# Planter Hitch

Theodore Idlewine, Chet Cooprider, Gideon Nobbe

April 21, 2005

Objective:

To accurately position an ammonia mole knife four inches to the side of each row unit on a White 5100 four row planter. The mole knives must have depth adjustability. This project will design a hitch that will mount to a toolbar frame to pull the White 5100 four row planter.

04/08/2005 04:28 pm
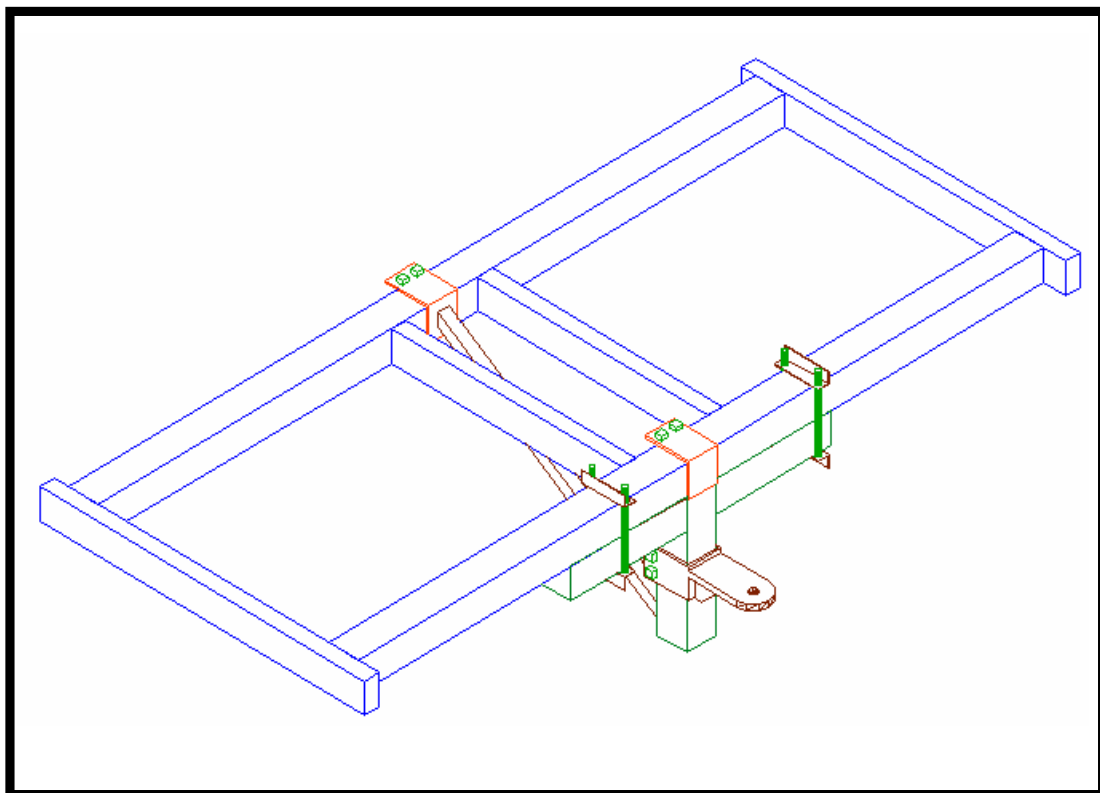
Objectives:

1. Design the hitch geometry,

2. Calculate stress loads and deflection for hitch components,

3. Submit design plans for approval and funding,

4. Construct hitch, and

5. Test hitch.

04/08/2005 04:47 pm

04/08/2005 05:15 pm

Clamp Load Calculation:

• 5/8 Grade 5, Torque 150 lb-ft

$$\sum f = \mu F_{CL}$$

$$f \geq 1800 \quad lbf$$

$$f_1 = 1440x$$

$$\sum f = 14400 \quad lbf$$

Hitch Thickness:

$$A = (w * t) - (2 * t * r)$$

$$\frac{1.5 * F}{A} = 20000$$

$$w = 4.5 \text{ in.}$$

$$F = 1800$$

$$r = .5625 \quad \text{in.}$$

$$t = .04 \quad \text{in.}$$

Actual   Size   Used   .75   in.

04/08/2005 04:41 pm

04/08/2005 04:38 pm

Worst Case Loading Scenario for Hitch Thickness

$$t = 0.75 \text{ inches}$$

$$A = 0.75 * \frac{\pi * d}{2}$$

$$A = 1.325$$

$$\frac{5600}{1.325} = 4226.4$$

$$\frac{20000}{4226.4} = 4.7 \text{ Safety Factor}$$

Hole Shear of Hitch:

$$\frac{6 * 35000 \quad psi}{6 * \pi * L_1 * .75}$$

$$L_1 = 1.5 \ in.$$

Structural Strength of Main Frame Tubing:

$$\frac{\frac{F}{2} * D * C}{I_{xx}} = 9633 \quad lb$$

$$F = 1800 \quad Lb$$

$$D = 42.75 \ inches$$

$$C = 2 \ inches$$

$$I_{xx} = 7.988$$

04/08/2005 04:28 pm

04/08/2005 04:27 pm

Sponsor: Gayle Hildreth