

EML2322L – MAE Design and Manufacturing Laboratory

Common Mistakes Identified during the Design Review

The following list contains common mistakes students we frequently see when performing the DML design review. By reviewing this list each semester and continuously adding to it we should become better at performing the design reviews.

A. Design Errors:

1. Motor mounts that are unusually thick ($> 3/16''$ or made out of steel (unless using sheetmetal))
2. Motor mounts that are mirror images, that have finished surfaces or fillets, that have tight tolerances on the overall dims, loose tols on important dims, that have threaded holes instead of clearance holes (or the wrong size clearance holes)
3. Motor mounts which don't use all mounting holes (except the 4.5 RPM Globe motor)
4. Denso motor mounts with too small of a shaft clearance hole ($\text{Ø}3/4''$ works well)
5. Wheel hubs that are larger or longer than necessary
6. Incorrect hole callout/dimensions for Entstort wheel hub, especially the hole taper that mates with Entstort motor splines
7. Incorrect clearance hole size/tolerance ($+0.001$ to $+0.002''$) for wheel hubs using set screws
8. Less than 5 threads of engagement
9. 80/20 and sheetmetal drawings which lack clear or appropriate tolerances for each piece ($\pm 0.020''$ is going to require a milling process to achieve)
10. Highly loaded components with only one attachment fastener which may slip when loaded
11. Interference / press fits or D-shaped holes for attaching parts to motor shafts
12. Designing features with flat-bottom holes unless absolutely necessary
13. Designing sheetmetal parts that are too complex to bend or that possess excessively high tols.
14. Not including the group number on their design
15. Part features requiring small cutting tools
16. Not considering room for tools necessary for assembly / disassembly

B. Assembly Errors:

1. Entstort motor assemblies lacking M8x1.25 nuts
2. Cytron motor assemblies lacking 4mm key or 11mm retaining ring / circlip
3. Denso motor assemblies lacking 4mm delrin spacers
4. Wheel attachment screws installed backwards in wheel hubs
5. Improper fasteners in assembly drawings because they didn't download the right ones
6. Improper explosion of Entstort motor, wheel hub, wheel, and M8 nut
7. T-nuts mated improperly
8. Missing exploded views on assemblies requiring them for clarity

C. Drawing Errors:

1. Missing required overall BOM using the provided template
2. BOM balloon numbers not listed in sequential (monotonic) order (1, 2, 3 or 10, 12, 20 is fine)
3. BOM balloon numbers inconsistent between assemblies (i.e. an 80/20 angle bracket should have the same balloon number across ALL drawings)
4. Incorrect placement of BOM in drawing
5. Drawings not organized in logical sequence by subassembly
6. Vague part names / descriptions
7. Improper drawing template (i.e. a manufactured part dwg. template used in an assy. dwg.)

8. Improper tolerance table (i.e. a machining tolerance table used for a sheetmetal part)
9. Sheetmetal parts lacking unfolded views
10. Missing material type, part quantity, gage/thickness, debur notes, and/or surface finish note(s)
11. Not updating revision letter for updated drawings after the design review (*Rev. B*, etc.)
12. Failing to change the scale for each drawing, or using scales that are too small to be clear
13. Missing names for drawer/designer
14. Incorrect part/assembly number or sheet numbering
15. Assembly/Part TITLE and DWG. NO. do not match BOM
16. Inconsistent notation of drawing notes
17. Poorly formatted tolerance table (text overlaps boundaries)
18. Failing to hide visible axes and cosmetic threads on downloaded fasteners
19. Reference dimensions (dimensioning a part feature within an assembly)
20. Missing locational or geometric dimensions
21. Failing to delete "IF APPLICABLE" from sheetmetal drawing template
22. Missing center mark on holes/radii
23. Views which are generally messy and should be improved like any proper technical document

D. Dimensioning Errors:

1. [All of them](#) 😊!

E. Fastener Errors:

1. Mating fastener holes cannot both be threaded!
2. Wrong fasteners threads in the wrong material type
3. Using fastener sizes below #6 or M4 without good reason
4. Incorrect hole callouts (incorrect tap drill sizes, line fit or non-standard clearance drill sizes)
5. Less than 5 engaged threads
6. Incorrect fastener lengths (motors, sheetmetal, wheel hubs, etc.)
7. Improper fastener notation in BOM
8. Failing to hide visible threads in assembly drawings
9. Not giving downloaded fastener models description names for use in the BOM

F. Budget Errors:

1. Not listing quantity of 80/20 provided to groups [free of charge](#).
2. Not including additional wheel hub material for clamping in the lathe (approx. 1-1/2")
3. Not including shipping charges for out of town orders (typ. around \$7)

G. Schedule Errors:

1. Pairing up on tasks that should only require one member
2. Not accounting for welding demo time (unless it's a group of 3 or less)
3. Not accounting for holidays / breaks
4. Member work times ending less than 15min before the end of the period

H. General Report / Printing Errors:

1. Poor print quality because students didn't print drawings as pdfs
2. [Gray drawing lines](#) (instead of black), SW watermark not in page border (if present at all)
3. Complete BOM, schedule, or budget printed in landscape orientation
4. Not using provided templates (BOM, drawings, budget, schedule)
5. Not using provided SW part and assembly drawing templates (including sheetmetal)