STRUCTURAL ANALYSIS AND COMPUATIONS
FOR INDIVIDUAL
ADHACO HORIZONTAL BLASK STRIKE AND LATCH

TYPE H-112

The following analysis and computations indicate the key phases of the structural strength of the individual Adhaco horizontal BlaskStrike and Latch.

The blask strike and latch is constructed primarily of components made of grade A malleable iron, grade 35018. conforming to ASTM A-47-52.
Operating rodes and strike rollers for complete assembly are constructed

Physical properties of the grade 35018 malleable iron are:

Tensile strength:	53,000 psi
Yield strength:	35,000 psi
Elongation 2 inches	18 %
Shear strength:	48,000 psi
yield shear strength:	23,000 psi

Considering that these values demonstrate ductile materials behavior. it is appropiate to consider an increase for dynamic effects.

The poperties of the C1018 cold fished steels are:

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Tensile strength:	64,000 psi
Yield strength:	54,000 psi
Elongation 2 inches	15 %
yield shear strength:	27,000 psi

For the purpose of analysis the values for steels used are talken as: 40,000 psi for tension and compression and 20,000 psi in shear. The H-120-B horizontal blast strikes and latches are analyzed herein:

The individual blast latch assembly is composed of three components-
the strike, latch tongue, and latch housing. The blast latch assemblies
need resist only negative loads sense positive loads are resisted by
the bearing of the door on the frame.

1. Blast Resistant Strike:

The strike fastening bolts are 1/2" diameter socket head cap screws
having assumed tention capacity of 70,000 psi and an area for tensile
strength of .142 sq. in. for a load cpapcity of .142 (70,000) = 9,950 lb.

considering uplift of the strike as shown below:
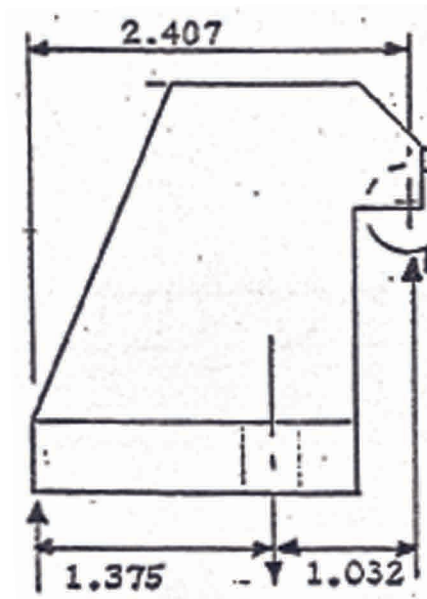
The value of P can be found for two and three bolts. The capacity
fortwo bolts is:

$$2.407 \ P = 2(9950) \ (1.375)$$

$$P = 11,300 \ lb.$$

The outstanding legs of the casting are 5/8 in. thick and two inches
wide. If the effective width is taken as 1 1/4(getsign)", the plastic moment
capcity would be:

$$\frac{1.25(.625)^2}{4} \ (40,000) = 4880 \ lb. \ in.$$

The limiting capacity of these legs is:

$$\frac{3}{4} p^* = 4880$$

$$p^* = 6520 \text{ lb.}$$

The associated capacity of the strike for two bolts would be:

$$P = \frac{6520}{9950} \times 11,300$$

$$P = 7450 \text{ lb.}$$

The roll pin is subjected to a double shear. the strength is 7700 ;b.
(This value is taken from the Elastic Strop Nut corp. of America, union,
New Jersey, Roll Pin Catalog (1958) p. 14)

The casting holding the roll pin is subject to shear above the roll
pin. The area of the casting in shear is:

$$2 \left(\frac{3}{4}\right)\left(\frac{3}{4}\right) = 1.12 \text{ sq. in.}$$

The associated capacity of this area is:

$$1.12 (20,000) = 22,400 \text{ lb.}$$

It is important to note that if the roll pin fails, the machined surface
of the tongue would simply contact the casting directly. This would
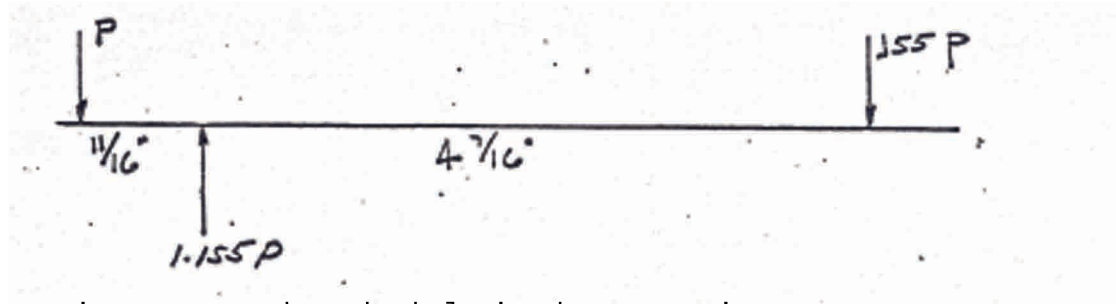not infleunce operation of the door.

The limiting strength of the strike is 7450 lb.

2. the latch pin (Tongue)

The tongue fits tightly into the multi-point latch housing at the strike
end. The support of the tongue is shown below:
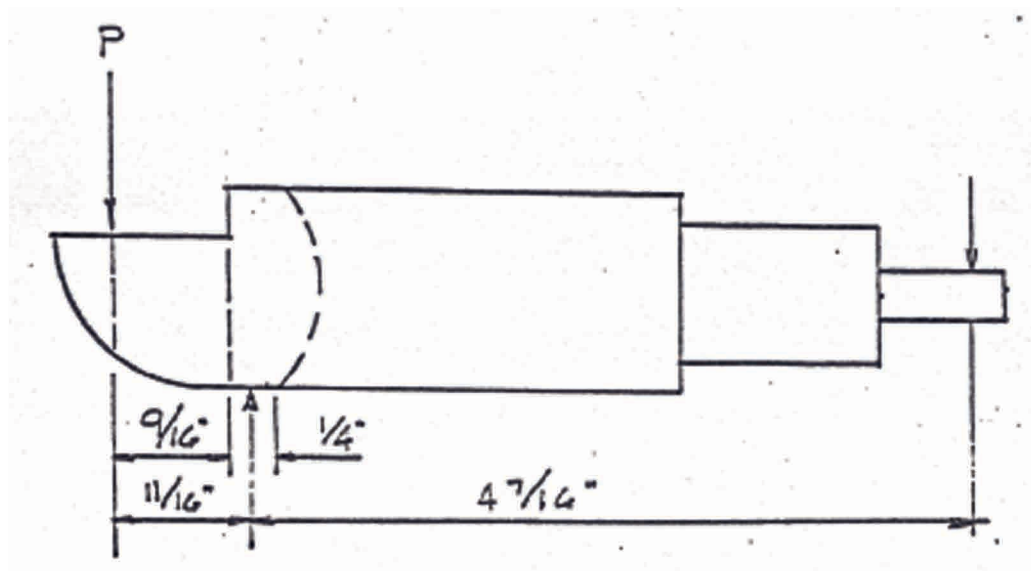
The load P is the load to be resisted - the limiting strength is thru the hole in the tongue.   The reactions are:
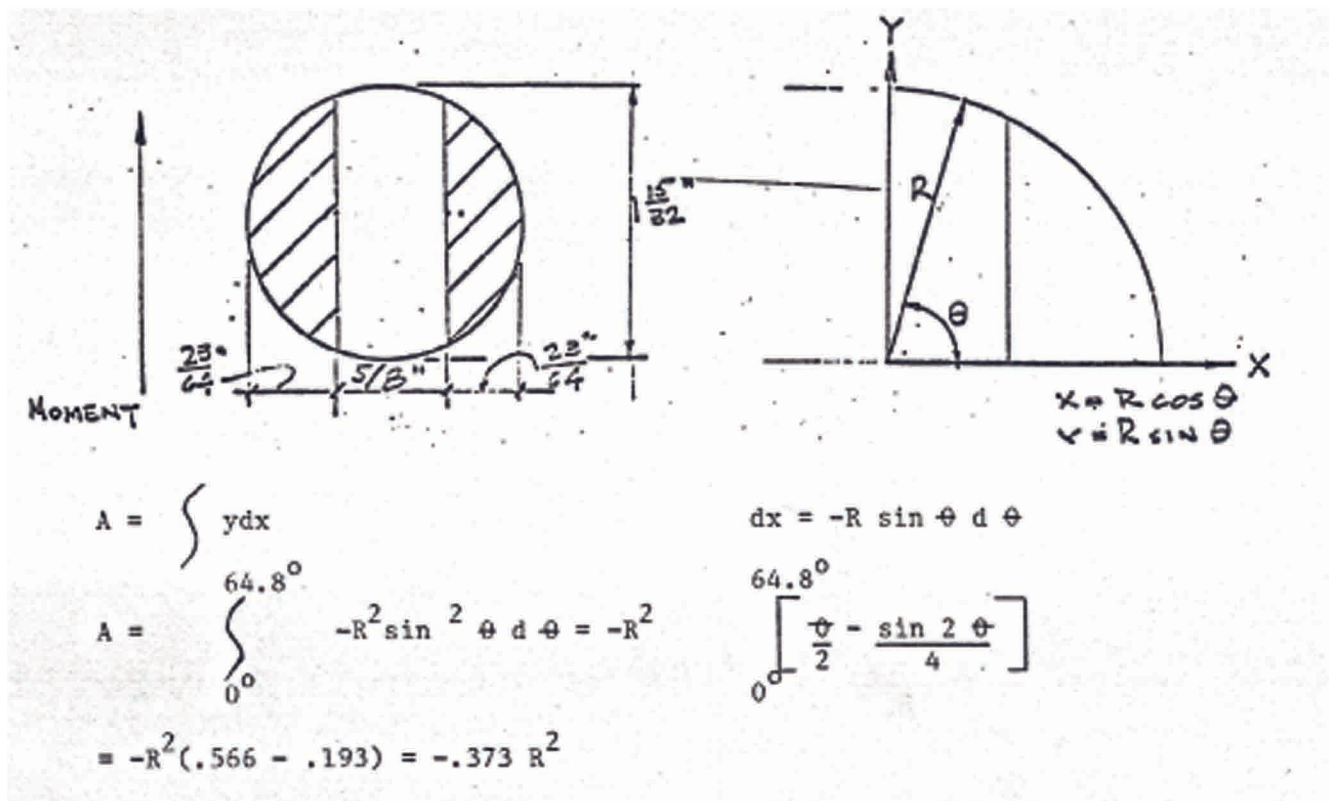

The maximum moment thru the hole in the tongue is

$$.155P \ (4-5/16) = .668P \text{ in.}$$

If P is in the lb, this moment is in lb in.

The strength of the tongue is found by considering bending thru the slotted section.

Tongue (Ref. dwg. 422-L04-B and H-120-B, and H-120-BRS)

$$A = \int y\,dx \qquad\qquad dx = -R \sin\theta\, d\theta$$

$$A = \int_{0°}^{64.8°} -R^2 \sin^2\theta\, d\theta = -R^2 \qquad \int_0^{64.8°} \left[\frac{\theta}{2} - \frac{\sin 2\theta}{4}\right]$$

$$= -R^2(.566 - .193) = -.373\, R^2$$

$$Mx = \int \frac{y^2}{2}\, dx = -\frac{R^3}{2} \int \sin^3 \theta \, d\theta$$

$$= -\frac{R^3}{2} \left[\frac{\cos^3 \theta}{3} - \cos \theta \right]_{0°}^{64.8°}$$

$$= -\frac{R^3}{2} (.0257 - .426 - .333 + 1) = .133\, R^3$$

$$\bar{y} = \frac{.133R^3}{.373R^2} = .360\, R$$

$$R = .7344"$$

$$A = .373\,(.7344)^2 = 0.201 \text{ in.}^2$$

$$\bar{y} = .360 \times (.7344) = .264 \text{ in.}$$

$$Mp = .201\,(.264)(40,000)(4) = 8450 \text{ lb. in.}$$

The limitation on P, therefore, is:

$$.668P = 8450 \text{ lb. in.}$$

$$P = 12,600 \text{ lb.}$$

The area is 4(.201) = .804 sq. in.

The associated shear strength is:

$$20,000\,(.804) = 16,080 \text{ lb.}$$

This relates to a load of:

$$.155P = 16,000$$

$$P = 103,000 \text{ lb.}$$

Considering a linear relationship between bending and shear stress results in:

$$\frac{P}{103,000} - \frac{P}{12,600} = 1$$

$$P(1 \div 8.2) = 103,000$$

$$P = \frac{103,000}{9.2}$$

$$P = 11,200$$

The limiting strength of the pin is, therefore , 11m200 lb.

3. Multi-Point Latch Housing:

Since the latch assembly is effective only for negative loads, the
housing is required only to hold the tongue in place. The latch assembly
will tend to lift about the edge closest to the strike. the 3/8" diameater
socket head cap screws have an effective area of .075 sq. in.. The
yield strength of the screw material is 170,000 psi - for the purpose of
anaalysis 70,000 psi is used, therefore, each screw has a potential strength
of .078 (70,000) - 5460 lb.. considering only the two furtherest screws
this is equivalent to a capcity of:

$$9/16 \ P = 4(2)(5460)$$

$$P = 78,200 \ lb.$$

The housing and attachment is, therefore, adequate.

CONCLUSION:

For the H-122   design (using 2 bolts in the strike) the strength is governed
by the strike to a strength of 7450 lb.