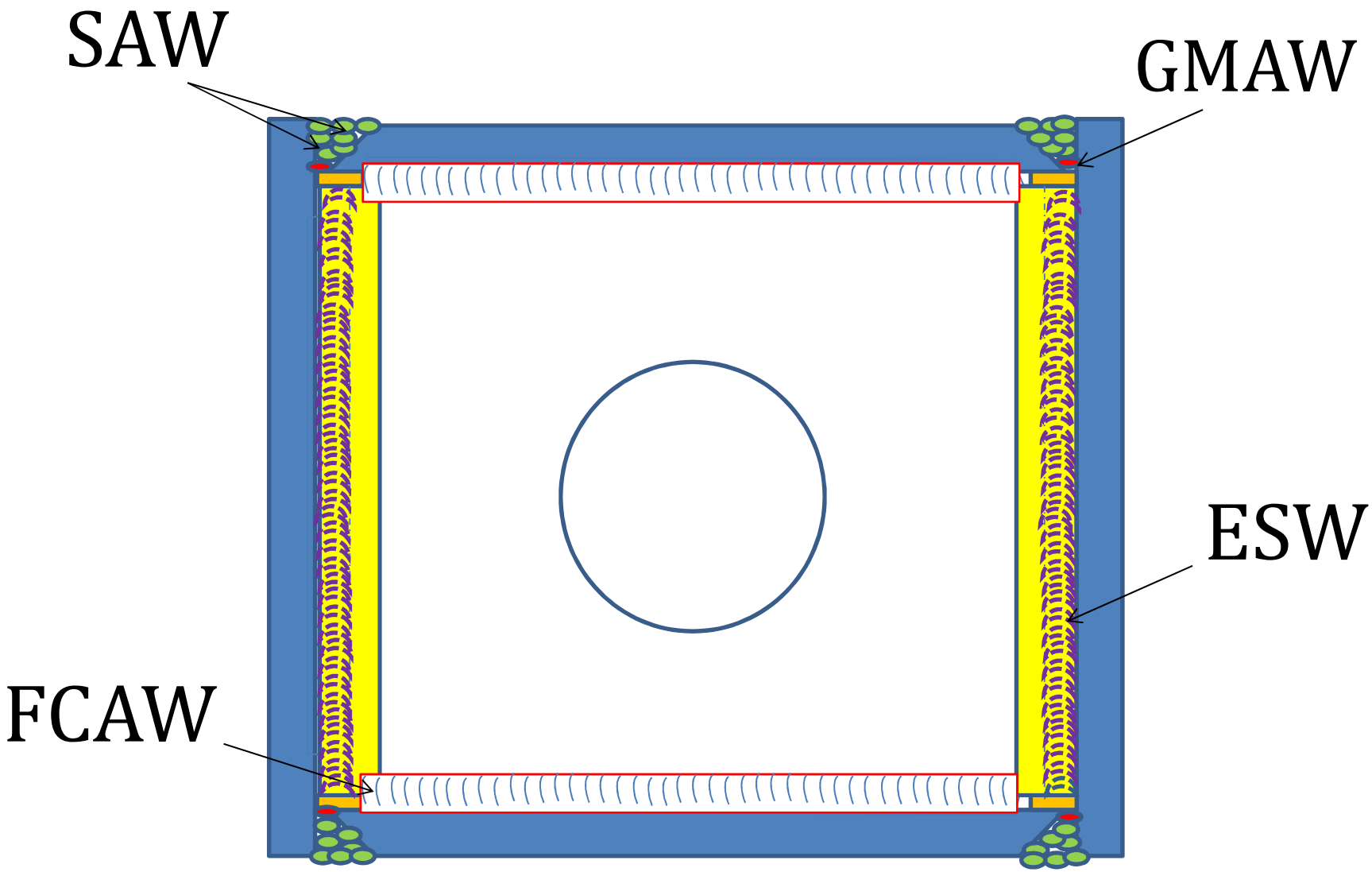
Min Dhama
Steel Structures Co., Ltd.

Cross Section



Min Dhama
Steel Structures Co., Ltd.

All Full Penetration Welding



Min Dhama
Steel Structures Co., Ltd.

Box Assembly

- Component parts are fitted-up temporarily with small amount of welds. These operation includes attachment of Side plates, Backing plates, Diaphragm plates, Stiffener plates.
- If design for diaphragm plates are with two sides ESW weld and two sides manual weld, then the manual welding is completed before the final side of box is completed.

Min Dhama
Steel Structures Co., Ltd.

U-Type Manual Welding

2 opposite sides of diaphragm plate are welded manually. The U-shaped box is closed to form a complete box.

Min Dhama
Steel Structures Co., Ltd.

Gas Metal Arc Welding (GMAW)

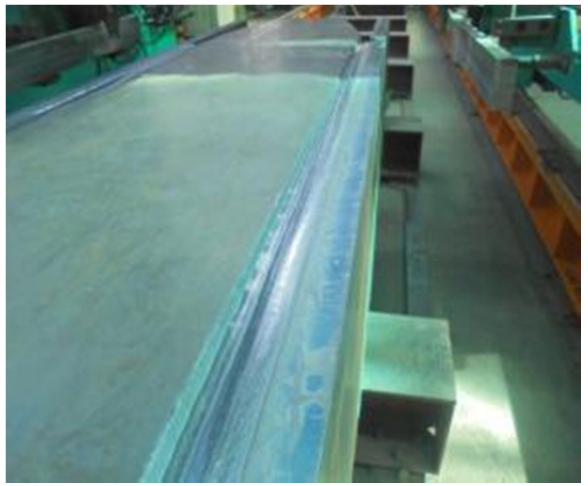
GMAW or CO2 welding for the 1st layer against backing plate

- Pre-heating to prevent crack propagation on the weld seam
- Welding control by operator (Ampere, Voltage, Travel speed, electrode oscillation, electrode angle for each weld pass)
- Important parameters: backing plate material, bevel angle, environment, welding input parameters

Min Dhama
Steel Structures Co., Ltd.

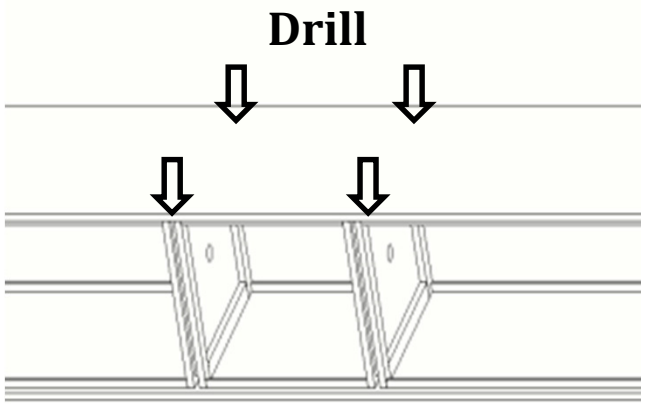
Submerged Arc Welding (SAW)

Fully mechanized process in which the welding head is moved along the joint by a gantry, boom or tractor. The electrode is a bare wire, advanced by a motor. Better quality welds are obtained as it is carried out in controlled conditions.



Min Dhama
Steel Structures Co., Ltd.

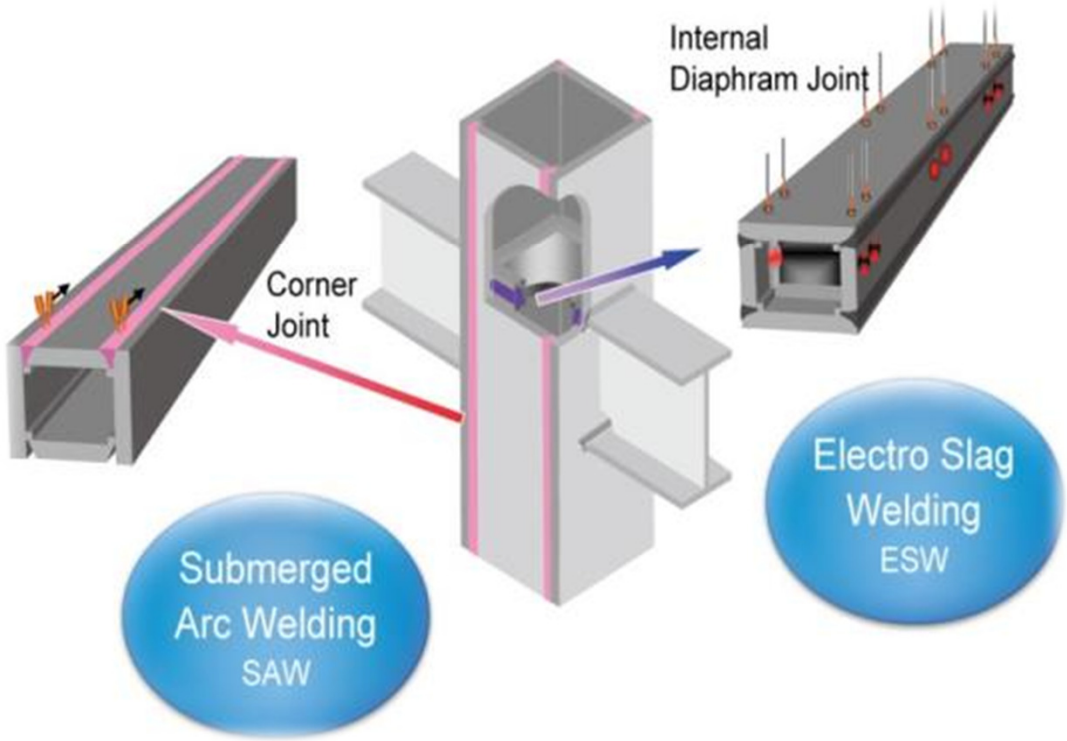
Drilling for Diaphragm Welding

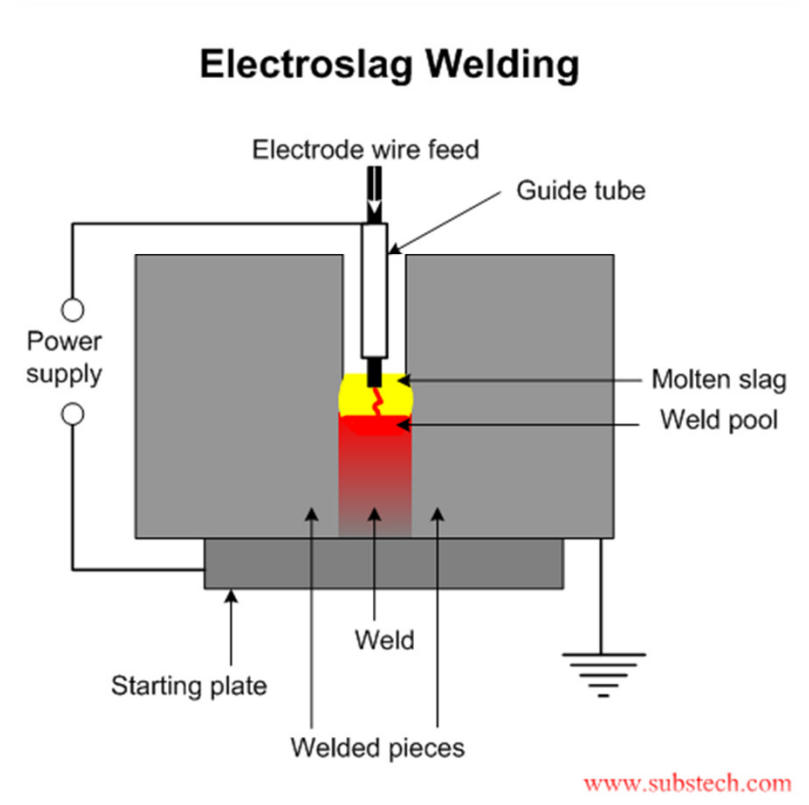


Drilling after SAW welding as preparation for Electro-slag Welding (ESW) welding of diaphragm plate and side plate

Min Dhama
Steel Structures Co., Ltd.

Electroslag Welding (ESW)





Electro-slag welding is an uphill welding process. Uphill welding process is a process in which weld joints are made in vertical direction and the plates to be weld held vertically.

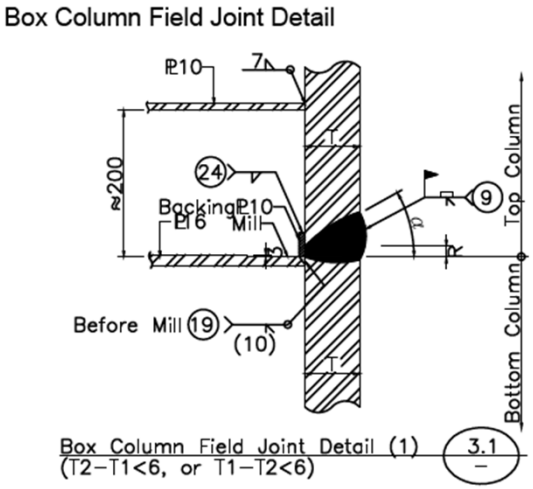
Min Dhama
Steel Structures Co., Ltd.

Electroslag Welding (ESW)

Min Dhama
Steel Structures Co., Ltd.

End-Face Milling

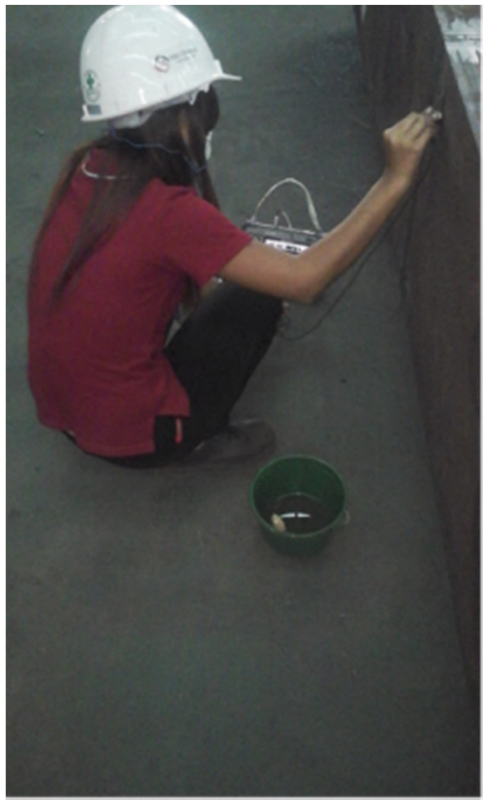
Top surface milling work is important due to column splicing with adjacent column



Min Dhama
Steel Structures Co., Ltd.

Box Column Inspection

Ultrasonic Inspection (UT) in box corner joints in accordance with specification



Ultrasonic Inspection (UT) in ESW joints in accordance with specification

Release to Assembly process after QC passed

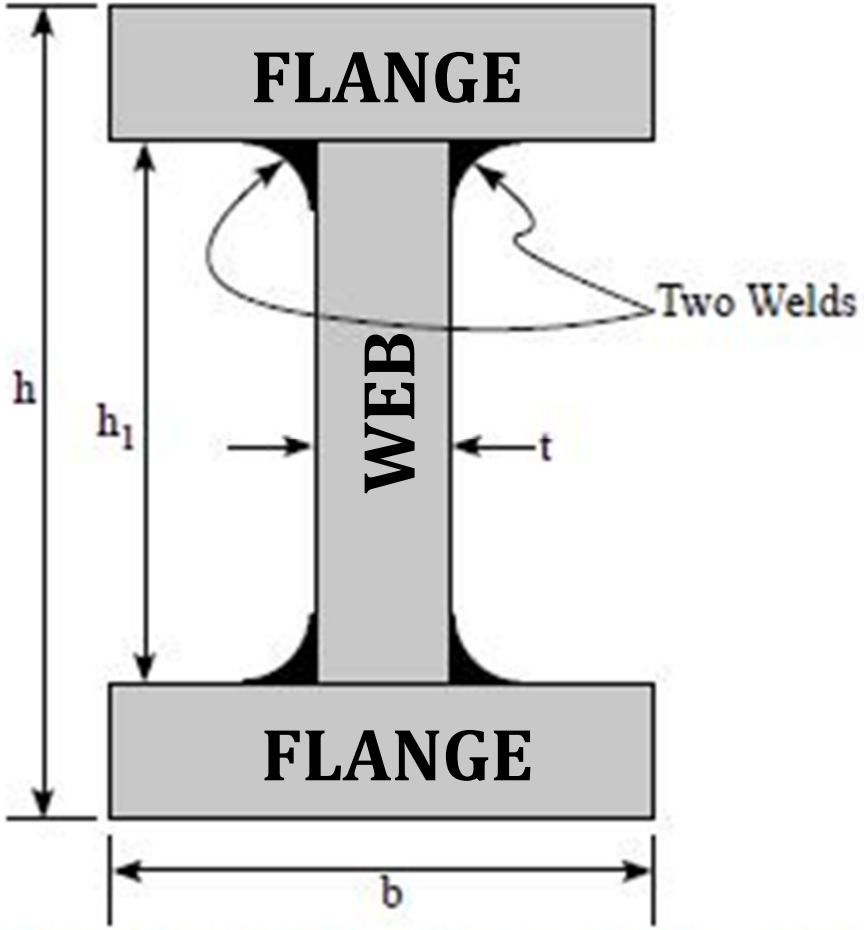
Min Dhama
Steel Structures Co., Ltd.

PLATE GIRDER & BEAM PRODUCTION

INNOVATION THROUGH **EXPERIENCE**

Min Dhama
Steel Structures Co., Ltd.

Built-up H (BH) Beam



Min Dhama
Steel Structures Co., Ltd.

Plate Cutting Process

By Flame or Arc Plasma Cutting

Min Dhama
Steel Structures Co., Ltd.

BH Assembly

Plate Girders and Beams are fabricated by welding together two flanges and a web plate. Before final welding, two flanges and a web plate are fitted-up with small amounts of weld to hold it in position.

Min Dhama
Steel Structures Co., Ltd.

Submerged Arc Welding (SAW)

Gantry Type Submerged Arc Welding Machine

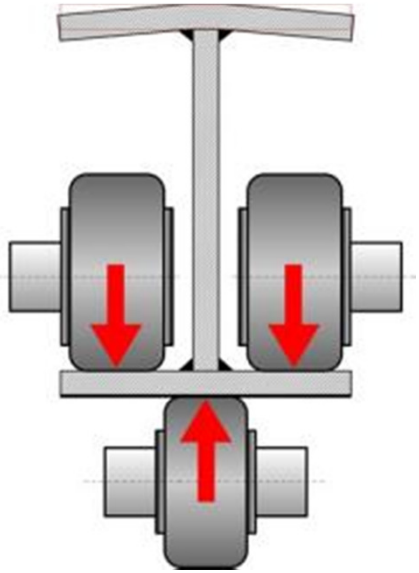
BH Welding Machine

QC checking after Weld

Submerged-Arc Welding (SAW) produces coalescence by the heat of an electric arc struck between a bare metal electrode and the base metal. The weld is shielded by flux, a blanket of granular fusible material placed over the joint. Pressure is not used on the parts to be joined. Filler metal is obtained either from the electrode or from a supplementary welding rod.

Min Dhama
Steel Structures Co., Ltd.

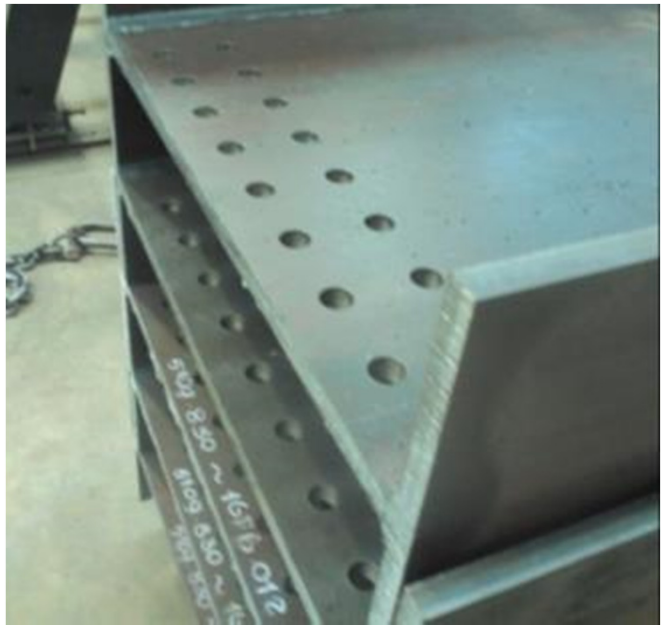
Straightening, Bending & Rolling



Flanges are often distorted when beams are welded on. This distortion can be rectified mechanically and hydraulically by our flange straightening machine in continuous operation by means of mechanical straightening of the flange.

Min Dhama
Steel Structures Co., Ltd.

Drilling & Cold Sawing



This process in NC (Numerically Controlled) tooling, registers and drills in response to keyed in data. Multiple holes can be drilled simultaneously.

3-axis Drilling & Band Saw Cutting, One Stop Solution

All band saws are mechanical and computer controlled. The saw blade is continuous metal edged, with cutting teeth, and driven by an electric motor.

Min Dhama
Steel Structures Co., Ltd.

COMPONENT PARTS PRODUCTION

Min Dhama
Steel Structures Co., Ltd.

Parts Production Process

Arc Plasma Cutting

Shearing & Cropping

Drilling

Punching

Min Dhama
Steel Structures Co., Ltd.

ASSEMBLY

Min Dhama
Steel Structures Co., Ltd.

Fitting & Welding

- Before final assembly, the component parts of a member are fitted-up temporarily with small amount of welds.
- The components are assembled and welded together by the fabrication team.
- This is critical because the assembly pieces must be correctly matched in accordance with the specification.

Min Dhama
Steel Structures Co., Ltd.

Critical Types of Assemblies

Y-Shape Base

X-Shape Node

K- Node

V- Node

Y- Node

Critical Areas :

Dimensions,
Orientations,
Welding
Sequences,
Distortion

Min Dhama
Steel Structures Co., Ltd.

Assembly Inspection

- Fit-Up Inspection
- Dimensional and Visual Inspection for Correct Location, Orientation, Straightness and Dimension tolerance, Bevel angle, Grinding, Cleanliness, Backing bar/ Back-gouging
- Visual Inspection of Welds for Welding Quality/Defects, Weld Appearance and etc.

Min Dhama
Steel Structures Co., Ltd.

Assembly Inspection

Non Destructive (MT or PT, UT) Examination

Min Dhama
Steel Structures Co., Ltd.

Trial Assembly

- Girders and other main components are pre-assembled to prepare or verify field splices.
- Trial assembly is a traditional way of ensuring that fit-up and geometry can be achieved at site, thus reducing the risk of delays in erection.

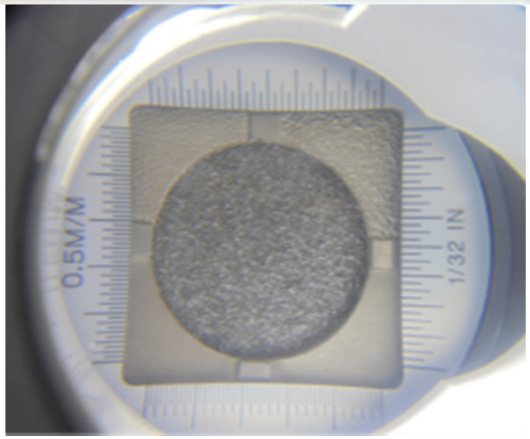
Min Dhama
Steel Structures Co., Ltd.

CLEANING & COATING

Min Dhama
Steel Structures Co., Ltd.

Cleaning / Surface Preparations

Shot Blasting Portal
(3m H X 2.5m W)



By using shots, surface oxides are removed and a rougher surface is obtained to provide an adequate key for metal spraying or special paint.

Min Dhama
Steel Structures Co., Ltd.

Painting & Coating

Airless Spray Painting (20,000m2 per month)

Painting is the principal method of protecting structural steelwork from corrosion. Paints are usually applied one coat on top of another. Primer is applied directly on to the cleaned steel surface.

Min Dhama
Steel Structures Co., Ltd.

LOGISTICS & TRANSPORT

Min Dhama
Steel Structures Co., Ltd.

Transportation

- Fabricated members are stored upright above ground in a shored position on platforms, skids or other similar supports.
- Good coordination and scheduling between project site and factory is critical to ensure timely delivery of members to support the tight erection schedule (JIT).

M Tower: 9,688 pieces / 539 truck loads / 14 tons / 14.5 metres length
Stacking and delivery logistics are critical parameters

Min Dhama
Steel Structures Co., Ltd.

Modes of Transport

By Road or River

MODE	Max Length (ft)	Max Height (ft)	Max Width (ft)	Max Weight (MT)
By Truck (normal road)	60’ (20m)	10’ (3m)	10’ (3m)	60 ton
By Truck (Highway)	60’ (20m)	16’ (4.8m)	20’ (6m)	60 ton
By Vessel (Barge)	60’ (20m)	16’ (4.8m)	50’ (15m)	75 ton

Min Dhama
Steel Structures Co., Ltd.

Health, Safety & Environment

- Tool Box Talks & Morning Briefings
- 712,000 man-hours without LTI
- Safety Training
- Risk Assessment

Min Dhama
Steel Structures Co., Ltd.

www.mindhamasteel.com
Hotline: 09-965 333 666

Thank You

We are proud
to be
associated with
M TOWER
Project

INNOVATION THROUGH **EXPERIENCE**

Min Dhama
Steel Structures Co., Ltd.

WEBSITE

For further information, kindly browse the following websites:

M TOWER

www.m-tower.co

Min Dhama
Steel Structures Co., Ltd.

www.mindhamasteel.com

All presentation materials, Q&A & event photo records will be uploaded on the above websites within the next 10 days. Do check it out!