$$S = 3(.12)\left(\frac{.791}{.12}\right)^2 / 6(.791)$$

$$S = 89.38 \quad *_{b=.11} = 82,666$$

$$.045 = \frac{8(5)}{.12E}\left(\frac{.791}{h}\right)^3$$

$$.11$$

$$h = .0496$$

$$b = .11 \; h = .0511 *$$

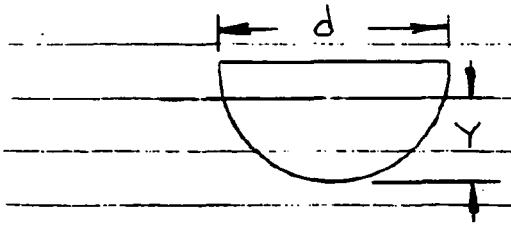
$$b = .11$$

F.H. SMITH
12.19.84

NBAR - EXTRACTOR DESIGN

STRESS ANALYSIS:

- UNIFORM CROSSECTION DESIGN



MOMENT OF INERTIA

$$I = \frac{(9\pi^2 - 64)d^4}{1152\pi}$$

$$Y = \frac{(3\pi - 4)d}{6\pi} = .288d$$

SECTION MODULUS

$$Z = I/Y$$

STRESS AT SUPPORT

$$S = Wl/Z$$

MAXIMUM DEFLECTION

$$y = Wl^3/3EI$$

l = LENGTH OF MOMENT ARM
E = MODULUS OF ELASTICITY (30×10^6)
W = LOAD

For:

$\ell = .791$; $E = 30 \times 10^6$; $d = .149$; $y = .045$

$I = 3.38 \times 10^{-6}$
$Y = .0429$
$Z = 7.88 \times 10^{-5}$
$W = 27.65$
$S = 277,677$

$\ell = .900$; $d = .149$; $y = .045$

$I = 3.38 \times 10^{-6}$
$Y = .0429$
$Z = 7.88 \times 10^{-5}$
$W = 18.77$
$S = 214,490$

$\ell = 1.00$; $d = .110$; $y = .045$

$I = 1.00 \times 10^{-6}$
$Y = .0317$
$Z = 3.17 \times 10^{-5}$
$W = 4.05$
$S = 127,748$

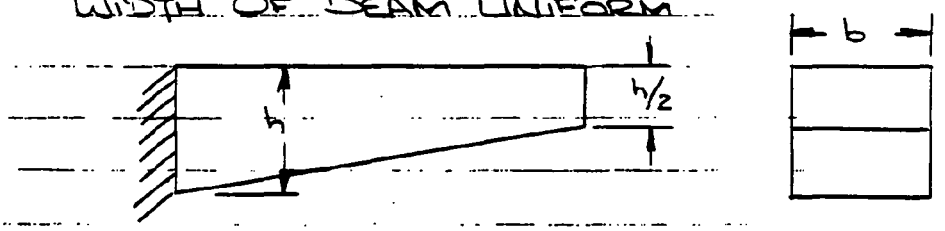
$\ell = .900$, $d = .110$; $y = .045$

$I = 1.00 \times 10^{-6}$
$Y = .0317$
$Z = 3.17 \times 10^{-5}$
$W = 5.55$
$S = 157,728$

CONCLUSIONS:

TO OBTAIN A DESIRED LOADING OF 5 lbs. THE CURRENT DESIGN WOULD HAVE TO BE LENGTHENED, TO INCREASE MOMENT ARM, AND REDUCED IN WIDTH, AT THAT, AN APPROXIMATE STRESS OF 157,700 P.S.I. WOULD BE REALIZED AT THE BENDING MOMENT. [THESE CALCULATIONS ARE BASED ON A UNIFORM CROSSECTION AND ARE THEREFORE APPROXIMATE DUE TO THE CLAW CONFIGURATION.]

- BEAMS OF UNIFORM STRENGTH
  WIDTH OF BEAM UNIFORM



LOAD AT ONE END

$$P = \frac{S b h^2}{6 \ell}$$

MAXIMUM DEFLECTION

$$\delta = \frac{8P}{bE}\left(\frac{\ell}{h}\right)^3$$

ℓ = LENGTH OF MOMENT ARM
P = LOAD
b = WIDTH OF BEAM
E = MODULUS OF ELASTICITY
S = STRESS

FOR :

ℓ = .791 ; P = 5 ; b = .149

h = .0462
f = .045
S = 74,615

CONCLUSIONS:

IT APPEARS THAT THIS TYPE OF BEAM DESIGN CAN READILY BE ADAPTED TO THE CURRENT EXTRACTOR DESIGN AND GIVE THE DESIRED LOAD AND REDUCE THE STRESS TO APPROXIMATELY 74,600 P.S.I. [AGAIN THESE CALCULATIONS ARE APPROXIMATE DUE TO THE CLAW CONFIGURATION.]