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INDUSTRY TECHNICAL NOTE
COLD FORMED STEEL CONSTRUCTION

JAN
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SINGLE DEFLECTION TRACK SELECTION

INTRODUCTION

Since the popular use of steel studs for framing full height walls, there has been a recognition that the top of the wall needs to allow for deflection of the floor or roof assembly above when subjected to an applied live load. The allowance for deflection is essential for interior non-load bearing applications.

It has been common practice to utilize either a single track with the wall studs nested into the track (see Figure 1) with no attachment of the wall sheathing or stud to the deflection track. An alternate assembly uses a track nested into another track with no attachment of the nested inside track to the outside track. The track within a track allows the stud at the top of the wall to be attached to the inside track to provide a more uniform load transfer to the outside deflection track flange, and to stabilize the studs against rotation.

OBSERVATIONS

Over the years the question of how to determine the effective width of that portion of the track flange to be used for calculating the required design thickness of the leg for the single track deflection assembly was largely unanswered and was up to the design professional to determine. The design professional could assume an effective width equal to the width of the stud flange bearing against the side of the deflection track (conservative) or a width equal to the on center spacing of the studs (un-conservative). The Army Corps of Engineers has adopted a procedure (ETL 1110-3-411) which recognizes the width of the stud flange plus a portion of the track flange on each side of the stud as being the effective width b_{eff} (see Figure 1).

It is recommended that the steel used for the deflection track have good ductility characteristics, (tensile strength to yield point ratio not less than 1.08 and total elongation not less than 10 percent in a two-inch gage length). Good ductility characteristics reduce the possibility of micro cracking during the roll-forming process and provide inelastic reserve.

Satisfactory performance is based on the following:

1. The track thickness must be sufficient to resist plate bending along the effective track flange width, b_{eff}.
2. Each stud flange must be stabilized to resist rotation of the stud.

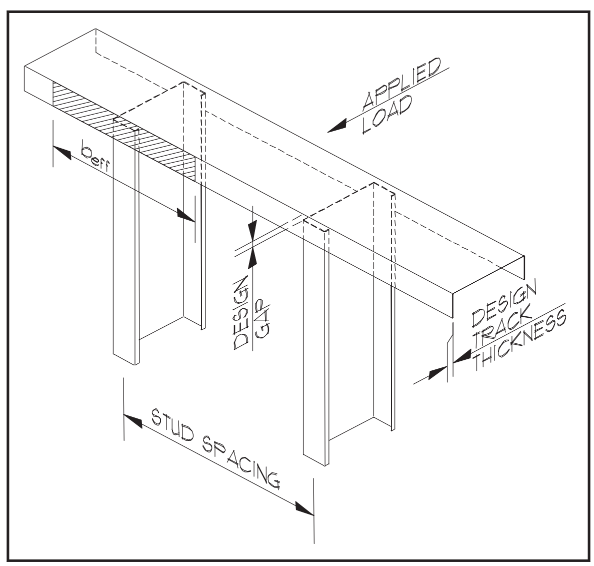

FIGURE 1

DEFLECTION TRACK THICKNESS DETERMINATION

Deflection track thickness determination based on the Army Corps of Engineers ETL 1110-3-411 procedure utilizes the effective width of the track leg in plate bending. The equation for determining the required thickness is:

$$t = \sqrt{\frac{7.5 \cdot P \cdot e}{F_y \cdot b_{eff}}}$$

where:

t = required design thickness, in inches

P = the maximum reaction at the top of the stud, in lbs. multiplied by 0.75 for wind or earthquake loads per A5.1.3 of the AISI Specification if applicable (Check local building code for application of reduction factor)

e =distance between the track web and the point of application of the reaction P, in inches (design gap times 1.5)

F_y = minimum steel yield stress, in psi

b_{eff}=effective width of the track in plate bending, given by:

$$b_{eff} = w_{stud} + 2 \cdot \left[\frac{e + 1.25}{\tan(30^{\circ})}\right]$$

w_{stud}=the stud flange width, in inches.

Design curves can be developed utilizing a typical interior, non-load bearing stud flange width of 1.25", a yield stress of either 33 ksi or 50 ksi (50 ksi is noted on the curves) and 16" and 24" on center stud spacing. A series of such curves are given in Figures 2 through 7.

By knowing the non-load bearing wall height, the lateral design load (typically 5 psf for interior walls), the design gap (gap between the end of the stud and the track web), the stud spacing, and the steel minimum yield stress of the track, the required design thickness of the single deflection track can be determined.

Thickness - Steel Components

Minimum Thickness[1] (mils)	Design Thickness (in)	Reference On Gauge No.
18	0.0188	25
27	0.0283	22
33	0.0346	20
43	0.0451	18
54	0.0566	16
68	0.0713	14
97	0.1017	12

[1] Minimum Thickness represents 95% of the design thickness and is the minimum acceptable thickness delivered to the job site based on Section A3.4 of the 1996 AISI Specification.

As an example:

Design load = 5 psf
Stud spacing = 24"o.c.
Design gap = 0.5"
Min. yield stress = 33 ksi
Wall height = 15'-0"
From Figure 3 design thickness of
t = .0451" (18ga.)

NOTE: Maximum allowable wall height = 19.52ft.

It is recommended that the depth of the deflection track flange be equal to the design gap plus 1 inch for one story buildings, and equal to 2 times the design gap plus 1 inch for all other applications to provide engagement of the stud into the deflection track. The longer track leg, for multiple story buildings, allows for the floor system supporting the stud wall to deflect while still maintaining engagement of the stud in the deflection track.

NOTE: The minimum uncoated delivered thickness can be equal to 95 percent of the design thickness per the 1996 AISI "Specification for The Design of Cold-Formed Steel Structural Members", Section A3.4.

DESIGN CHART FOR SINGLE DEFLECTION TRACK[a,b,c.]

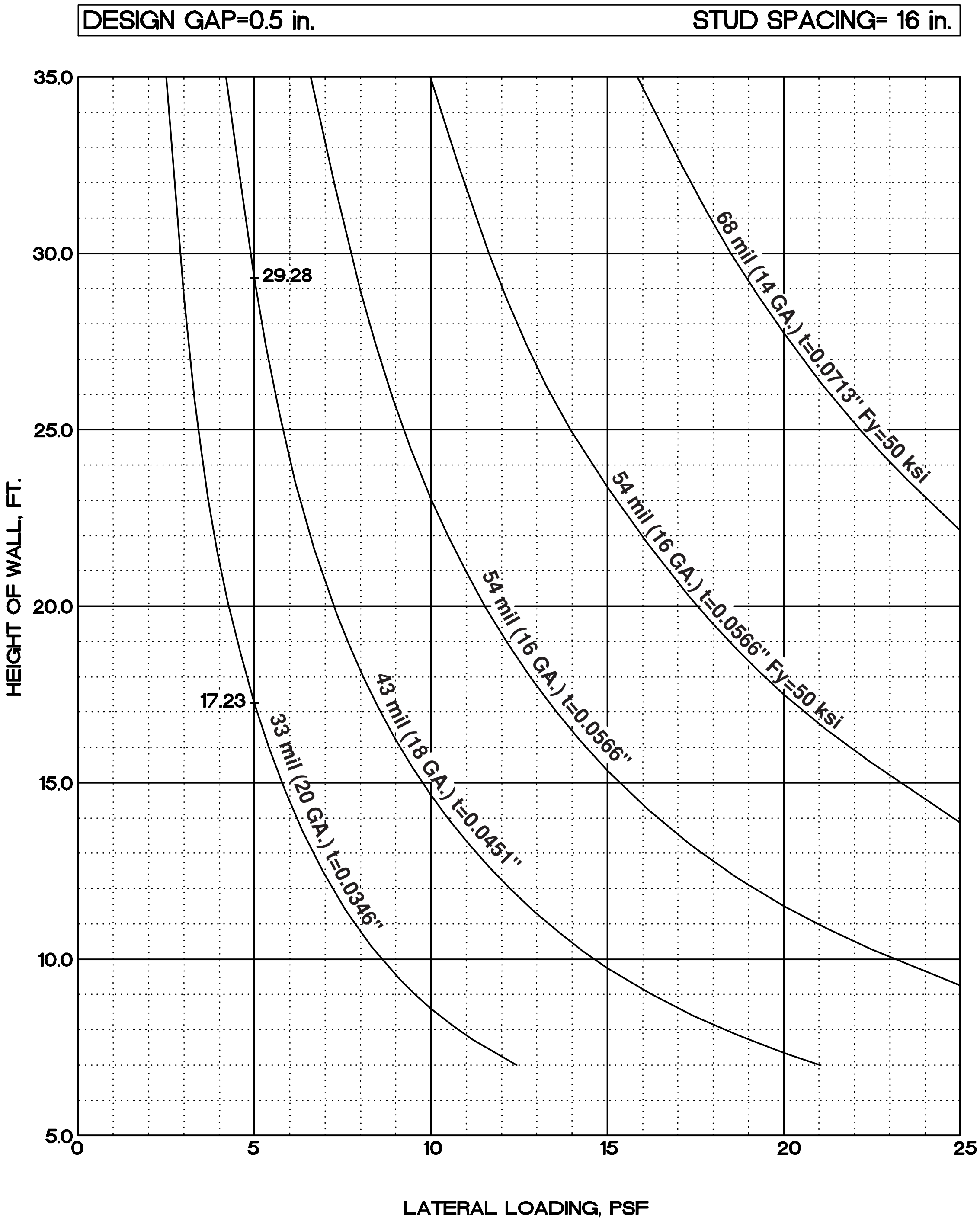

FIGURE 2

Notes:

a. Fy=33 ksi unless noted otherwise.

b. t=Design thickness.

c. Lateral load has been modified for duration of load (0.75) per A5.1.3 of the AISI Specification. No further reduction allowed; increase lateral load where other load durations govern.

DESIGN CHART FOR SINGLE DEFLECTION TRACK[a,b,c.]

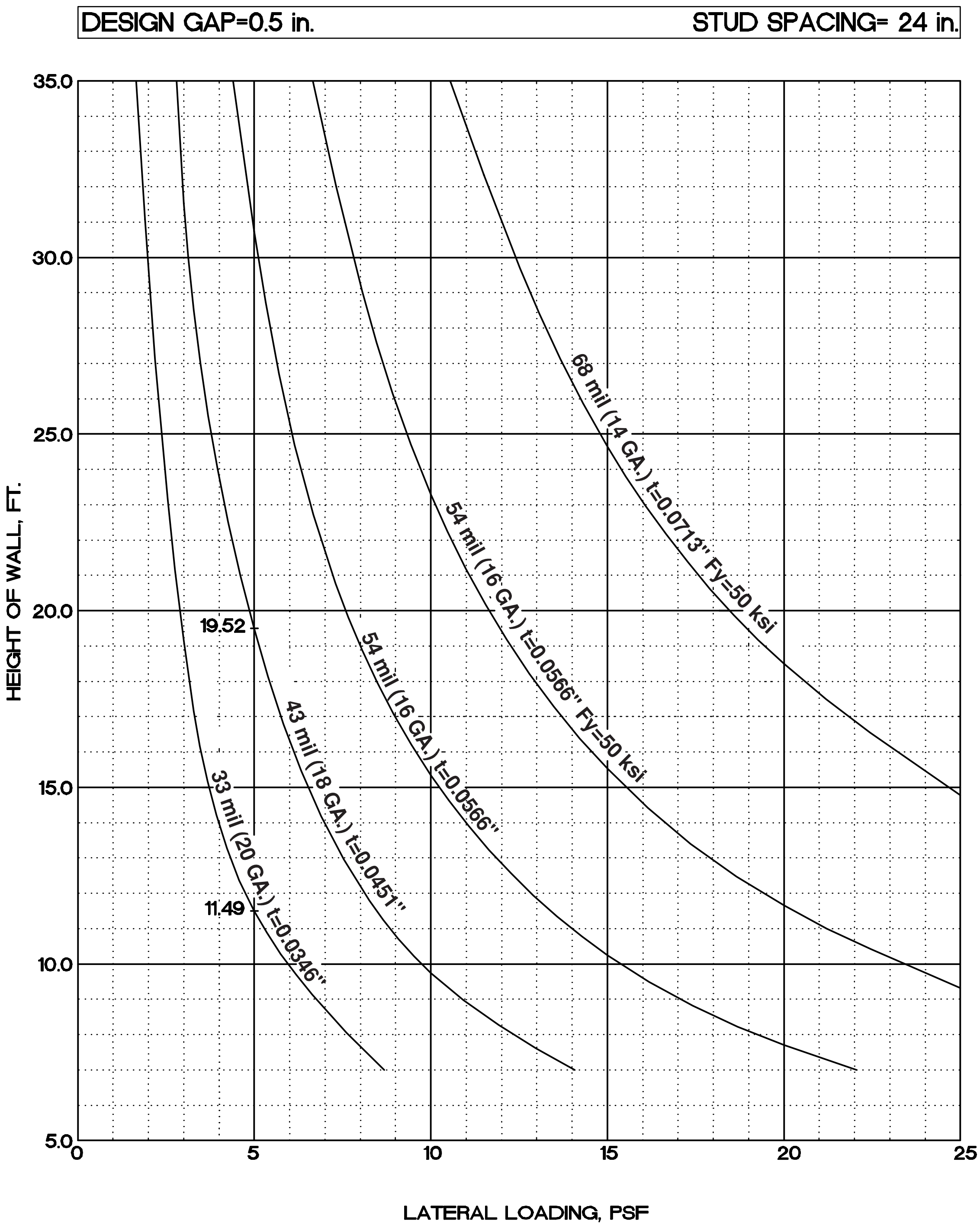

FIGURE 3

Notes:

a. Fy=33 ksi unless noted otherwise.

b. t=Design thickness.

c. Lateral load has been modified for duration of load (0.75) per A5.1.3 of the AISI Specification. No further reduction allowed; increase lateral load where other load durations govern.

DESIGN CHART FOR SINGLE DEFLECTION TRACK[a,b,c]

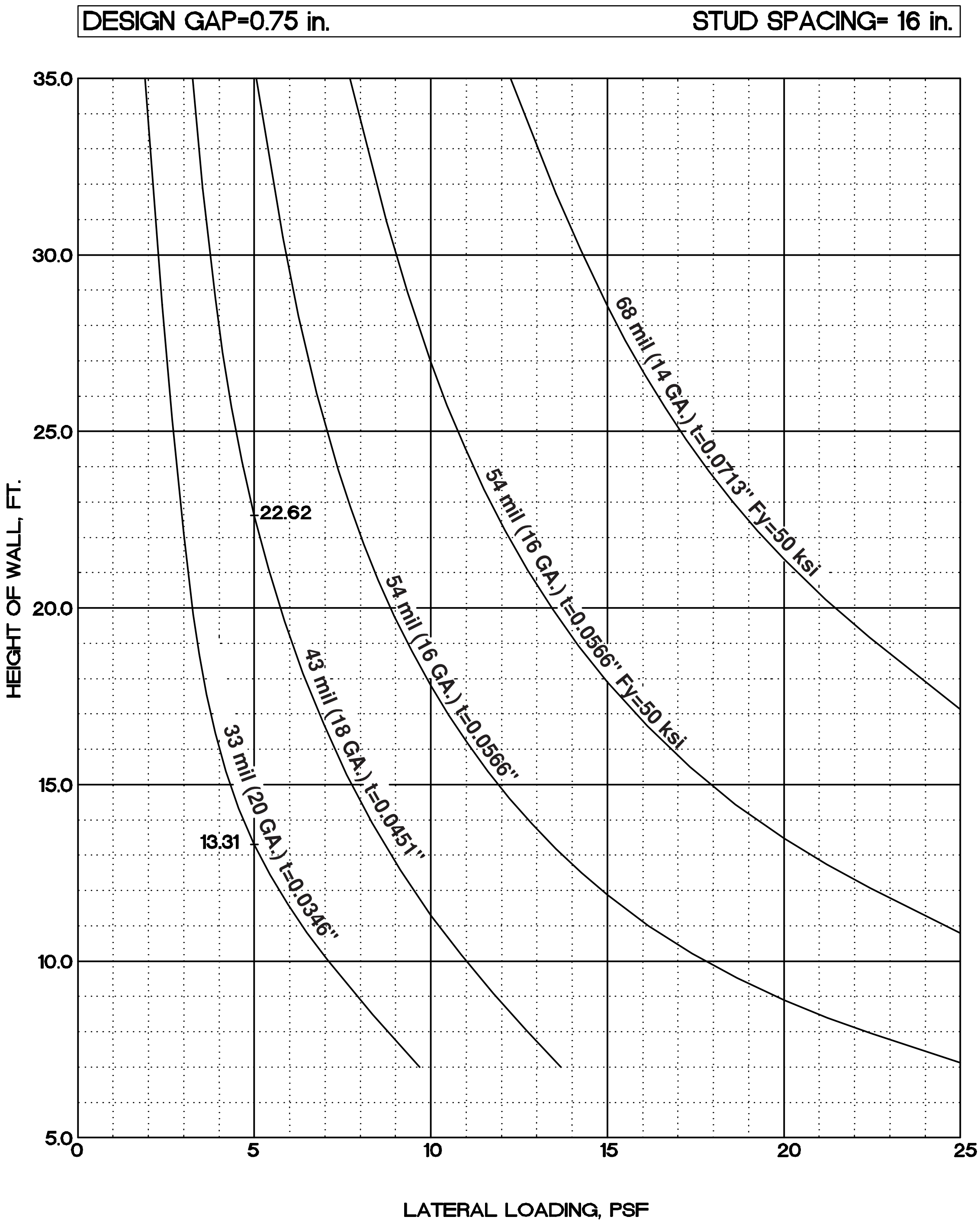

FIGURE 4

Notes:
a. Fy=33 ksi unless noted otherwise.
b. t=Design thickness.
c. Lateral load has been modified for duration of load (0.75) per A5.1.3 of the AISI Specification. No further reduction allowed; increase lateral load where other load durations govern.

DESIGN CHART FOR SINGLE DEFLECTION TRACK[a,b,c.]

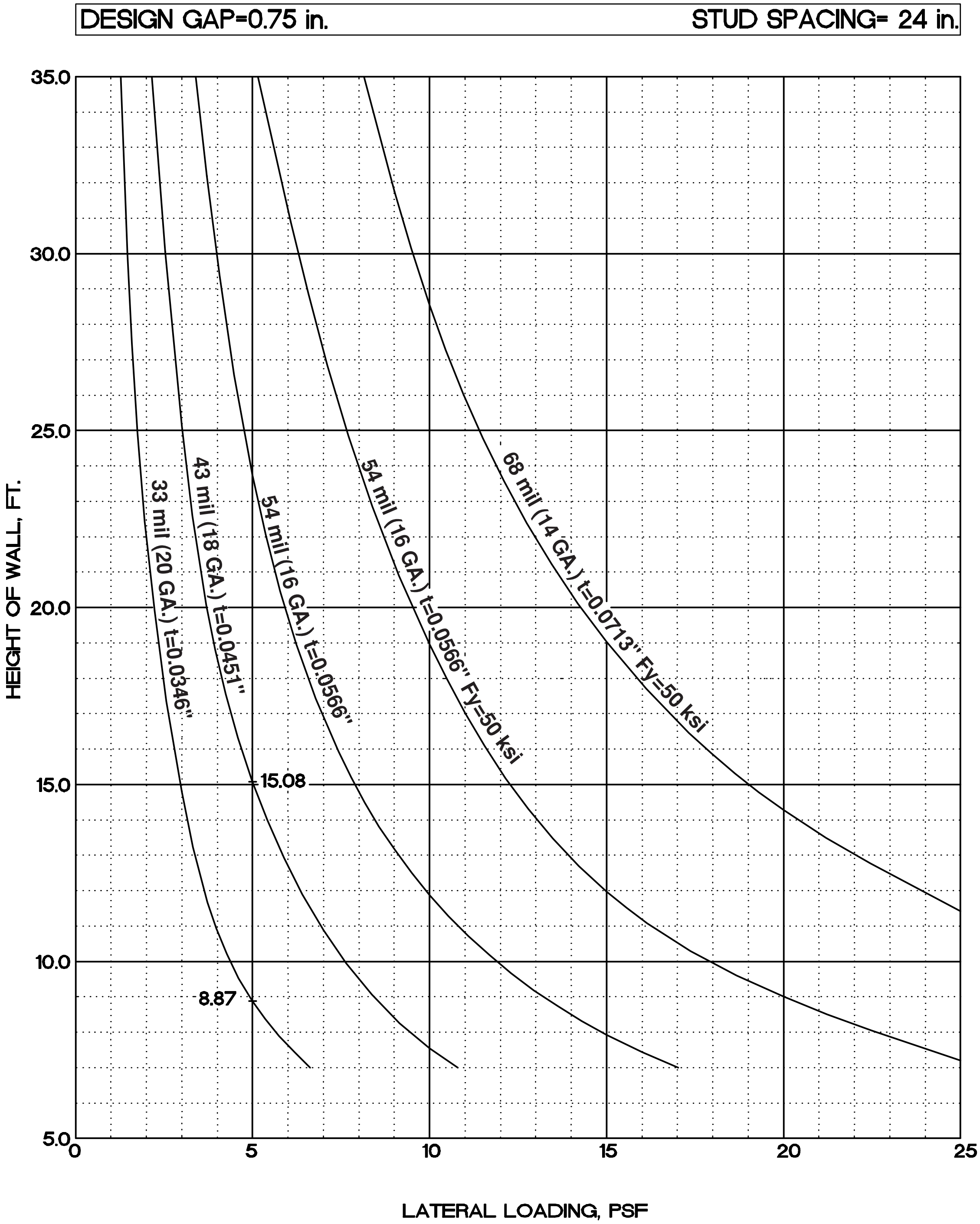

FIGURE 5

Notes:

a. Fy=33 ksi unless noted otherwise.

b. t=Design thickness.

c. Lateral load has been modified for duration of load (0.75) per A5.1.3 of the AISI Specification. No further reduction allowed; increase lateral load where other load durations govern.

DESIGN CHART FOR SINGLE DEFLECTION TRACK[a,b,c.]

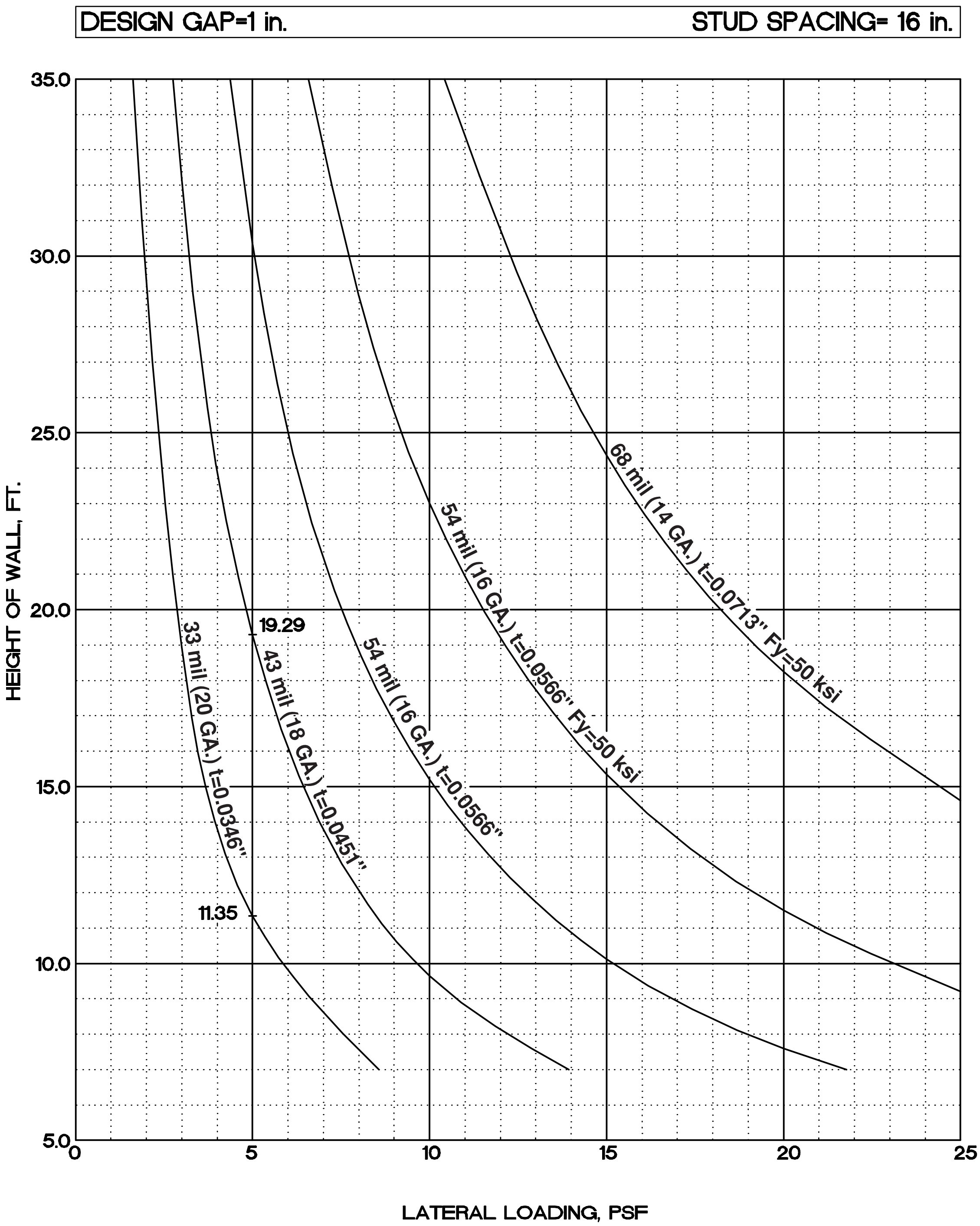

FIGURE 6

Notes:
a. Fy=33 ksi unless noted otherwise.
b. t=Design thickness.
c. Lateral load has been modified for duration of load (0.75) per A5.1.3 of the AISI Specification. No further reduction allowed; increase lateral load where other load durations govern.

DESIGN CHART FOR SINGLE DEFLECTION TRACK[a,b,c.]

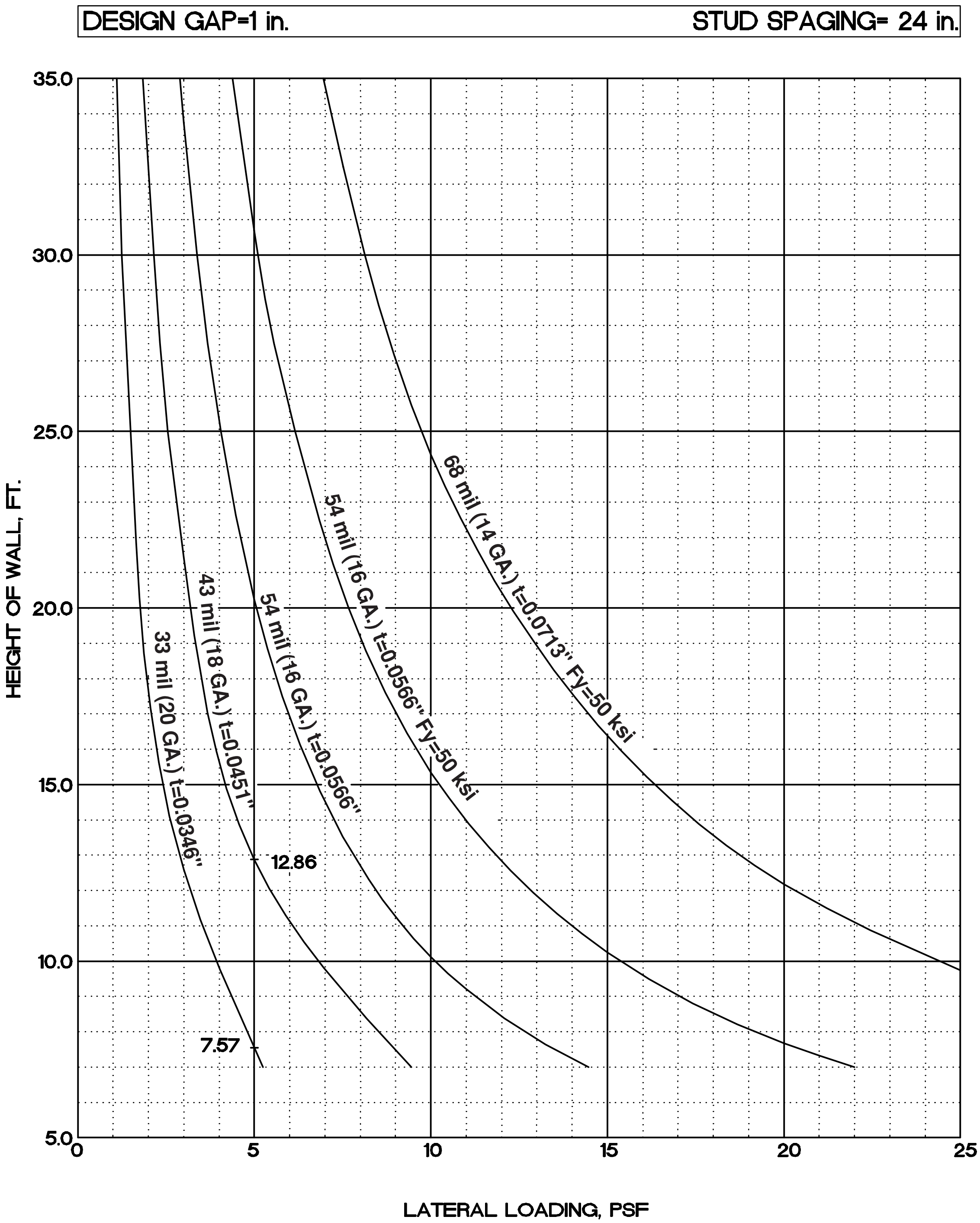

FIGURE 7

Notes:

a. Fy=33 ksi unless noted otherwise.

b. t=Design thickness.

c. Lateral load has been modified for duration of load (0.75) per A5.1.3 of the AISI Specification. No further reduction allowed; increase lateral load where other load durations govern.

SSMA MEMBER