Title: Optimal Design of a Steel Drum

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Problem: A 55-gallon Tight Head Steel Drum is constructed by attaching 18 gage (i.e. .0428 inches thick) steel disks to the top and bottom of a cylinder created by rolling up a 20 gage (i.e. .0324 inches thick) steel sheet.

The vertical seam on the cylinder is welded together and the top and bottom are attached by a pressing/sealing machine. The pressing/sealing process requires approximately $\frac{13}{10}$ inches from the cylinder and $\frac{3}{4}$ inches from the disk to be curled together and hence these inches are lost in the final dimensions. In addition, the top and bottom are set down $\frac{5}{8}$ inches into the cylinder. For clarification, refer to the American National Standard (ANSI) specification diagram below.

Steel can be purchased in coils (rolls) of any specified width. Construction costs can be summarized as follows:

- 18 gage steel is 45 cents/square foot
- 20 gage steel is 34 cents/square foot
- Welding and pressing/sealing cost 10 cents/foot
- Cutting steel costs 2 cents/foot
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1. Find the dimensions of the drum of minimal cost, assuming no material is wasted. State any assumptions or choices you make (e.g., width of rolls used). Include an appropriate graph.

2. Find the dimensions of the drum of minimal cost, assuming that wasted material from cutting out the top and bottom is discarded. State any assumptions or choices you make (e.g., width of rolls used). Include an appropriate graph.

3. Provide a reasonable explanation for the choice of ANSI specifications.