E - 831
WIDE BAND LABORATORY
Investigation of Live - Load Capacity for
Cat-Walks @ Elev. 748.
East Side; Between Column Lines 5 & 6

REFERENCE DRAWINGS

Drawing No.:	Description:
1) 8 - 4 - 66E, S - 2 dtd. 2-10-88	Wide Band Crane - Roof Hatch Plan, Section, Details
2) 8 - 4 - 66, SS - 6 Rev. 2, dtd. 5-18-84	Cat-Walk & Loading Dock Plan, Section, Details
3) 8 - 4 - 66, A - 4 Rev. 5, dtd. 7-18-84	Wide Band Crane - Roof Hatch Plan, Section, Details
4) 8 - 4 - 66, A - 2 Rev. 12, dtd. 1-4-85	Building Elevations
5) 8 - 4 - 66, A - 1 Rev. 7, dtd. 9-7-84	Floor Plans, Door & Room Schedules & Details
6) 8 - 4 - 66, A - 3 Rev. 9, dtd. 10-17-84	Building Sections, Details, & Room finish Schedule
7) 8 - 4 - 66, C- 8 Rev. 2, dtd. 5-18-84	Sections

Dead Load Inventory: Cat-Walk (Sketch No. 5)

3.5 inch Concrete Walkway: $Wt_{conc} := \left(\frac{3.5}{12}\right)\cdot(150.0)\ \frac{lbs}{S\_Ft}$ $\quad Wt_{conc} = 44\ \frac{lbs}{sf}$

2 inch Multi-Deck Type " V " 20 gage: (0.359; 0.0396 inch) $Wt_{deck} := 5.0\ \frac{lbs}{sf}$

Combined Weight of Concrete & Metal Deck: $Wt_{conc\_deck} := Wt_{conc} + Wt_{deck}$

$Wt_{conc\_deck} = 49\ \frac{lbs}{sf}$

Channel: 12 X 20.7: $Wt_{CH\_12} := 20.7\ \frac{lbs}{L\_F}$

Angle: 3 X 3 X 3/8: $Wt_{Angle} := 7.2\ \frac{lbs}{L\_F}$

Each Angle Support contains 9 L. Ft. of 3 X 3 X 3/8 angle.

The Cat-Walk between Col. Lines 5 & 6 is also supported by two W12 Stair Stringers (Sketch No. 6), in addition to three, 3 X 3 X 3/8 inch angle knee-braces.
Since these stringers are much stiffer than the 3 X 3 X 3/8 inch angle knee-braces, consider the length effected "external loading" as 14.5 feet.

Between the stair stringer & construction joint there are two angle supports.

$Wt_{Ang\_sup} := Wt_{Angle}\cdot 18 \quad Wt_{Ang\_sup} = 130 \quad lbs$

Length of Cat-Walk from stair stringer to construction joint: $L_{c\_w} := 14.5\ ft$

Hand Rail: (Sketch No. 7) 1 1/4 inch Dia.; vertical @ 4' - 0" O. C.; 3 horizontal: $Wt_{H\_R} := 2.27\ \frac{lbs}{L\_F}$

No. of H. R. Verts = 4 @ 3.5 ft.

No. of H. R. Horizontals = 3

Total Weight of Hand Rail between Stair Stringer & construction joint:

$$TW_{H\_R} := \left[\left(L_{c\_w}\right)\cdot\left(Wt_{H\_R}\right)\cdot 3\right] + \left(4\cdot 3.5\cdot Wt_{H\_R}\right)$$

$$TW_{H\_R} = 131 \quad lbs$$

Total Weight of Channel between Stair Stringer & construction joint:

$$CH_{Wt} := \left(Wt_{CH\_12}\right)\cdot L_{c\_w} \quad CH_{Wt} = 300 \quad lbs$$

Dead Load Weight of 14 ft. - 6 in. section of Cat-Walk

$Wt_{conc\_deck} = 49 \ \frac{lbs}{sf}$ $\quad Wt_{Ang\_sup} = 130 \ lbs$ $\quad TW_{H\_R} = 131 \ lbs$ $\quad CH_{Wt} = 300 \ lbs$

$Wt_{cat\_walk} := \left[\left(Wt_{conc\_deck}\right) \cdot (14.5) \cdot (4.75) \right] + \left(Wt_{Ang\_sup}\right) + \left(TW_{H\_R}\right) + \left(CH_{Wt}\right)$

$Wt_{cat\_walk} = 3918 \ lbs$

Allowable Live Load on Cat-Walk = 100. lbs/sf $\quad Live_{load} := 100.0 \ \frac{lbs}{sf}$

***T**otal **A**llowable **L**ive **L**oad on 14.5 foot section of Cat-Walk:* $T\_A_{live\_load} := \left(L_{c\_w}\right) \cdot 4.75 \cdot Live_{load}$

$T\_A_{live\_load} = 6888 \ lbs$

Dead Load - to - Live Load Ratio: $\quad Load_{Ratio} := \frac{Wt_{cat\_walk}}{T\_A_{live\_load}}$ $\quad Load_{Ratio} = 0.57$

Dead Load Inventory; Aluminum Beams & Trolley-Extrusions:

From Table 3, Dwg. 2285-3-MC-209509;
Aluminum Association "I" Beams:

$\text{Density}_{AL} := 0.098\frac{\text{lbs}}{\text{in}^3}$ $\quad (12^3)\cdot\text{Density}_{AL} = 169\ \frac{\text{lbs}}{\text{ft}^3}$

Depth	$d1_{al} := 7.0$	$d2_{al} := 8.0$	$d3_{al} := 8.0$	$d4_{al} := 9.0$
Weight	$Wt1_{al} := 5.80$	$Wt2_{al} := 6.18$	$Wt3_{al} := 7.02$	$Wt4_{al} := 7.51$

Depth	$d5_{al} := 10.0$	$d6_{al} := 10.0$	$d7_{al} := 12.0$	$d8_{al} := 12.0$
Weight	$Wt5_{al} := 8.65$	$Wt6_{al} := 10.29$	$Wt7_{al} := 11.67$	$Wt8_{al} := 14.29$

From Sketch No. : Total Length of Al. Beam & Extrusion Carried by Steel Supports, near Beam Center Line and Angle Supports attached to Cat-Walk. Use 14.29 lbs. per L. Ft. for Aluminum Bea

Length: $L_{al\_bm} := 12.0\ \text{ft}$

Group - of - Three: Aluminum Support Beams: $3\cdot(12)\cdot 14.29 = 514$ lbs

Area of Trolley-Extrusion: $\text{AREA}_{extrusion} := 8.0571\text{in}^2$

Trolley-Extrusions: $3\cdot\left(\frac{8.0571}{144}\right)\cdot 12.0\cdot 169 = 340$ lbs

Total Dead Load; Group - of - Three; $DL_3 := 514 + 340$

$DL_3 = 854$ lbs

Group - of - Four:

Aluminum Support Beams: $4\cdot(12)\cdot 14.29 = 686$ lbs

Trolley-Extrusions: $4\cdot\left(\frac{8.0571}{144}\right)\cdot 12.0\cdot 169 = 454$ lbs

Total Dead Load; Group - of - Four: $DL_4 := 686 + 454$

$DL_4 = 1140$ lbs

Grand Total Dead Load Group 3 & 4: $GT_{D\_L} := DL_3 + DL_4$

$GT_{D\_L} = 1994$ lbs

This Load is Equally Shared by Cat-Walk and μ-Filter-Steel Support near Beam-Line. $C\_W_{load} := \frac{1994}{2}$

$C\_W_{load} = 997$ lbs

Dead Load Weight of 14 ft. - 6 in. section of Cat-Walk

$Wt_{cat\_walk} = 3918$ lbs

Allowable Live Load on Cat-Walk = 100. lbs/sf $Live_{load} := 100.0 \frac{lbs}{sf}$

***T**otal **A**llowable **L**ive **L**oad on 14.5 foot section of Cat-Walk:*

$T\_A_{live\_load} := (L_{c\_w}) \cdot 4.75 \cdot Live_{load}$

$T\_A_{live\_load} = 6888$ lbs $C\_W_{load} = 997$ lbs

Ratio of Cat-Walk-Load from Al. Beams - to - Total Allowable Live Load as percent:

$$Load_{Ratio} := \left(\frac{C\_W_{load}}{T\_A_{live\_load}}\right) \cdot 100.0$$

Live Load Reduction as per-cent of Allowable Live Load: $Load_{Ratio} = 14.5$ %

Reference Engineering Note MSD - 006 - E 831, dtd. July 24, 1995

Dead Load Design- Weight of MH-Array: $Wt_{MH} := 1000.$

Live Load Assumption for Instrumentation Wire: $Wt_{live} := 1000.0$ lbs

$$1.6 \cdot Wt_{live} = 1600 \text{ lbs}$$

One Detector Array, including instrument wire, weighs 1800 lbs.

Weight of Detector-Array is carried equally by Aluminum Support Structure (attached to Steel Beams) and to 3 X 3 X 3/8 Angles attached to the Cat-Walk. Add 900. lbs to the 997 lbs. Cat-Walk load.

$$C\_W_{load} = 997 \text{ lbs}$$

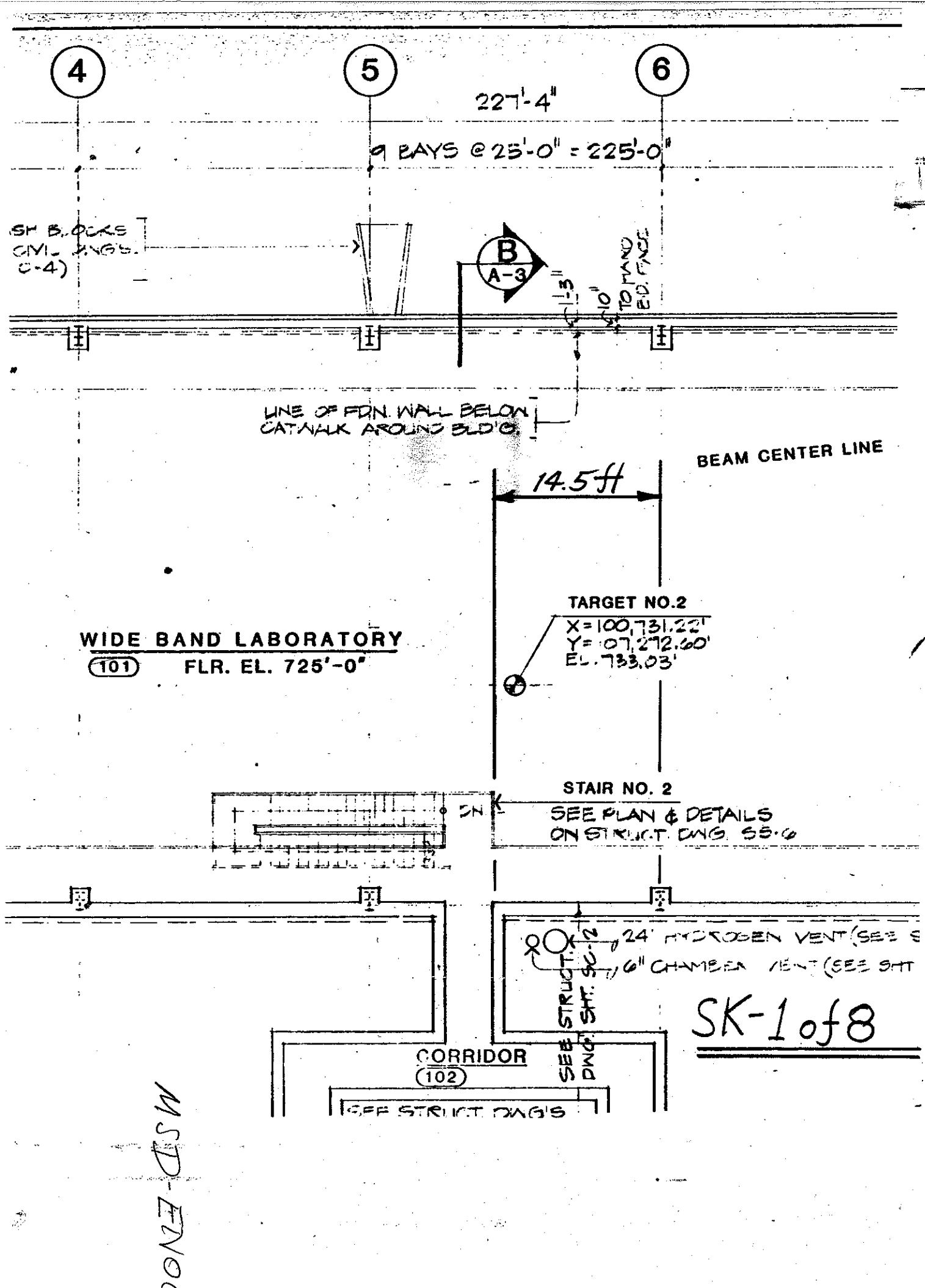
$$C\_W_{AL\_DETEC} := C\_W_{load} + 900$$

$$C\_W_{AL\_DETEC} = 1897 \text{ lbs}$$

Equivalent Live Load per S. Ft. on Cat-Walk.including Dectector Array and Aluminum Support Structure:

$$\frac{1897}{14.5 \cdot 4.75} = 28 \quad \text{psf}$$

Live Load Reduction as per-cent of Allowable Live Load: 28%.


4
5
6
227'-4"
9 BAYS @ 25'-0" = 225'-0"
B
A-3
TO HAND RAIL
LINE OF FDN. WALL BELOW CATWALK AROUND BLDG.
BEAM CENTER LINE
14.5 ft
TARGET NO.2
X=100,731.22'
Y=07,272.60'
EL. 733.03'
WIDE BAND LABORATORY
101
FLR. EL. 725'-0"
STAIR NO. 2
SEE PLAN & DETAILS ON STRUCT. DWG. S5.6
24" HYDROGEN VENT (SEE S
6" CHAMBER VENT (SEE SHT
SEE STRUCT. DWG. SHT. SK-2
CORRIDOR
102
SEE STRUCT. DWG'S
SK-1 of 8

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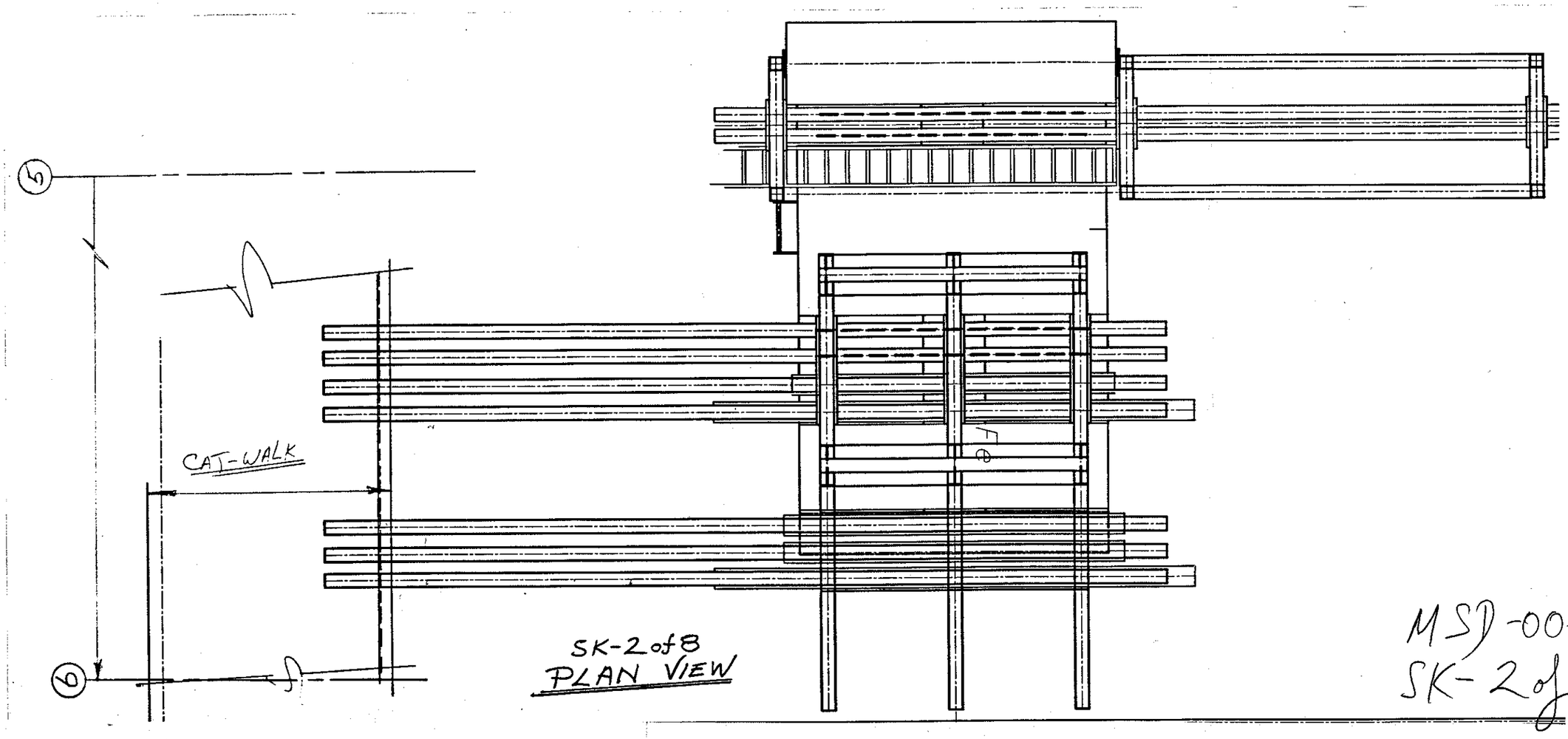

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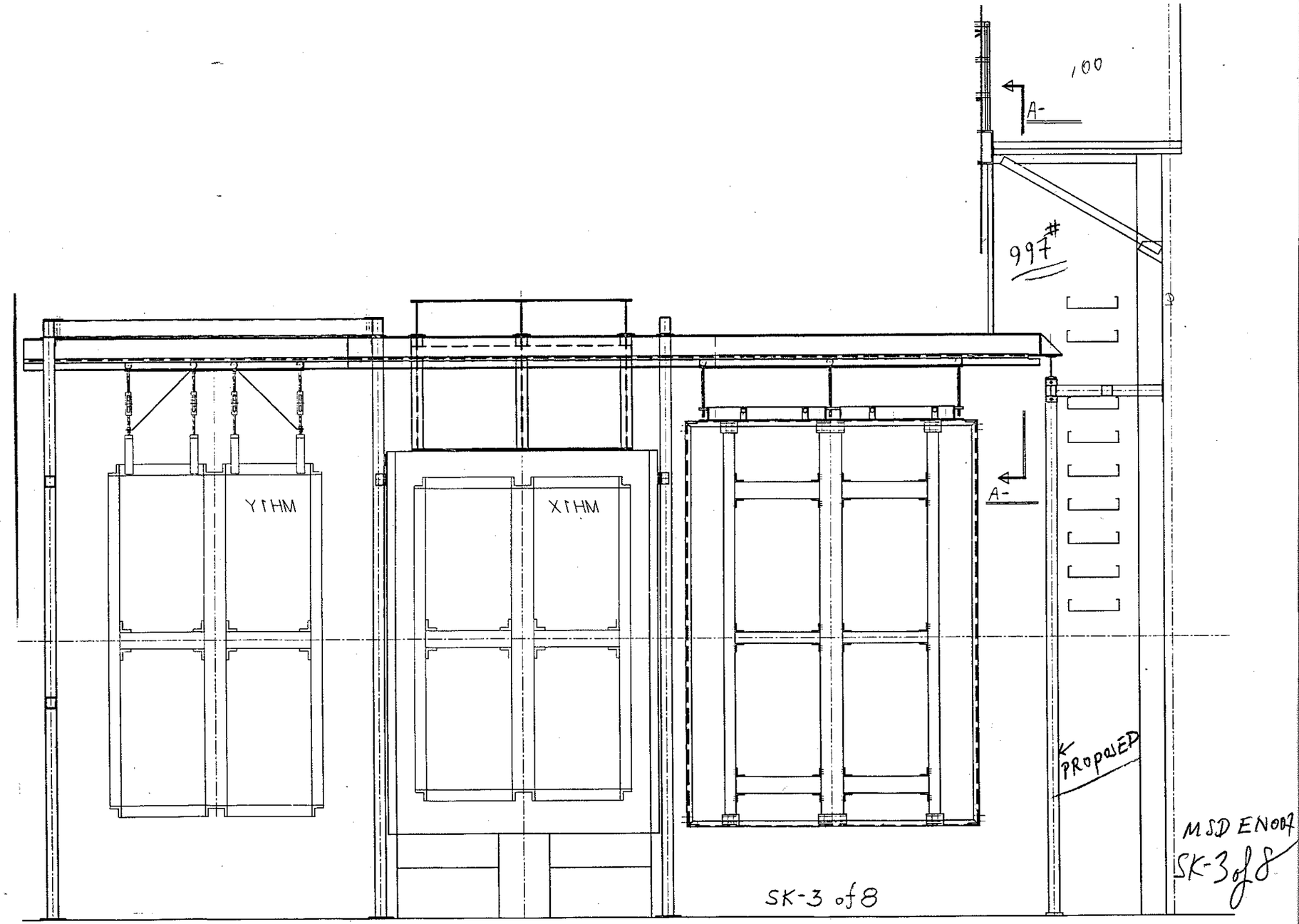
SK-2 of 8


100
A-
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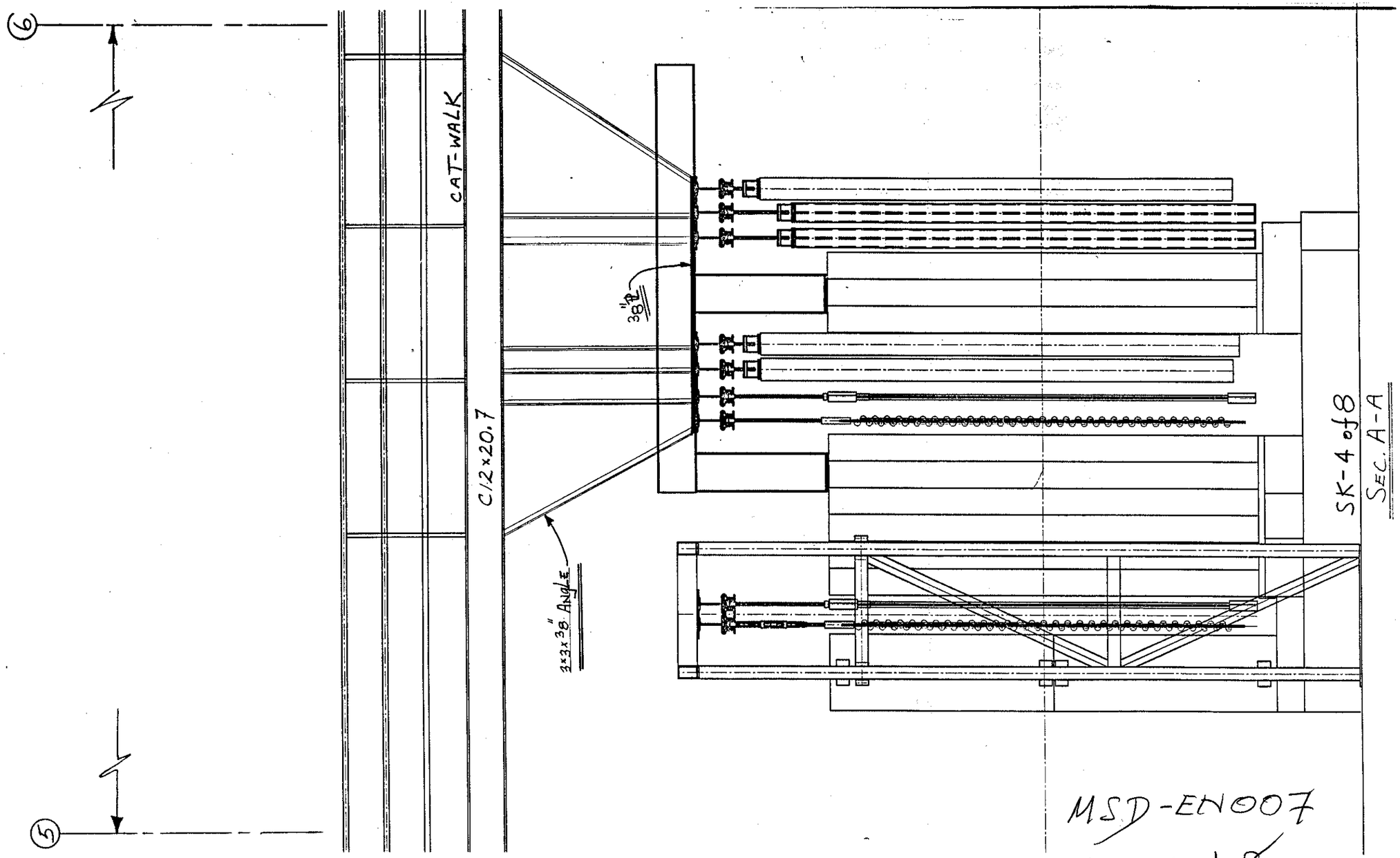
SK-3 of 8
SK-3 of 8



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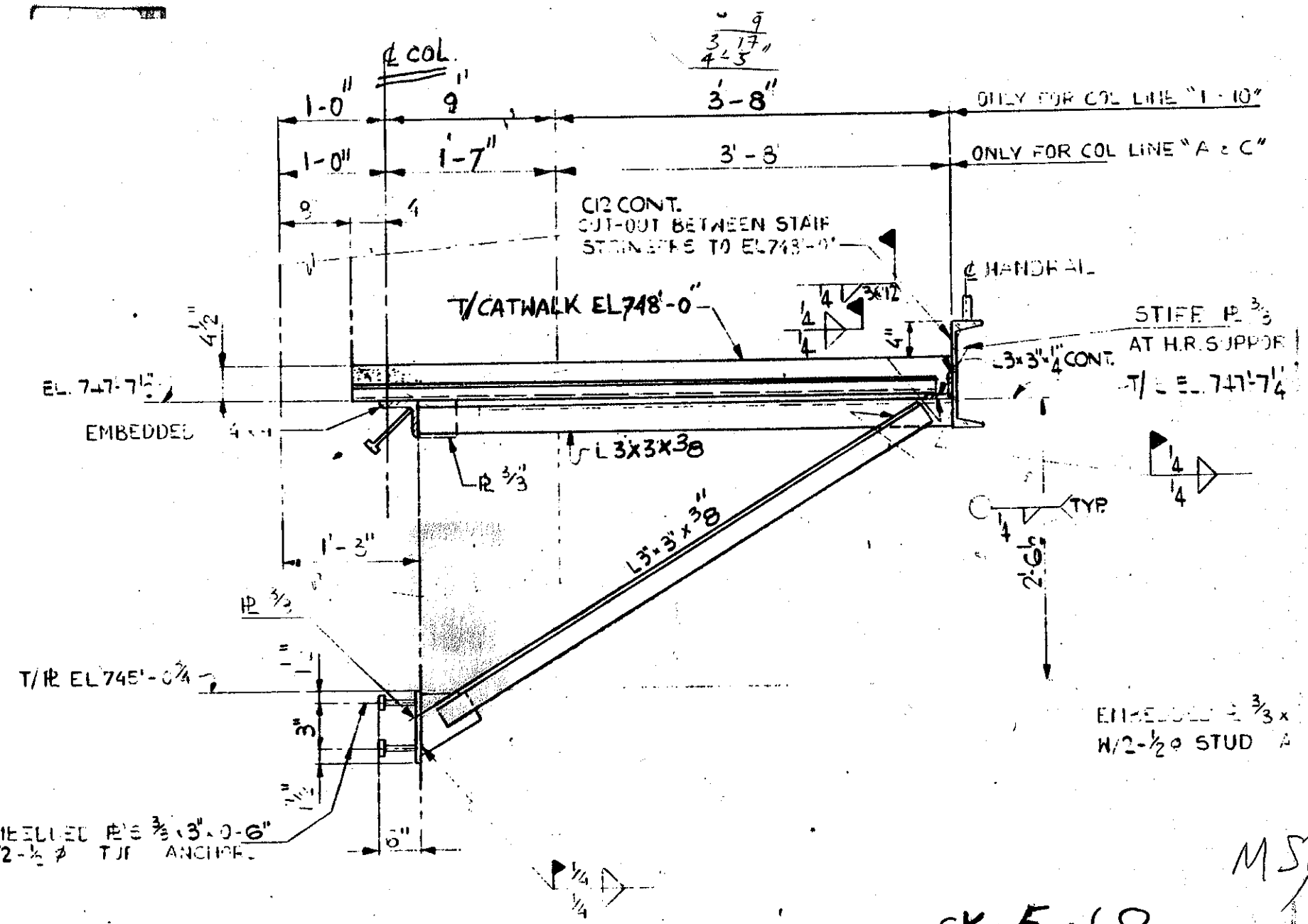

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SECTION A TYP. CATWALK SUPPORTS

SCALE 1" = 1'-0"

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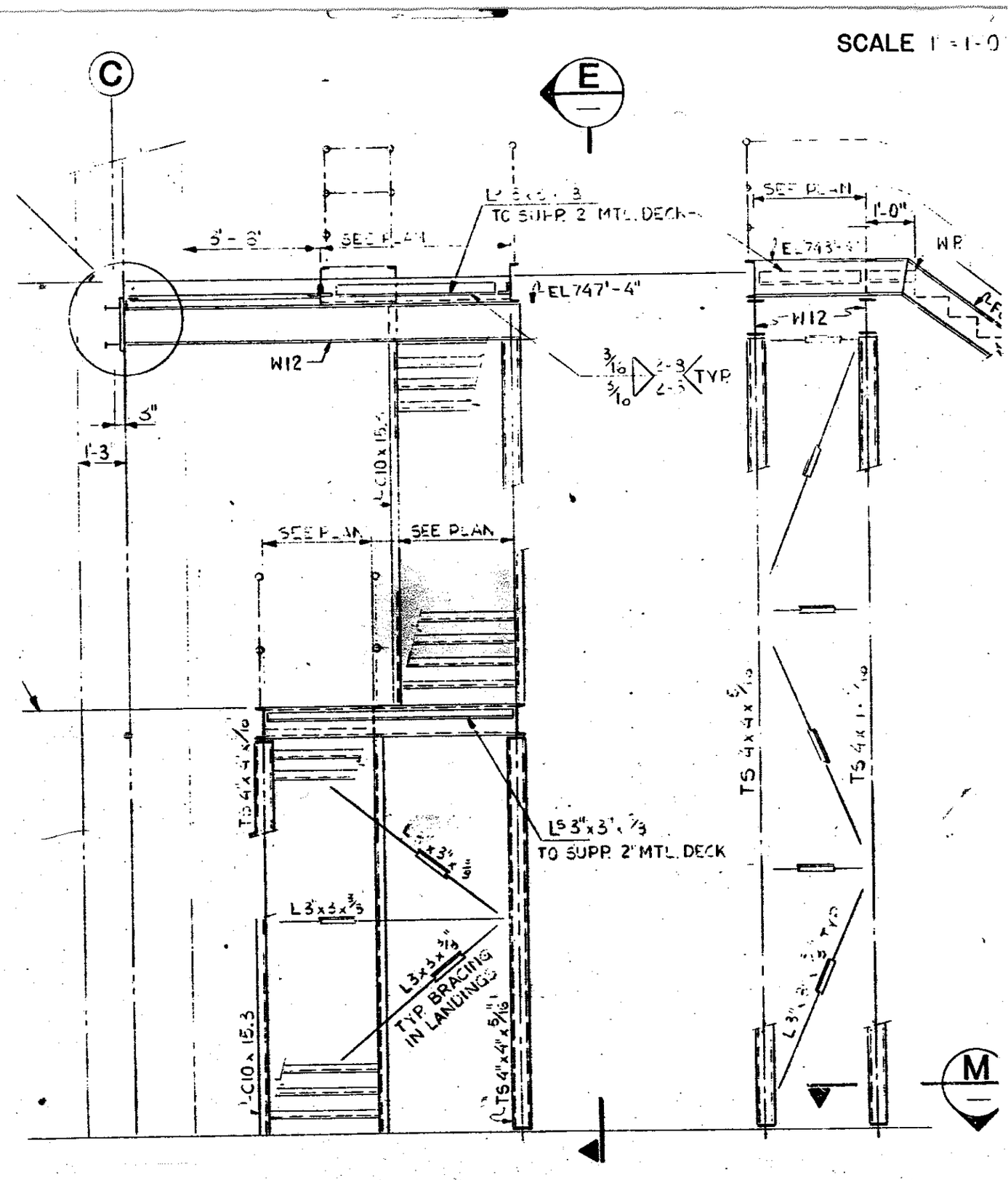
SCALE 1" = 1'-0"



SECTION D
SCALE 3/8" = 1'-0"

SECTION E
SCALE 3/8" = 1'-0"

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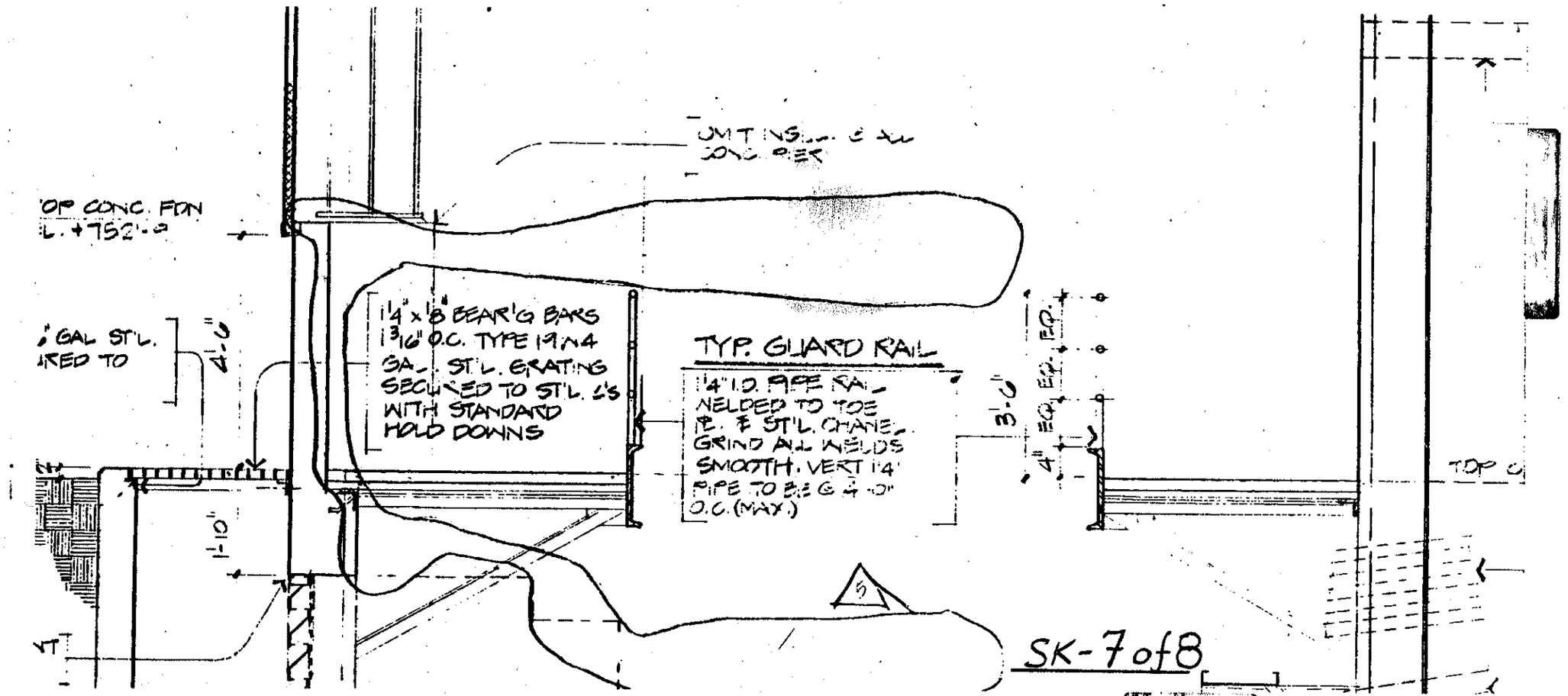

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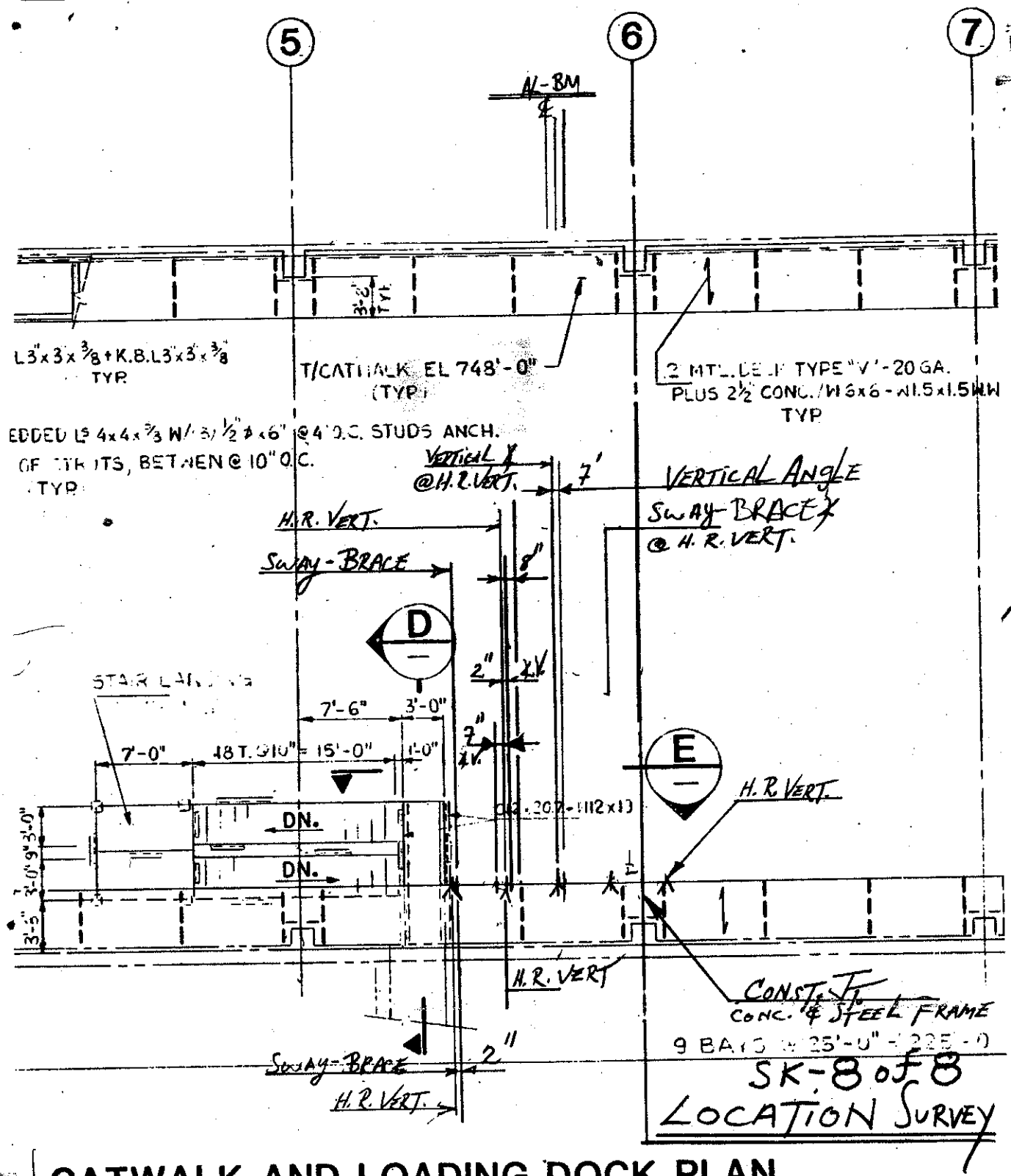

CATWALK AND LOADING DOCK PLAN

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