Code of Practice for Mechanical Engineering Plans

General

Mechanical Engineering drawings or plans are submitted for assessment prior to fabrication, construction, refurbishment or manufacturing. This is regulated under the Vehicle Registration and Construction Regulation 36 (1), (2) & (3) of the Land Transport Authority Regulation 2000. Despite the type of mechanical engineering plan, it should include mechanical designs, specifications and photographs.

Types of Mechanical Engineering Drawings

There are three main types of Mechanical engineering drawings submitted for assessment.

1) **Assembly drawings**-These drawings outline all parts, components, systems and sub-assemblies that make the final assembled product including the BoM (Bill of Materials) on the drawing lists each part number, part name, and part quantity.

2) **Manufacturing drawings**- These drawings outline the parts and components to be manufactured in detail and the structures that is formed by these parts/components aligned to each other by appropriate assembly elements such as temporary and permanent fastening including the BoM (Bill of Materials) on the drawing lists each part number, part name, and part quantity.

3) **Refurbishment, modification or retrofitting drawings**-These drawings outline the parts, components and systems to be refurbished, modified and/or retrofitted including the BoM (Bill of Materials) on the drawing lists each part number, part name, and part quantity.

Mandatory Requirements

The mandatory requirements for the Mechanical Engineering drawings are as follows:

1) The drawing must be done in AutoCAD;

2) The drawings must be done on A4 paper with a descriptive title on each drawing;

3) The drawing must be drawn to scale;

4) The graphical representation of the shape of each part, namely shape description;

5) The dimensions of each part; size description. The nominal size must match the actual size;

6) 1st or 3rd angle projection drawings;

7) Explanatory notes on the individual drawings, giving the specifications of materials, consumables and fasteners.

8) Relationships of each part to the others (in assembly drawings);

9) Detailed drawing for anchorage and mounting points;

10) Bill of Materials which is the part list for all materials used.

11) Chassis and engine number to be included in the drawing. Designers name and date to be included. The plan and specifications must be stamped and signed by the designer.

Specifications depending on type of Engineering plan

1) Grade and specification of material (i.e. steel, aluminium, stainless steel etc.)

2) Dimension of materials used (length x width x thickness). This will include limits, fits (clearance, transition or interference) and tolerance for machined mating parts (mechanical inserts, locks, pins, keys and plugs)

3) Type of joints (i.e. fillet, mitre, butt, lap, corner, edge and tee etc.)

4) Type and specifications of welding (weld rod size, welding position, welding rod compatibility with parent material etc.)

5) Grade and type of temporary fasteners (bolts, nuts, U-bolts, mechanical fasteners, screws, rivets, lugs, circlip, hose clips and connectors etc.)

6) Grade and type of permanent fasteners (arc, mig, tig, aluminium or stainless steel welding)

7) Adhesive including glues, epoxies, or various plastic agents.

8) Electrical wirings details including circuit diagram (electrical sizing to suit load)

9) Hydraulic components i.e. hydraulic pumps, ramp cylinder, hoses, fittings (hydraulic sizing to suit load)

10) Pneumatic details i.e. pneumatic fittings (pneumatic sizing to suit load)

11) Surface finishing, metal primer coating and metal finish.

Load rating (as and when applicable)

Load ratings can be from the manufacturers specifications, test results or calculations. The following are the types of load ratings:

1) Pressure rating for designed hydraulic system;

2) Strength rating for designed structures under shear, tensile, compressive or torsional loads;

3) Load rating for designed load carrying structures.

Inspection Requirements (Verified by Certifying Officer)

The Inspection requirements to ensure that fabrication is carried out per plan or for any alteration as stated below:

1) Stage 1 - To ensure that proper materials are used as per plan and the floor structure such as the main runner, cross runners, welding are up to standard All welding of members must be neat with good penetration and also the mounting brackets, hold down bolts must be inspected and pictures must be accompanied in the report as an evidence.
2) Stage 2 – This is an Intermediate inspection stage where floor plate is installed. This inspection must conform to the approved drawings.
3) Stage 3 – This is a final inspection stage where all work is completed and painted. An overall final inspection is also to be carried out by the Certifying officer before the structure is certified correct & safe for use.

Design Checklist (Verified by Certifying Officer)

The Design Checklist must include the followings for the proposed new fabrication mechanical drawings only:

- Draftsmen Business Licence number;
- Proposal Drawing Title Page with vehicle ID;
- Material Specification;
- Bill of Materials;
- Floor Framing Plan, Floor Plan, Respective Elevations;
- Cross-Sections with symbol indicating details on respective sheet number;
- Detailed Drawings:
    - U-Bolt attachment – size, material type, timber or rubber packing in between runner;
    - Vertical guide attachment – size, material type, bolt fixing size;
    - Sectioning views;
    - Headboard details – size, material type, plate fixing;
    - Under-run Barrier - size, material type, fixing methods;
    - Welding sizes, techniques, rod selection specifications;
    - Calculations on turntable/fifth wheel installations;
    - Electrical drawings-7 conductors with distinguishing colours.