

Mechanical Design Homework #6
Assigned 10/17/12, Due 10/24/12

Shaft Fits and Beam Design

1. You have an open ABEC-1 R6 bearing (you can look up tolerances on mcmaster.com). You need to design the tolerances on a shaft to fit into the bearing and a hole to contain the bearing. The bearing OD is $7/8 +0, -0.0004$ inches and the bearing ID is $3/8 +0, -0.0003$.

Specify the tolerances on the hole to receive the bearing for an LC1 fit.

Specify the tolerances on the shaft diameter to fit into the bearing using an LC1 fit. NOTE: because the hole diameter is specified as $3/8 +0, -0.0003$, you need to recast this as a “nominal +upper tolerance, -0” to use the table. NOTE: The LC1 hole tolerance for 0.24-0.40 is $+0.0004, -0$, so assume this is the actual tolerance on the bearing ID, rather than the ABEC tolerance. Is this a good assumption? Why or why not?

Make your answer as a sketch of the hole and the shaft end, with associated toleranced dimensions.

2. You have a support member, 18” long, which is subjected to a 300 lb load 3” from one end and a 300 lb load 3” from the other end. The beam is simply supported. What is the maximum deflection for this beam, if the beam is ...
 - a. a uniform rectangular steel beam 2”x2”
 - b. a uniform rectangular aluminum beam 2”x2”
 - c. a 2x2x1/4 steel tube (Appendix 16-5)
 - d. a 2x1 aluminum channel (Appendix 17)
 - e. a 2x1 aluminum t-shape (see mcmaster-carr for geometry). You will need to calculate the area moment of inertia for this shape, but Solidworks is your friend.

Hint: use Table A14-1 for the deflection. (Actually, the table handed out in class will be more suited to this problem.)