Roll bending: A 2-part rule

The 10-20 Rule

Stay out of trouble, save time and money, and remain within the laws of physics.

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One of the most common questions people have regarding roll bending is how small or tight of a radius can a given profile be bent. This is an important question for many reasons. What an architect, engineer, or artist can put to paper regarding curved and bent shapes may or may not apply to the material that has been selected or may not even apply to the laws of physics.

When it is your task to turn these designs into reality here is a handy rule-of-thumb that can: 1) keep you out of trouble, 2) save time, and, 3) help you make design recommendations that are more likely to fall within the laws of physics. It is a two-part method called the Eagle 10-20 Rule.

When roll bending any profile, the inside of the radius is compressed and the outside of the radius is stretched. Roll bending feasibility is dependent upon how well a profile can hold up to these forces. The Eagle 10-20 Rule is not machine specific and can help determine if a profile is suitable for roll bending at a given radius with non-heated material.

Part 1: Multiply the material height by 10 to get the minimal roll-able diameter.

Equation:
Material Height x 10 = Minimal Inside Diameter

It may be possible to roll bend smaller diameters but the effects of material deformation and distortion will be more significant. If the required radius is at or below the calculated minimal inside diameter, it is best to physically test the material to determine the results and bend quality.

Part 2: Divide the material height by the material thickness. If the result is greater than 20, the material will fail/distort and is not suitable for roll bending.

Equation: Material Height ÷ Material = Less than 20

You can think of a scale of 1 to 20, where "1" is very easy and "20" is very difficult. With profiles which score 15 to 20 it may be necessary to roll the part in multiple passes to relieve stress off of the profile. Or it may be necessary to use a filler (nylon or shot medium) to provide additional support to withstand the bending pressures.

If the score is high, testing is recommended to determine results or roll bending quality and profile aesthetics.

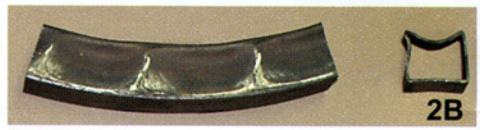
Scores that fall below 15 indicate the profile will be easier to roll bend. Easier means that these profiles will require fewer roll bending passes and will take less time to produce.

More detailed information on roll bending can be found at www.eaglebendingmachines.com.

Two Passes 20" I.D.

Single Pass 30" I.D.

Single Pass 20" I.D.
Profile Collapse



Single Pass 30" I.D.
Sidewall Deformation

5 Passes 30" I.D.
No Sidewall Deformation

1 Pass 104" I.D.

PROFILE A 2" x 2" x 0.125"
Square Tubing ASTM A-513

PROFILE B 2" x 2" x 0.075"
Square Tubing ASTM A-513

Profile A: The "Eagle 10-20" bend factor for profile A = 2 ÷ 0.125 = 16. This bend factor is below 20.

1A and 2A: Profile 1A was rolled to a 20" I.D. in two passes. Profile 2A was easily rolled to a 30" I.D. using a single pass.

Profile B: The "Eagle 10-20" bend factor for profile B = 2 ÷ 0.075" = 26.6. This bend factor is above 20.

1B, 2B, 3B, and 4B: Profile 1B collapsed under the roll bending pressure and could not be rolled to a 20" I.D. regardless of the number of passes used. Profile 2B exhibited sidewall deformation when rolled to a 30" I.D. in one pass. Profile 3B required 5 passes to roll to produce an acceptable 30" I.D. with no sidewall deformation. Profile 4B was rolled to a 104" I.D. in a single pass with no sidewall deformation.

Conclusion: The selection of profile A for a 30" I.D. is able to be rolled 5 times faster than material B, produces a better quality bend, and will save labor cost.