INVITATION NO. DACW33-79-B-0012

MAJOR REHABILITATION PROJECT

BOURNE HIGHWAY BRIDGE

CAPE COD CANAL

BOURNE, MASSACHUSETTS

SPECIFICATIONS

FOR THE

REHABILITATION OF THE BOURNE BRIDGE

VOLUME 2 OF 3 - STEEL REPAIR

LOCATION SKETCHES - SPANS 1, 2, 3

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.

TC423
.N43B775
1979
v.2

APRIL 1979

INVITATION NO. DACW33-79-B-0012

VOLUME ~~1~~ 2 of 3

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K E Y

FOR

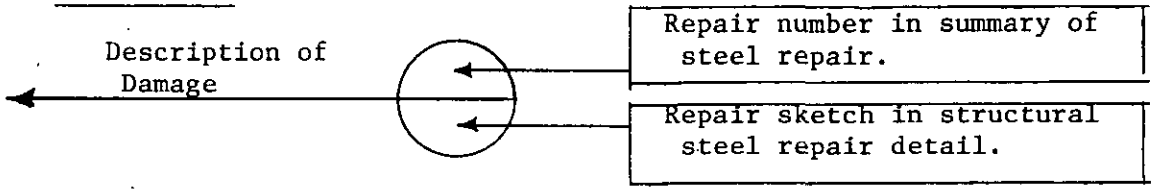
STEEL REPAIR LOCATION SKETCHES

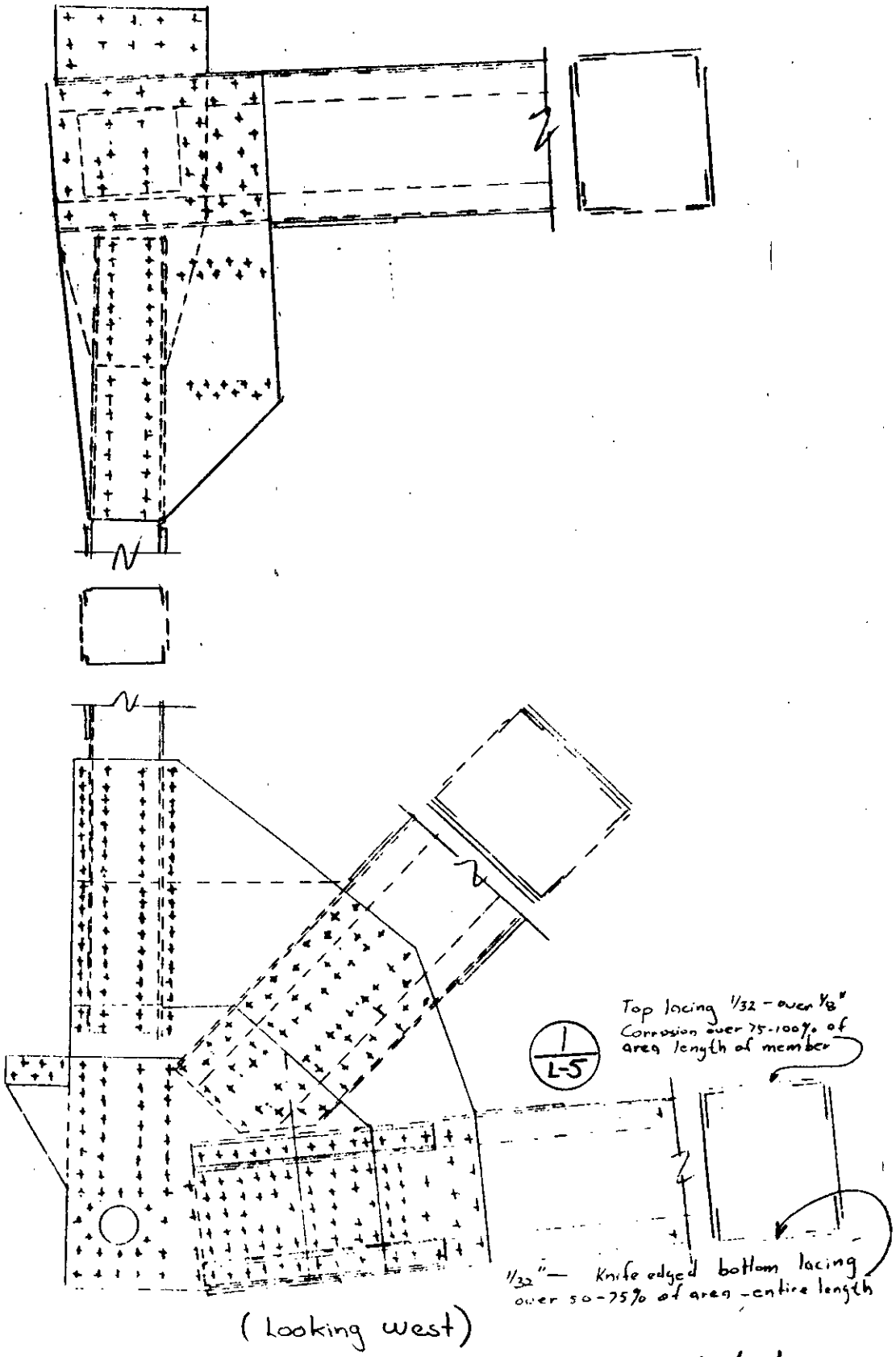
1. SKETCH NUMBER

Member Type	Span	Bay or Panel Point (PP)
A. Truss B. Floor Beam and Stringer C. Sidewalk Bracing D. Top Lateral Truss Bracing E. Bottom Lateral Truss Bracing F. Truss Sway Bracing G. Wind Chord Bracing Span 1	Main Span 1, 2, 3 Approach Spans 4,5,6,7	One Digit is a P.P. Two Digits indicate a bay between two P.P. E or W indicates a side if applicable. E is on east side. W is on west side.

EXAMPLE: A/5/6E is a truss member on Span 5 at Panel Point 6 on the east truss.

2. REPAIR ITEM





(Looking west)

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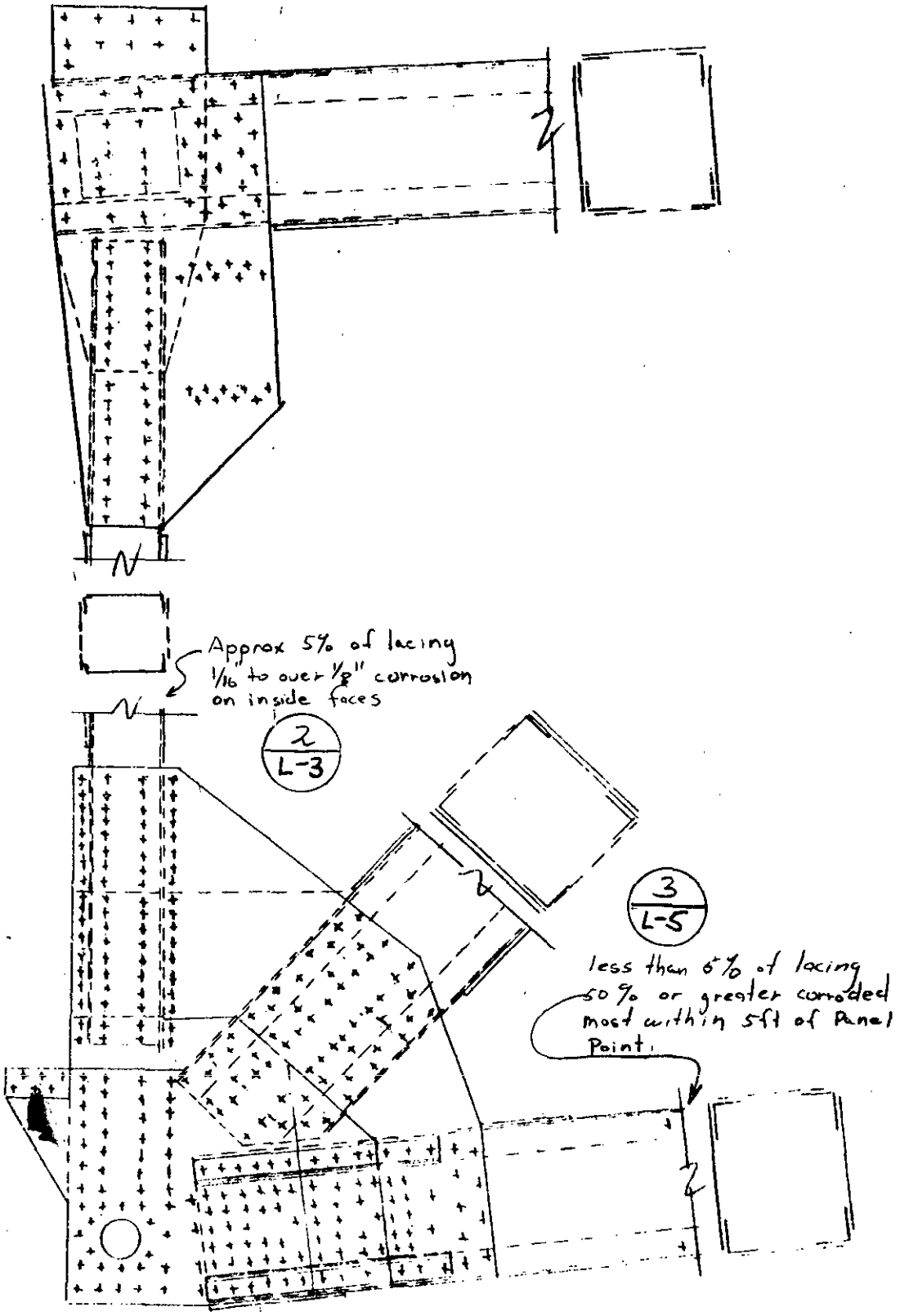

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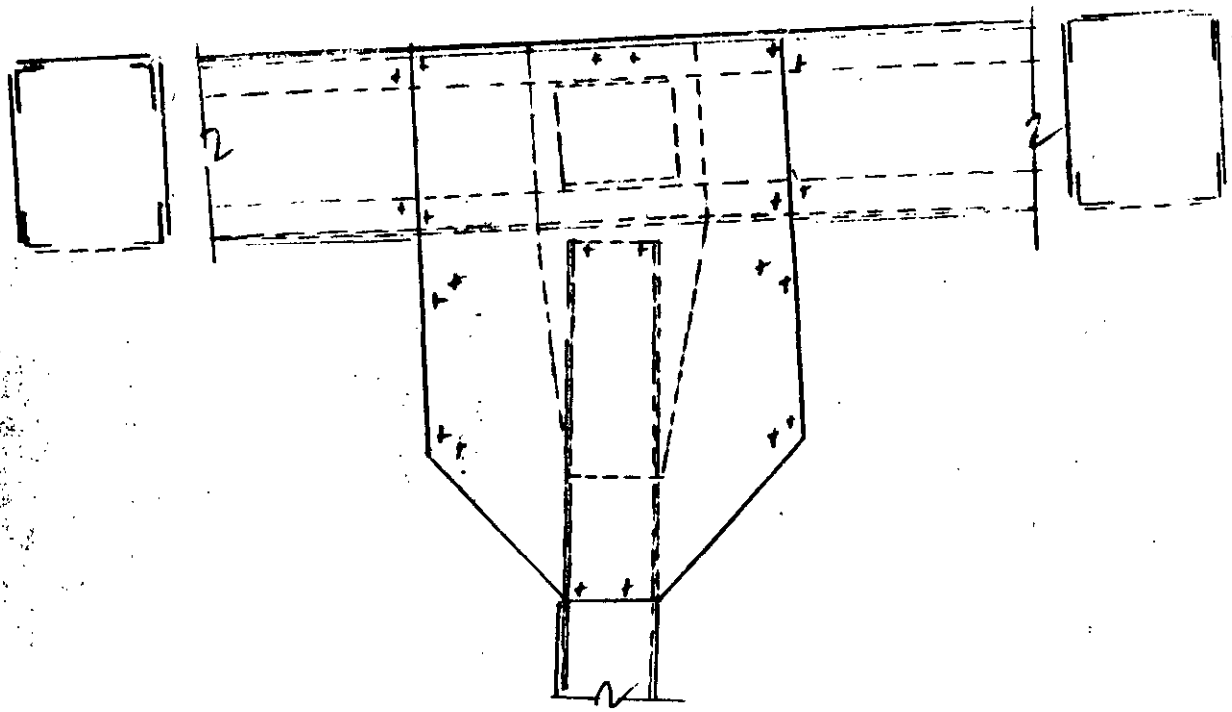

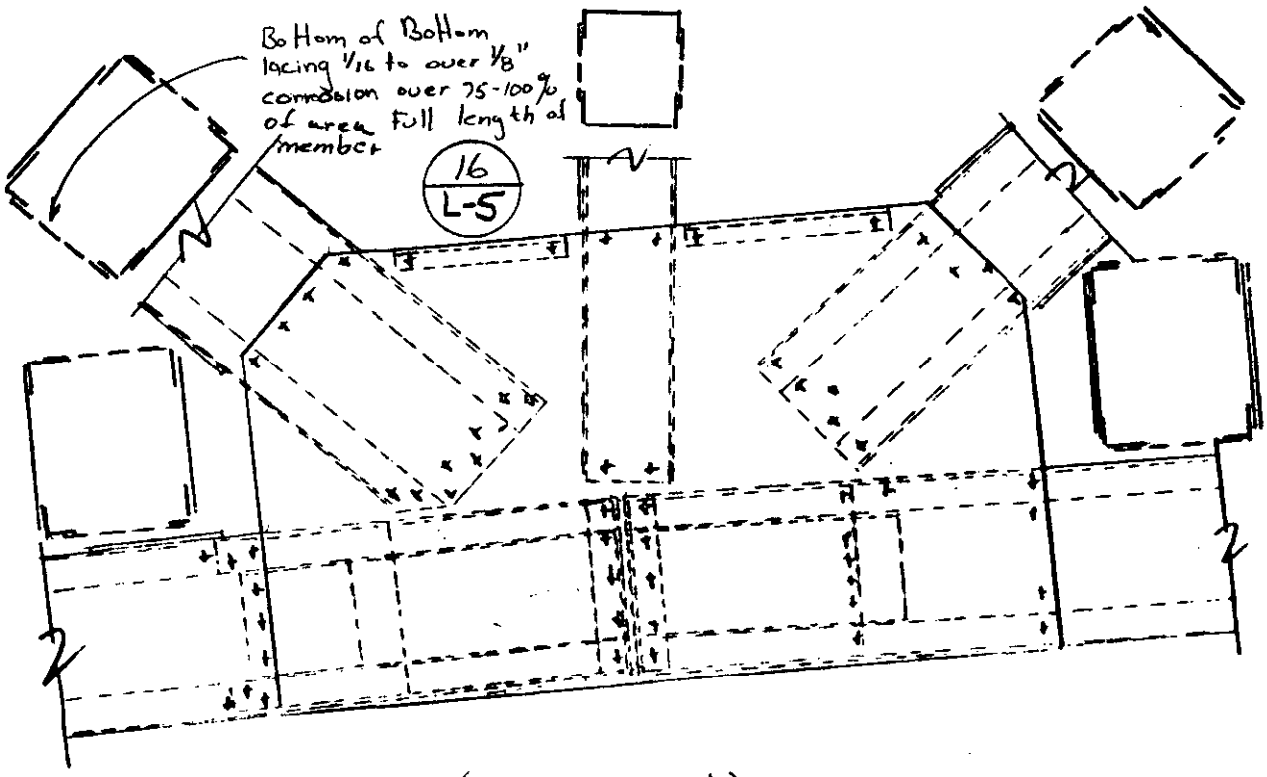

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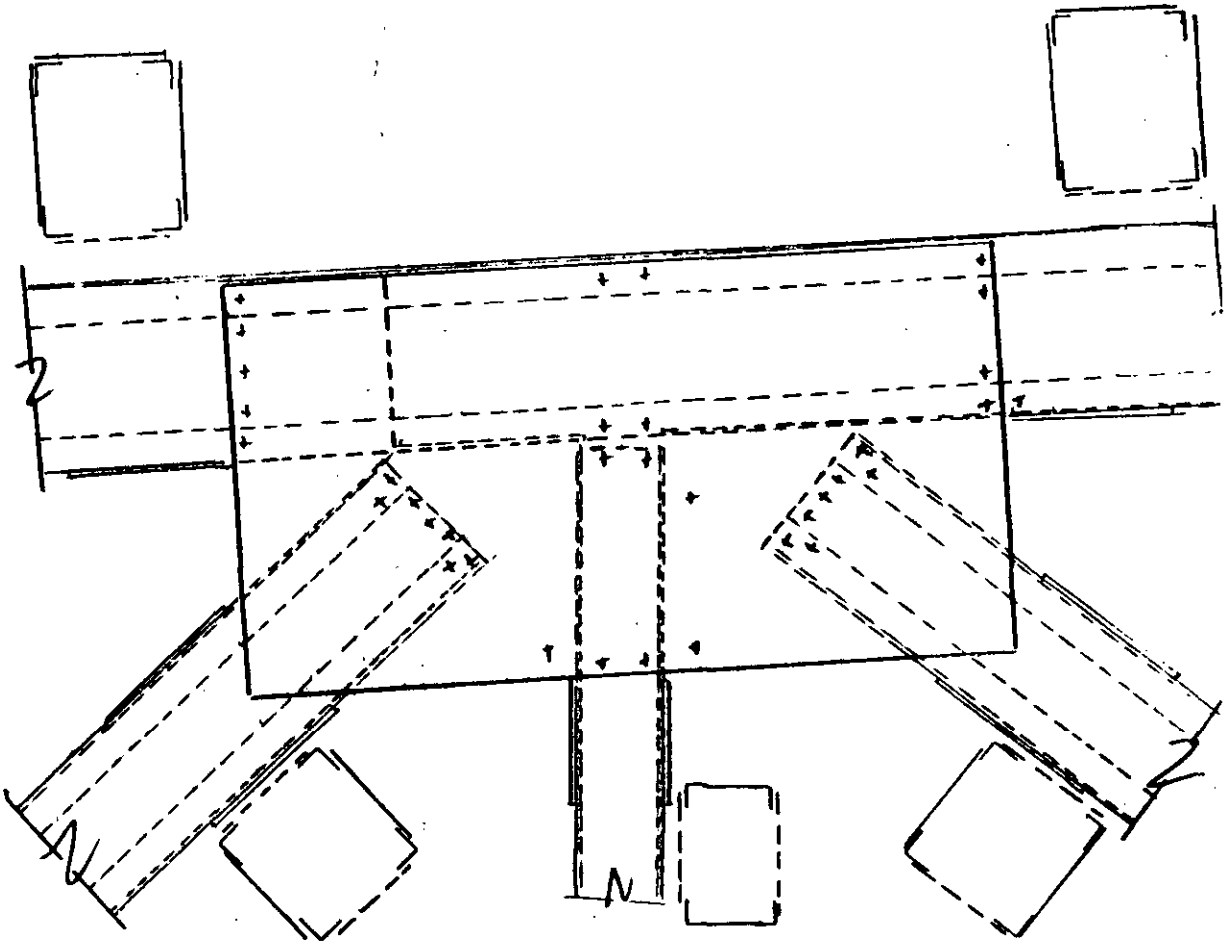

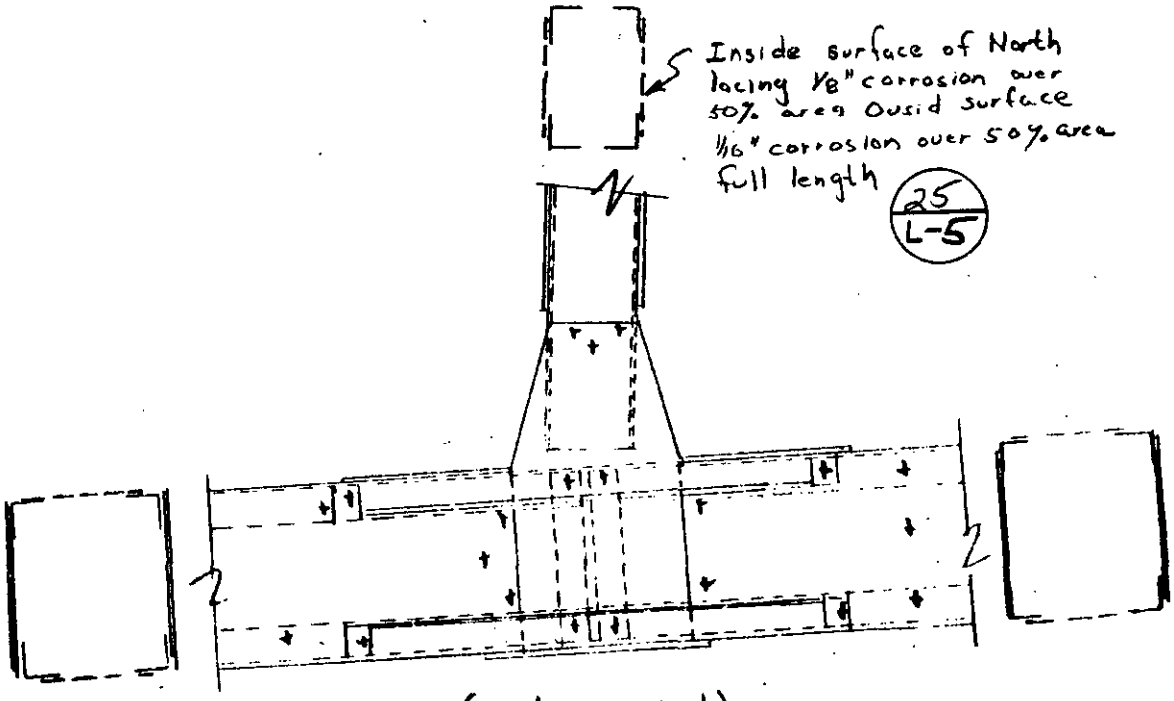

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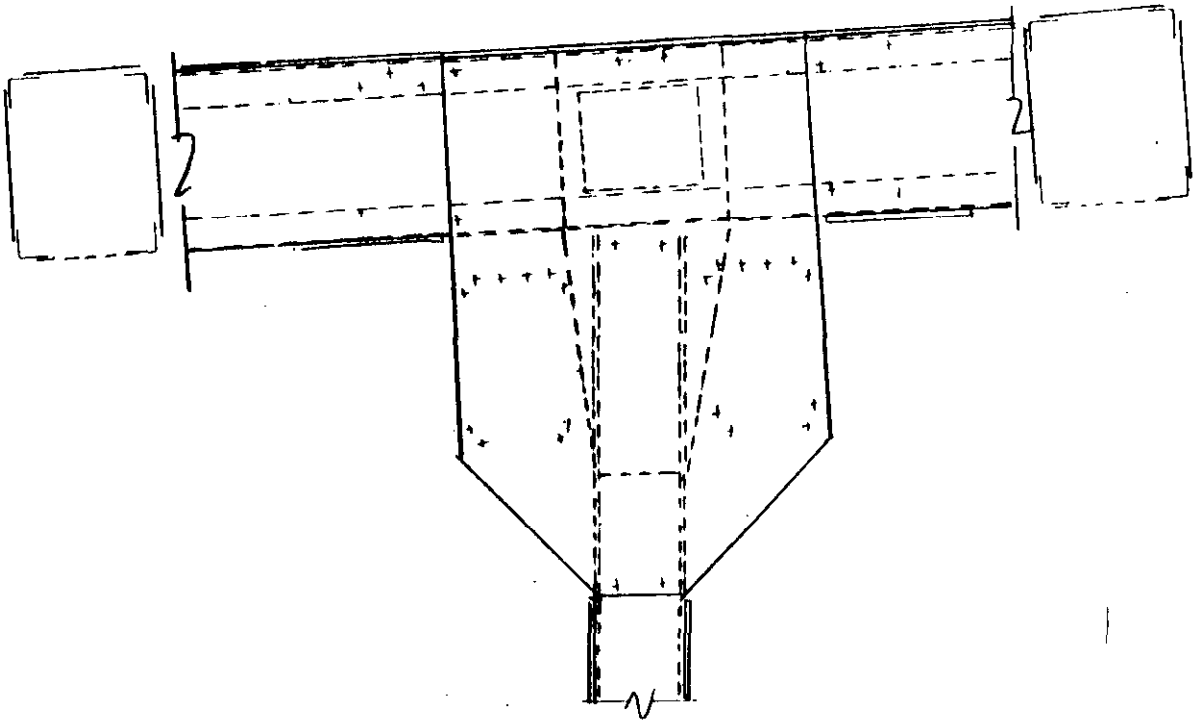

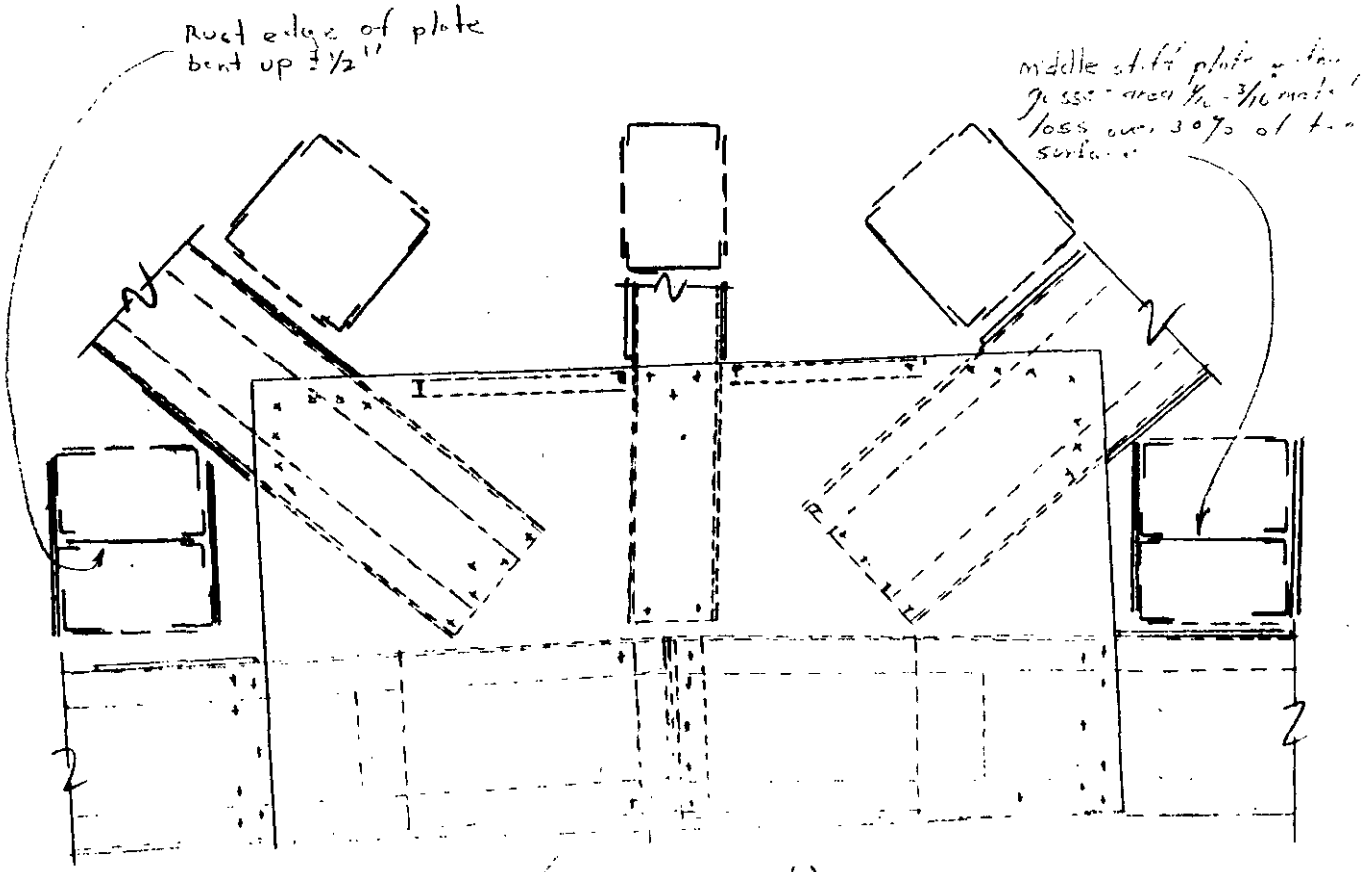

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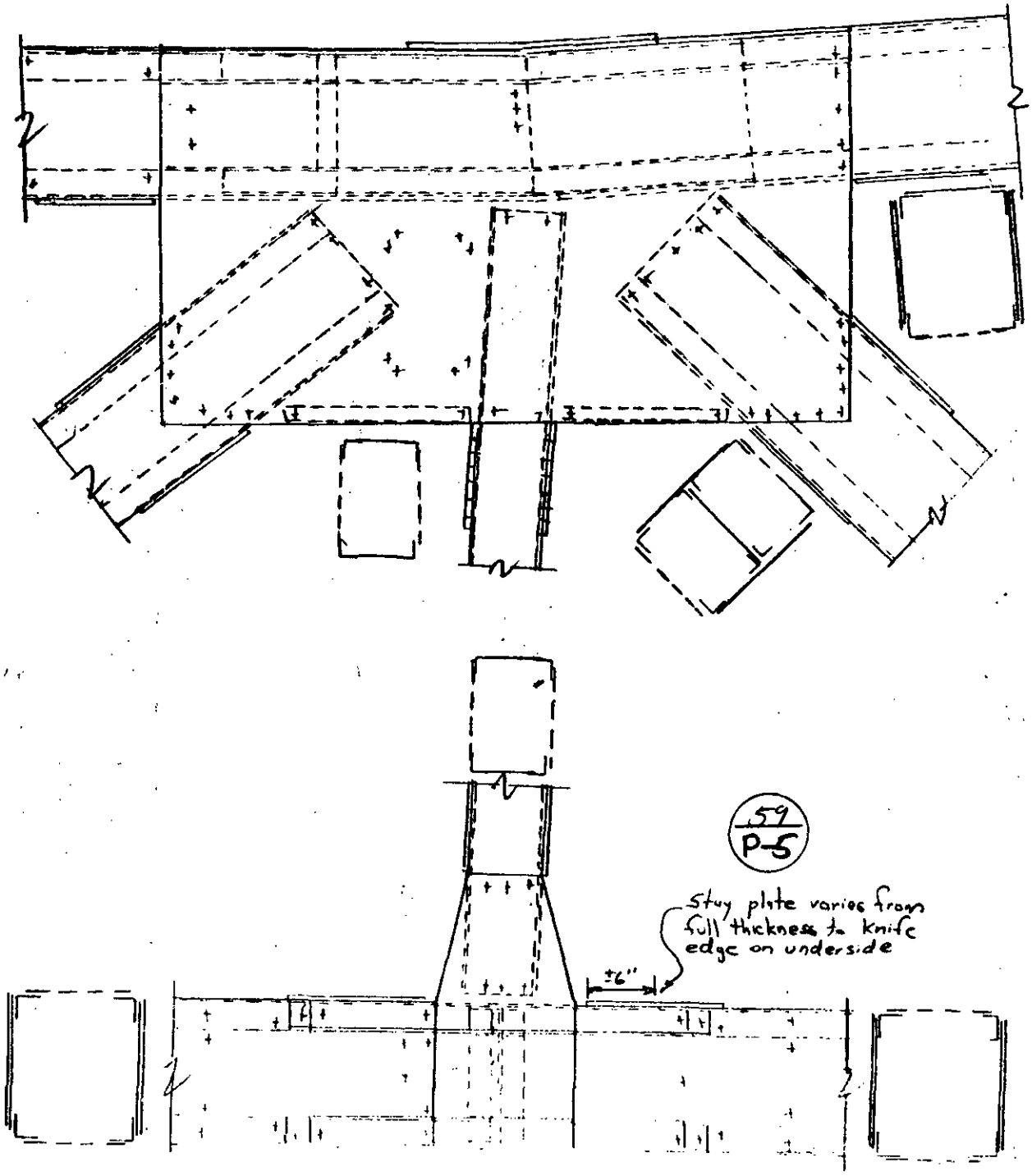

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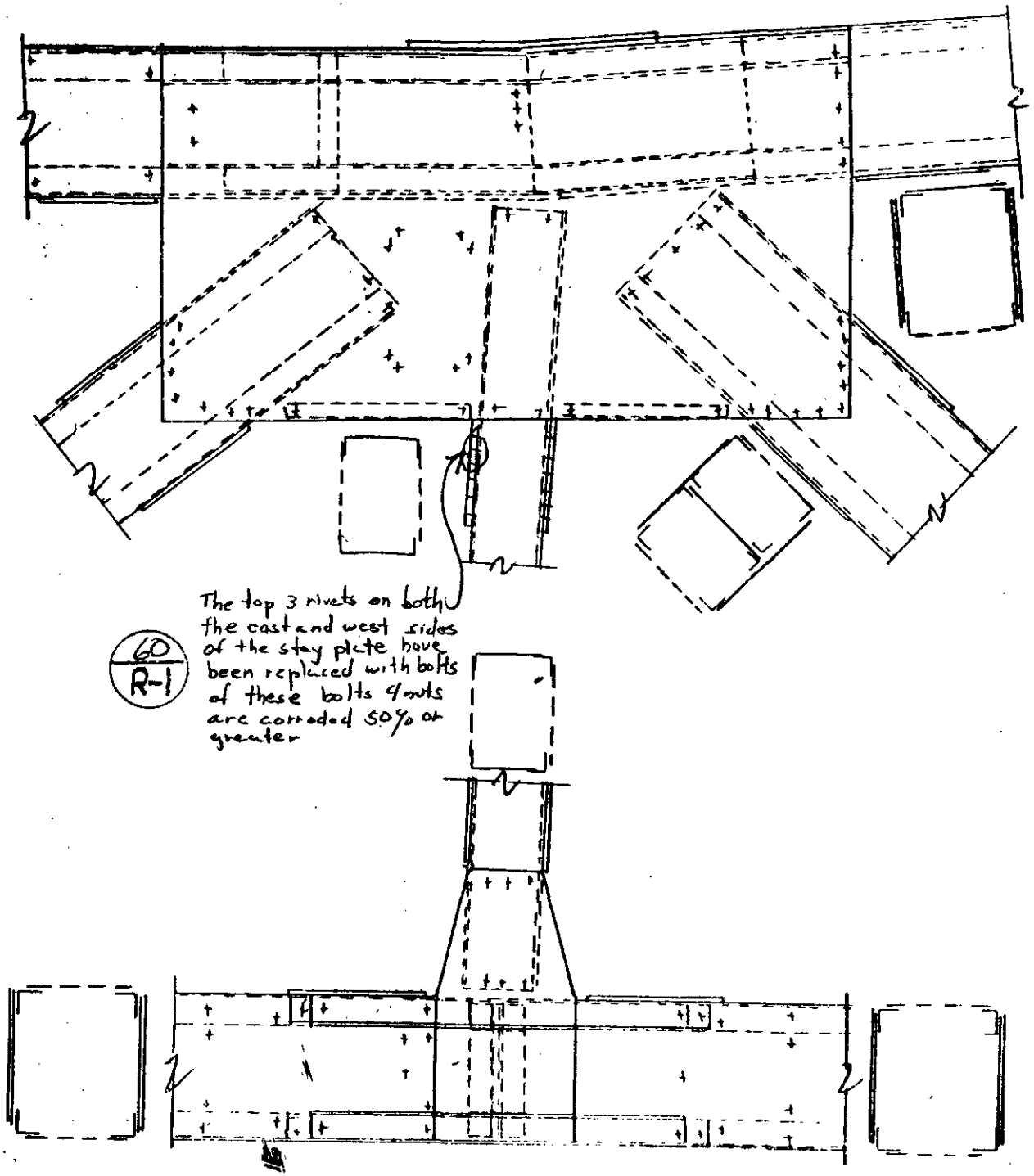

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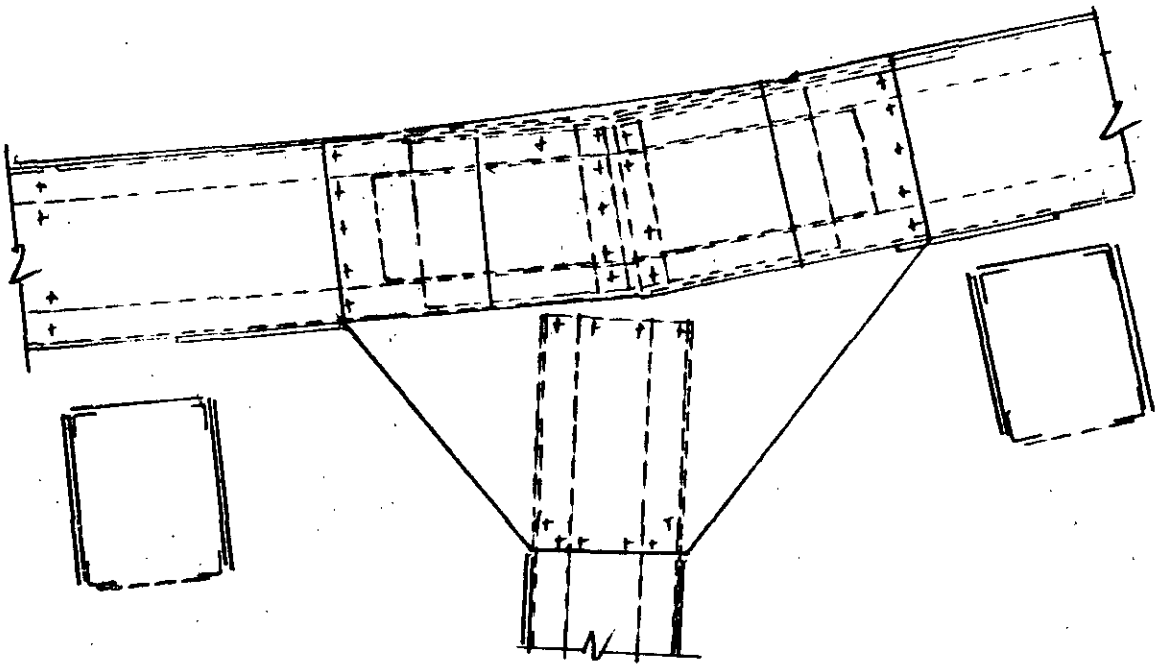

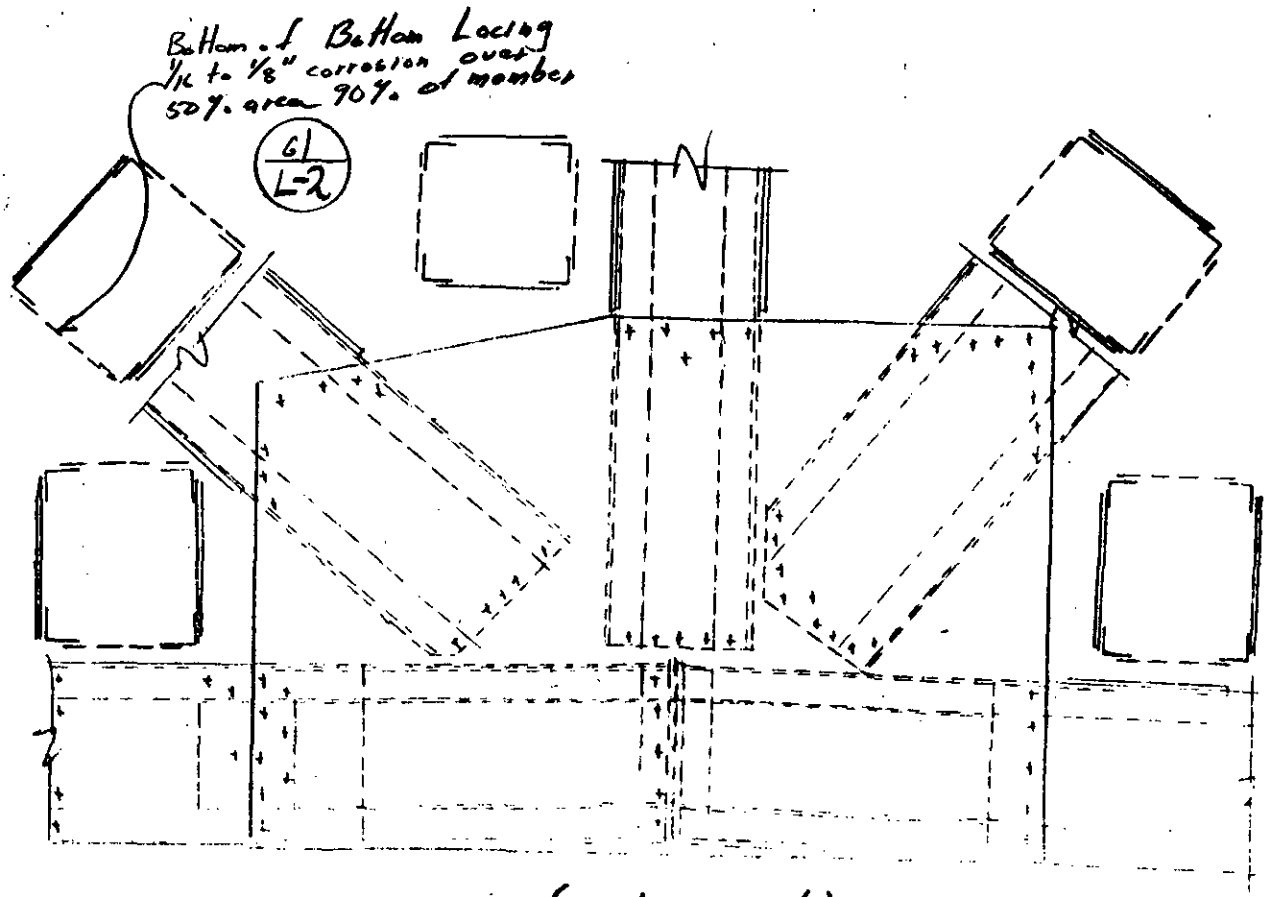

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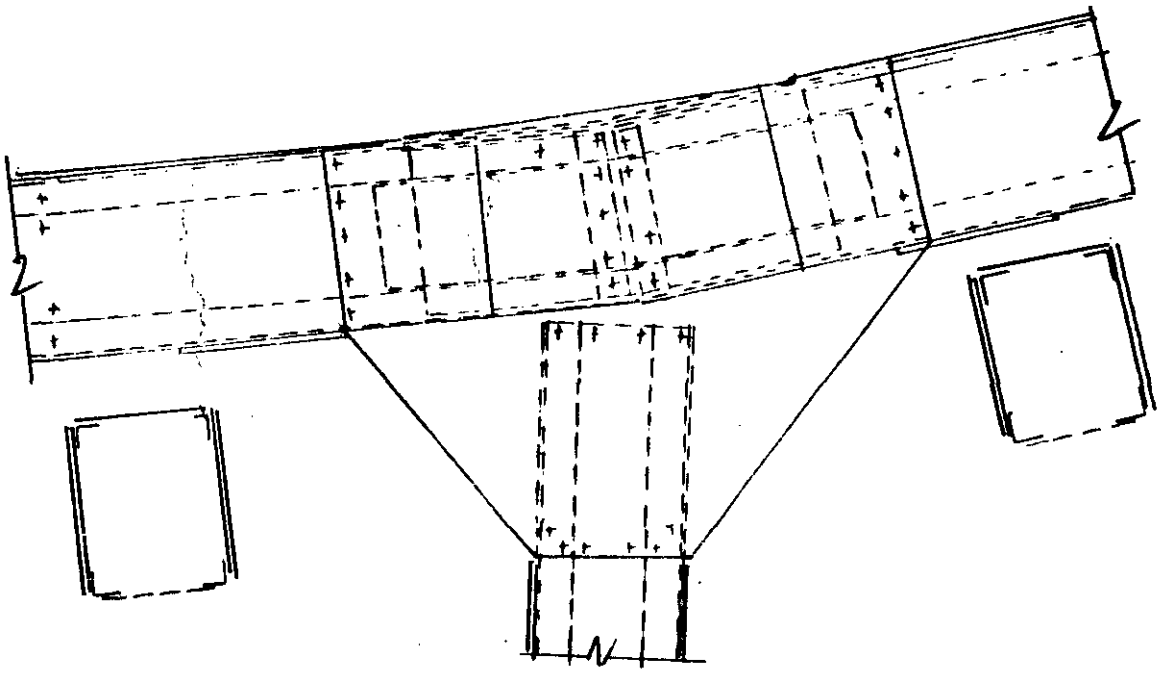

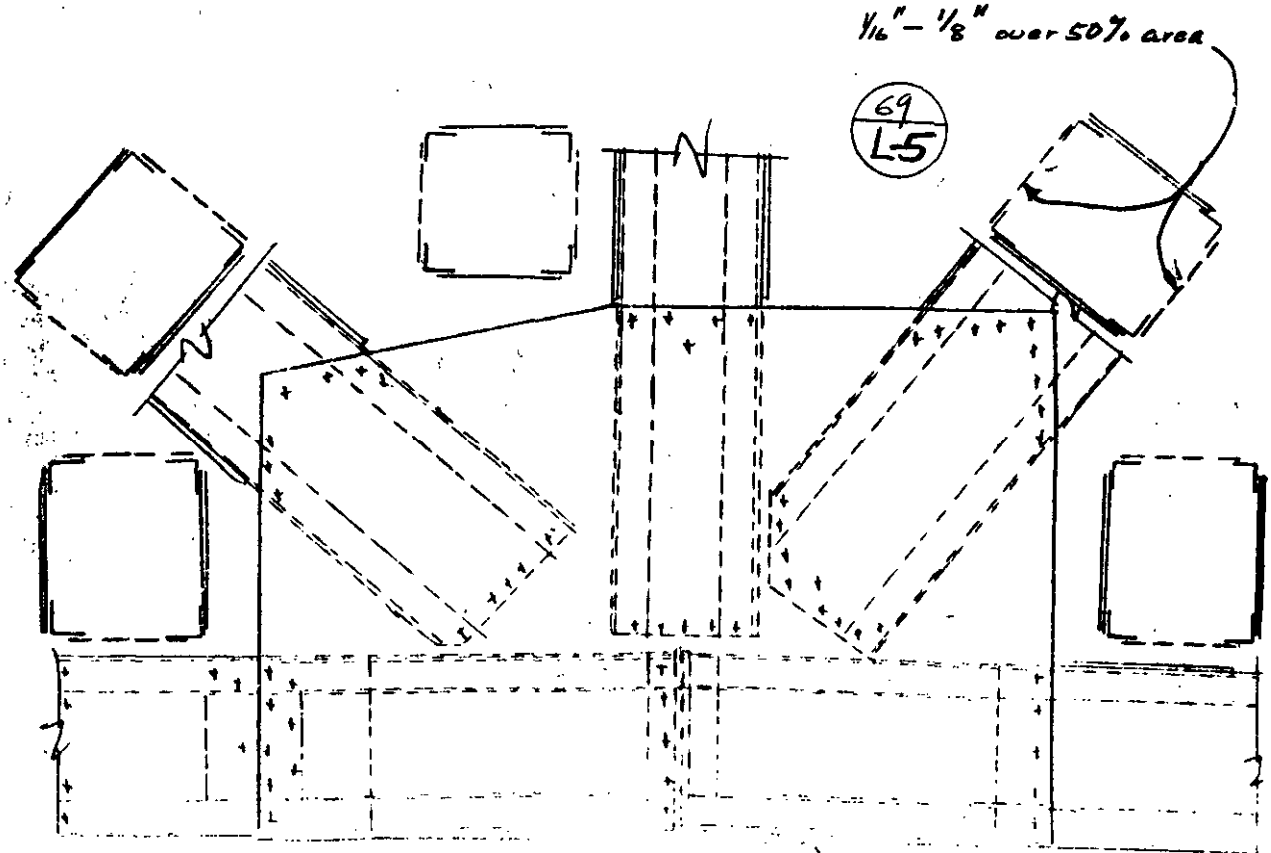

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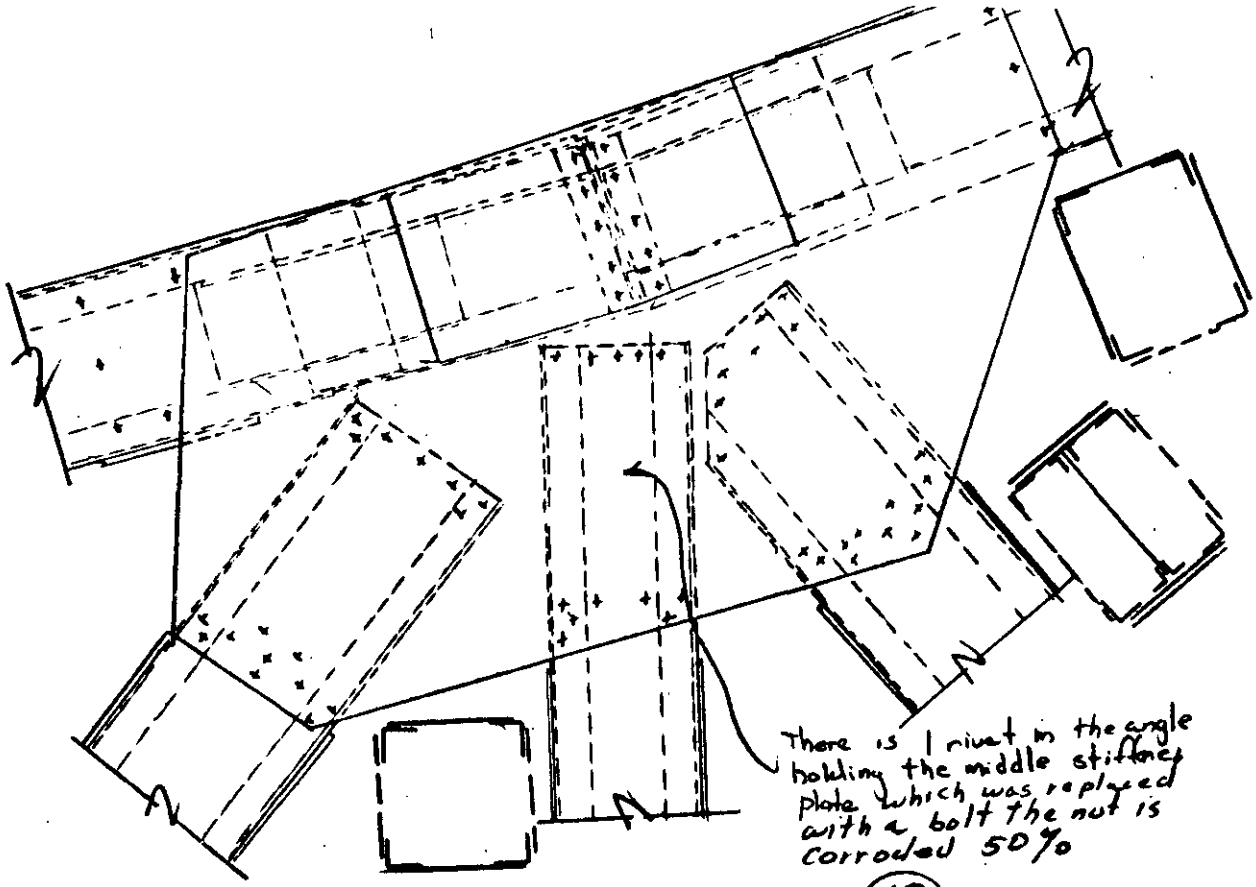

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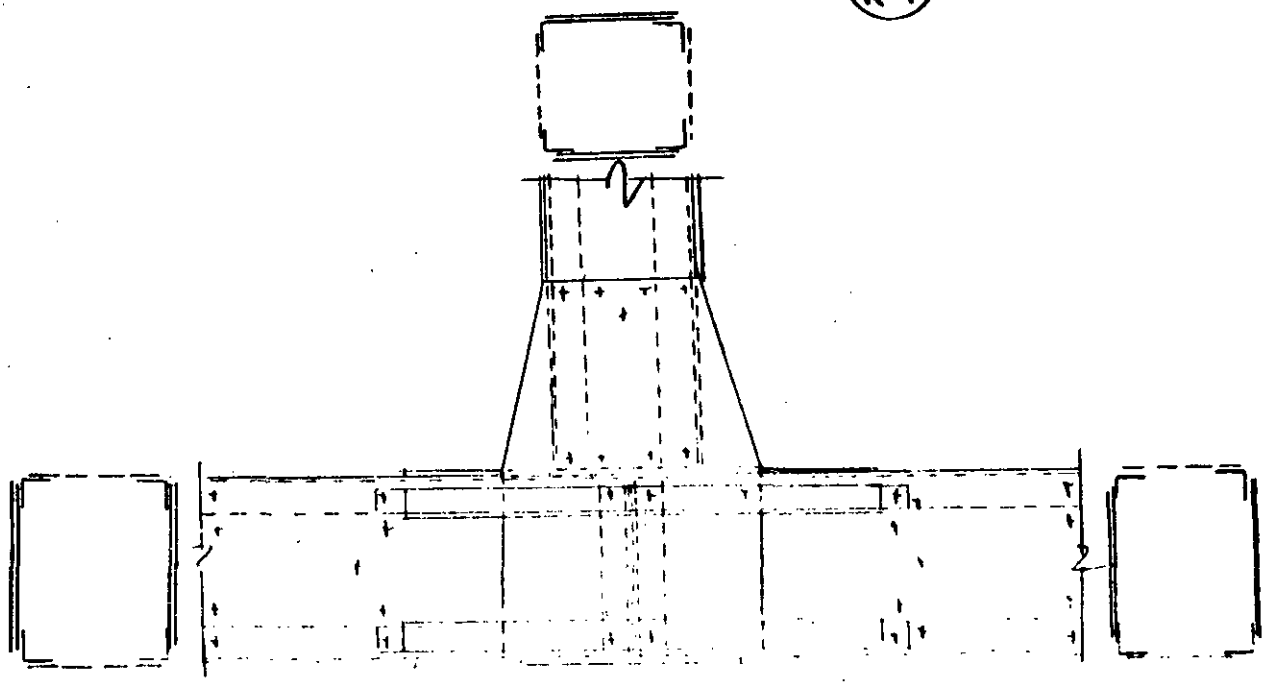

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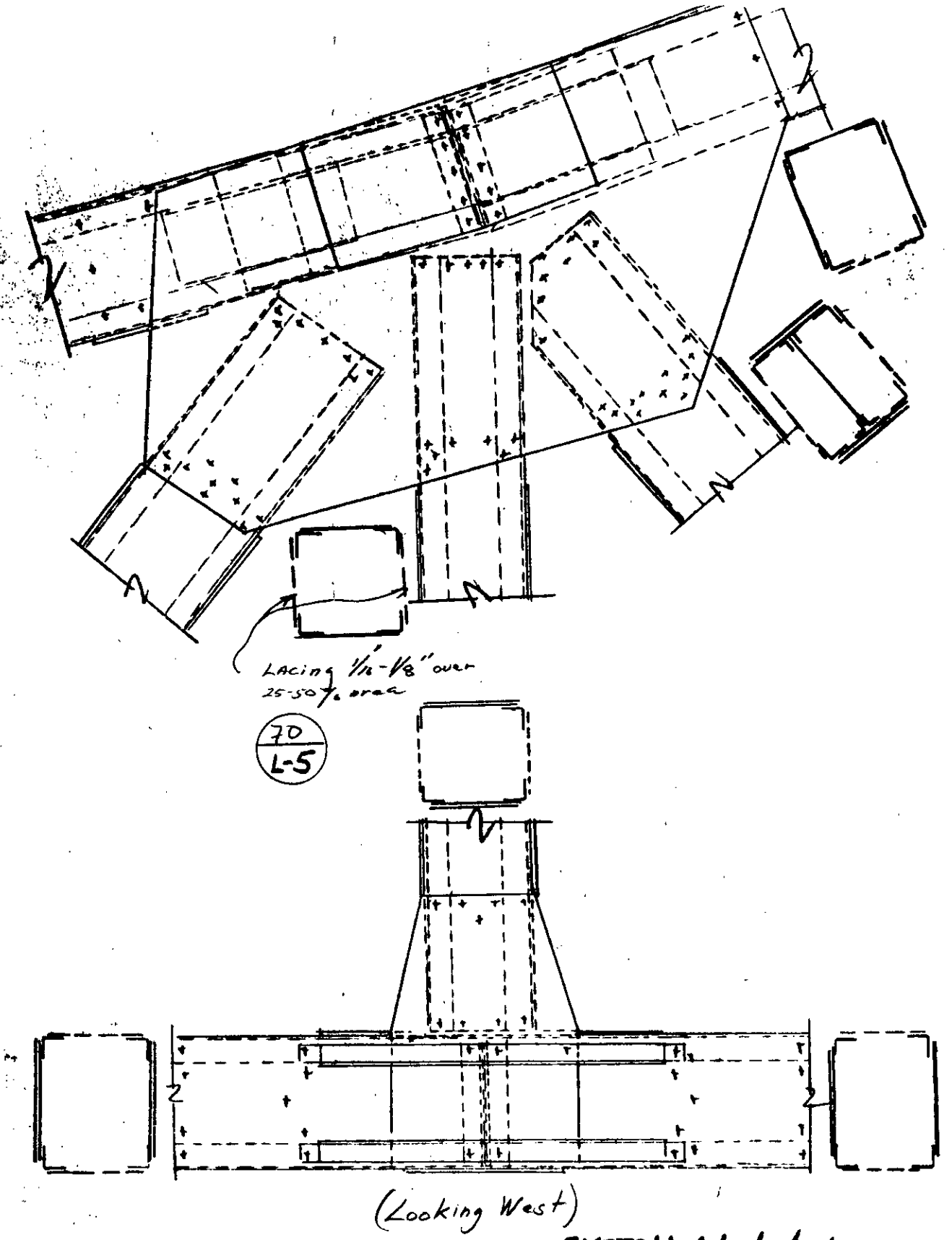

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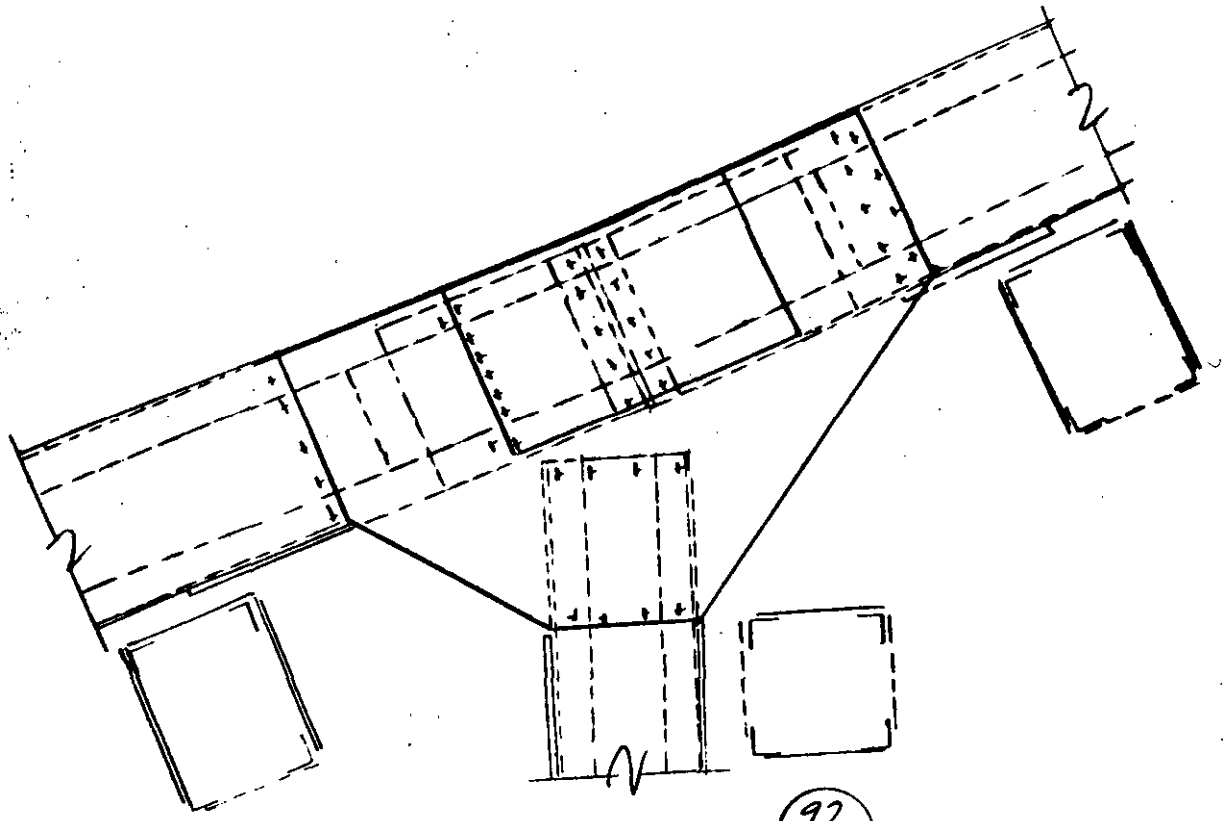
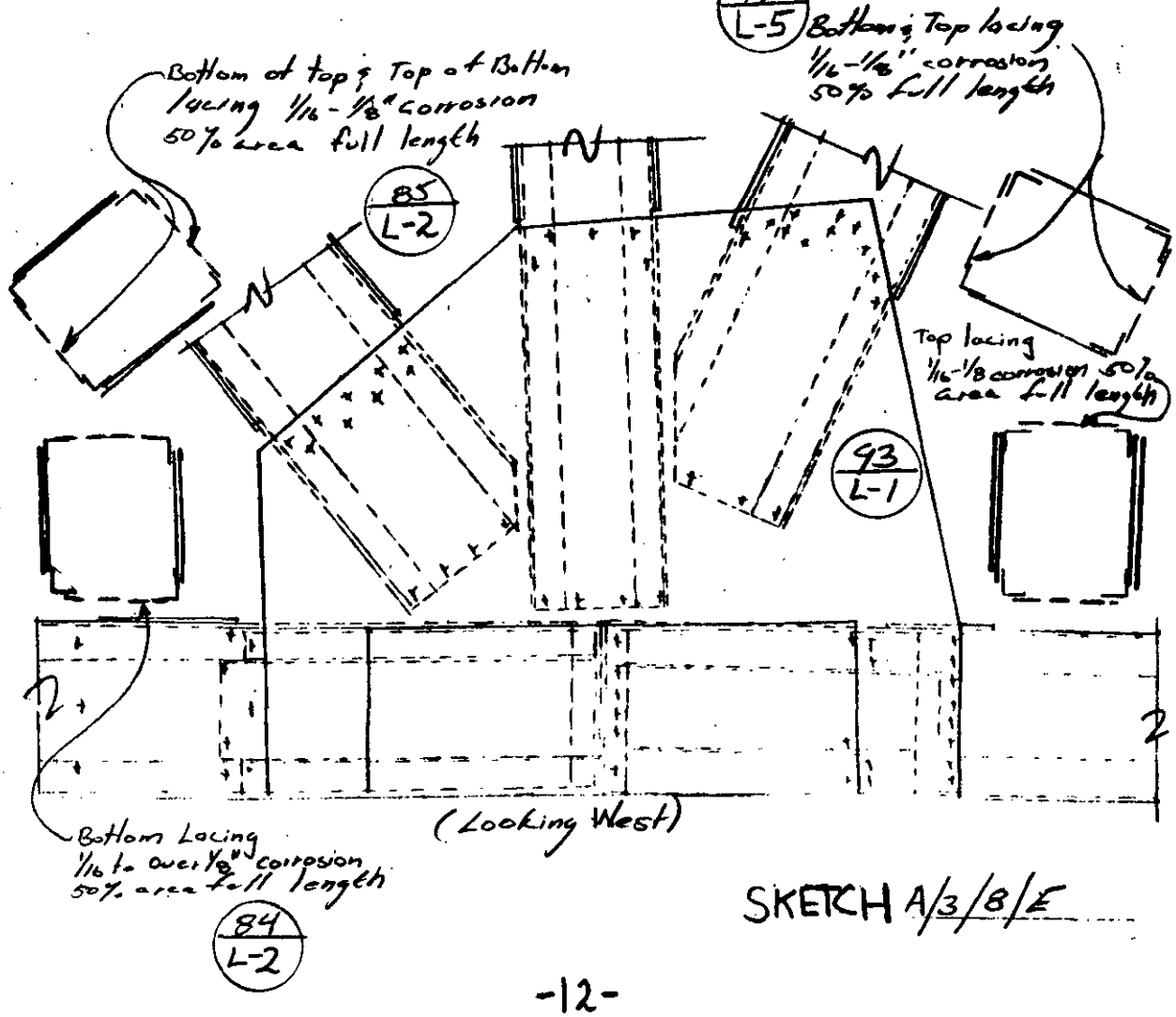
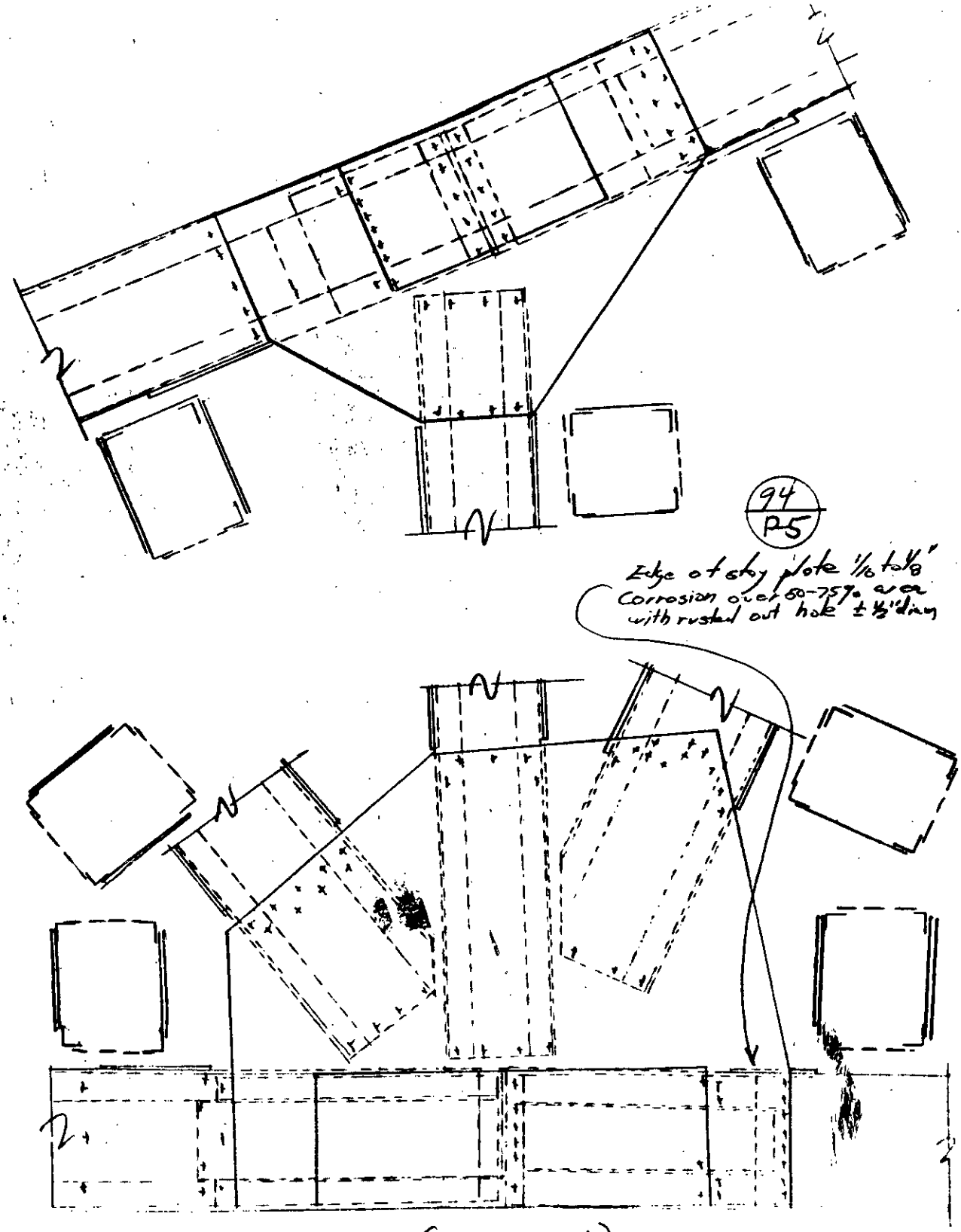



92
L-5
Bottom & Top lacing
1/16-1/8" corrosion
50% full length
Bottom of top & Top of Bottom
lacing 1/16 - 1/8" corrosion
50% area full length
85
L-2
Top lacing
1/16-1/8 corrosion 50%
area full length
93
L-1
(Looking West)
Bottom Lacing
1/16 to over 1/8" corrosion
50% area full length
84
L-2

SKETCH A/3/8/E



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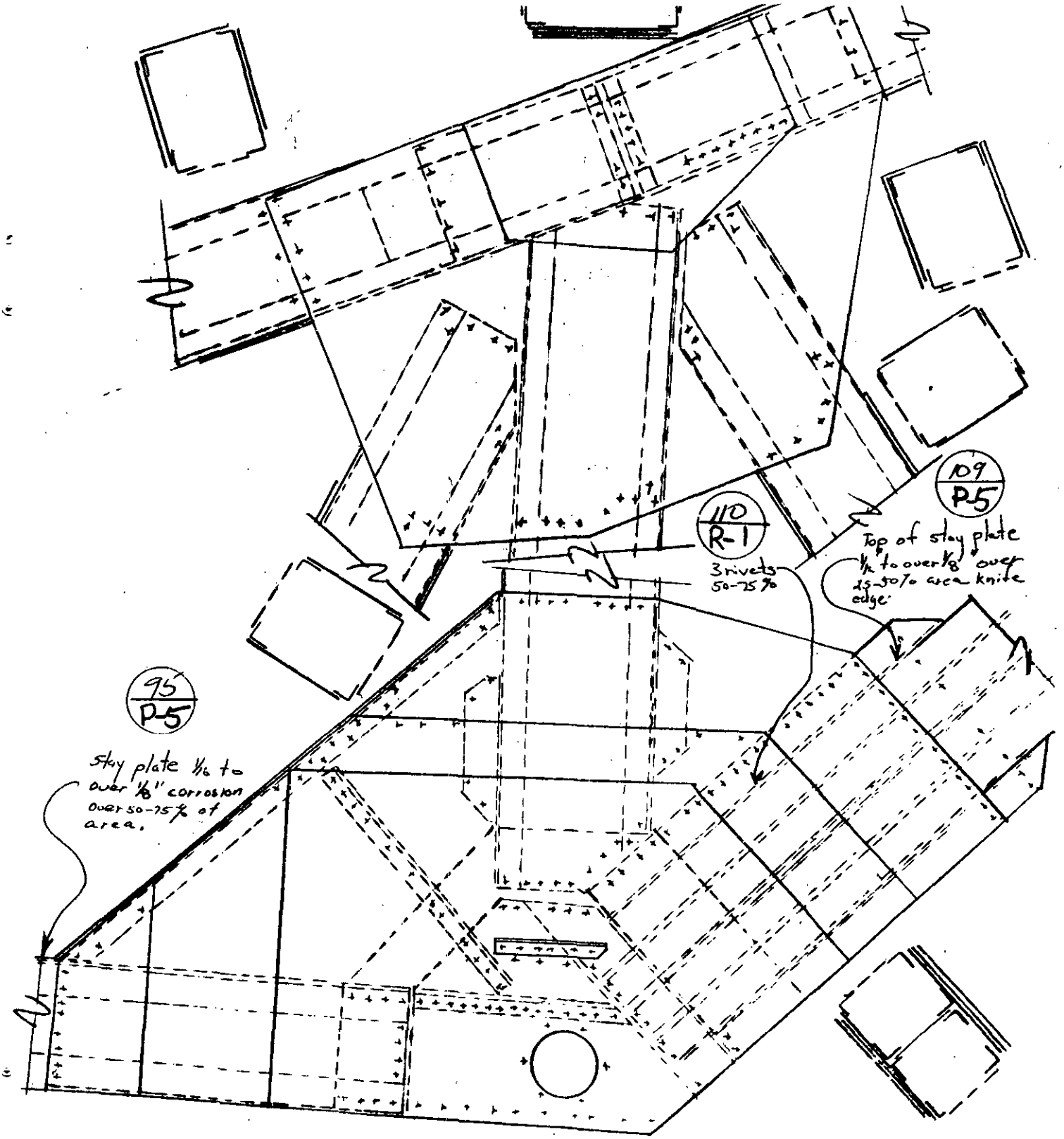

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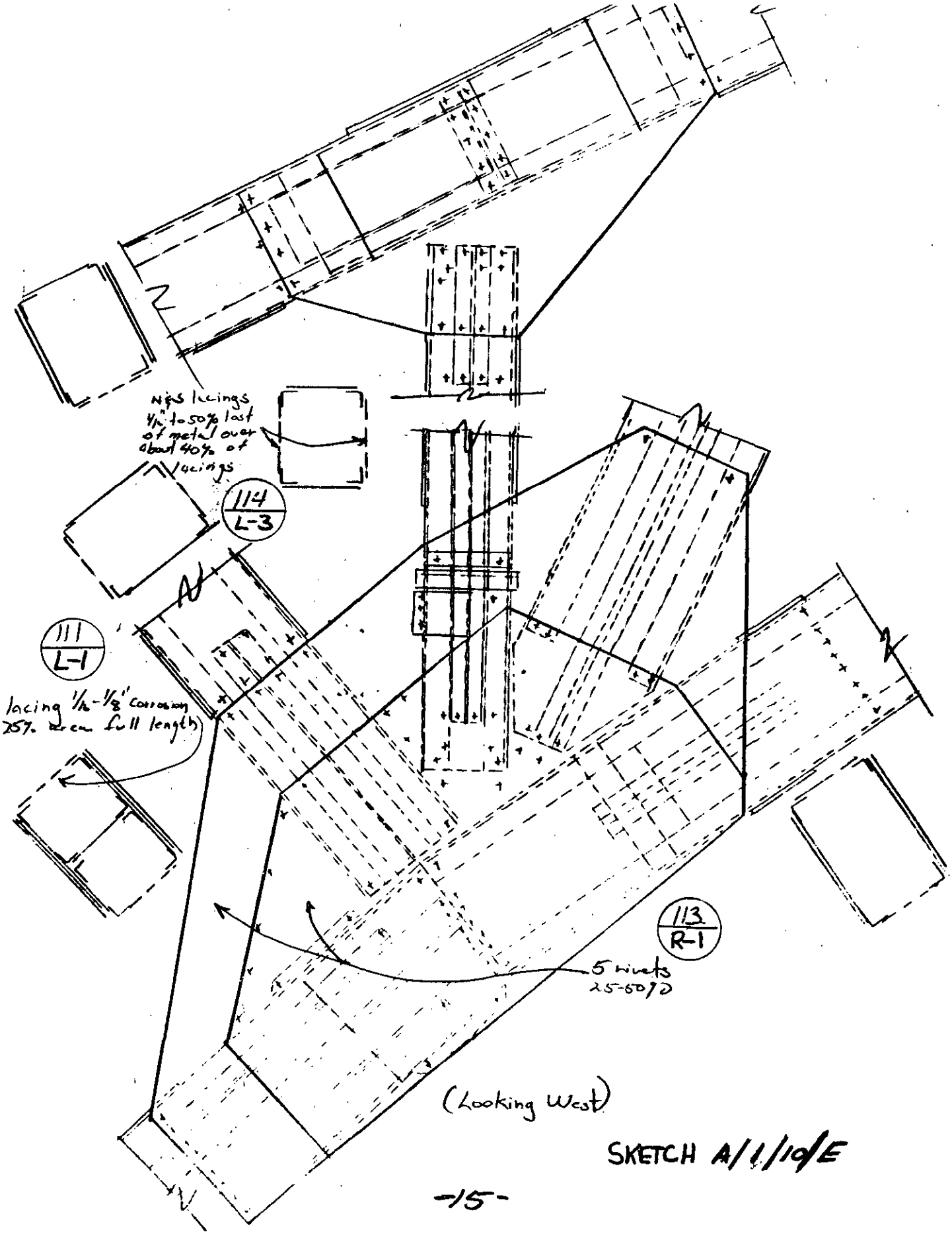

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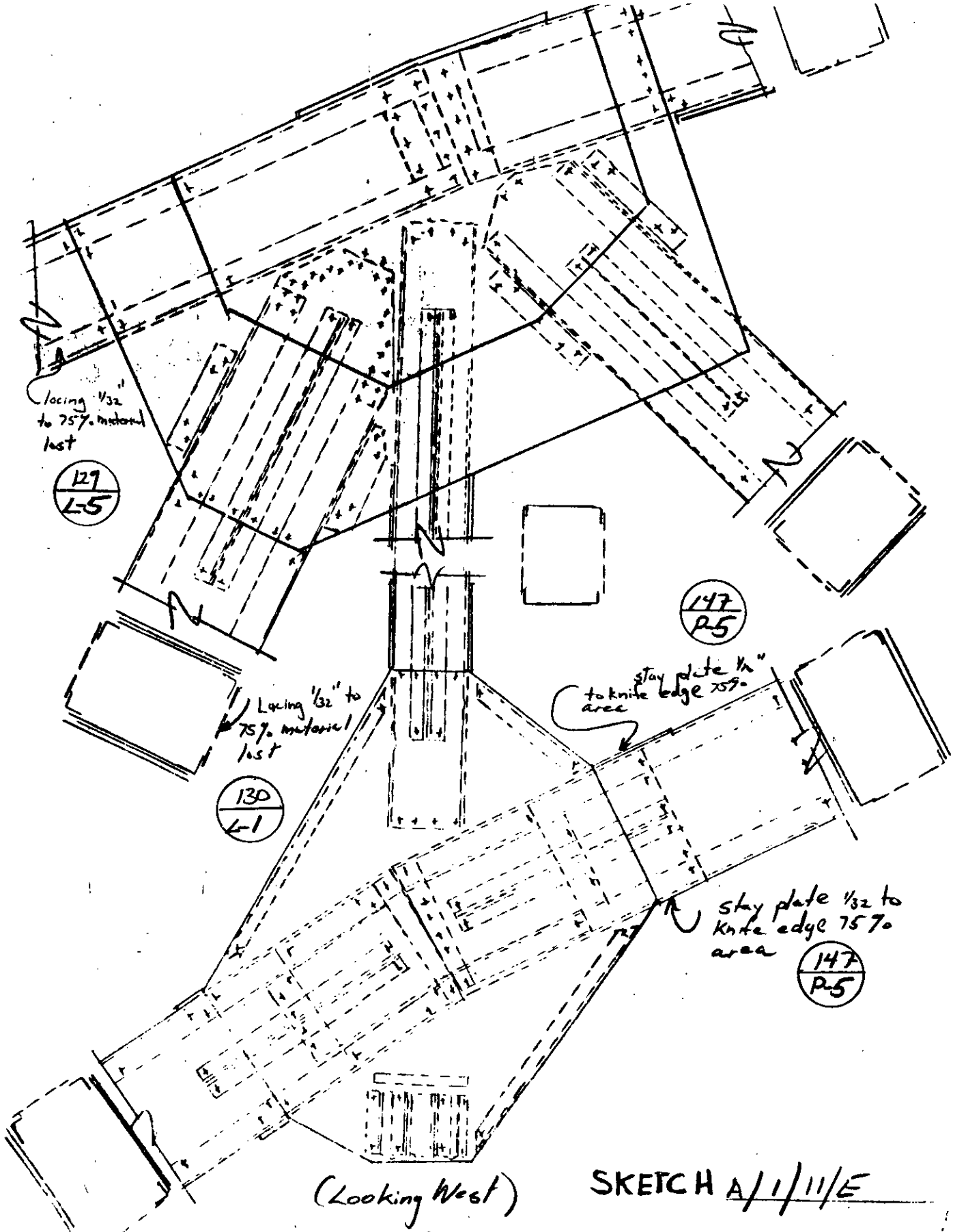

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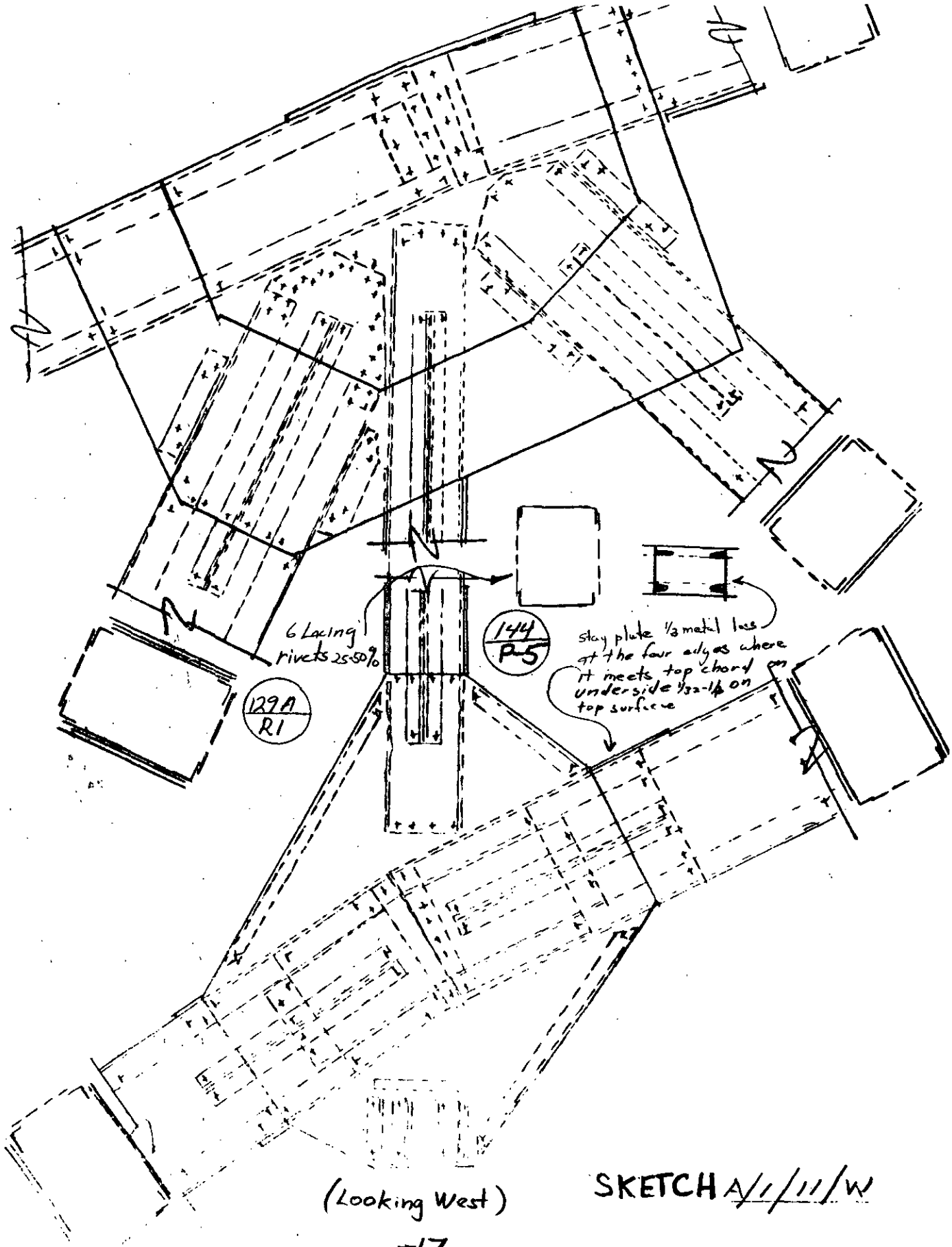

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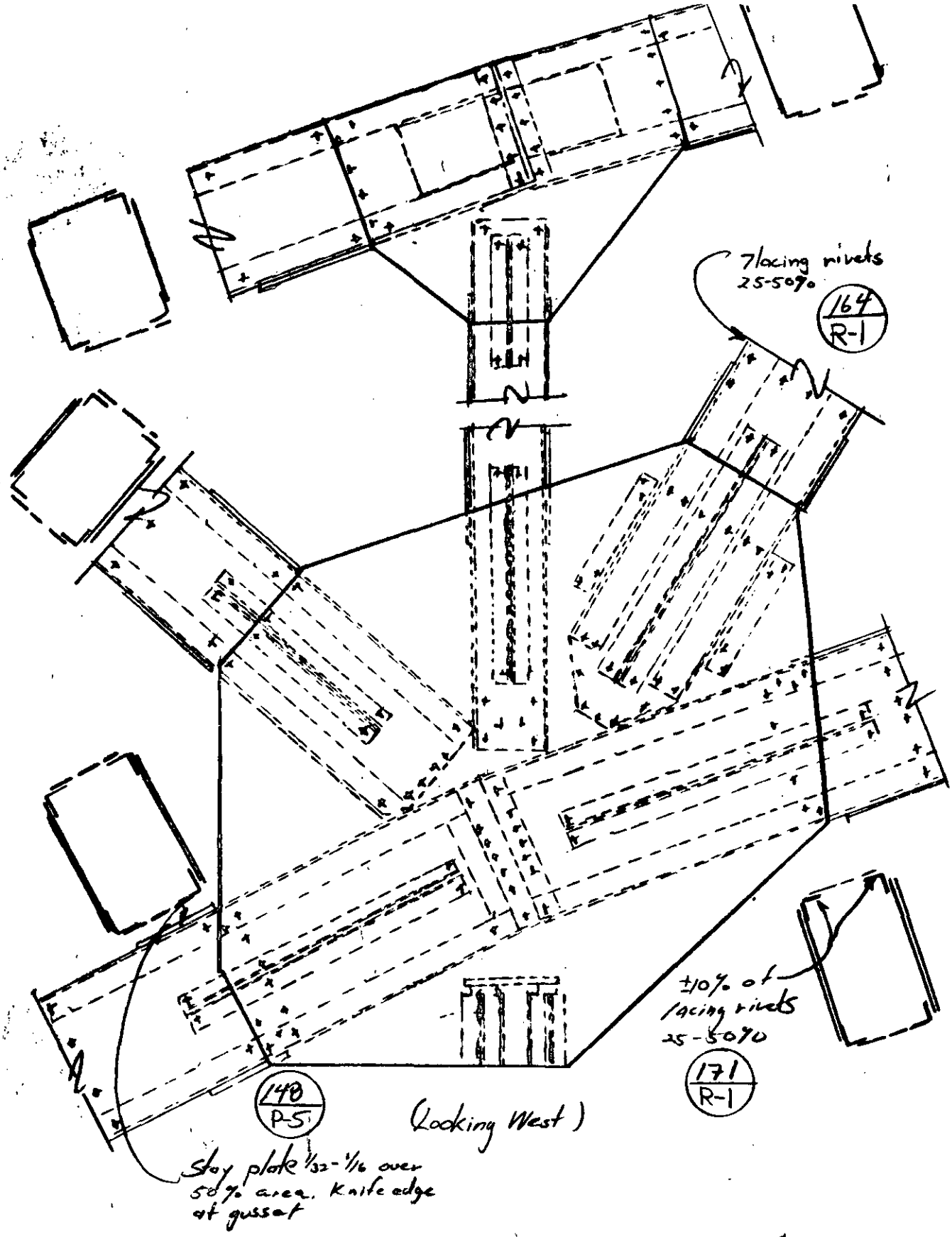

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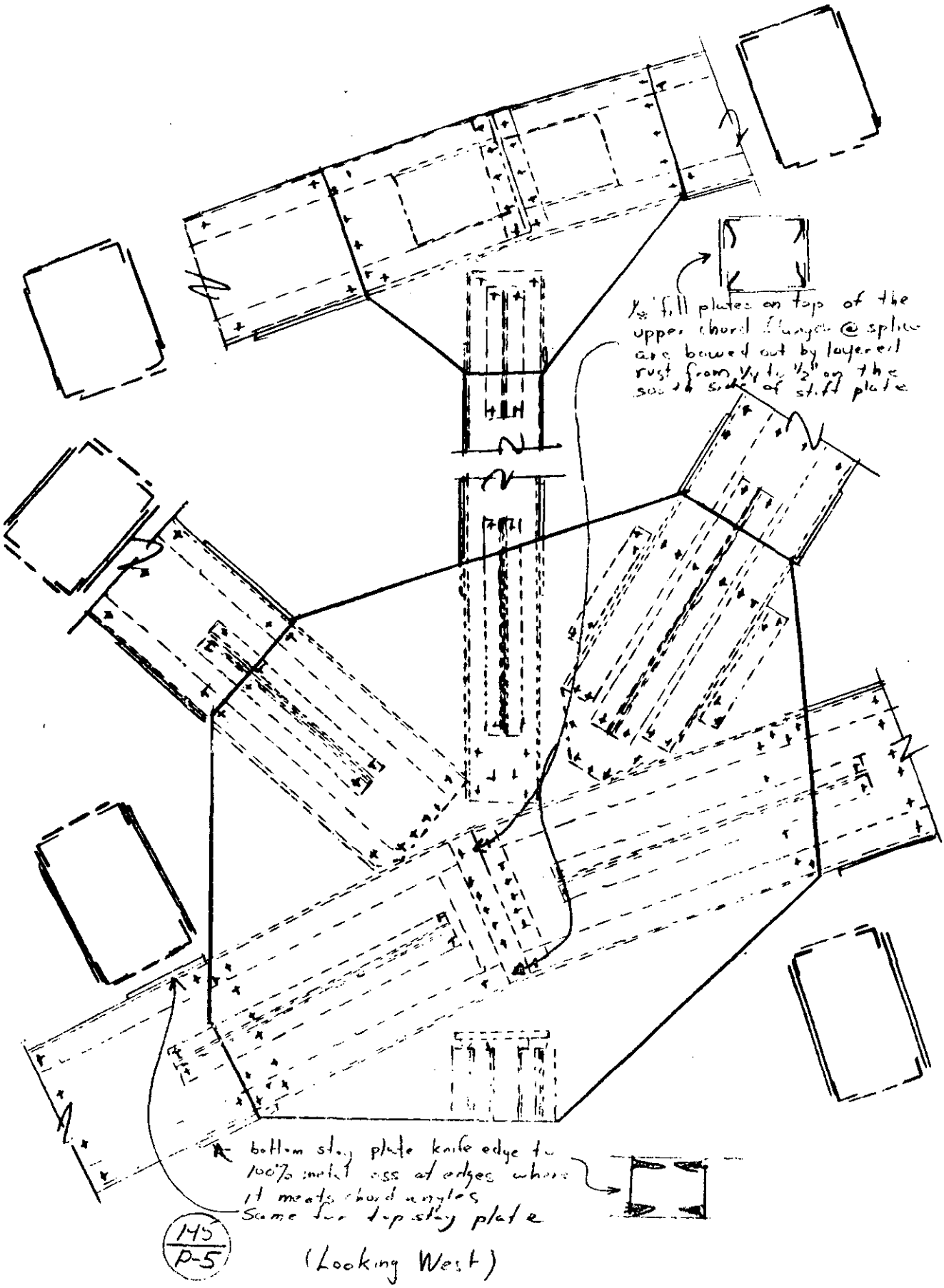

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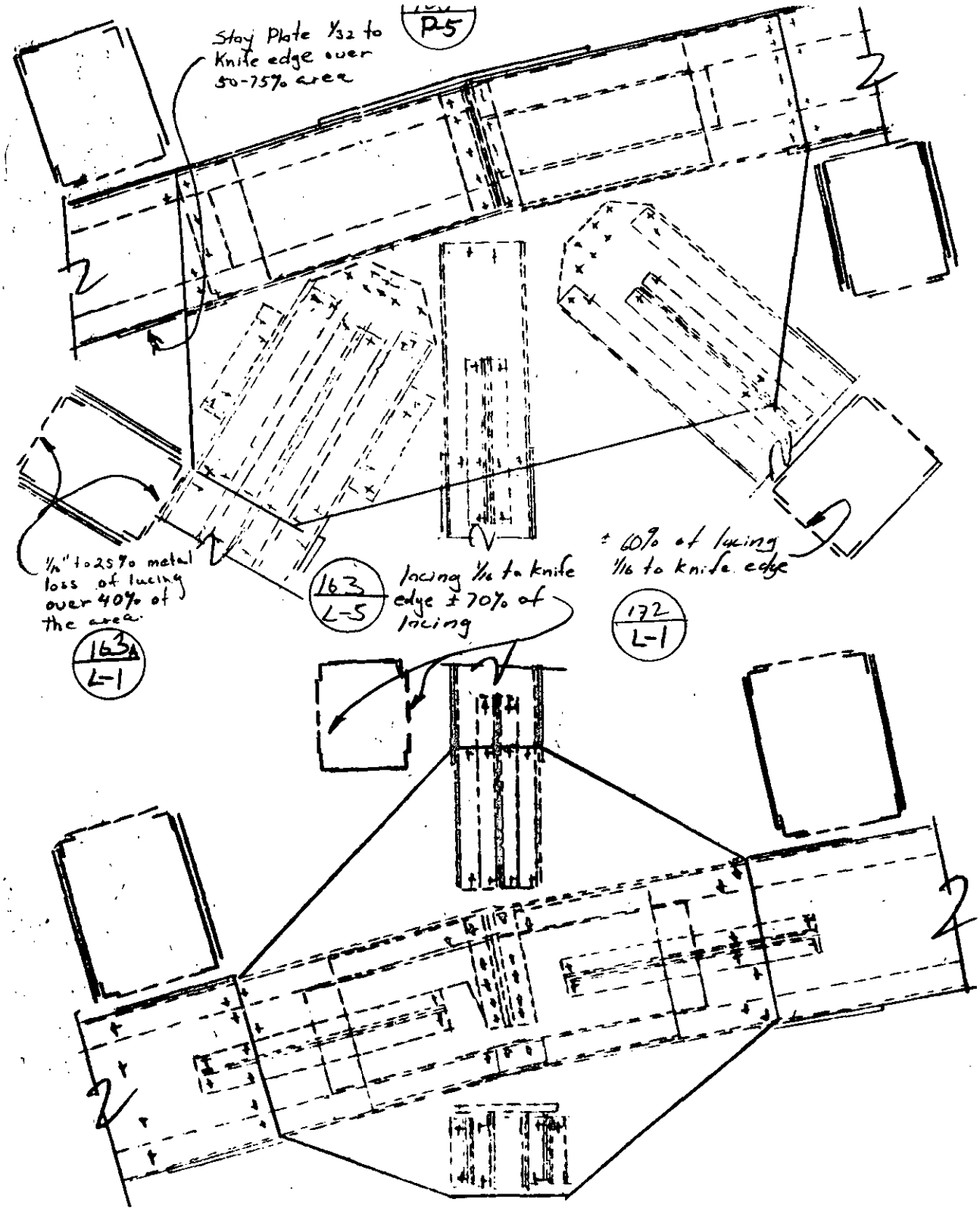

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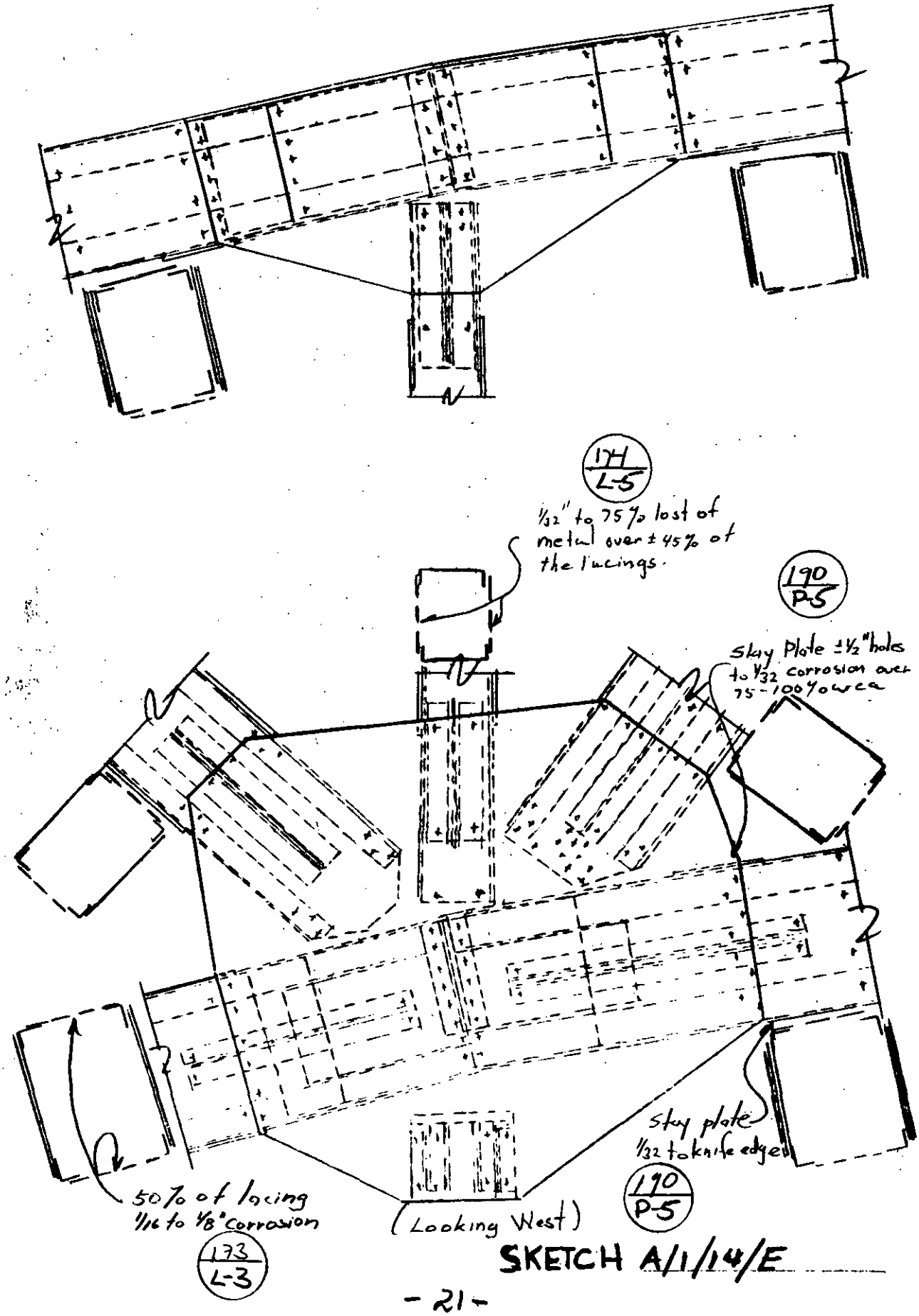

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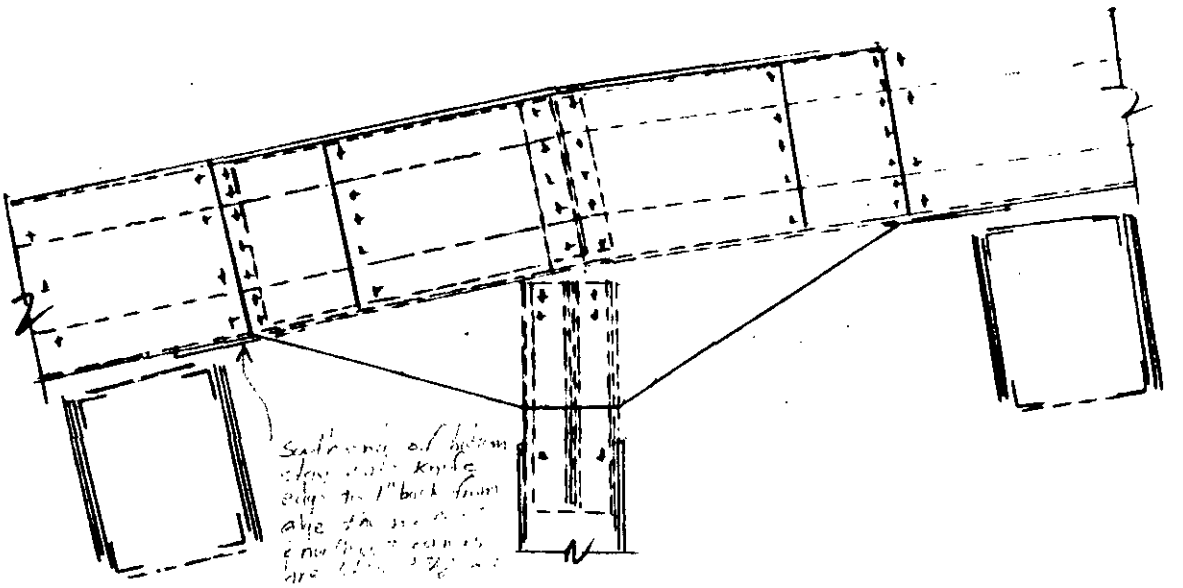

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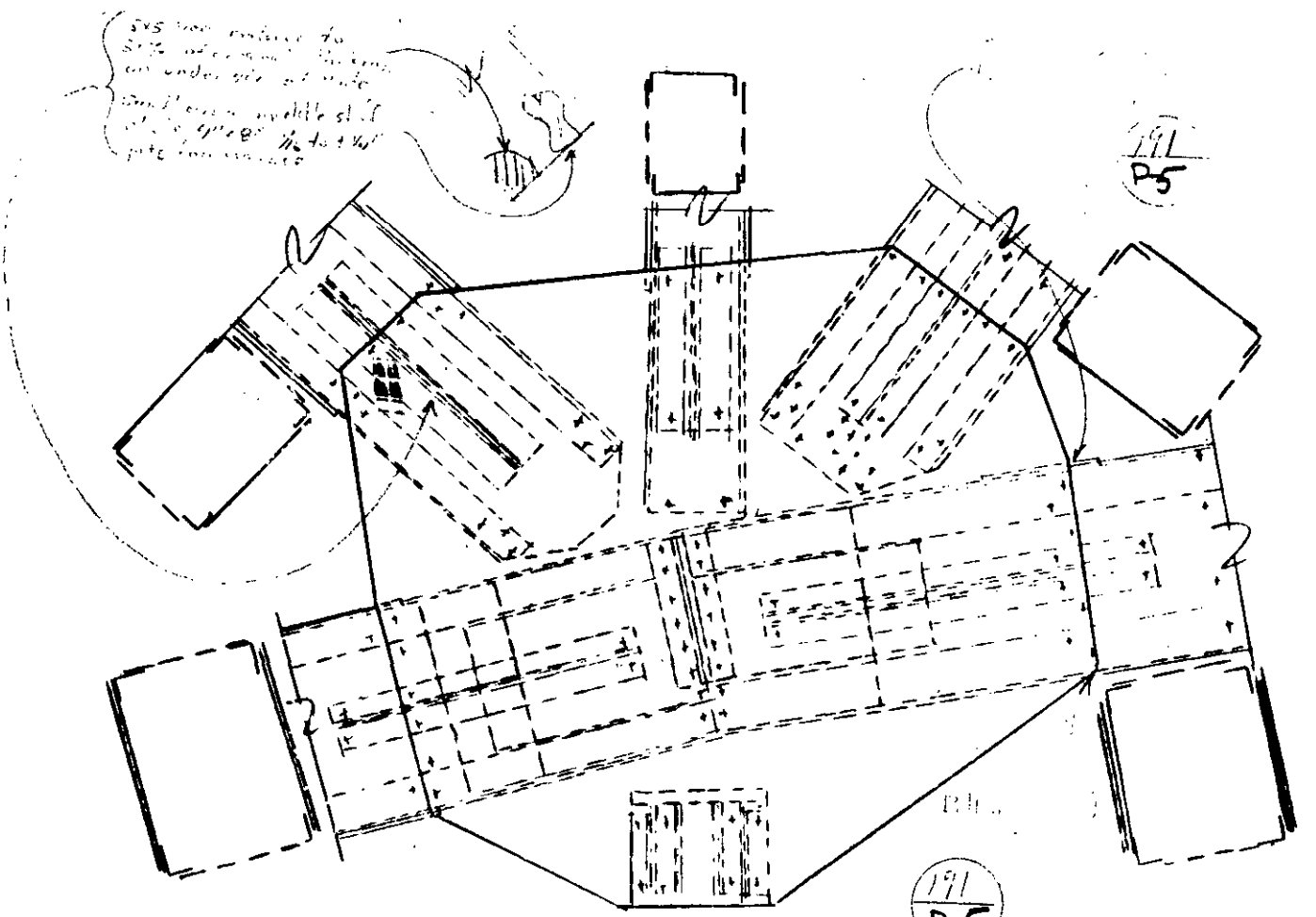

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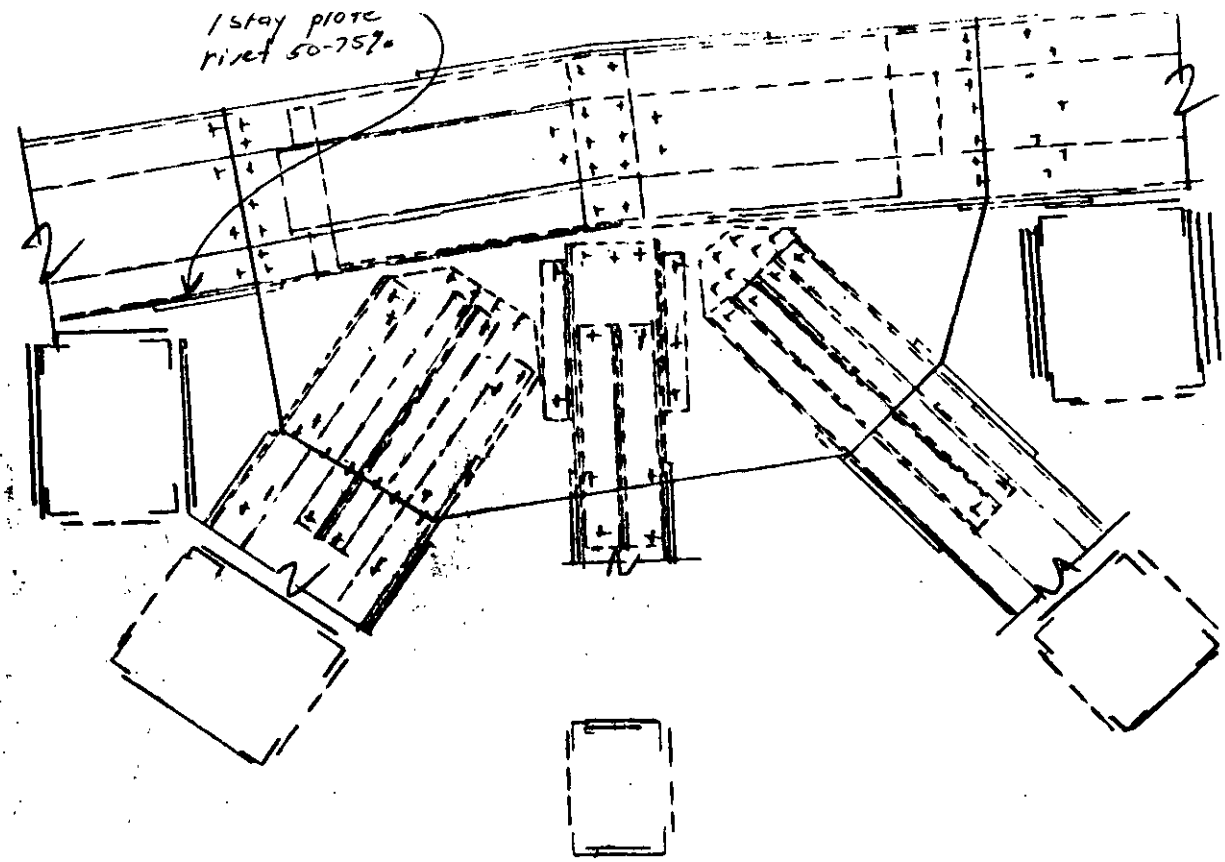

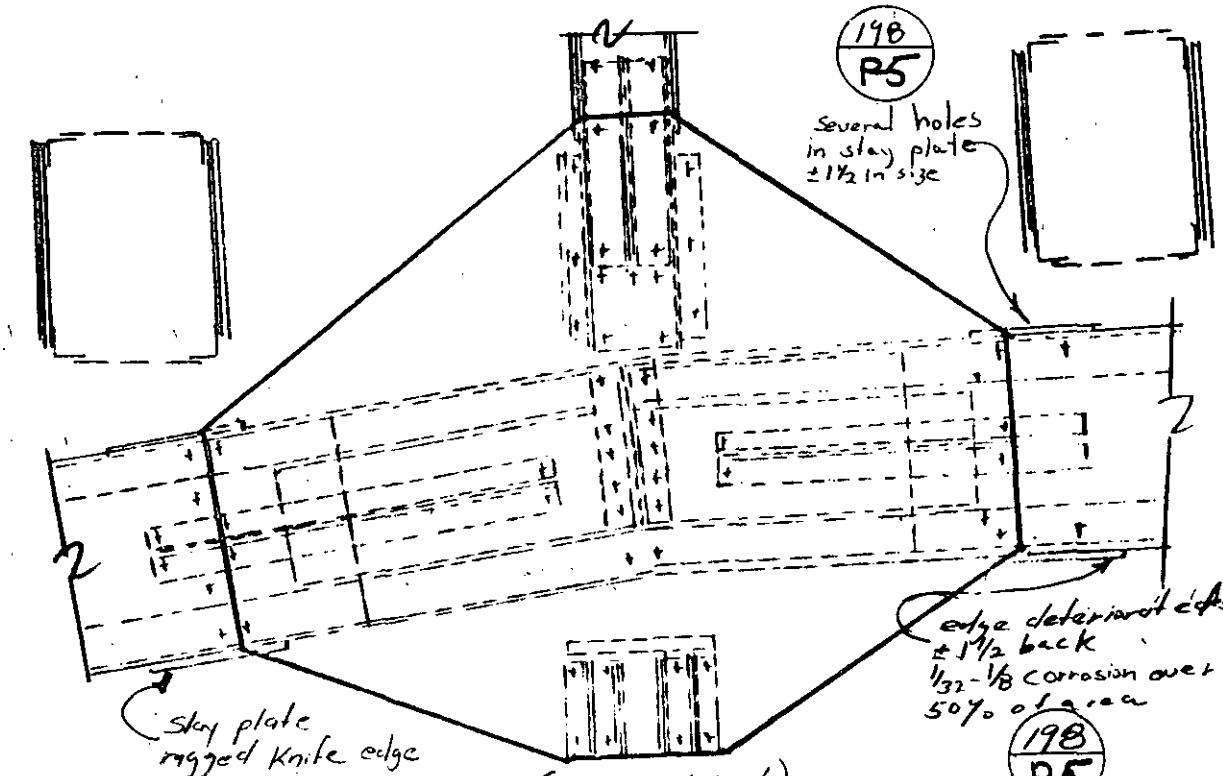

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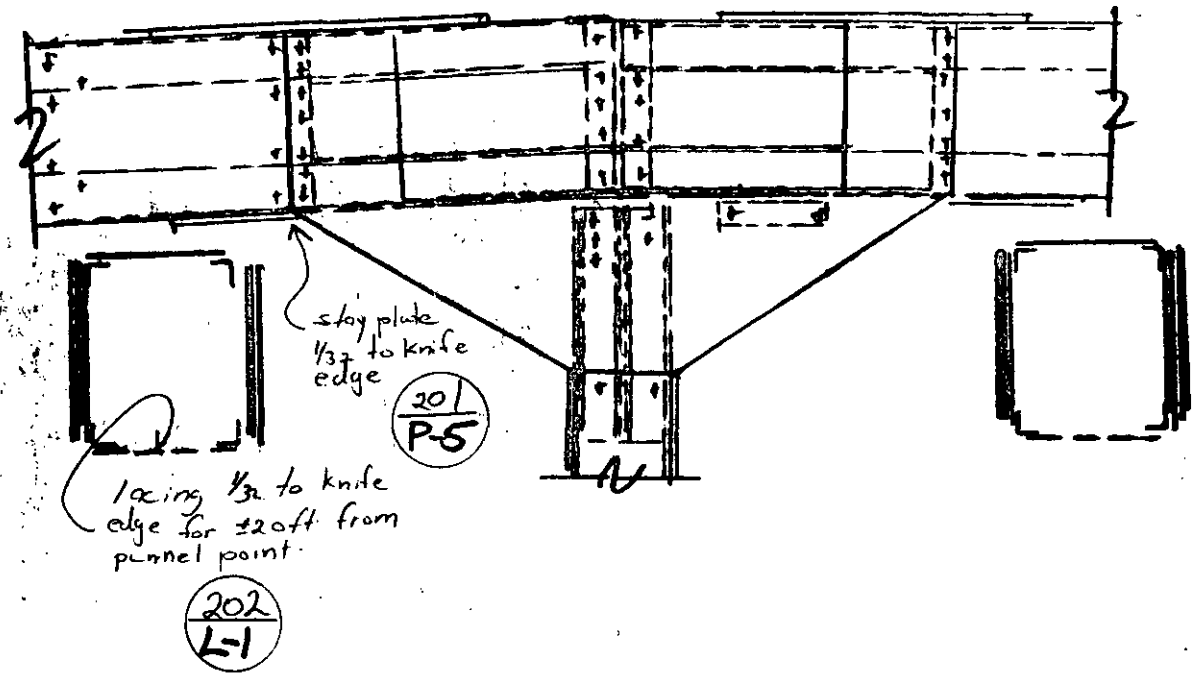

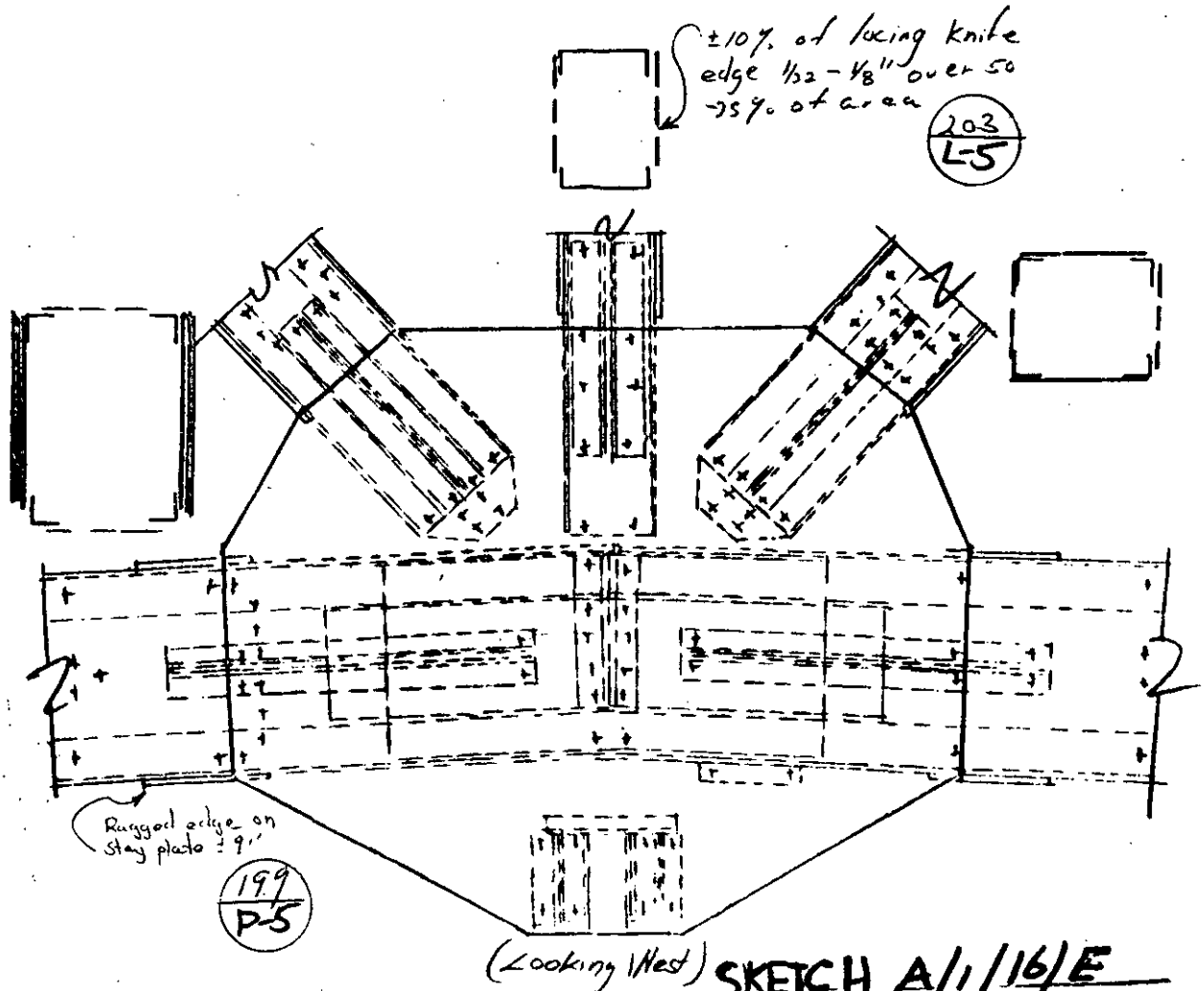

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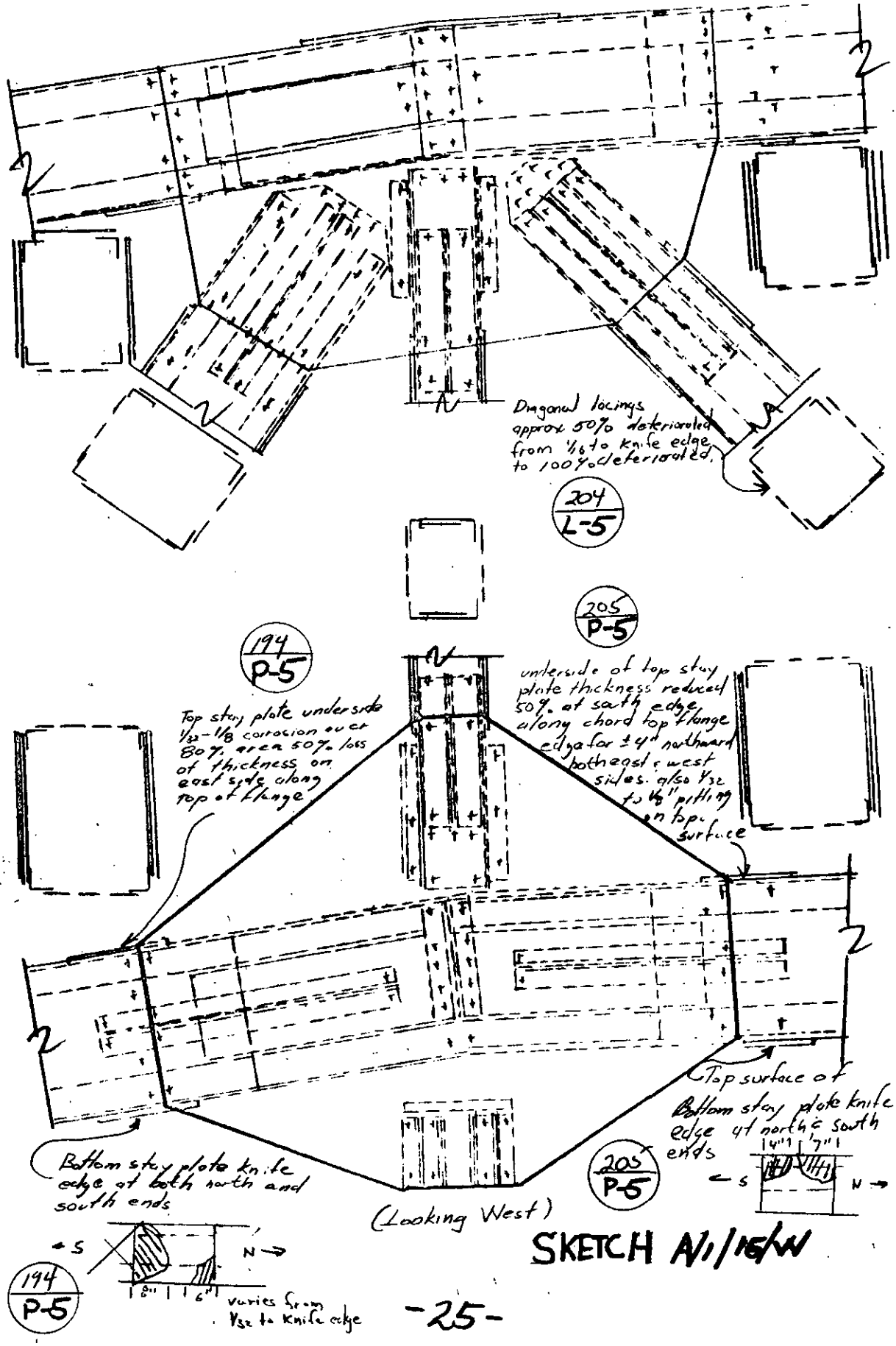

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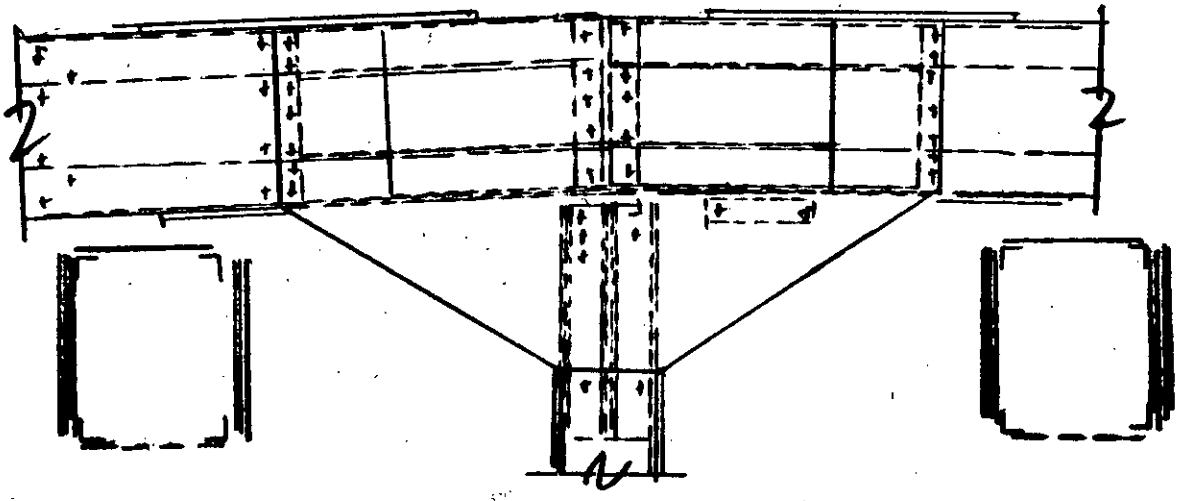

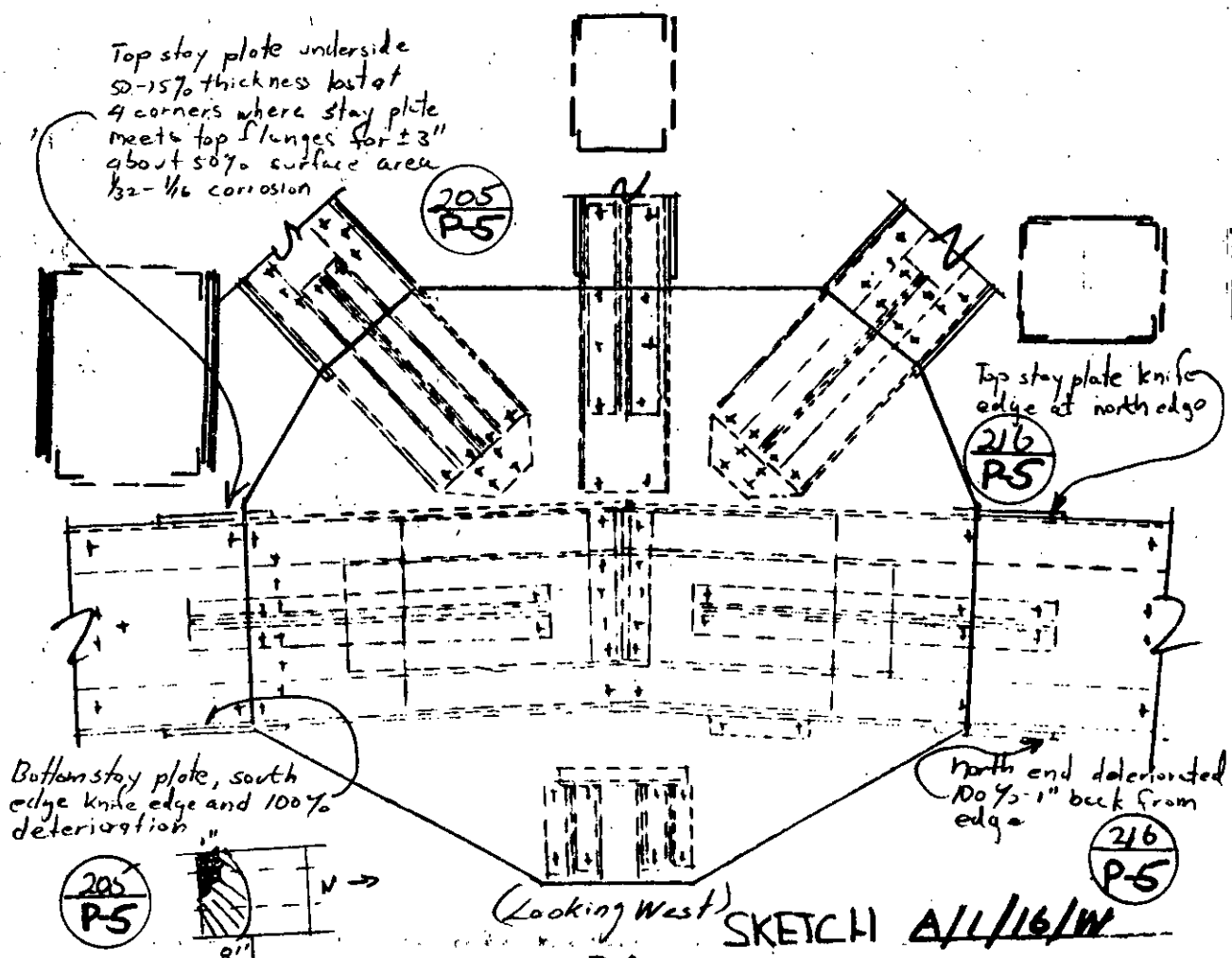

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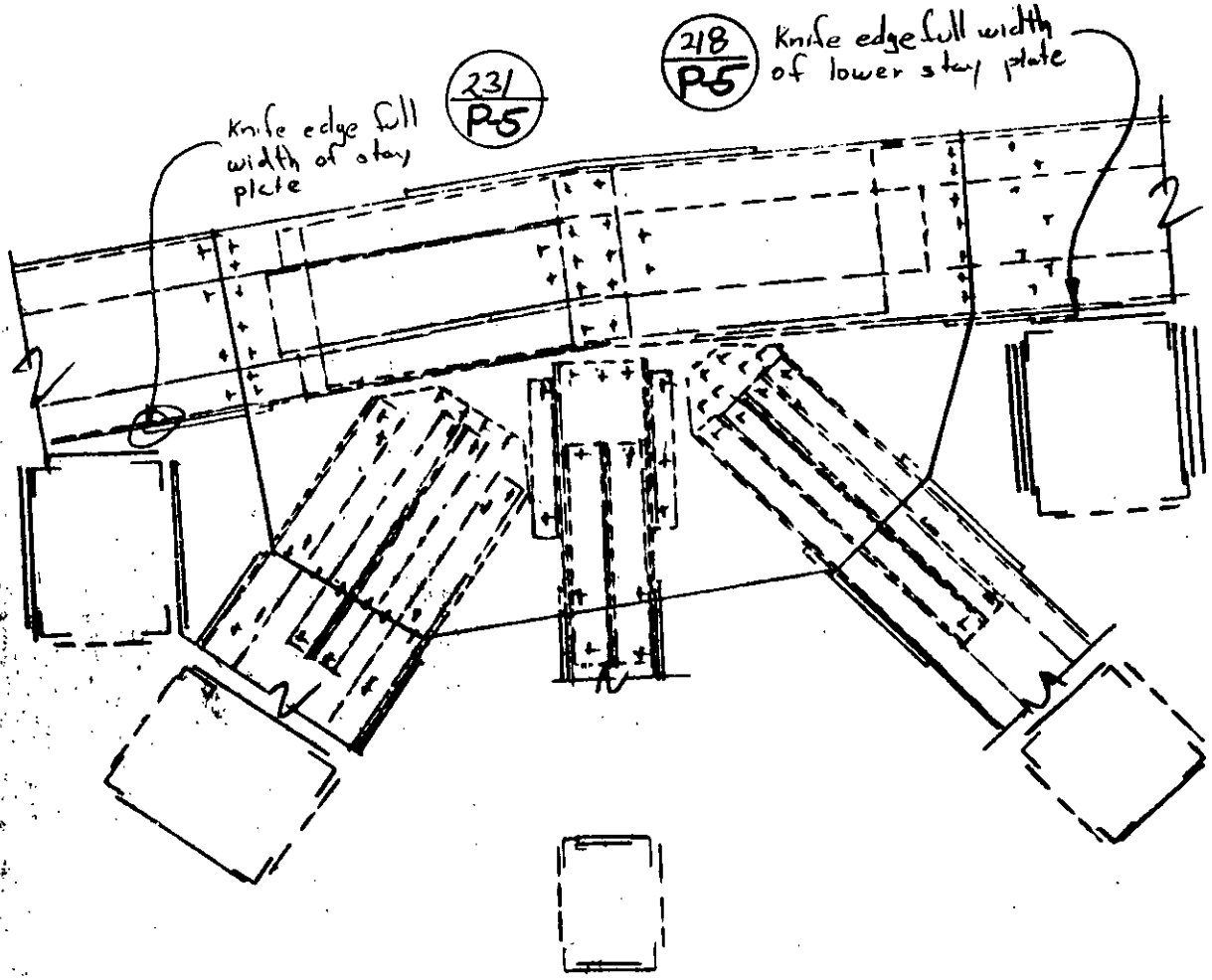

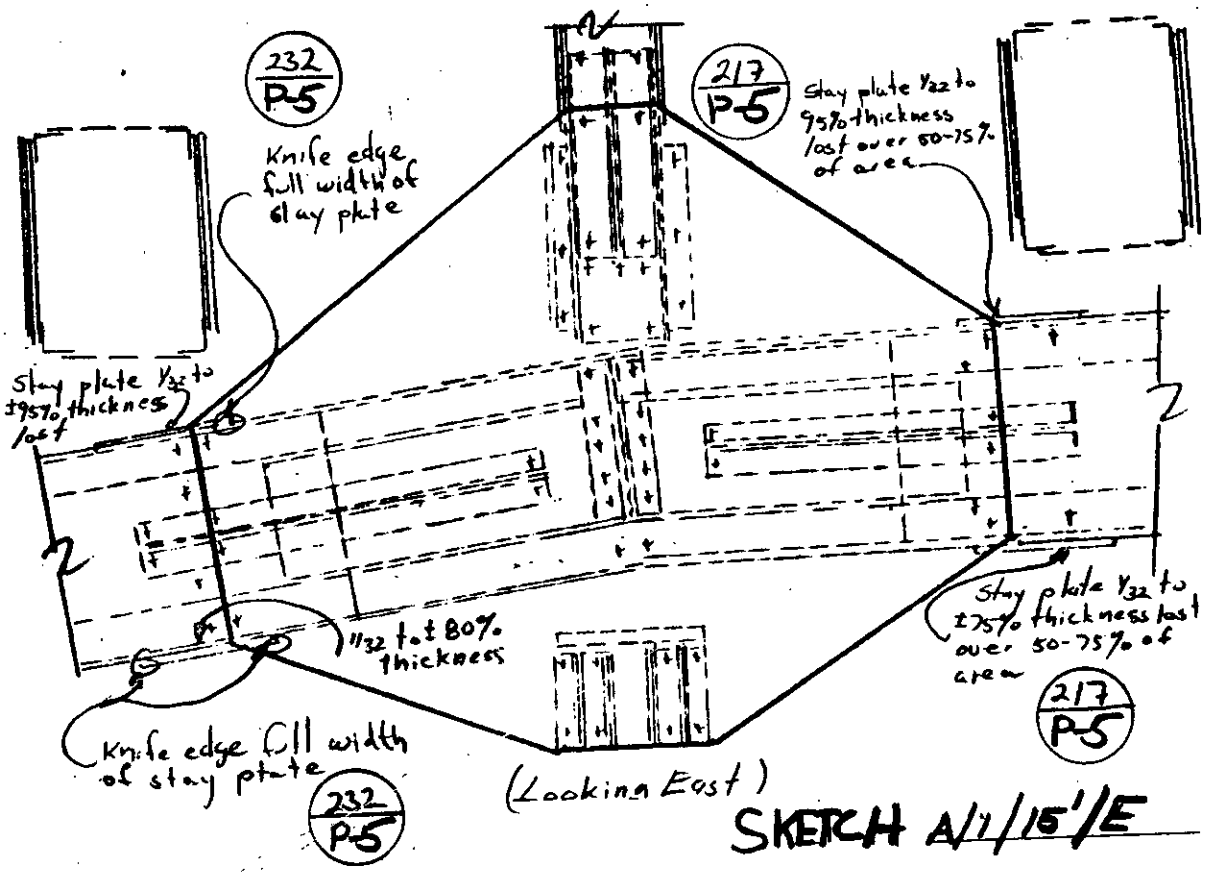

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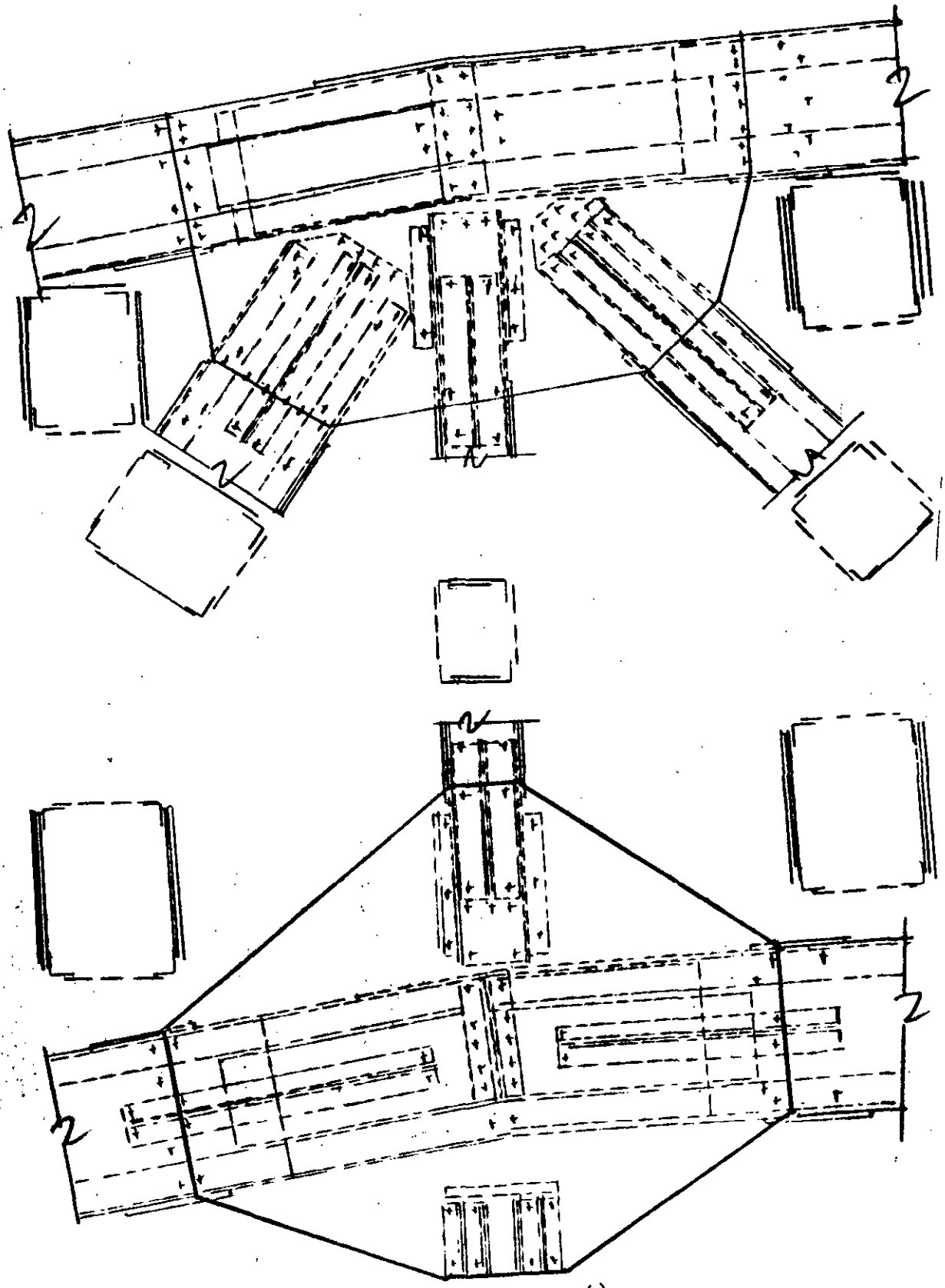

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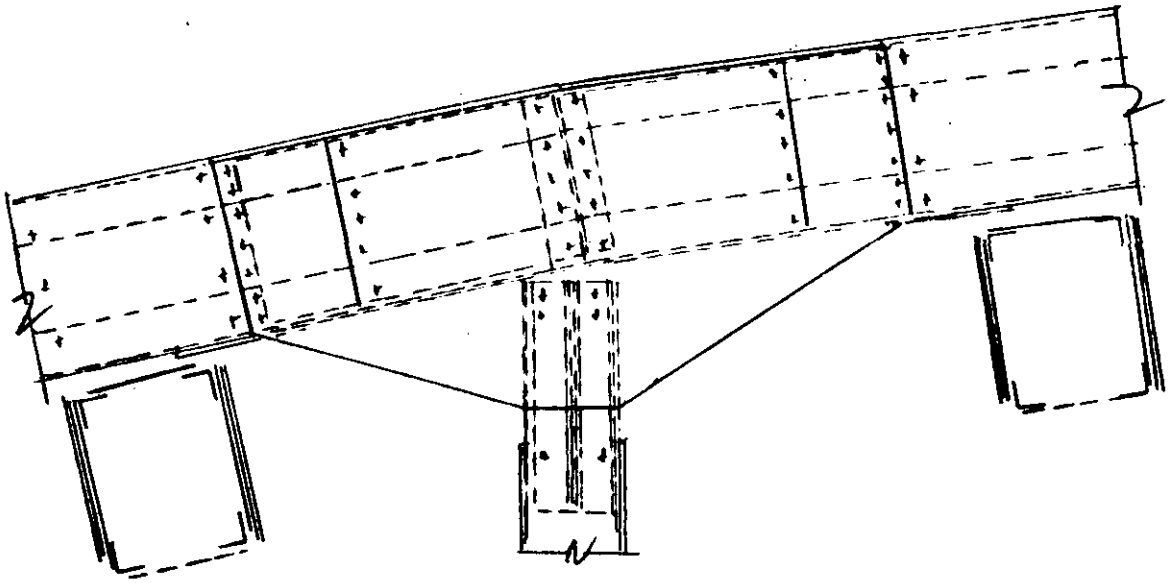

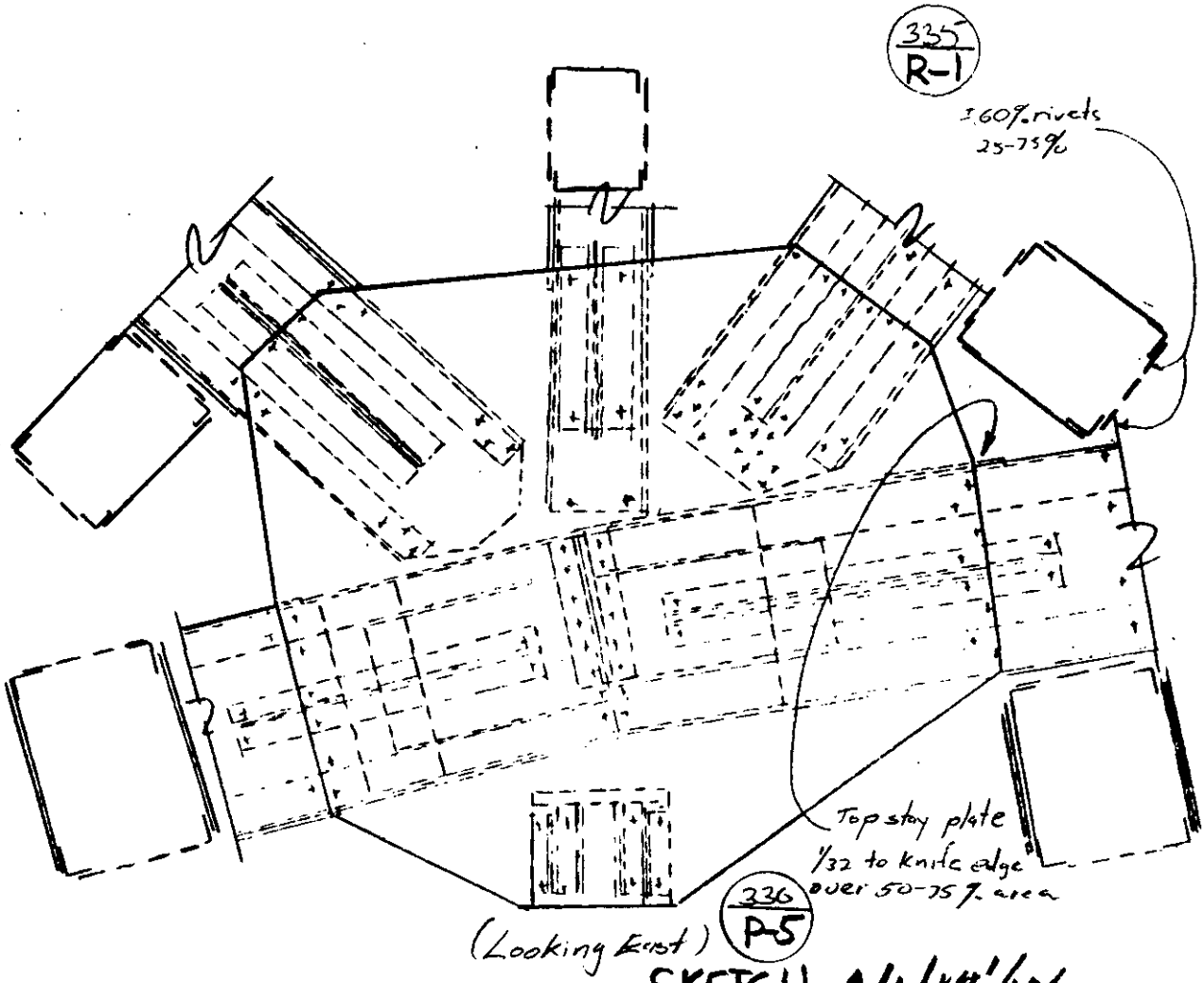

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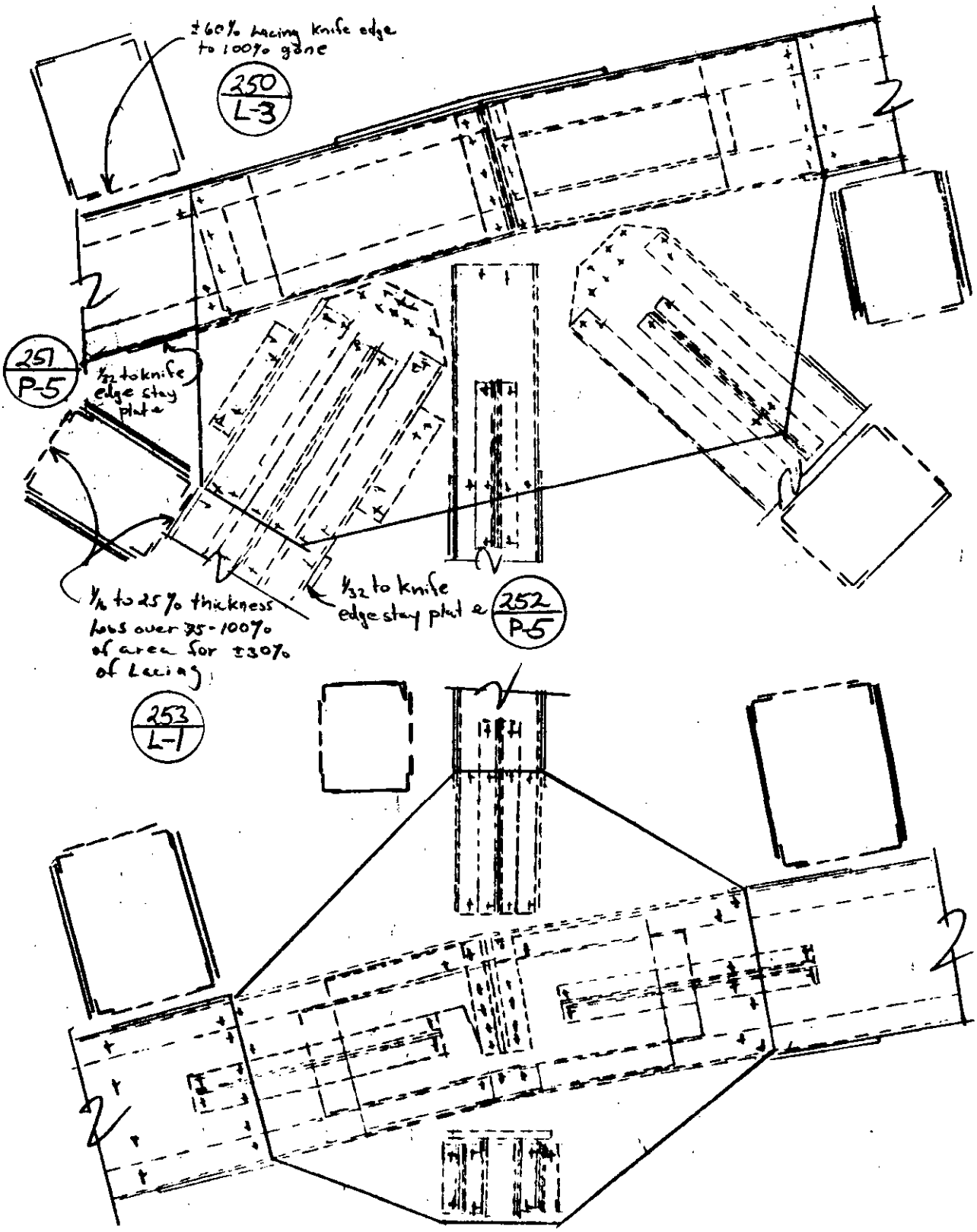

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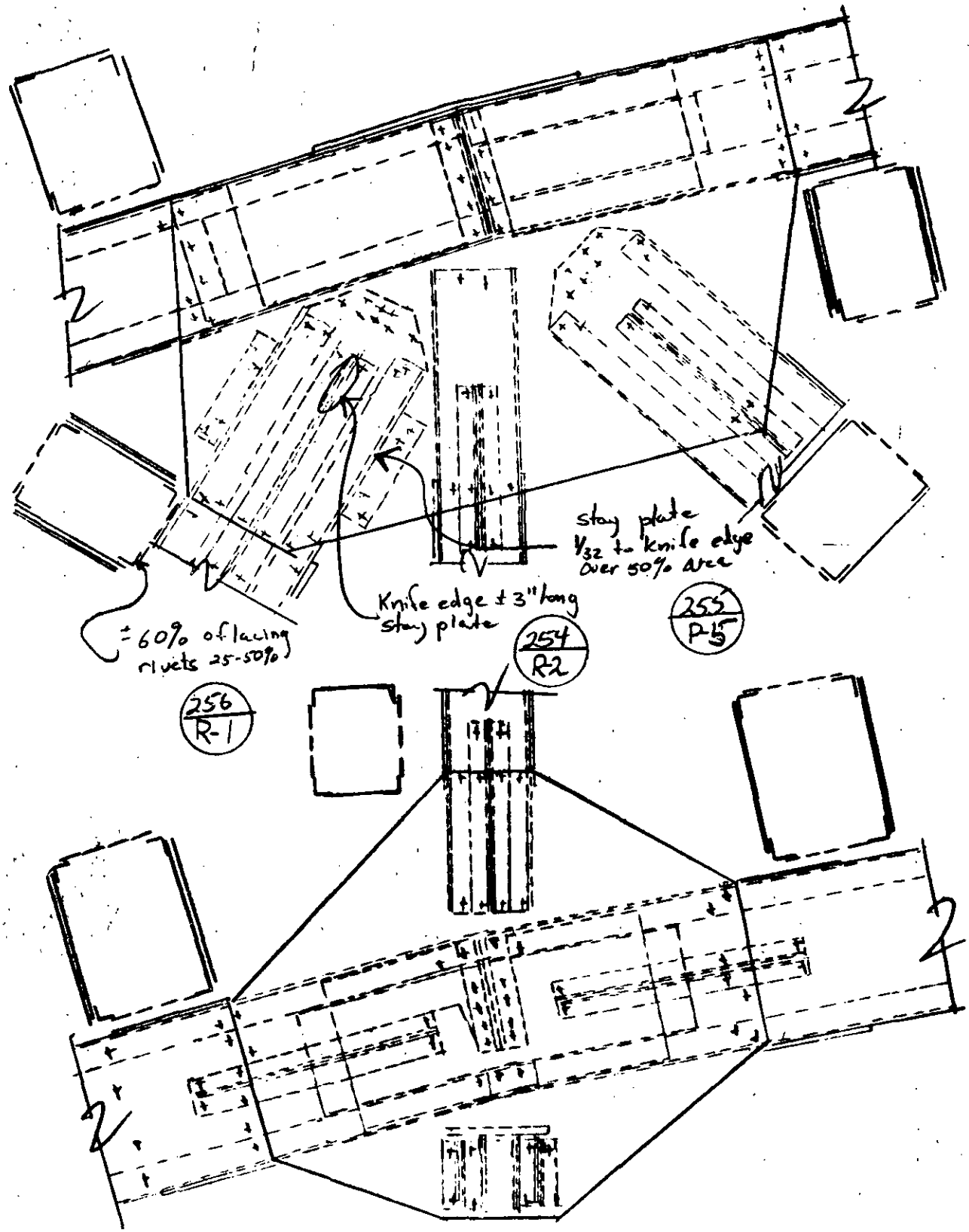

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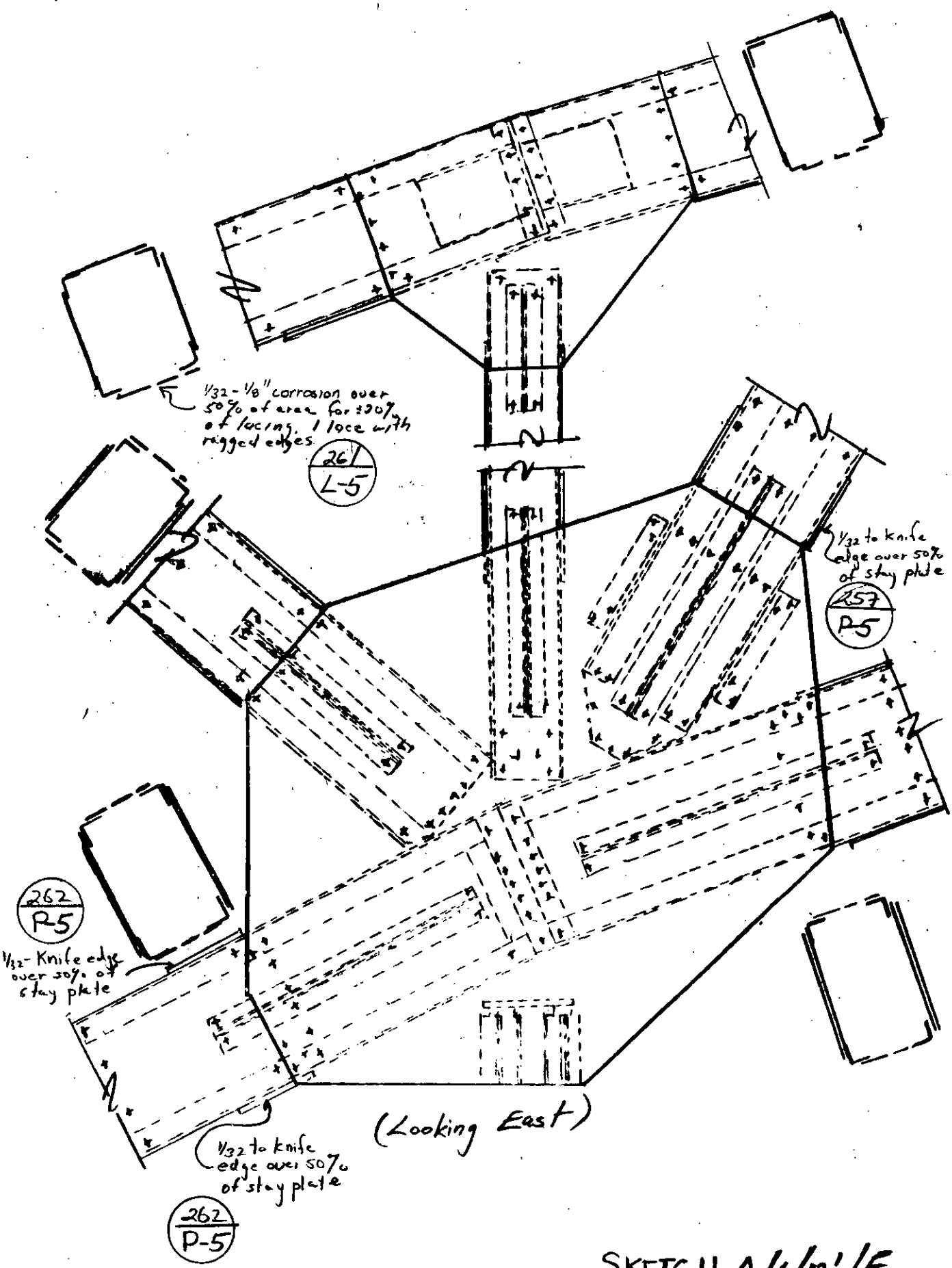

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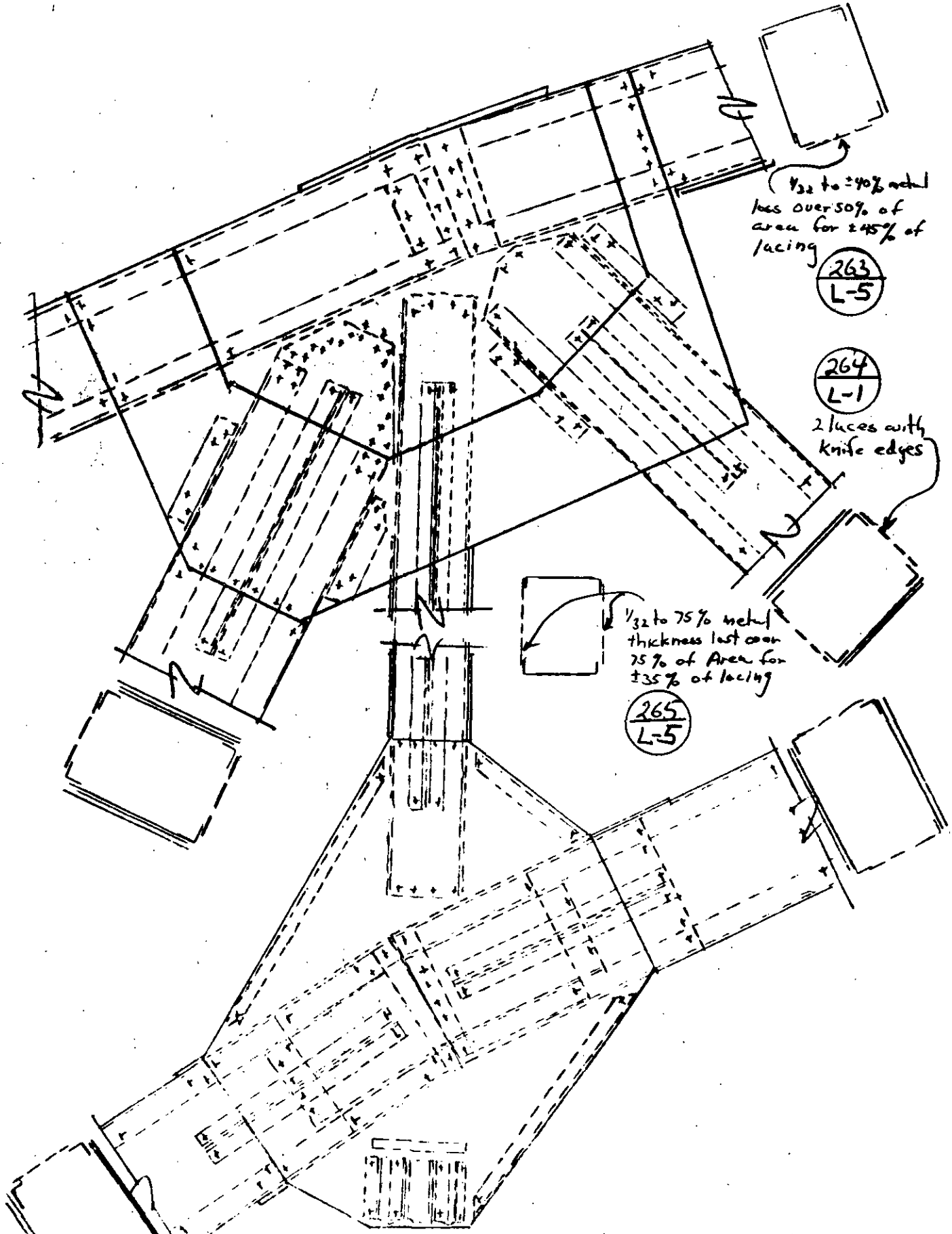

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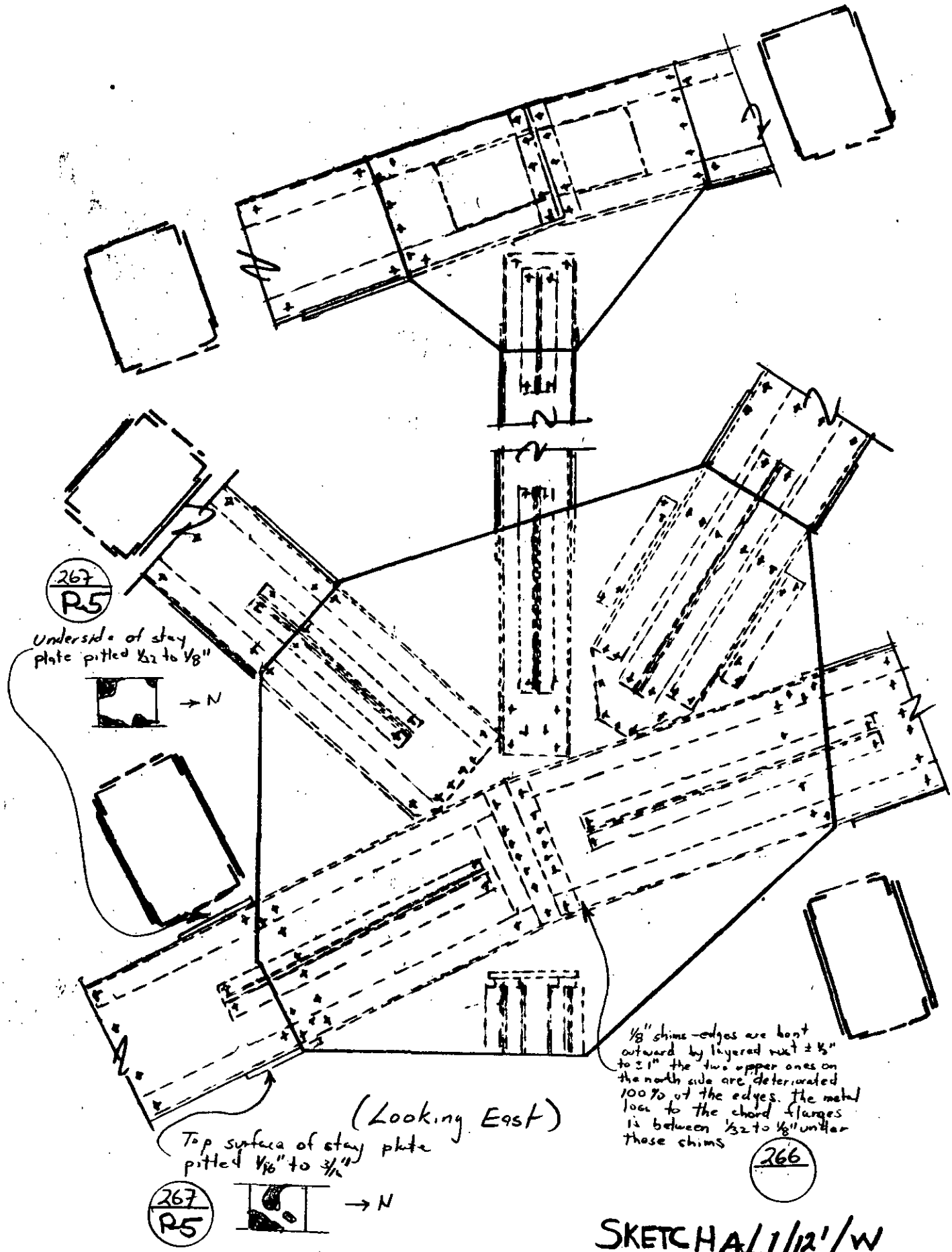

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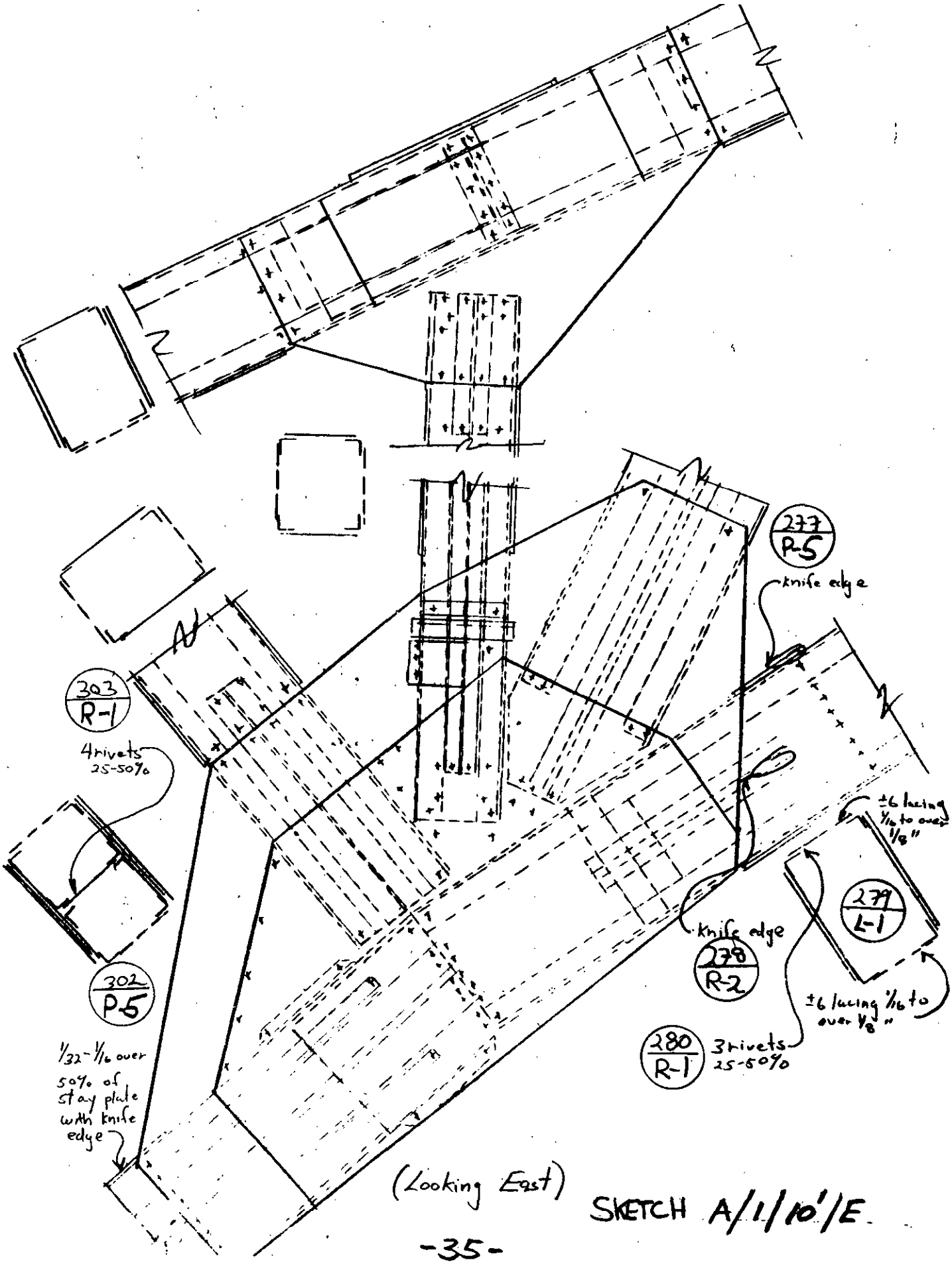
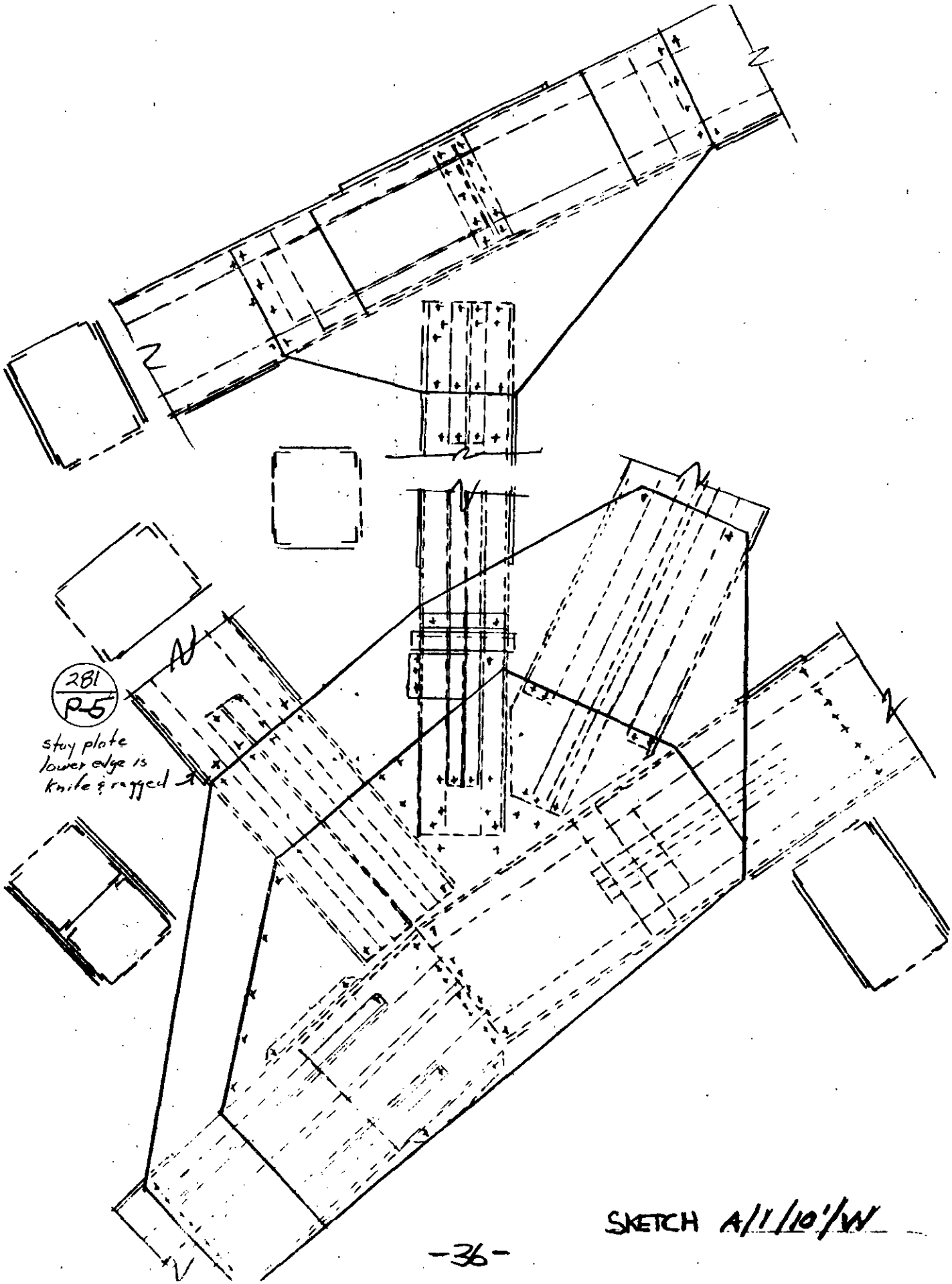
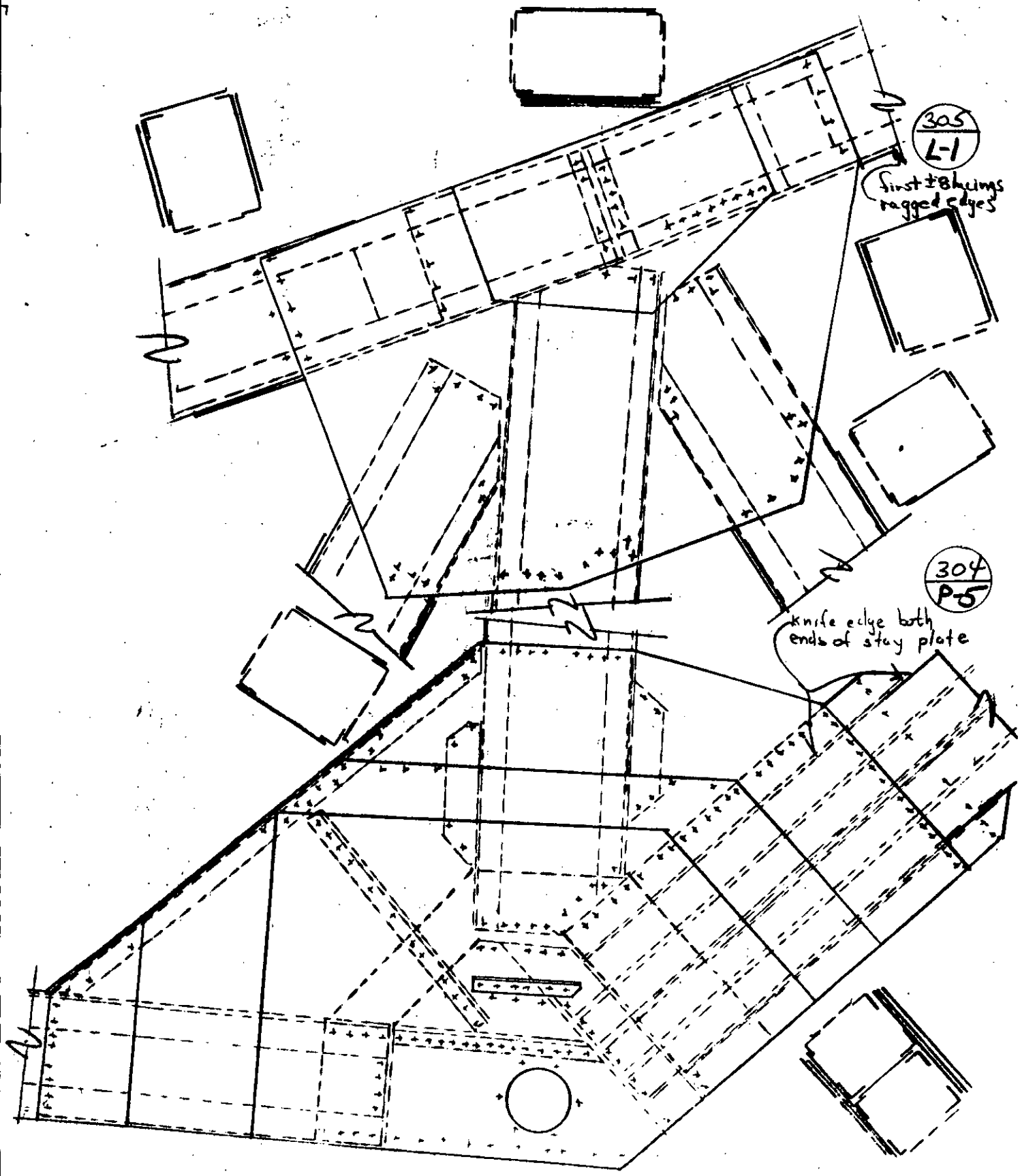


SKETCH A/1/10'/E

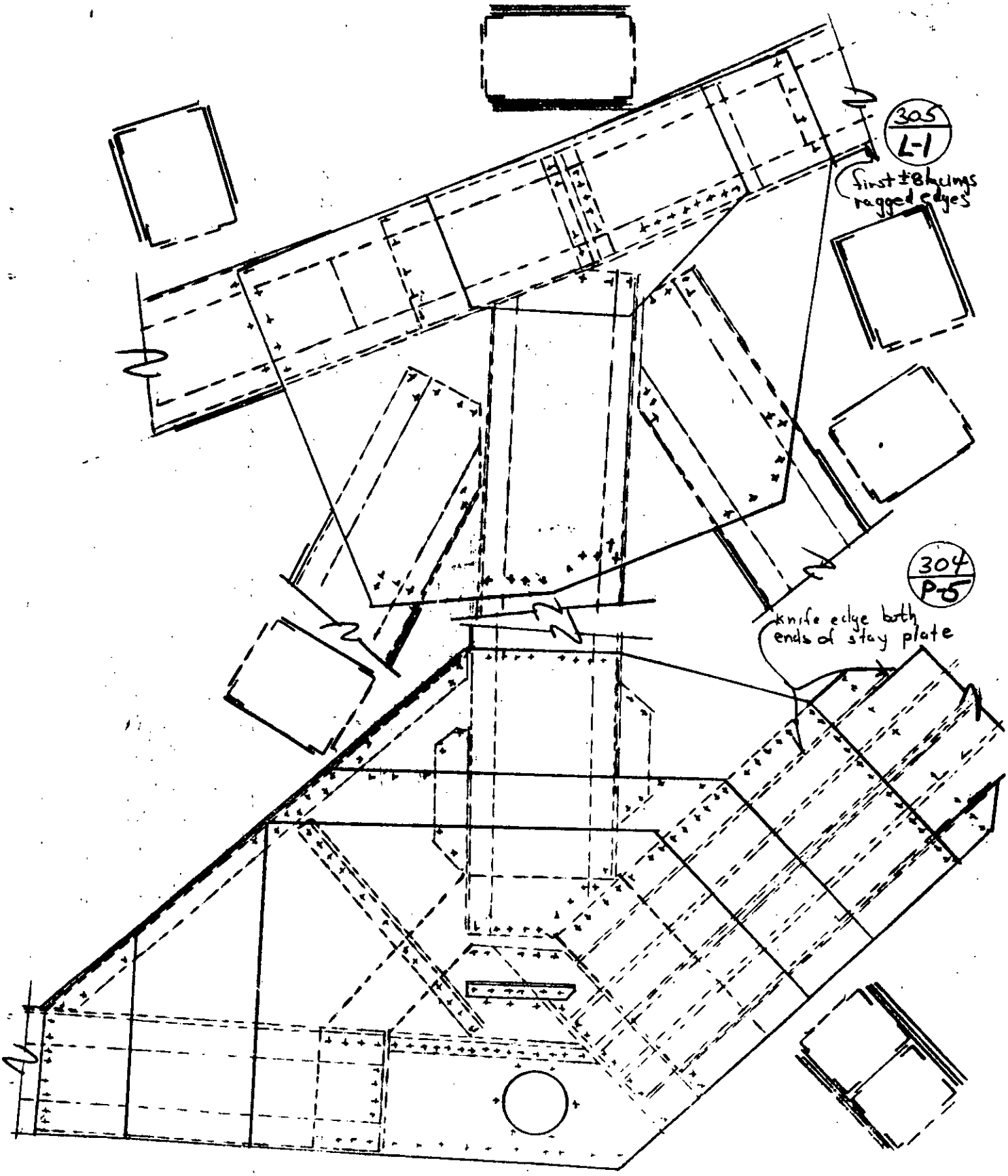


SKETCH A/1/10'/W



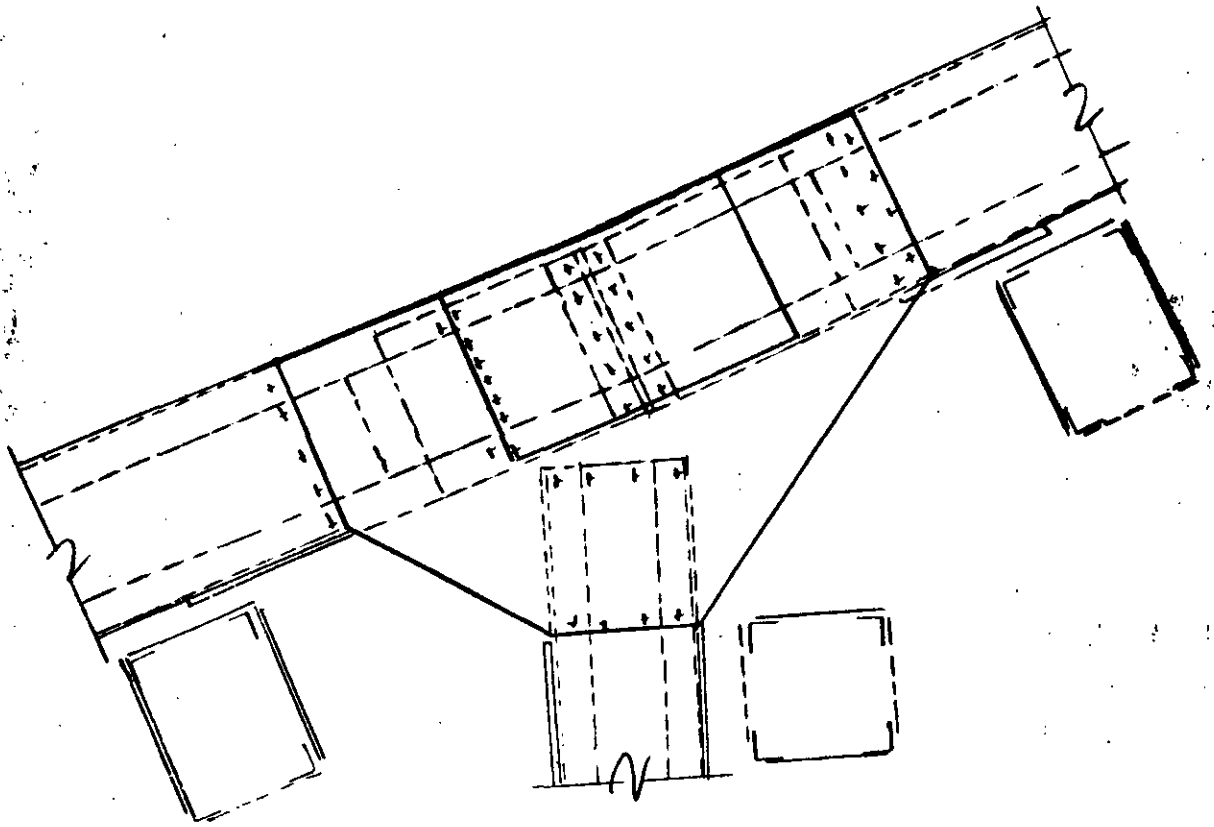
(Looking East)

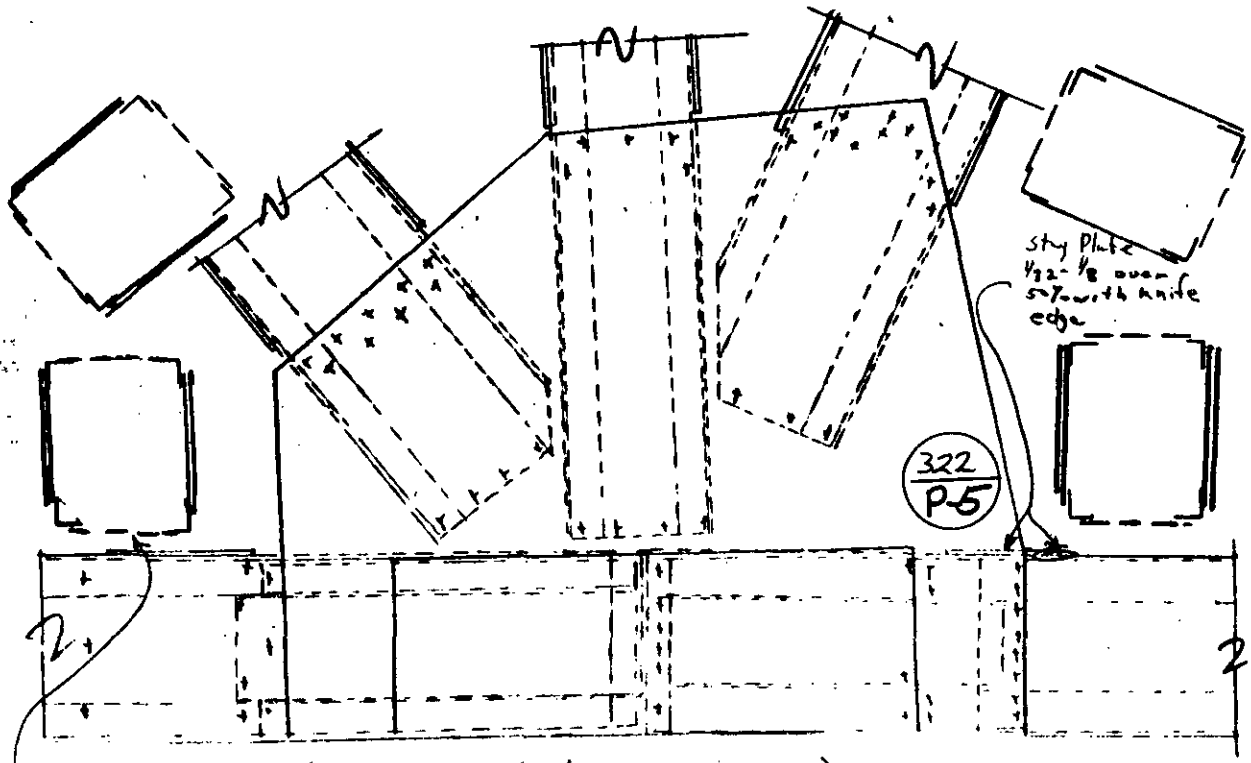
SKETCH A/1/9'/E



(Looking East)

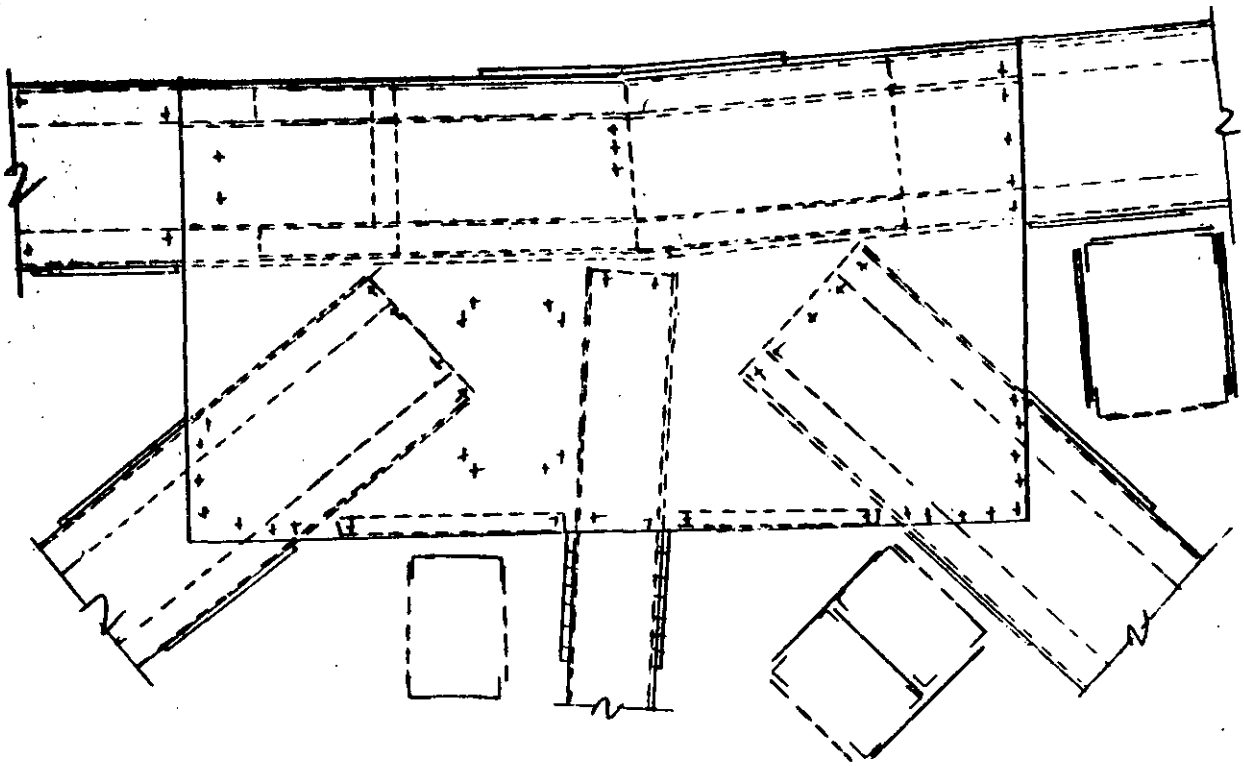
SKETCH A/1/9'/E

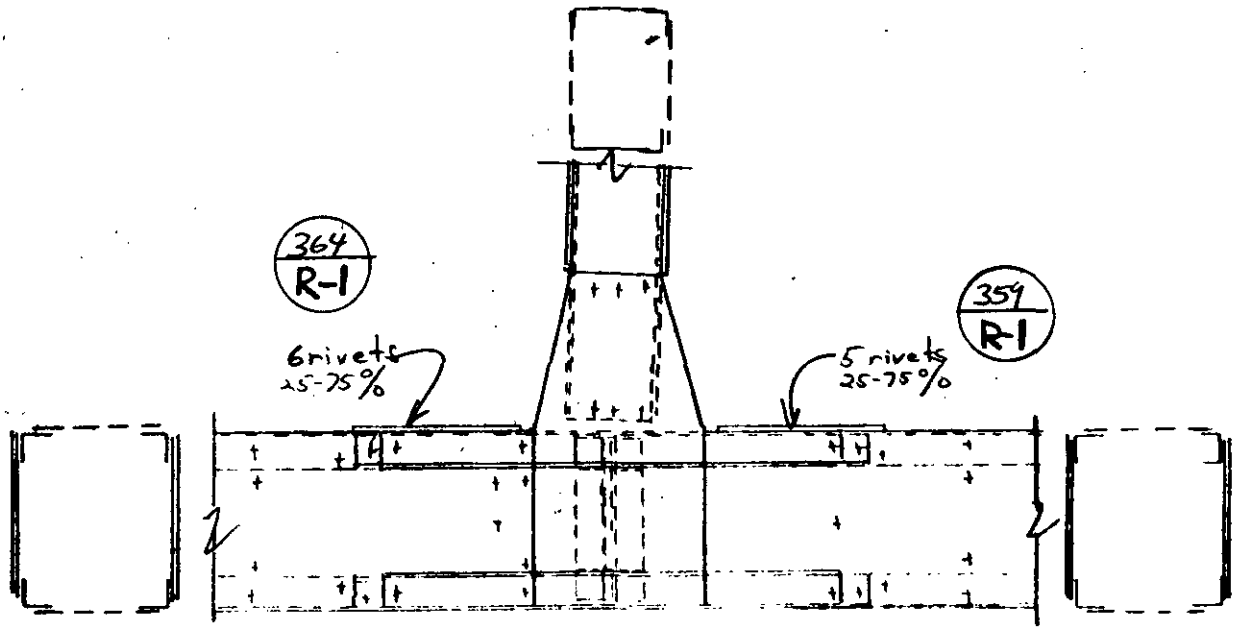




(Looking East)

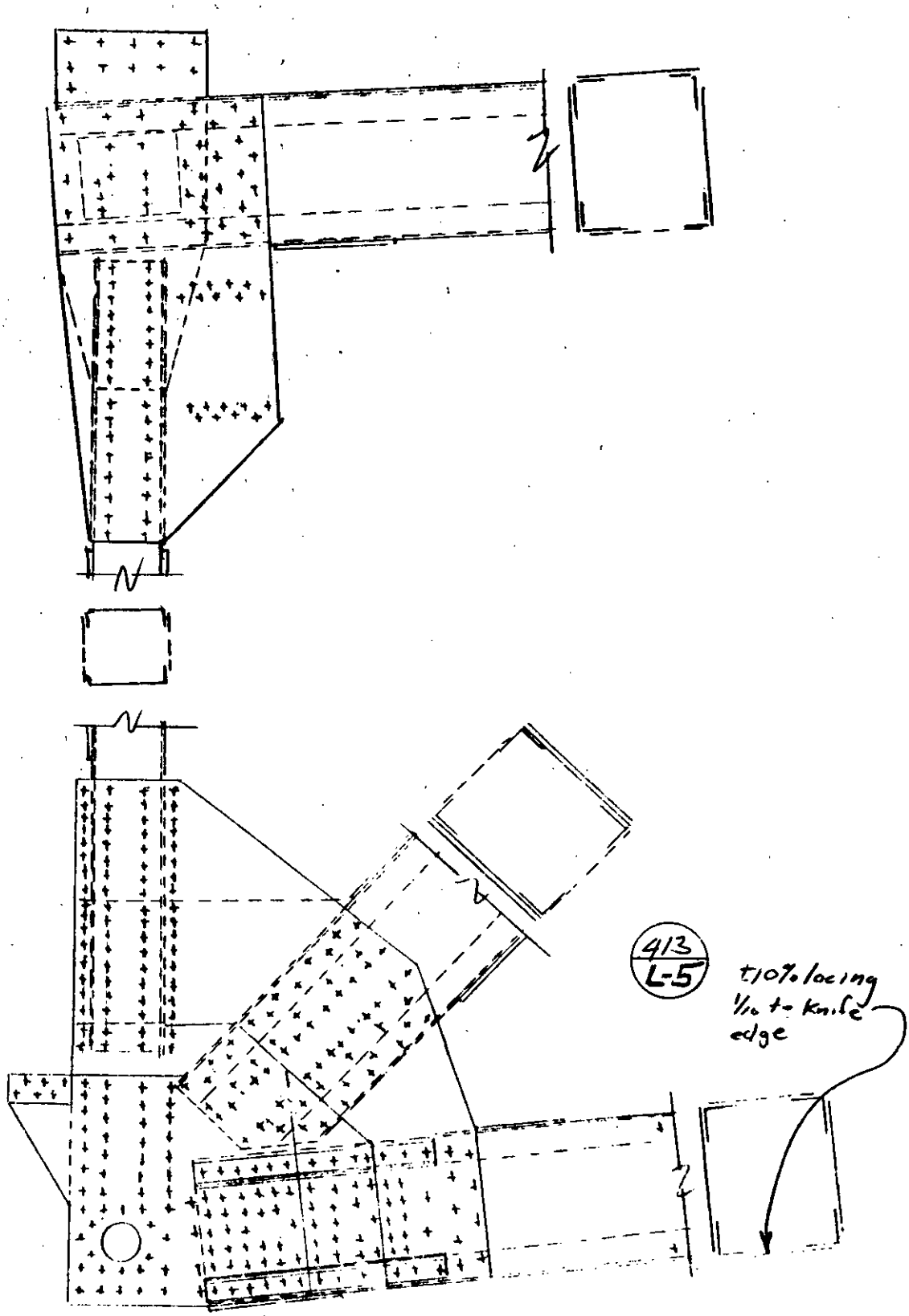
SKETCH A/2/8"/E





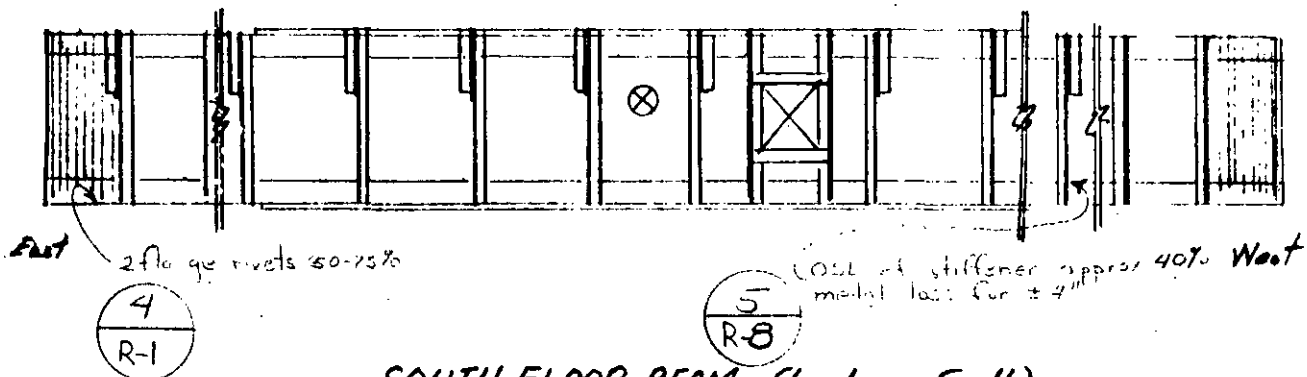
(Looking East)

SKETCH A/2/5'/E

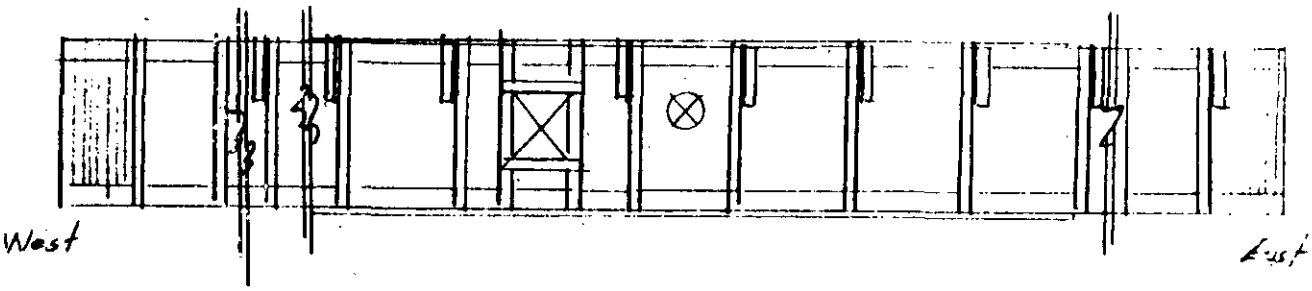


(Looking East)

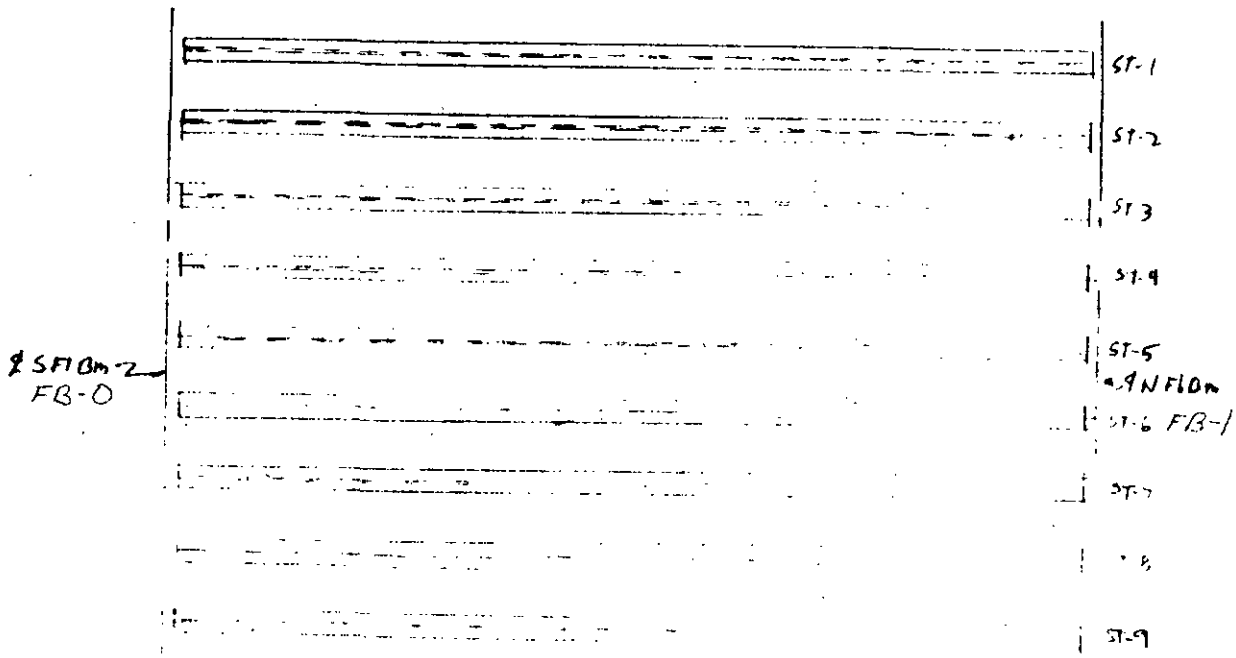
SKETCH A/2/0'/E



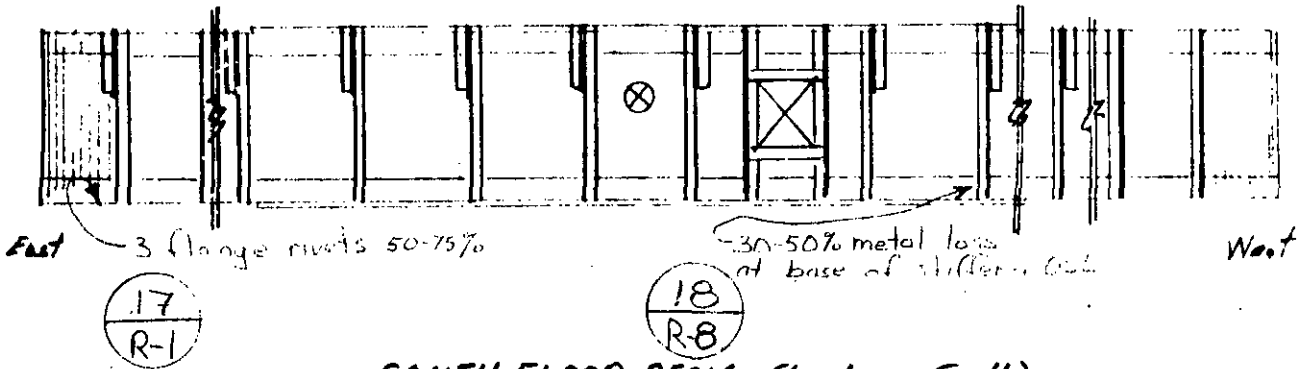
SOUTH FLOOR BEAM (Looking South)



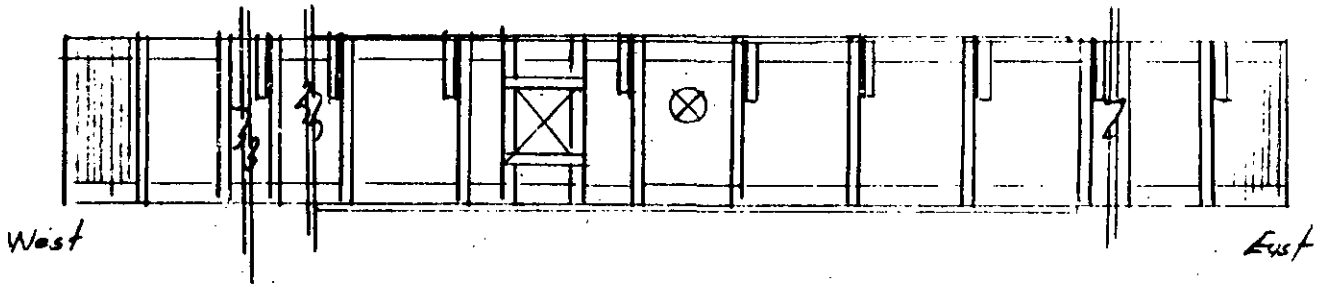
NORTH FLOOR BEAM (Looking North)



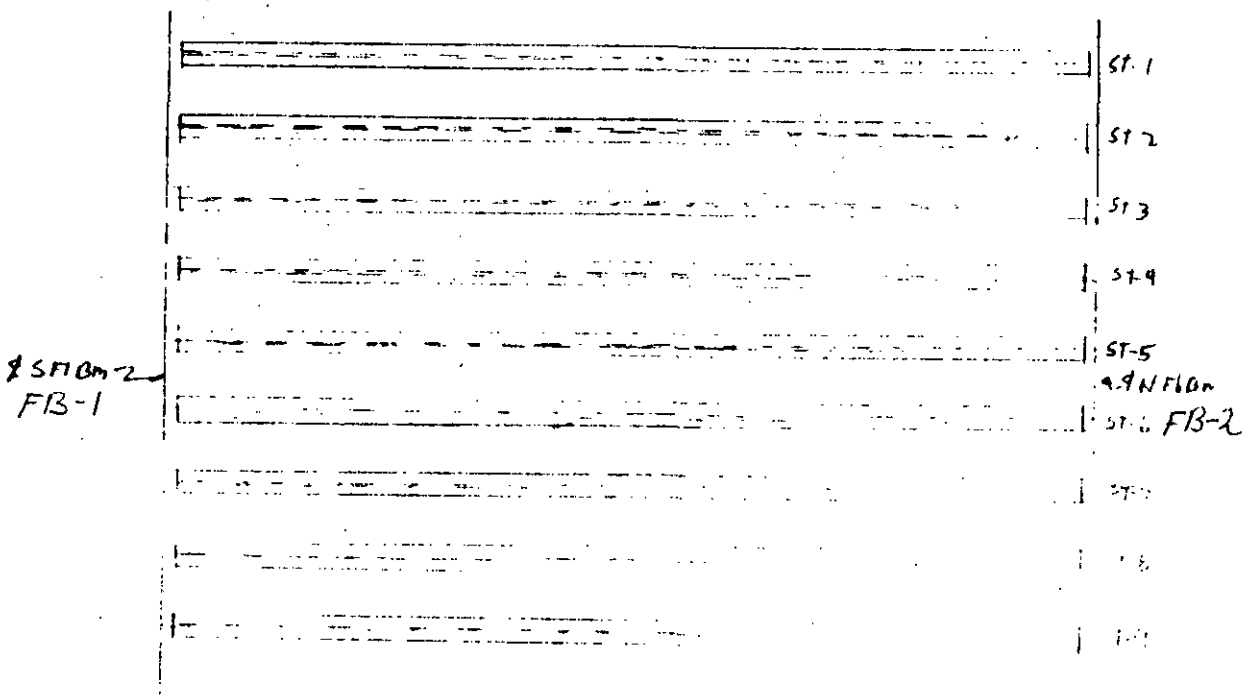
SKETCH B/3/0-1



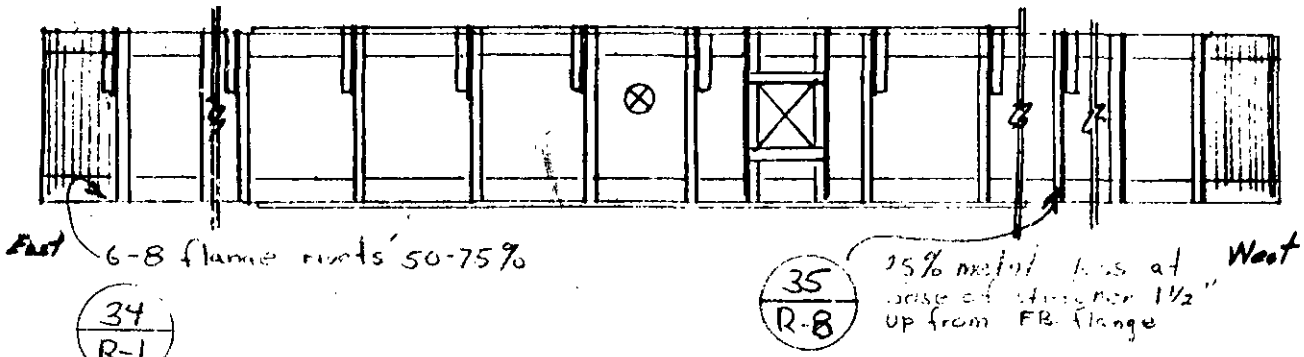
SOUTH FLOOR BEAM (Looking South)



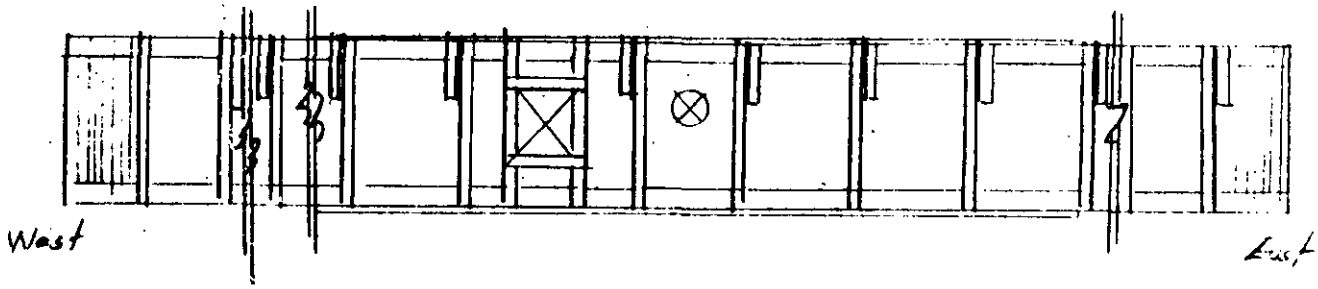
NORTH FLOOR BEAM (Looking North)



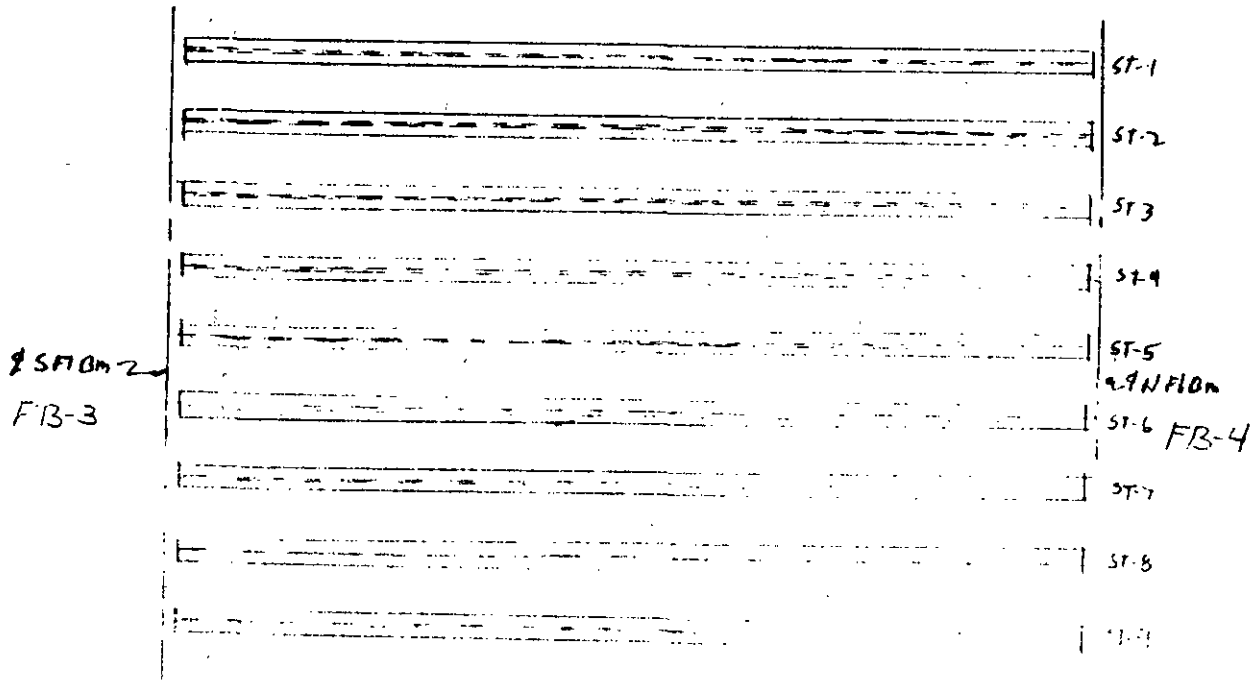
SKETCH B/3/1-2



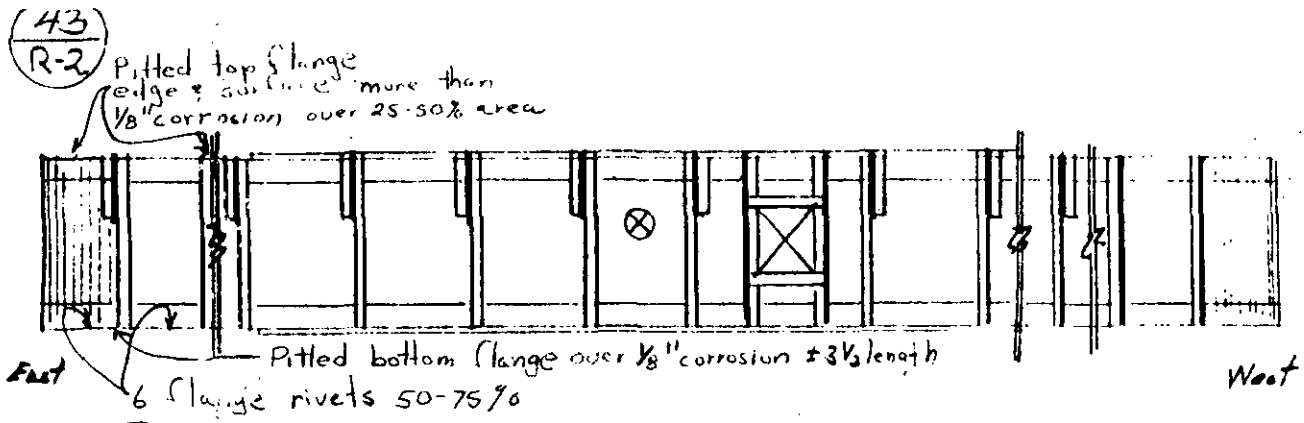
SOUTH FLOOR BEAM (Looking South)



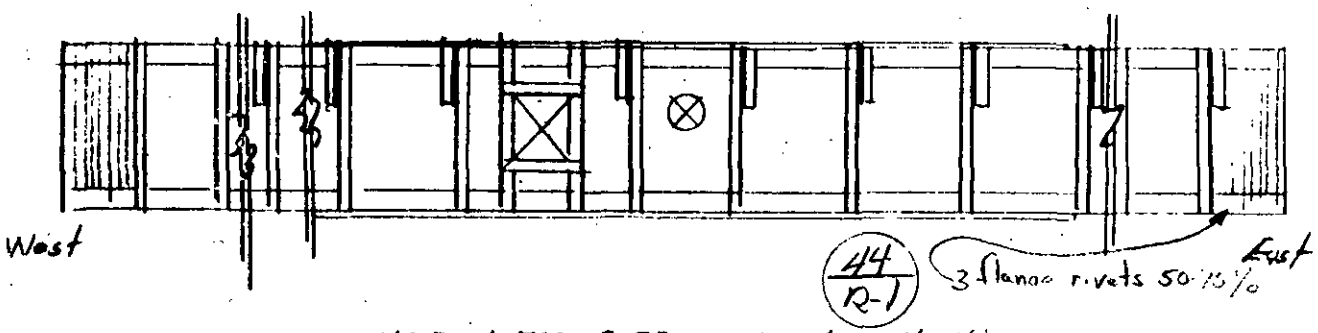
NORTH FLOOR BEAM (Looking North)



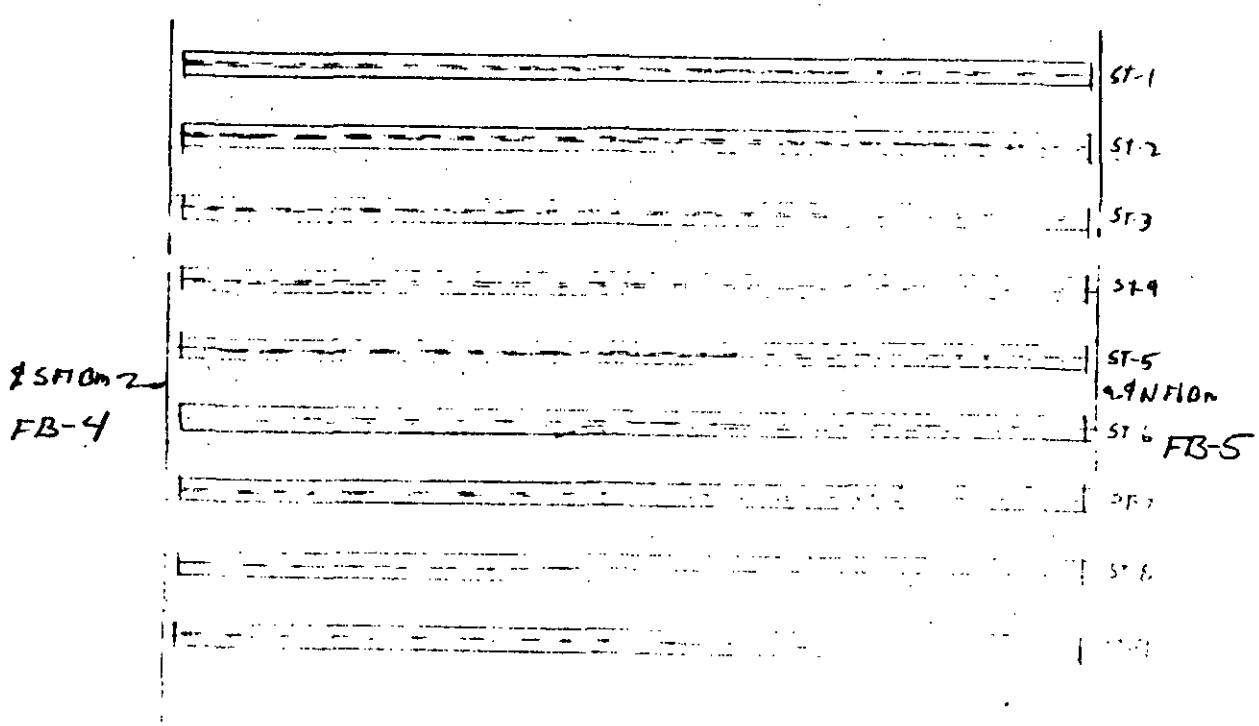
SKETCH B/3/3-4



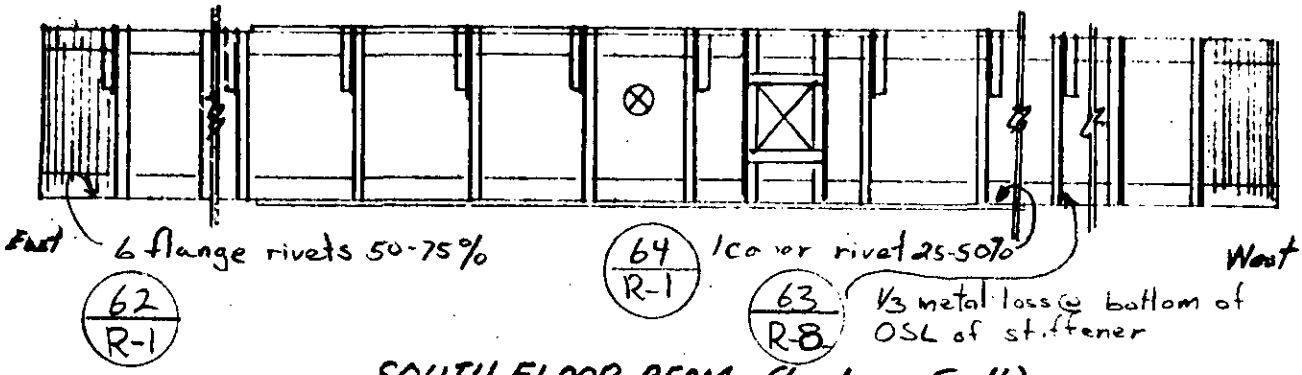
SOUTH FLOOR BEAM (Looking South)



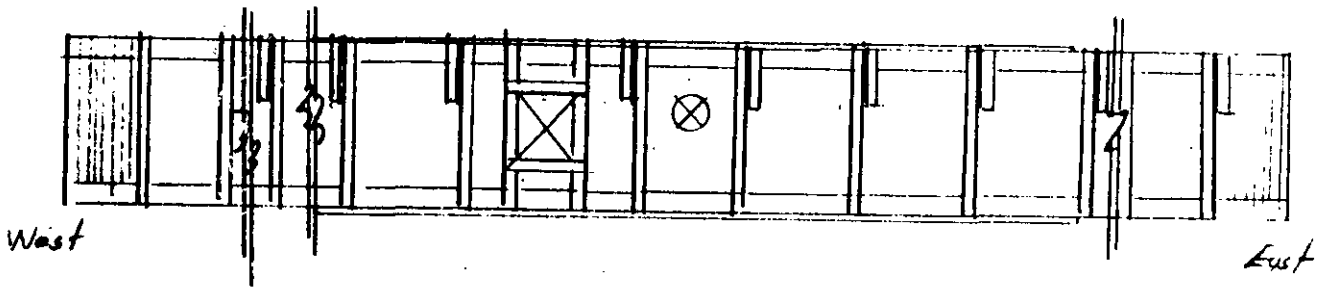
NORTH FLOOR BEAM (Looking North)



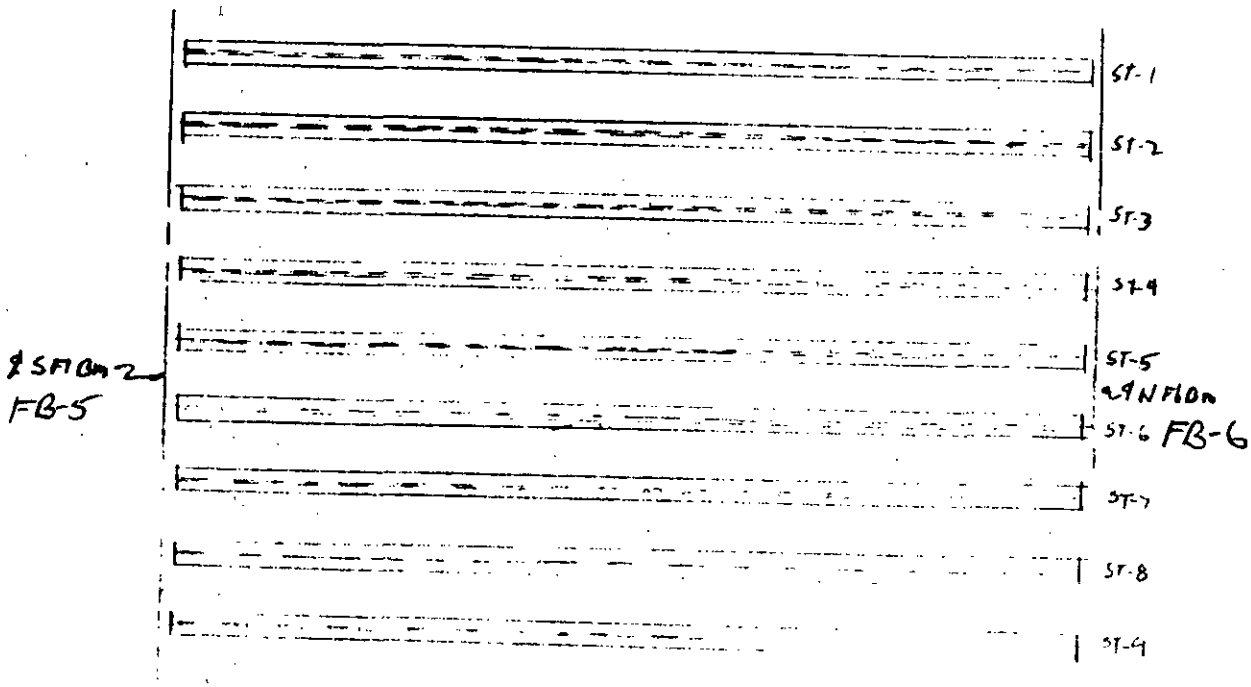
SKETCH B/3/4-5



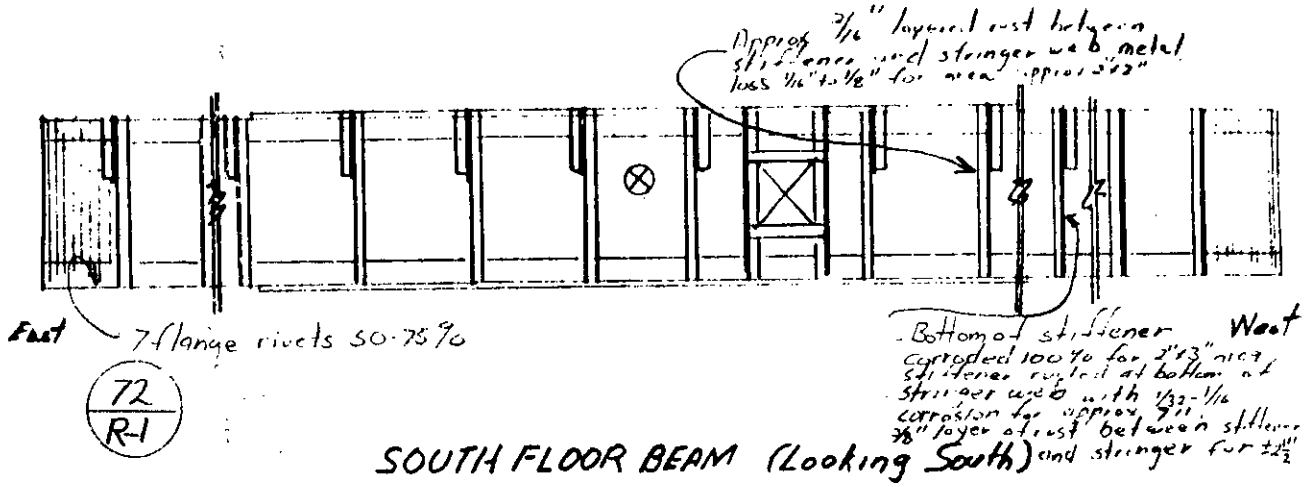
SOUTH FLOOR BEAM (Looking South)



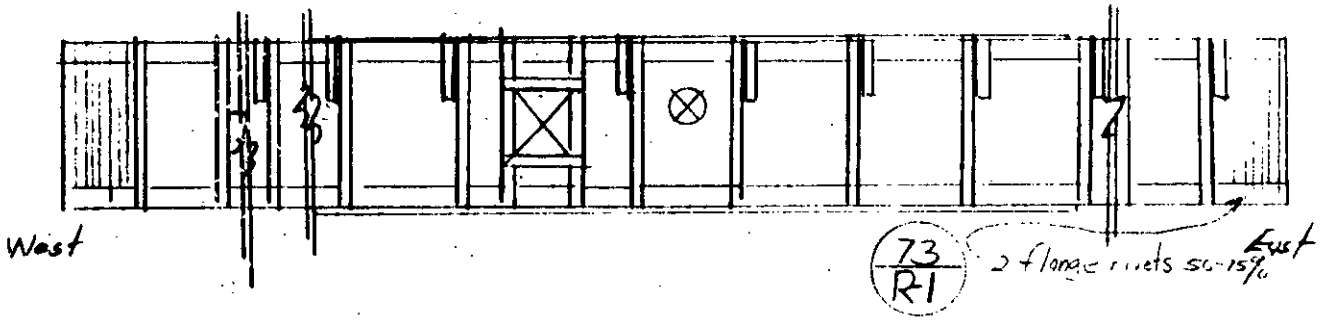
NORTH FLOOR BEAM (Looking North)



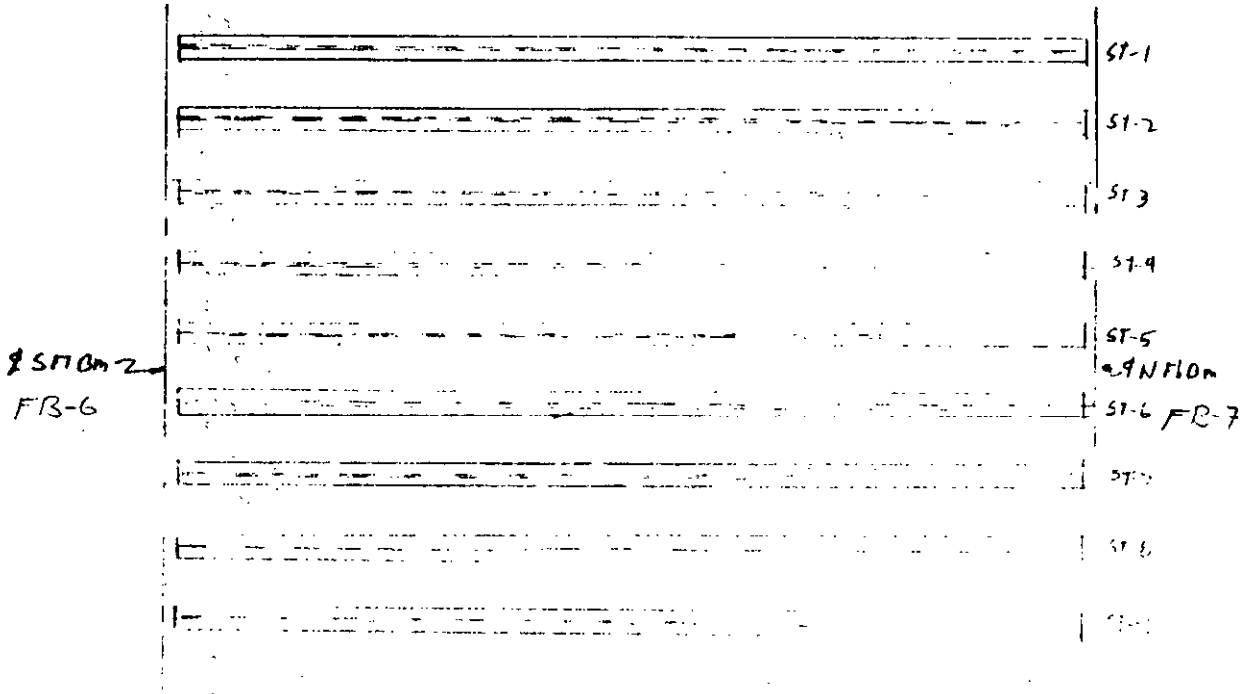
SKETCH B/3/5-6



SOUTH FLOOR BEAM (Looking South)



NORTH FLOOR BEAM (Looking North)



SKETCH B/3/6-7

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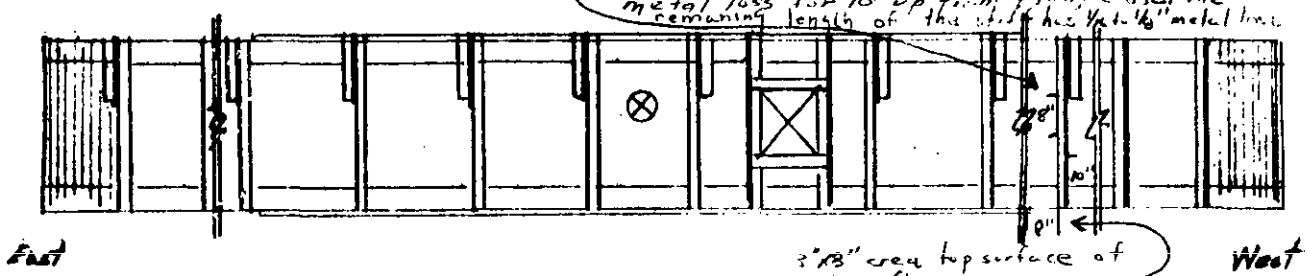
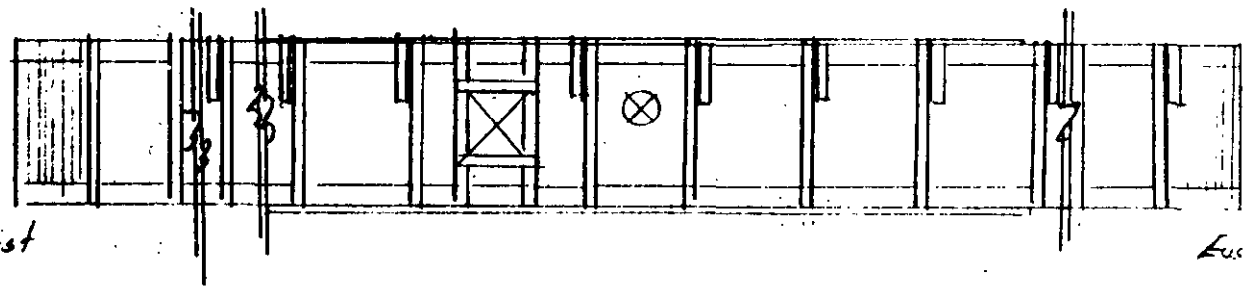
R-8

there is approx 30% metal loss of stiffener where stringer ties at bottom of web. There is layered rust 5/8" thick between web & stiffener. Metal loss @ the web is 1/16 to 1/8" for a length of 8". Bottom of stiffener is badly corroded 50-100% metal loss for 10" up from flange osl. The remaining length of the stiff has 1/16 to 1/8" metal loss

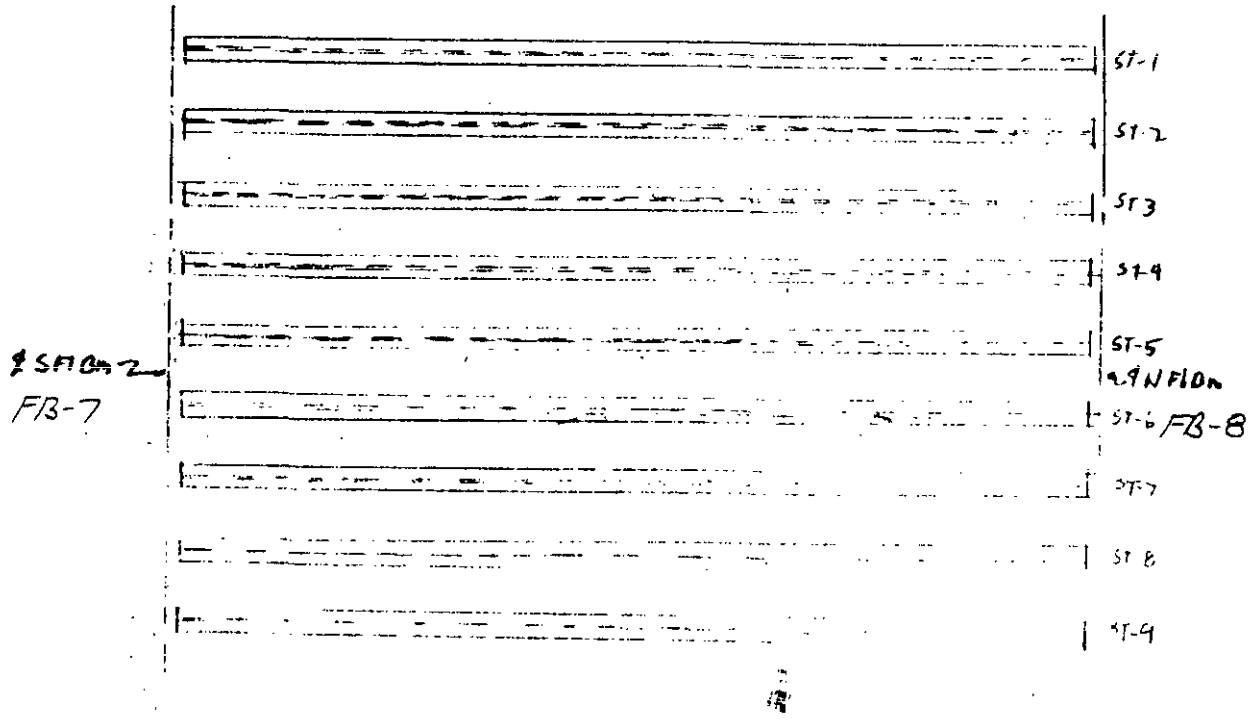


3"x8" area top surface of bottom flange corrosion is 1/8" to 3/16" metal loss. rest of bottom flange to west has max 1/32" metal loss

SOUTH FLOOR BEAM (Looking South)



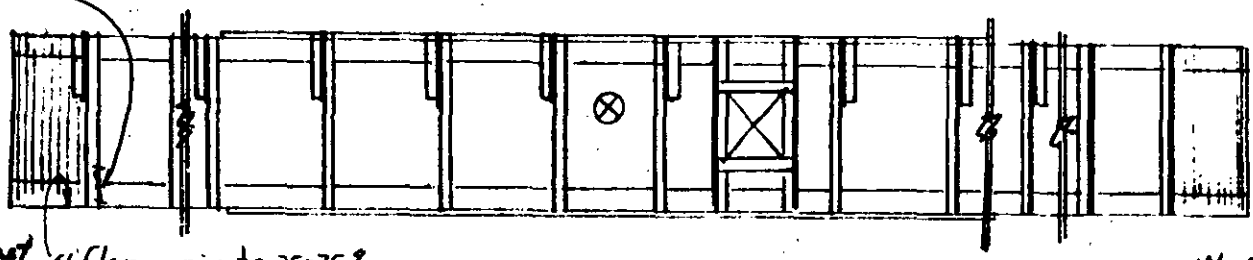
NORTH FLOOR BEAM (Looking North)



SKETCH B/3/7-8

96
R-2

Stiffener knee edge ±2" long from B. flange

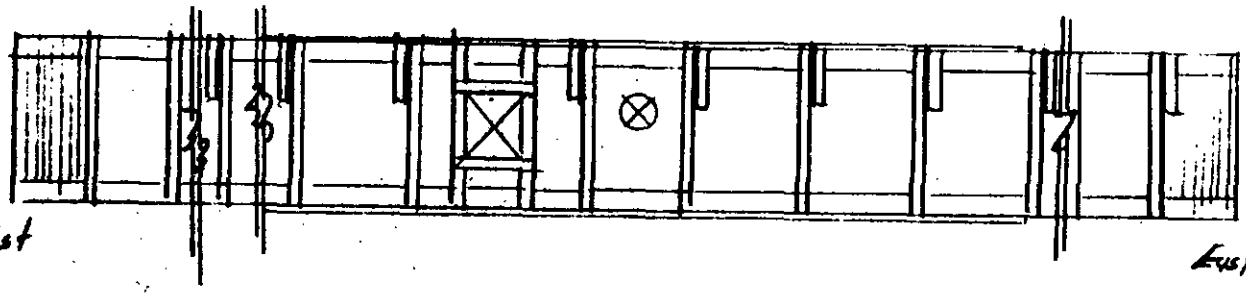


East 4" flange rivets 25-75%

West

97
A-1

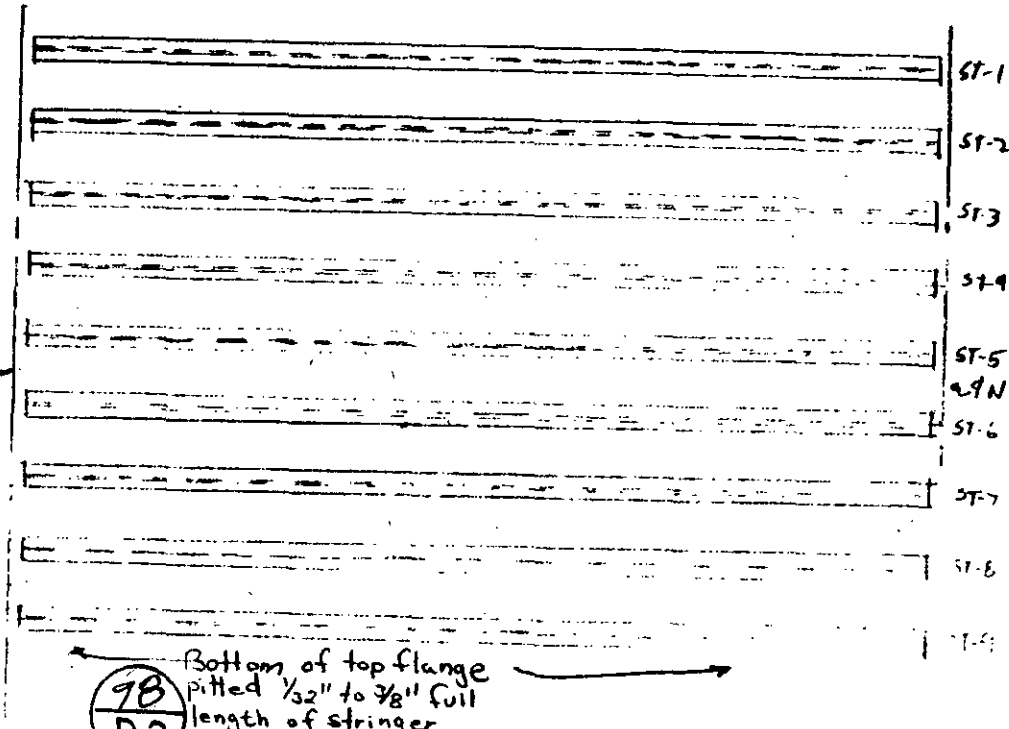
SOUTH FLOOR BEAM (Looking South)



West

East

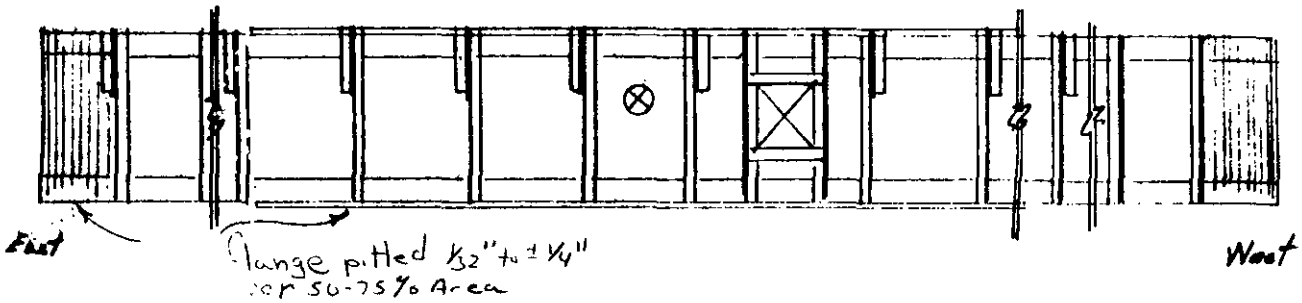
NORTH FLOOR BEAM (Looking North)



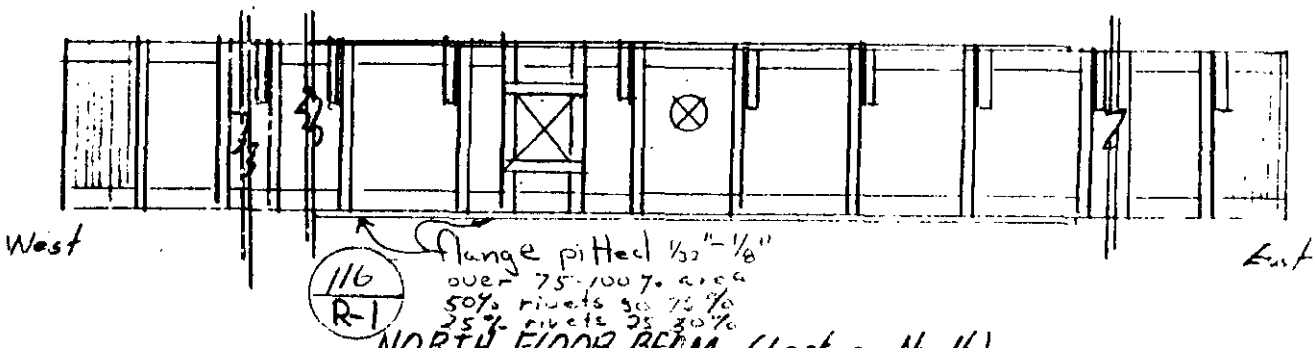
98
R-2

Bottom of top flange pitted 1/32" to 7/8" full length of stringer

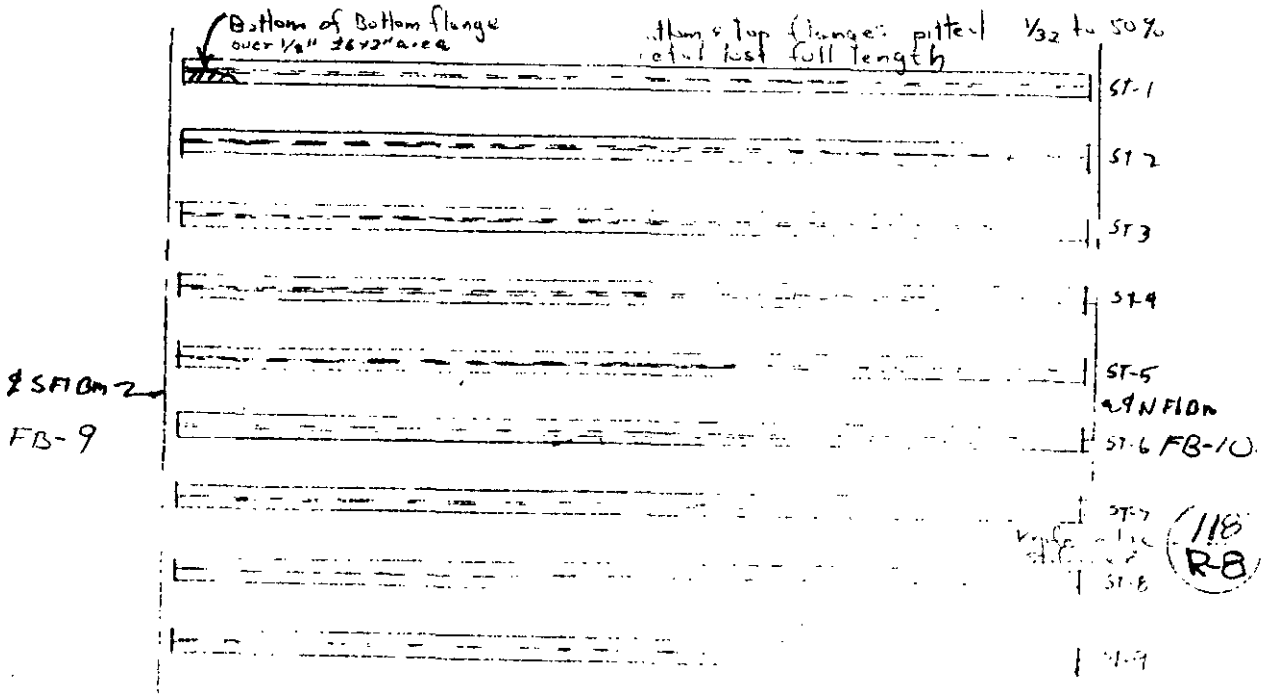
SKETCH B/3/8-9



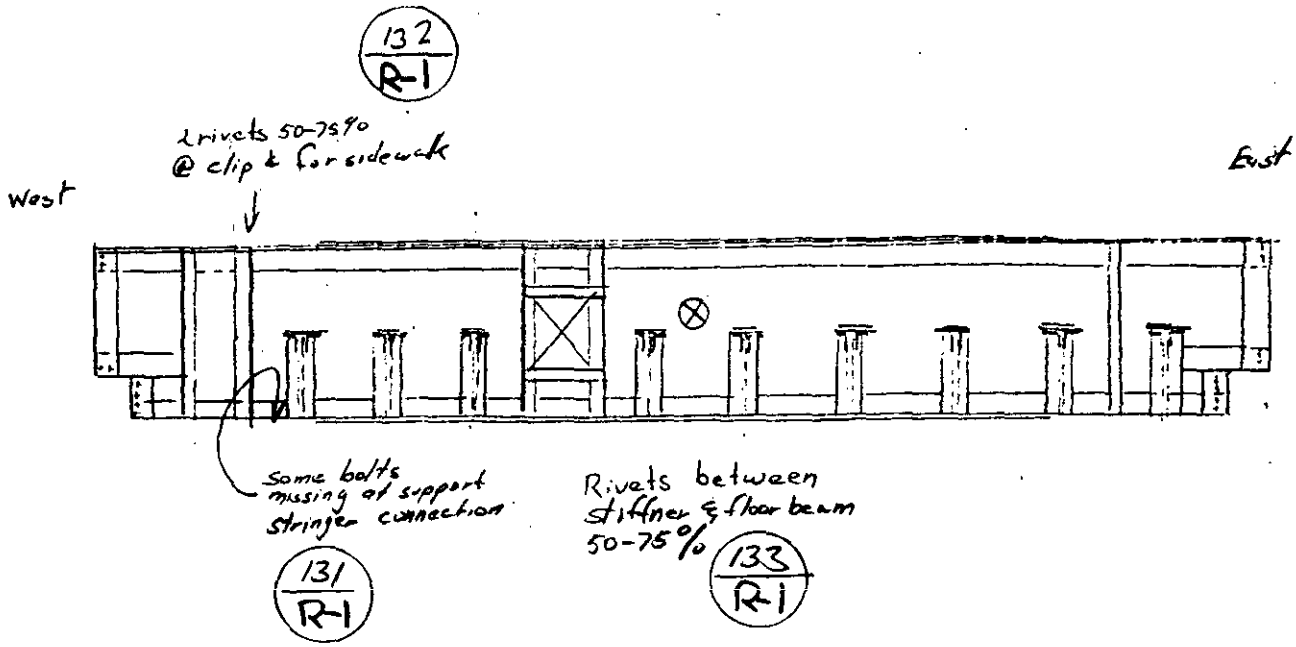
SOUTH FLOOR BEAM (Looking South)



NORTH FLOOR BEAM (Looking North)

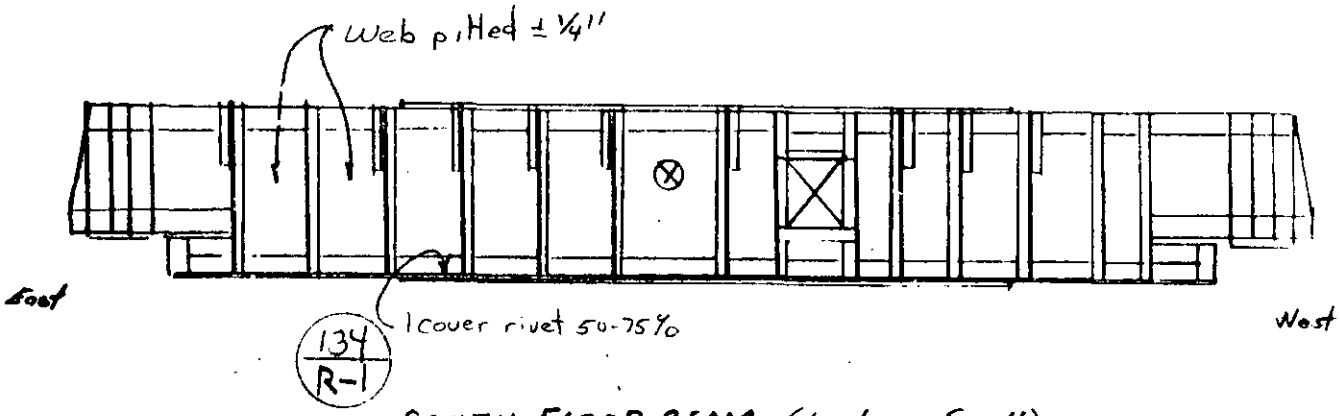


 SKETCH B/1/9-10

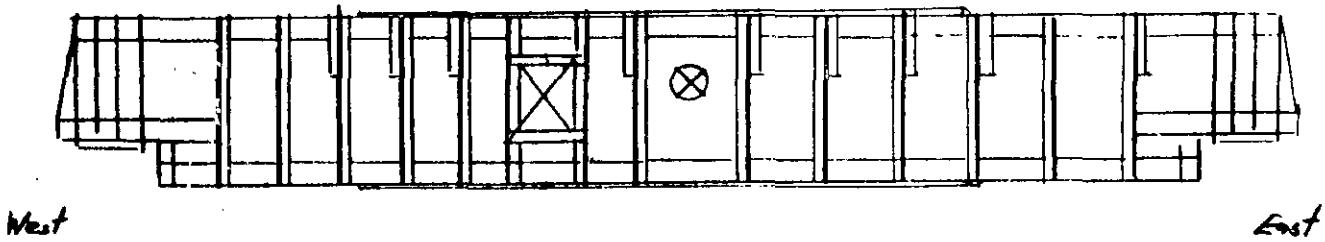


SOUTH FLOOR BEAM (looking South)
(OPPOSITE HAND)

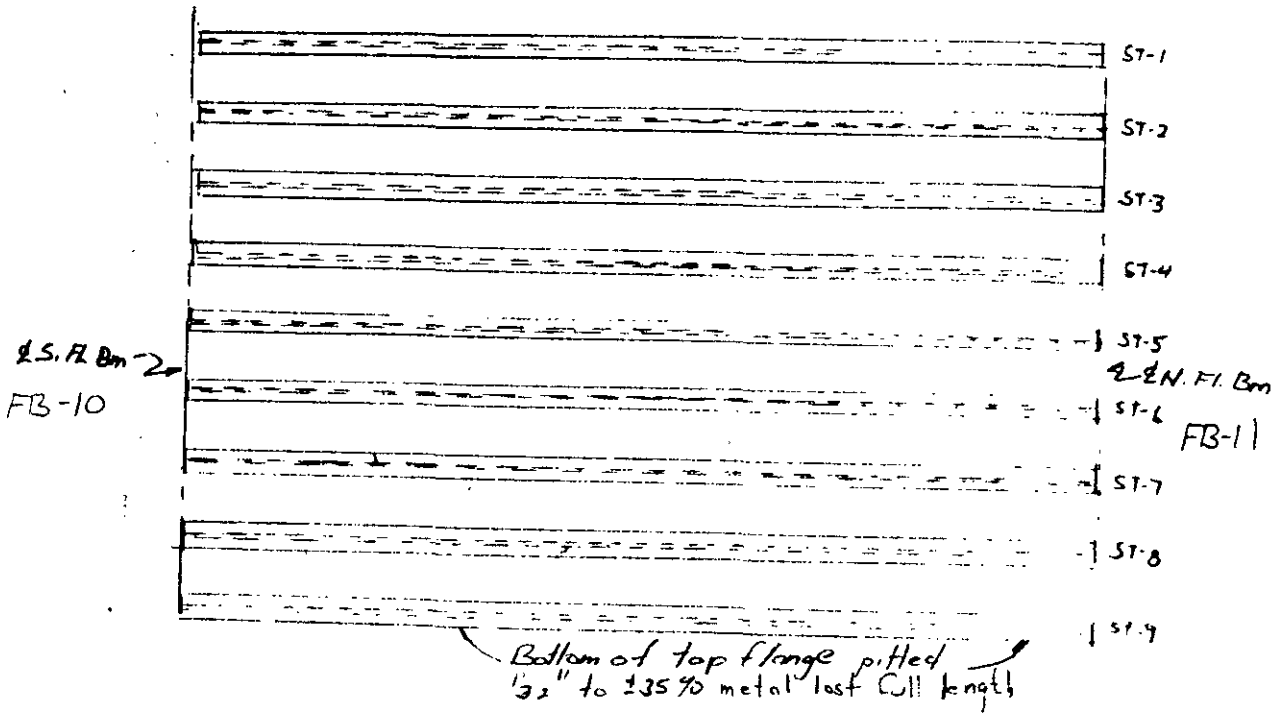
SKETCH B/1/10-11



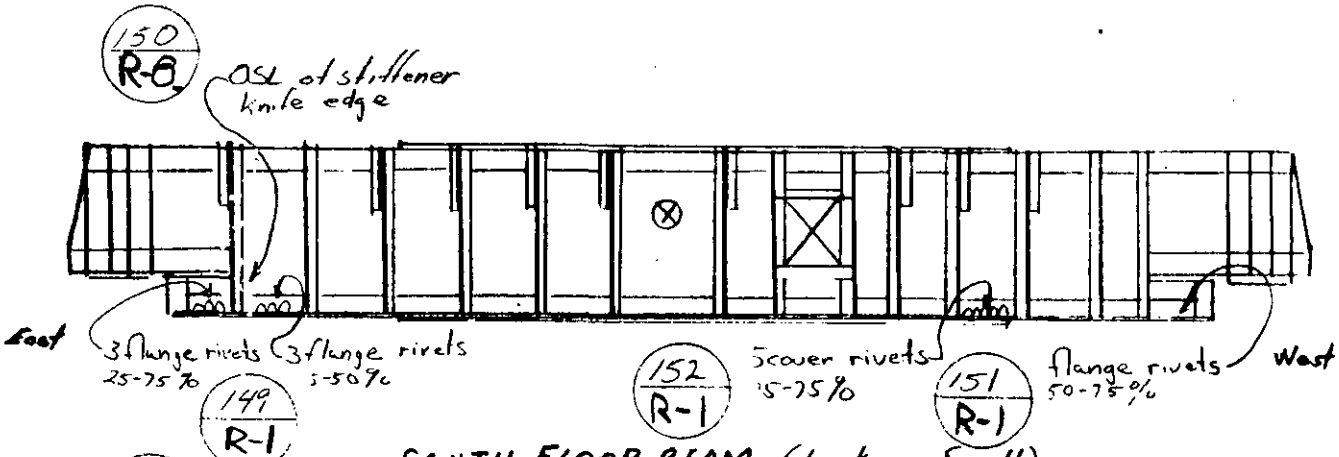
SOUTH FLOOR BEAM (Looking South)



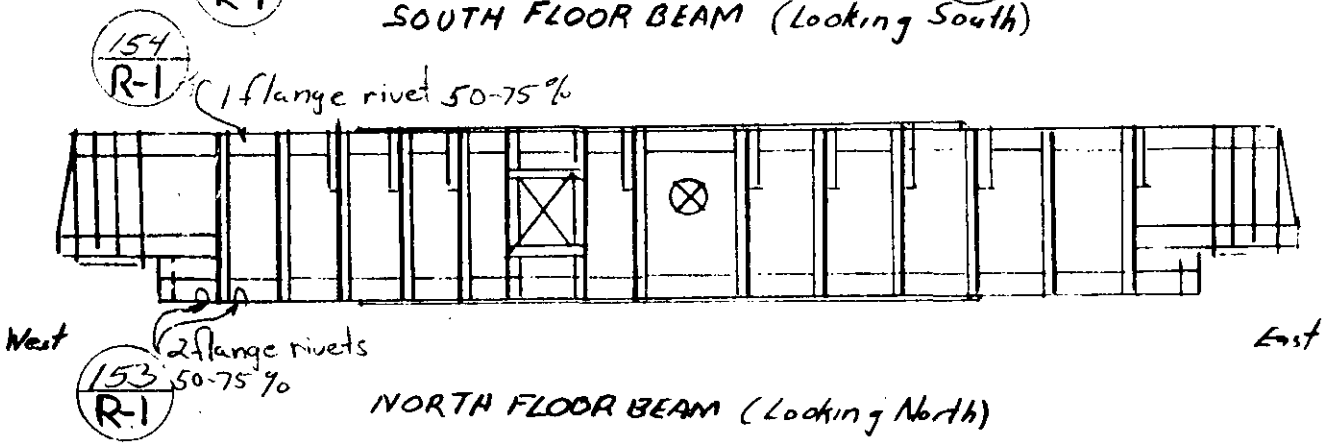
NORTH FLOOR BEAM (Looking North)



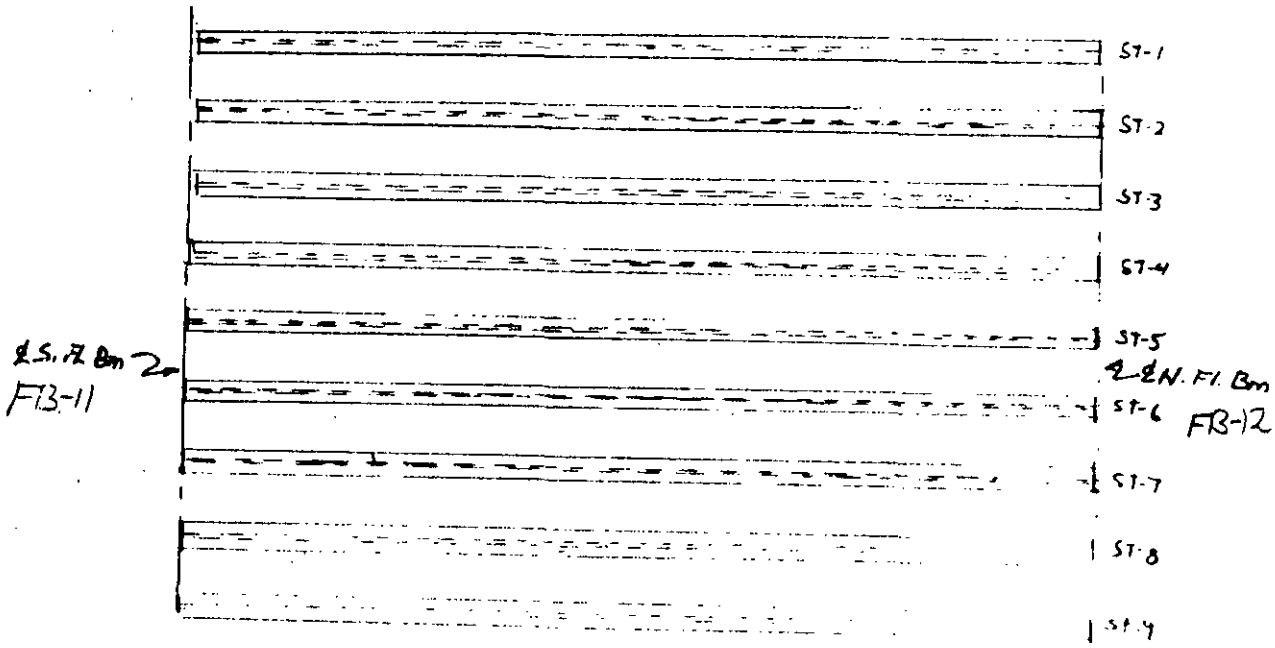
SKETCH B/1/10-11



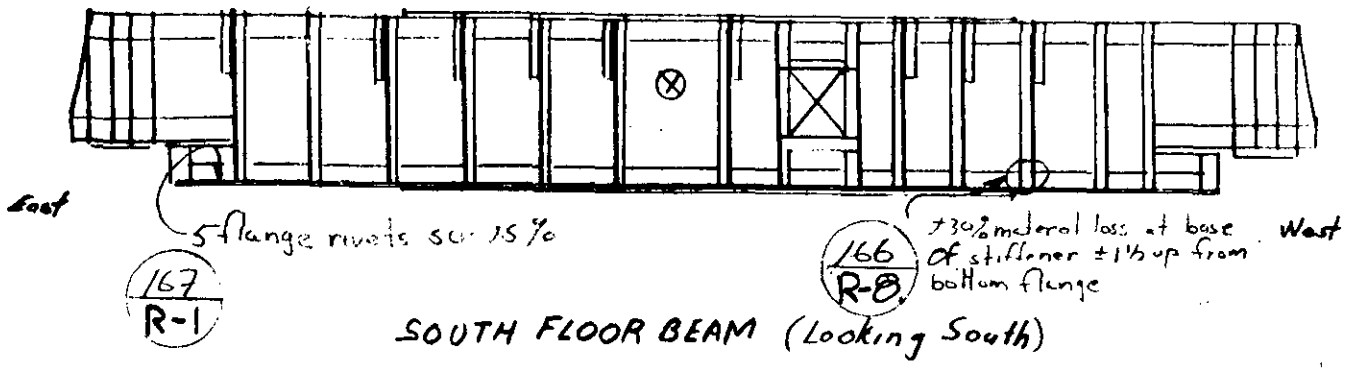
SOUTH FLOOR BEAM (Looking South)



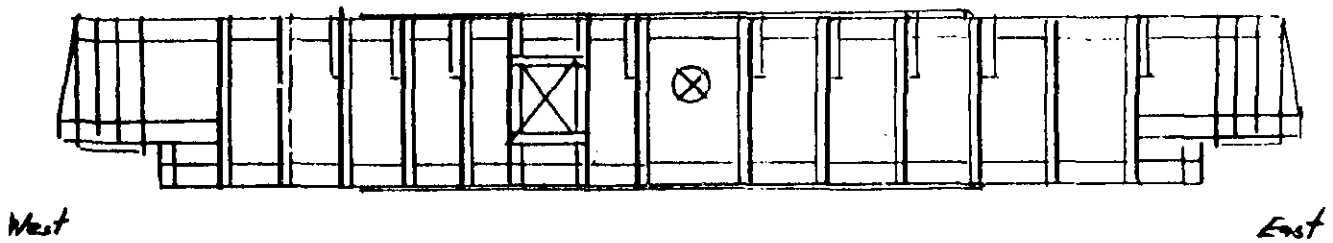
NORTH FLOOR BEAM (Looking North)



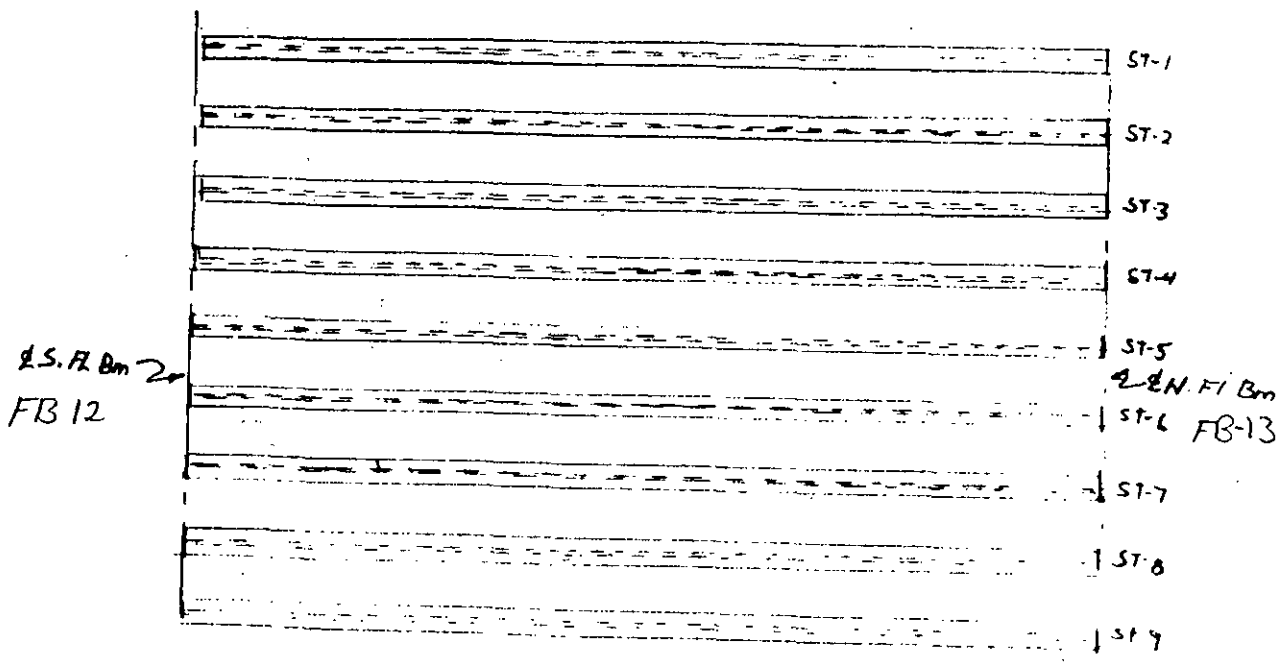
SKETCH B/1/11-12



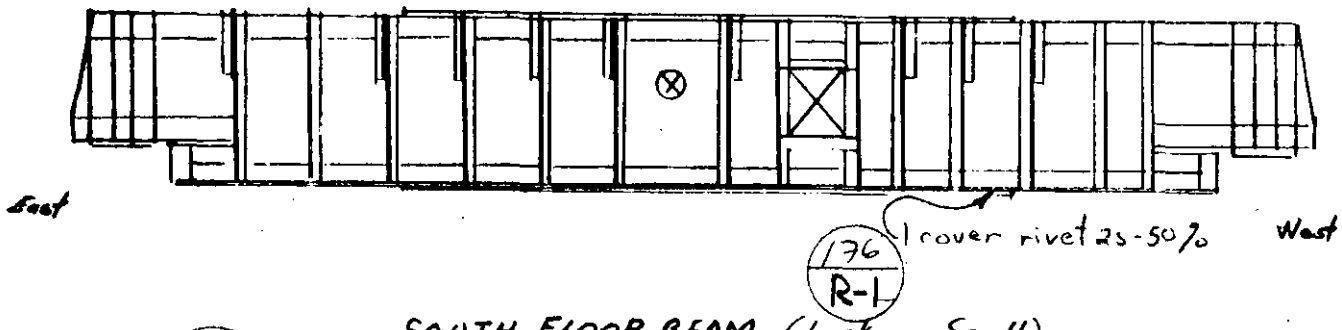
SOUTH FLOOR BEAM (Looking South)



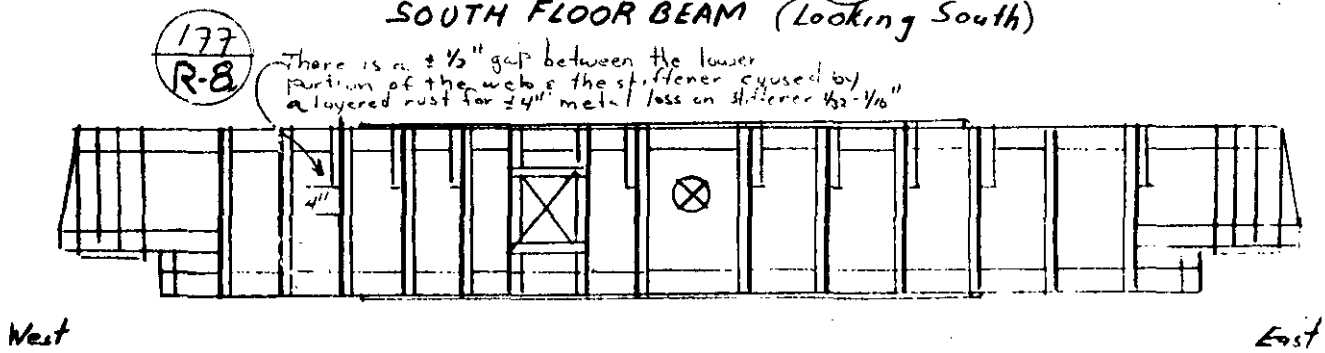
NORTH FLOOR BEAM (Looking North)



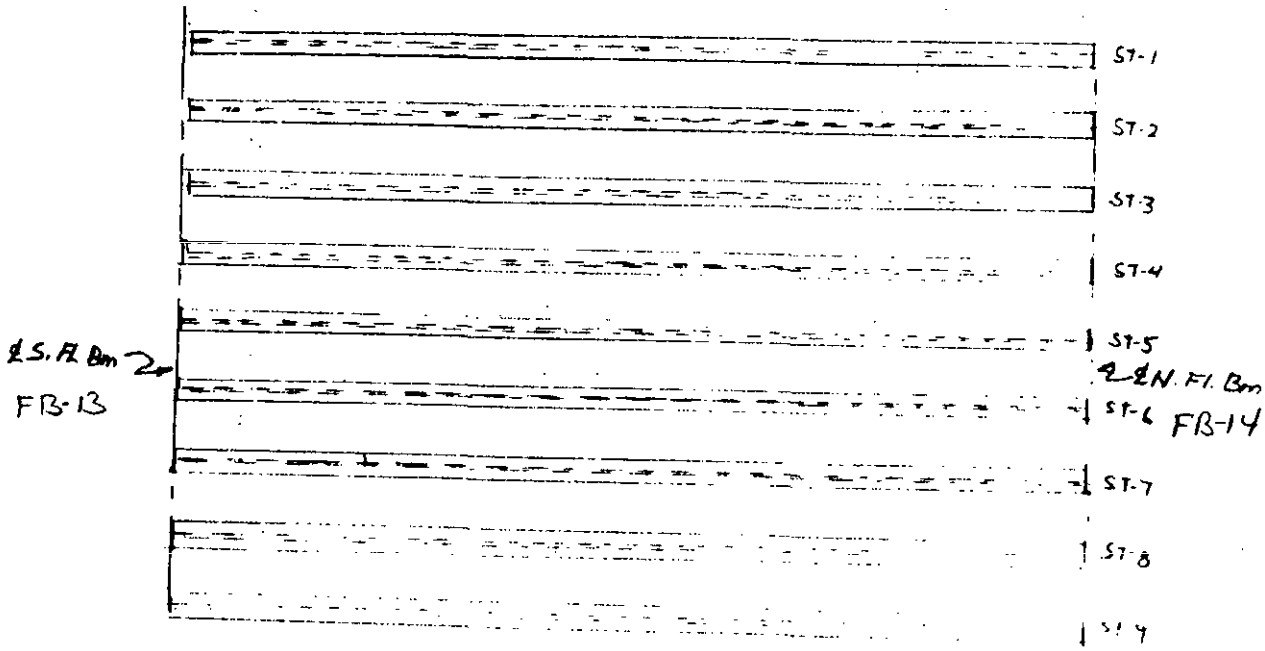
SKETCH B/1/12-13



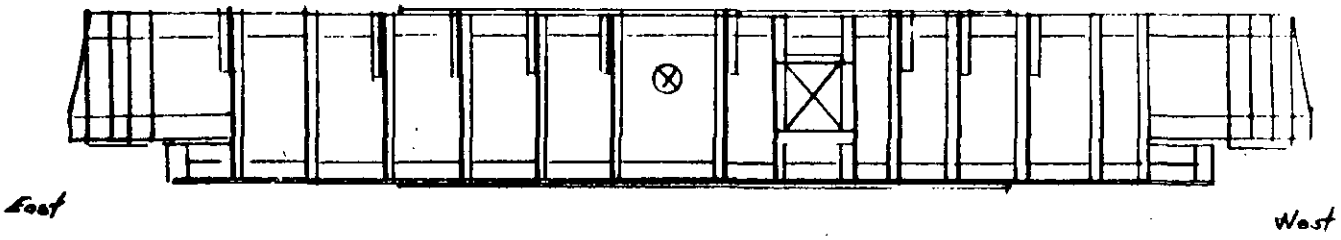
SOUTH FLOOR BEAM (Looking South)



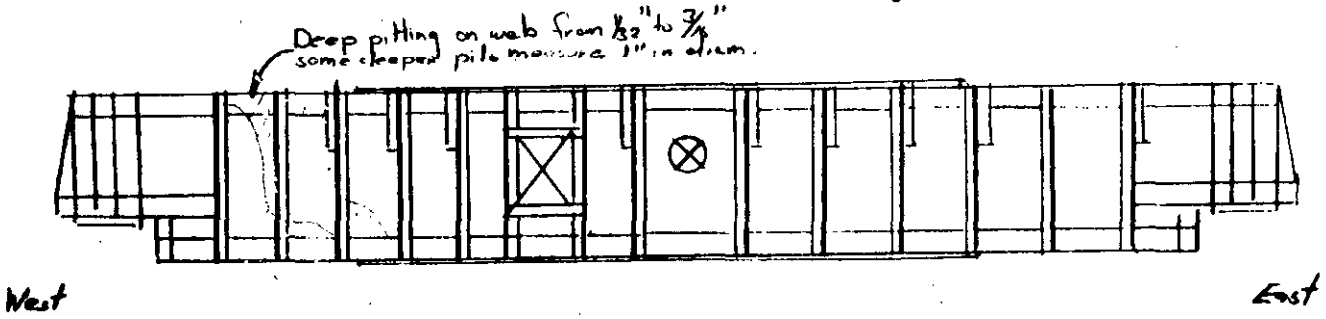
NORTH FLOOR BEAM (Looking North)



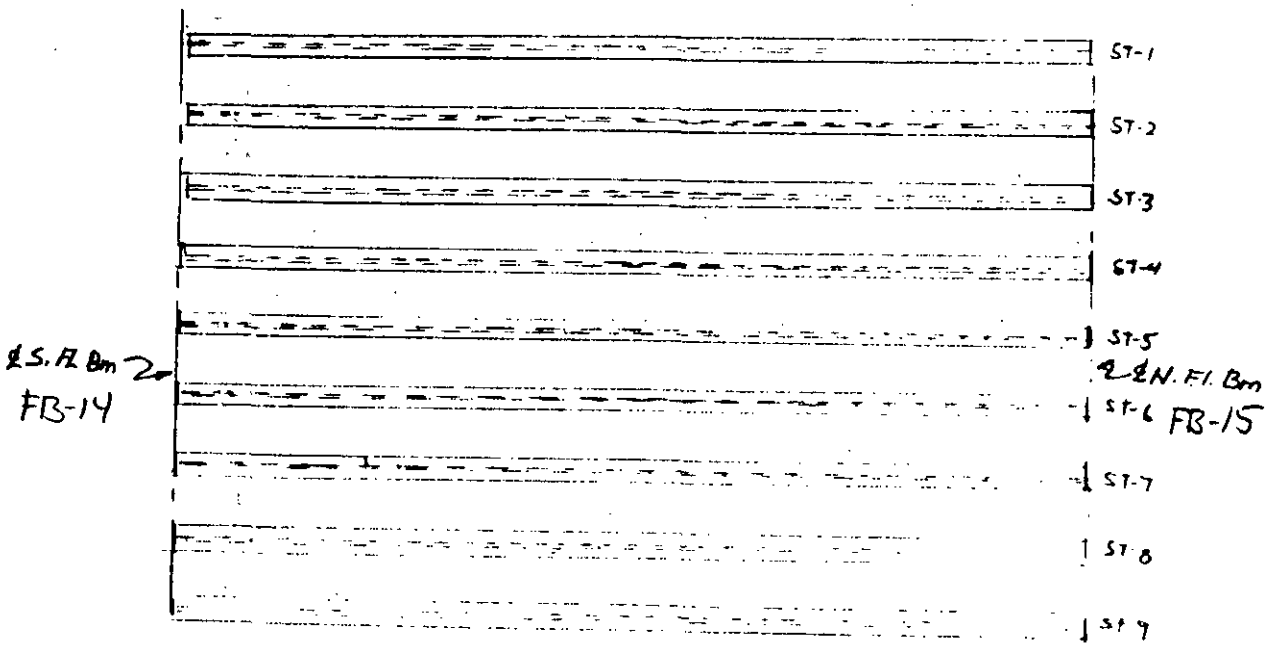
SKETCH B/1/13-14



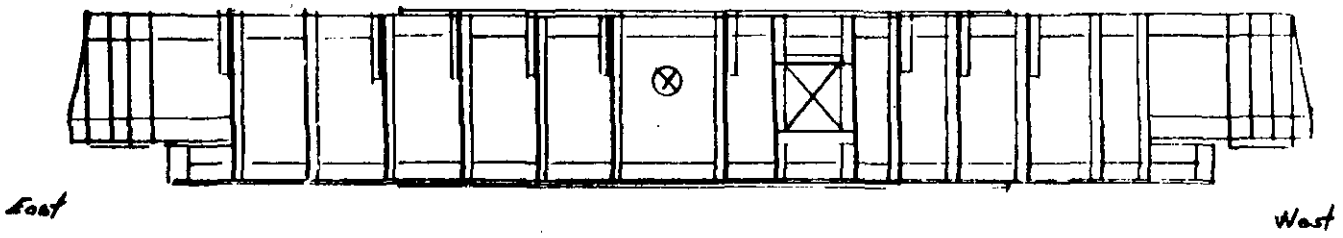
SOUTH FLOOR BEAM (Looking South)



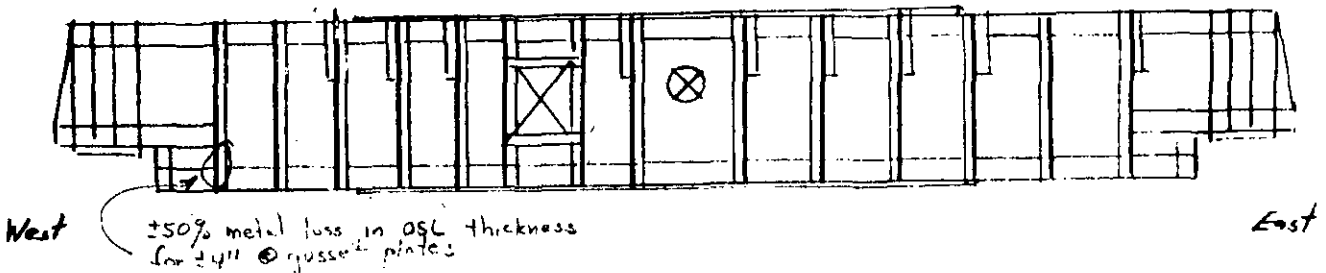
NORTH FLOOR BEAM (Looking North)



SKETCH 13/1/14-15



SOUTH FLOOR BEAM (Looking South)



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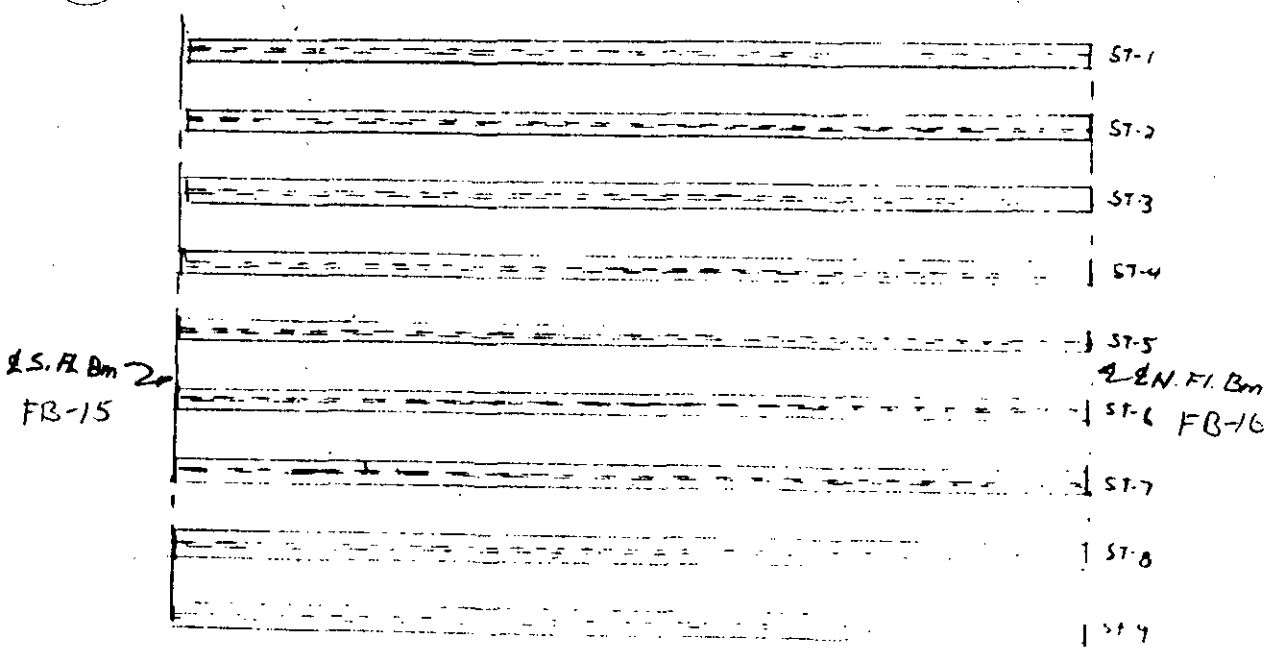
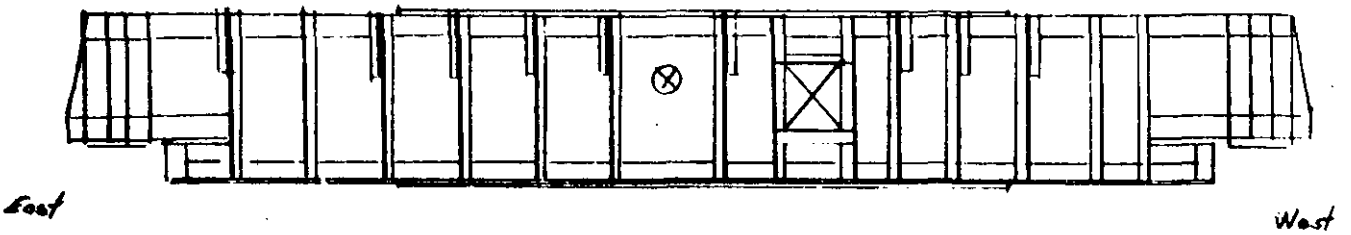
R-8

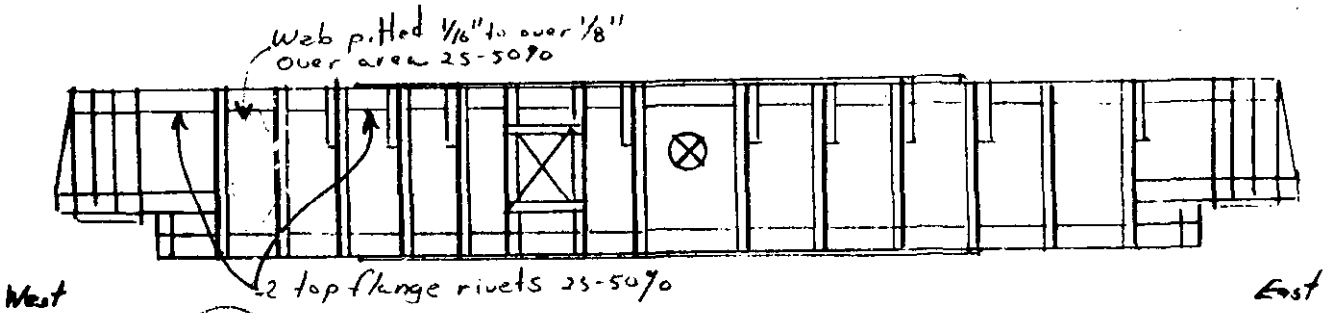
NORTH FLOOR BEAM (Looking North)



SKETCH B/1/15-16



SOUTH FLOOR BEAM (Looking South)



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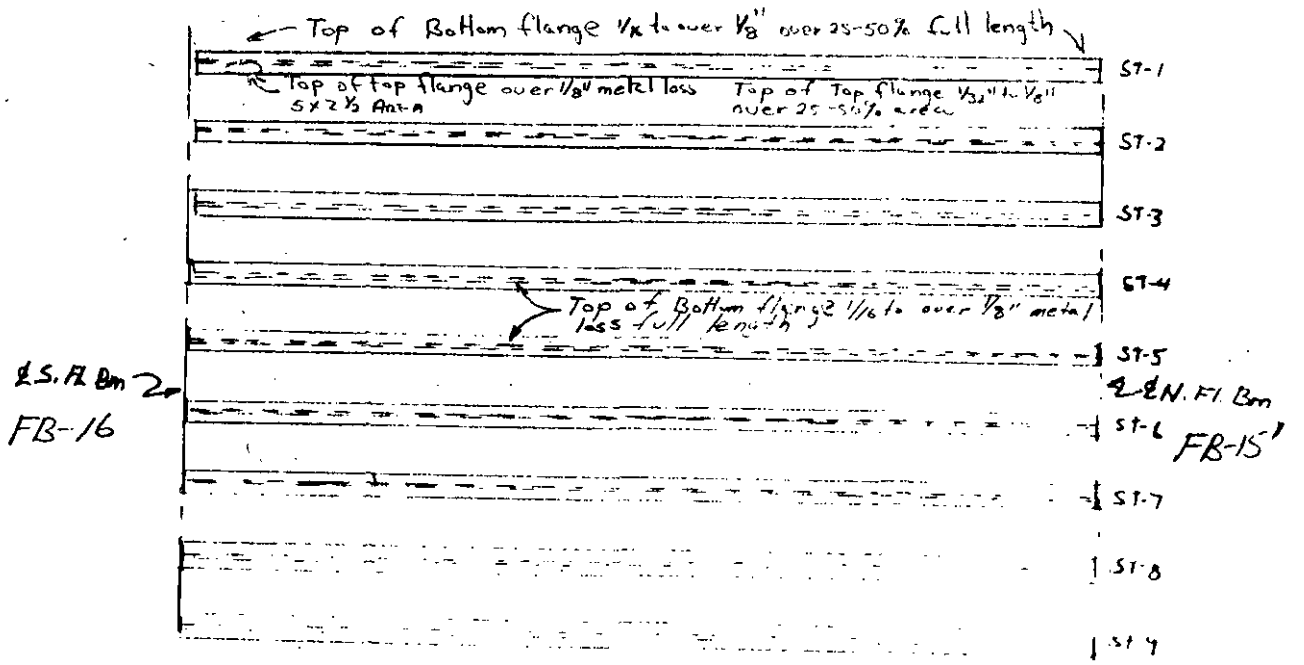
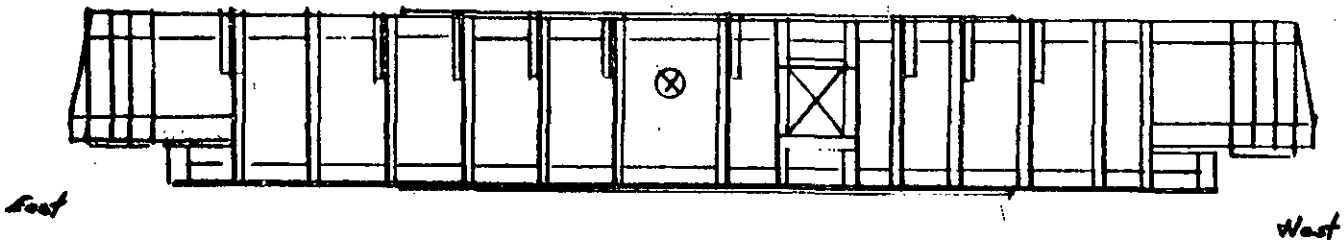
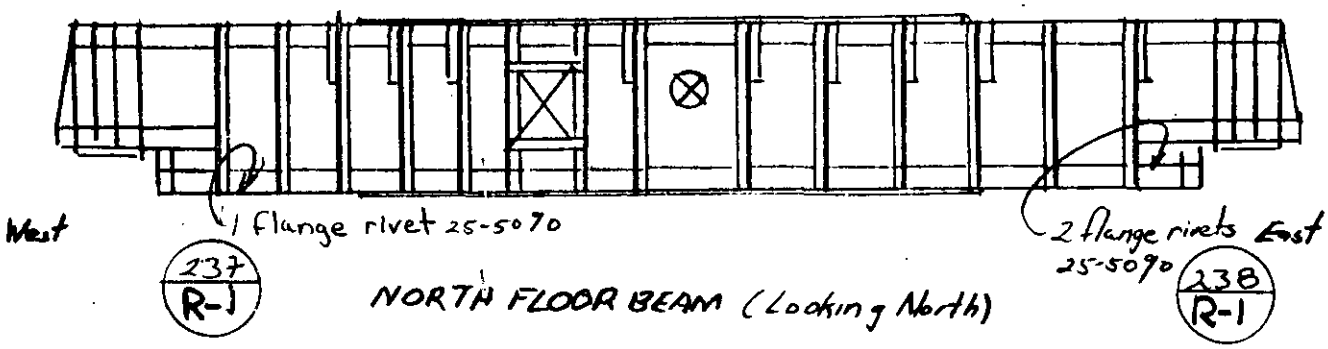
NORTH FLOOR BEAM (Looking North)



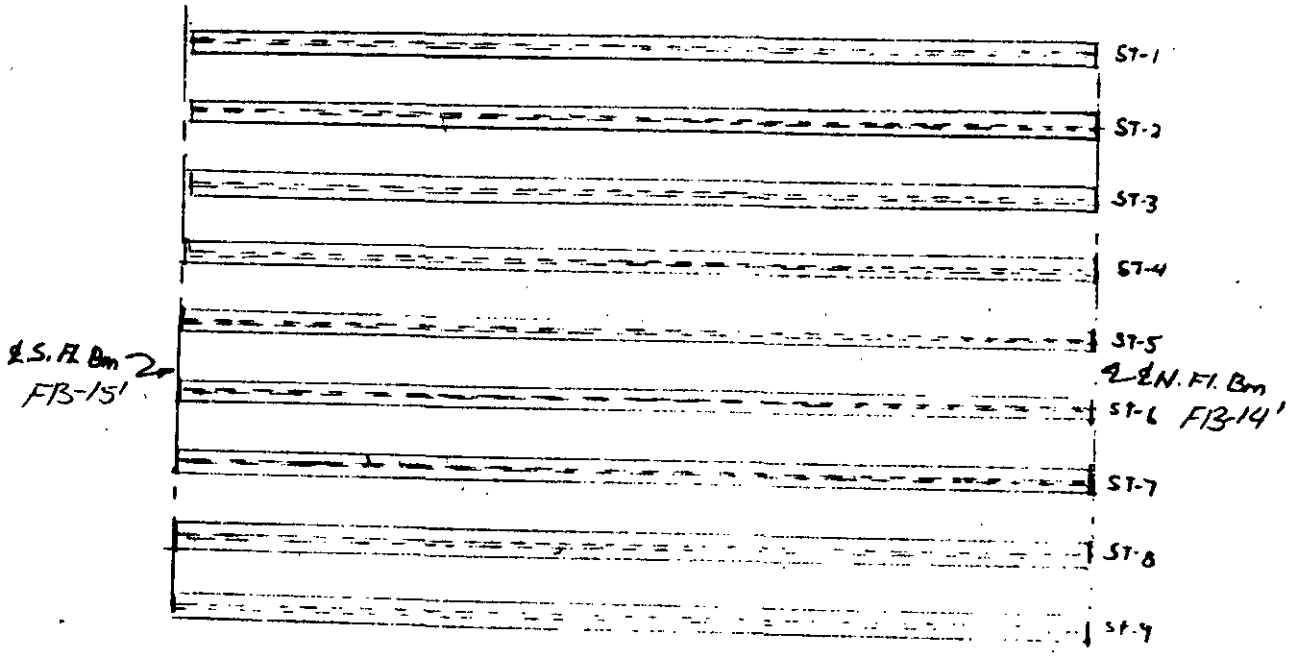
SKETCH B/1/16-15'



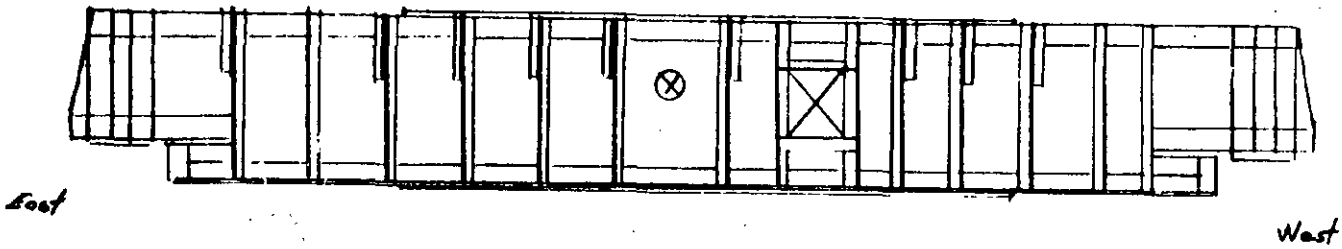
SOUTH FLOOR BEAM (Looking South)



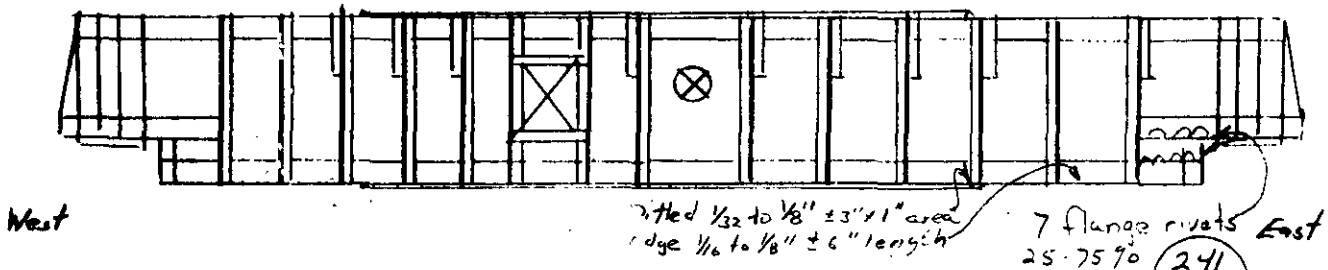
NORTH FLOOR BEAM (Looking North)



SKETCH B/1/15'-14'



SOUTH FLOOR BEAM (Looking South)



NORTH FLOOR BEAM (Looking North)

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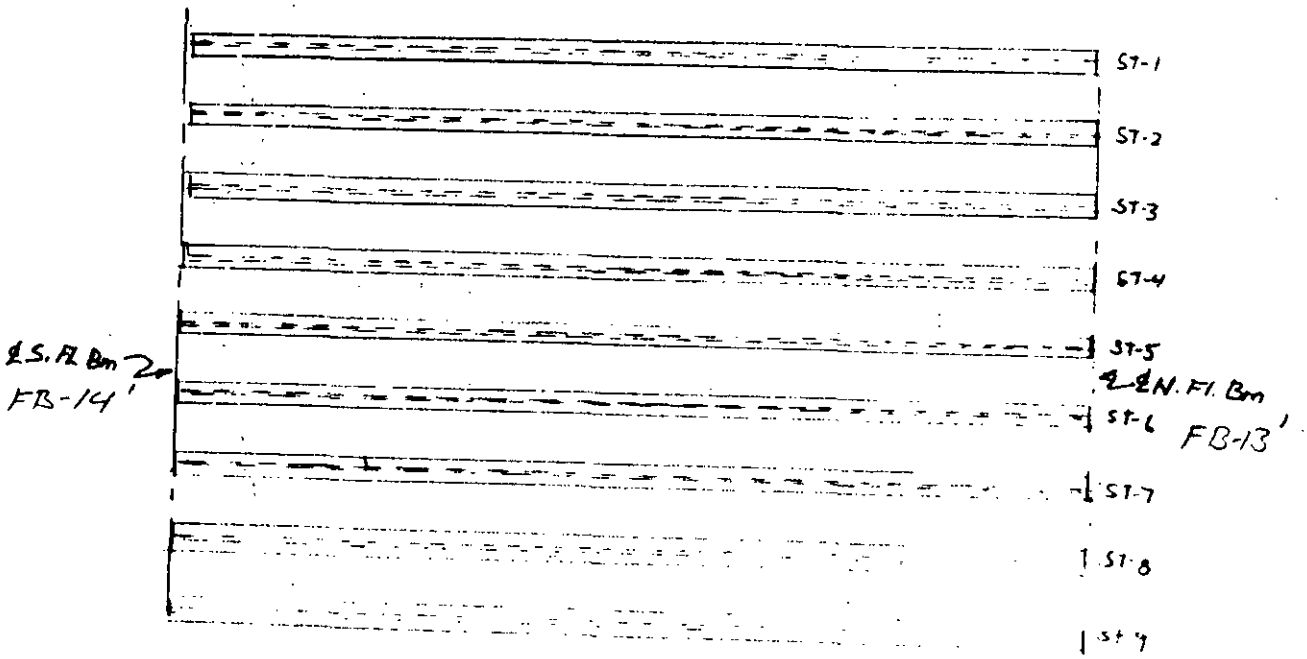
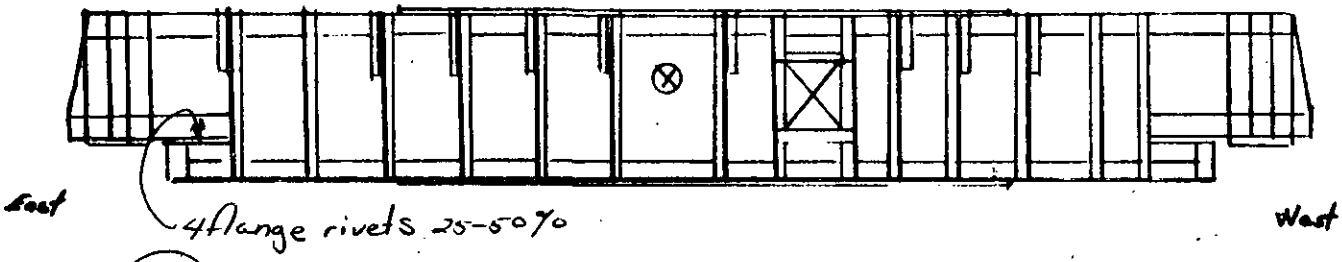
R-1



SKETCH B/1/14-13'



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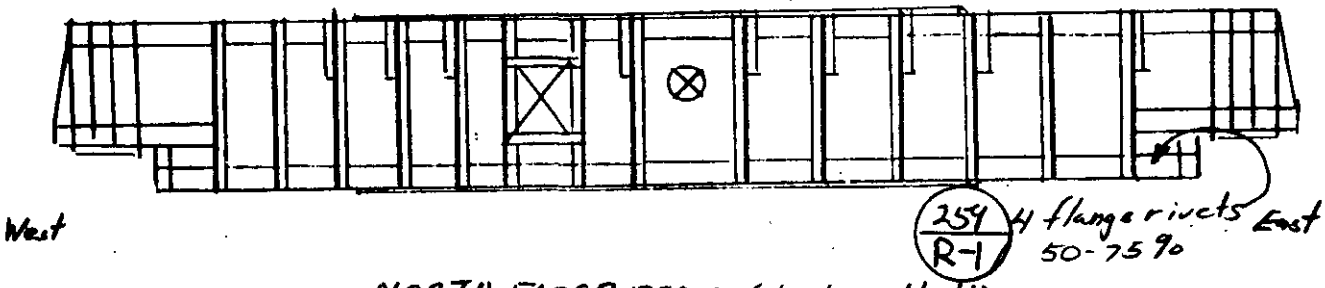
SOUTH FLOOR BEAM (Looking South)



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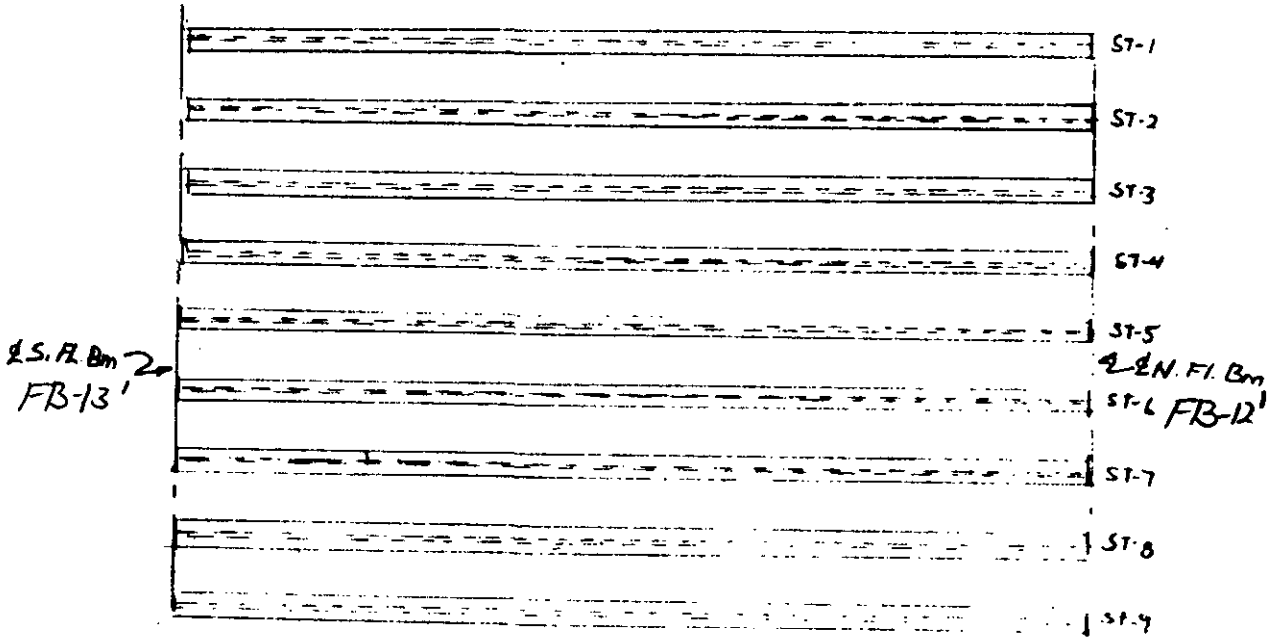
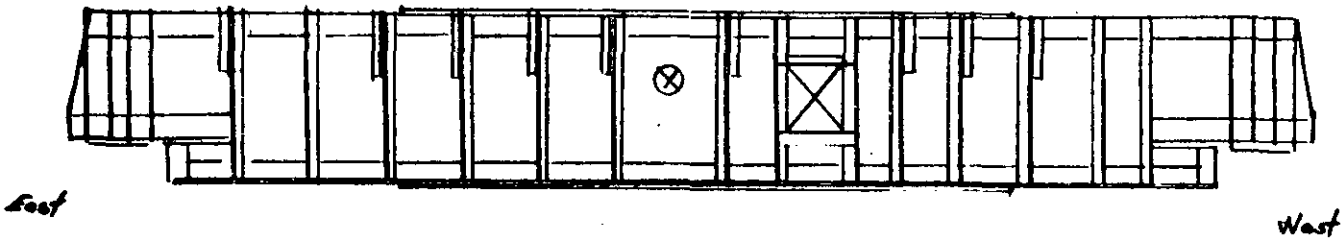
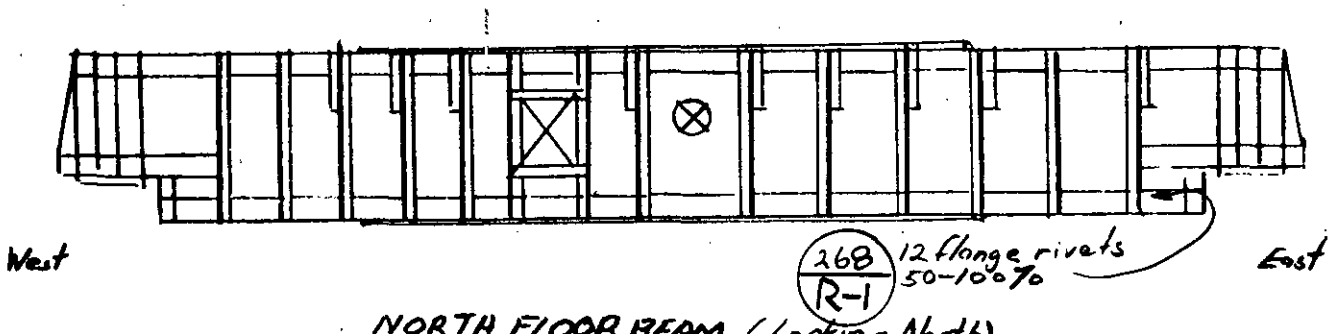
NORTH FLOOR BEAM (Looking North)



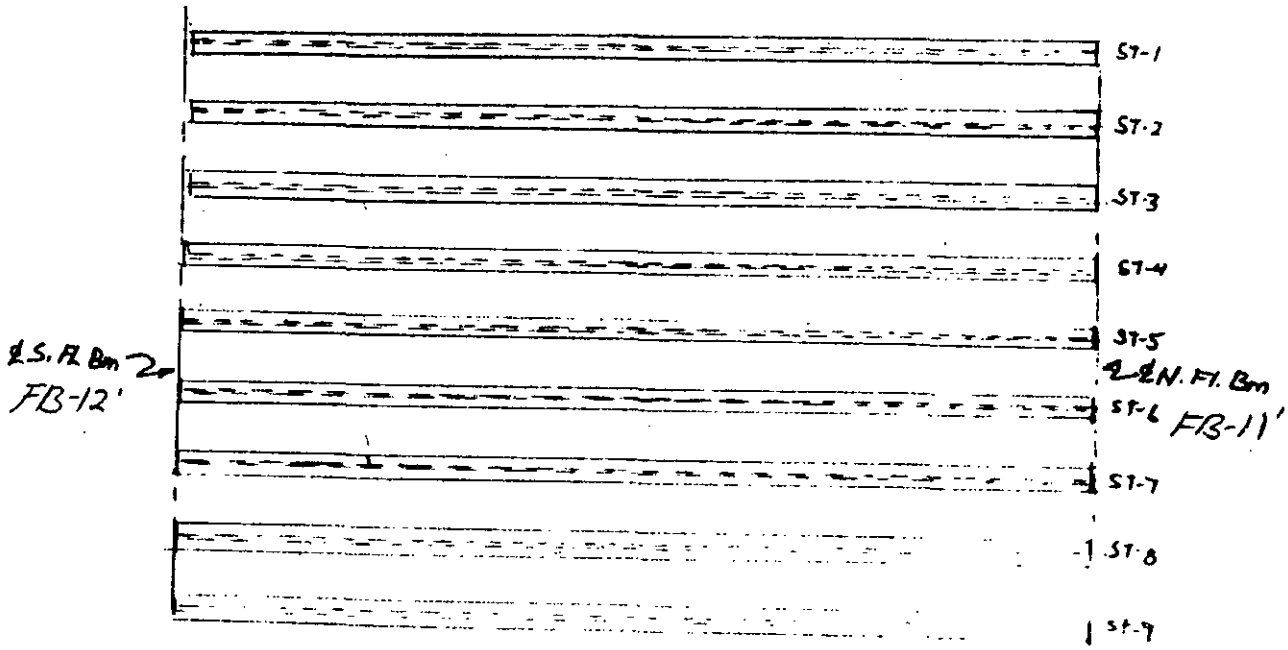
SKETCH B/1/13'-12'



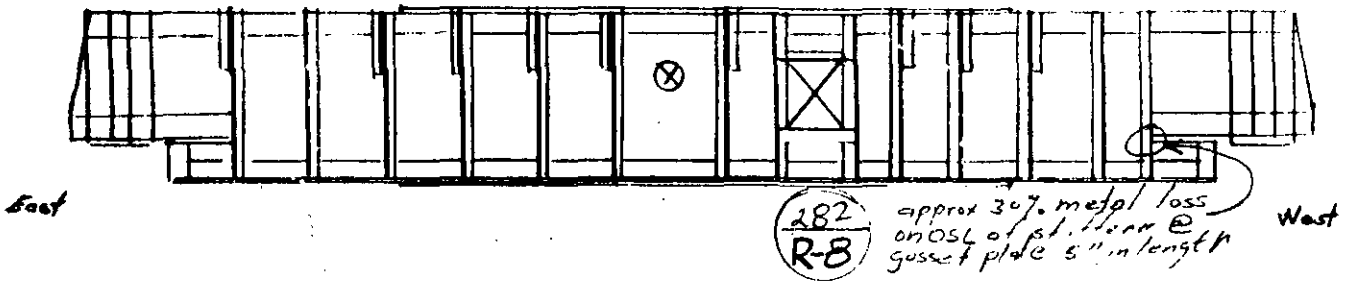
SOUTH FLOOR BEAM (Looking South)



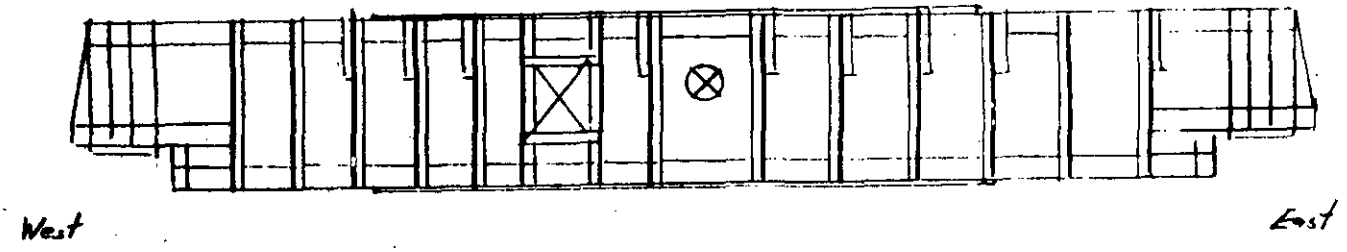
NORTH FLOOR BEAM (Looking North)



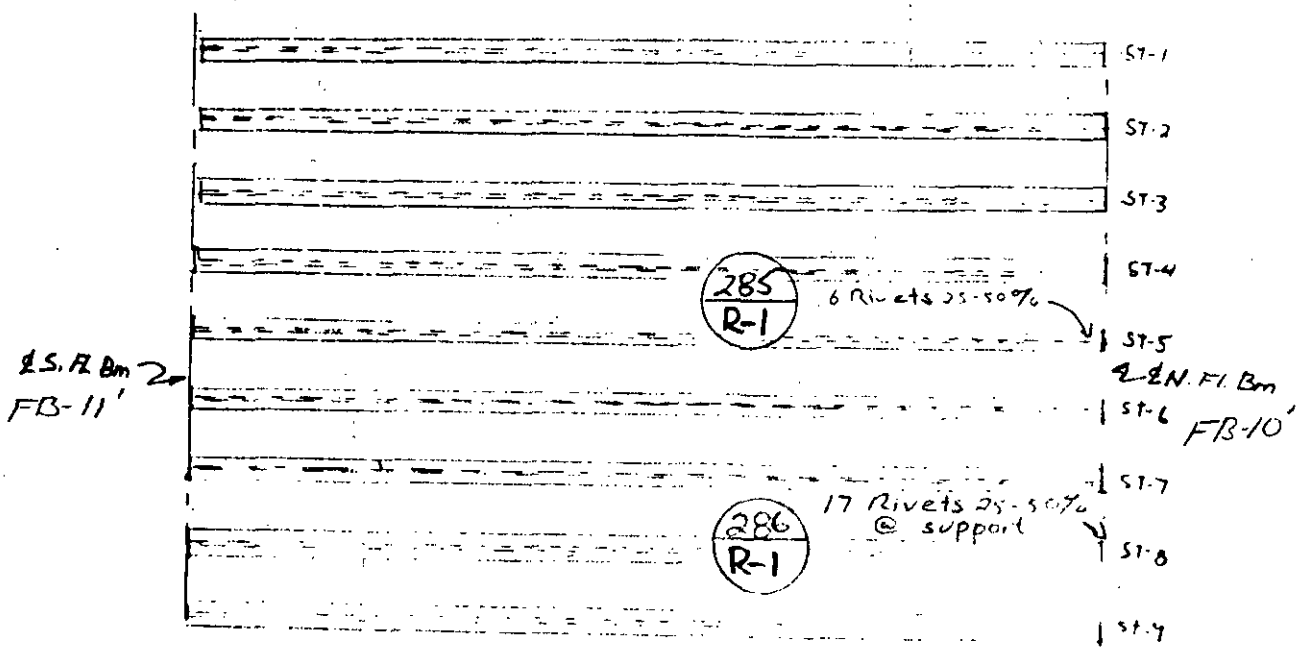
SKETCH B/1/12-11'



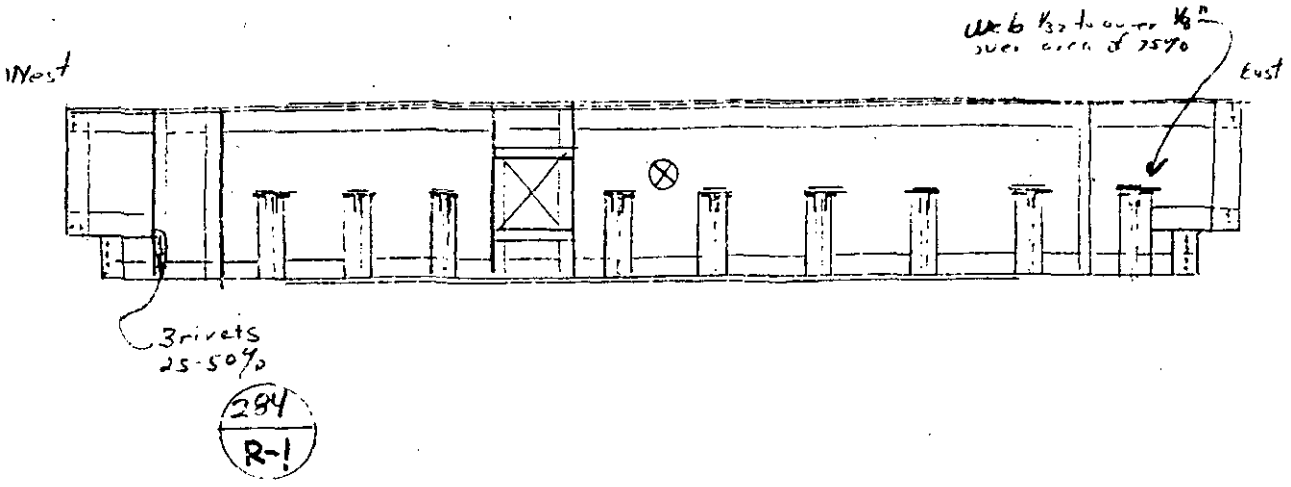
SOUTH FLOOR BEAM (Looking South)



NORTH FLOOR BEAM (Looking North)

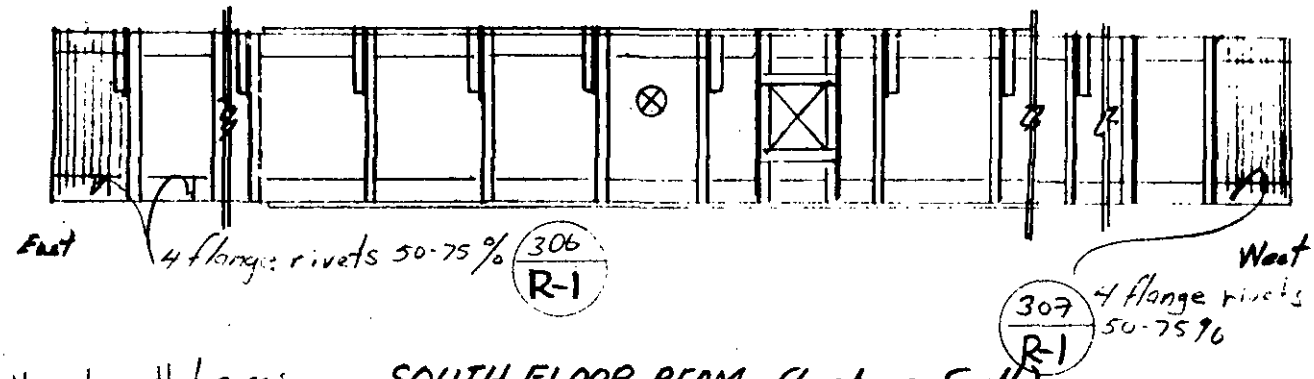


SKETCH B/1/11'-10'

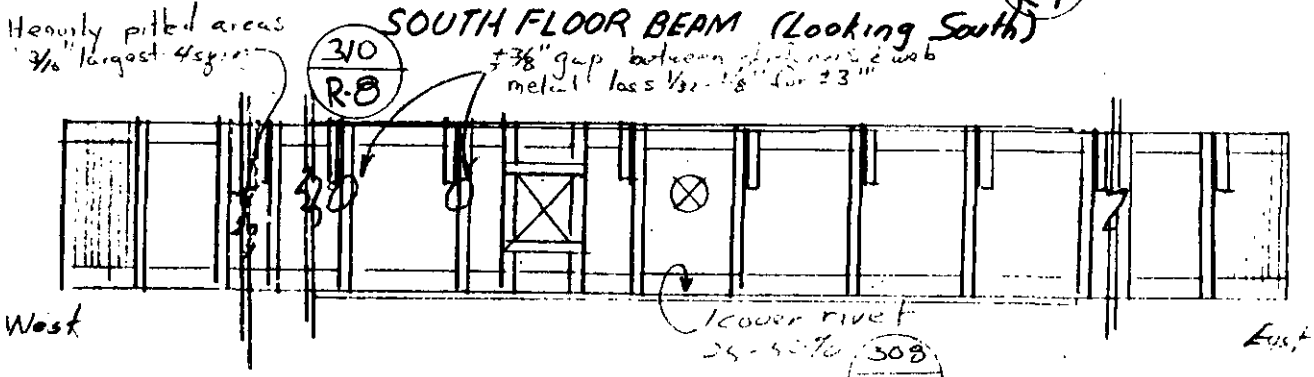


NORTH FLOOR BEAM (Looking North)

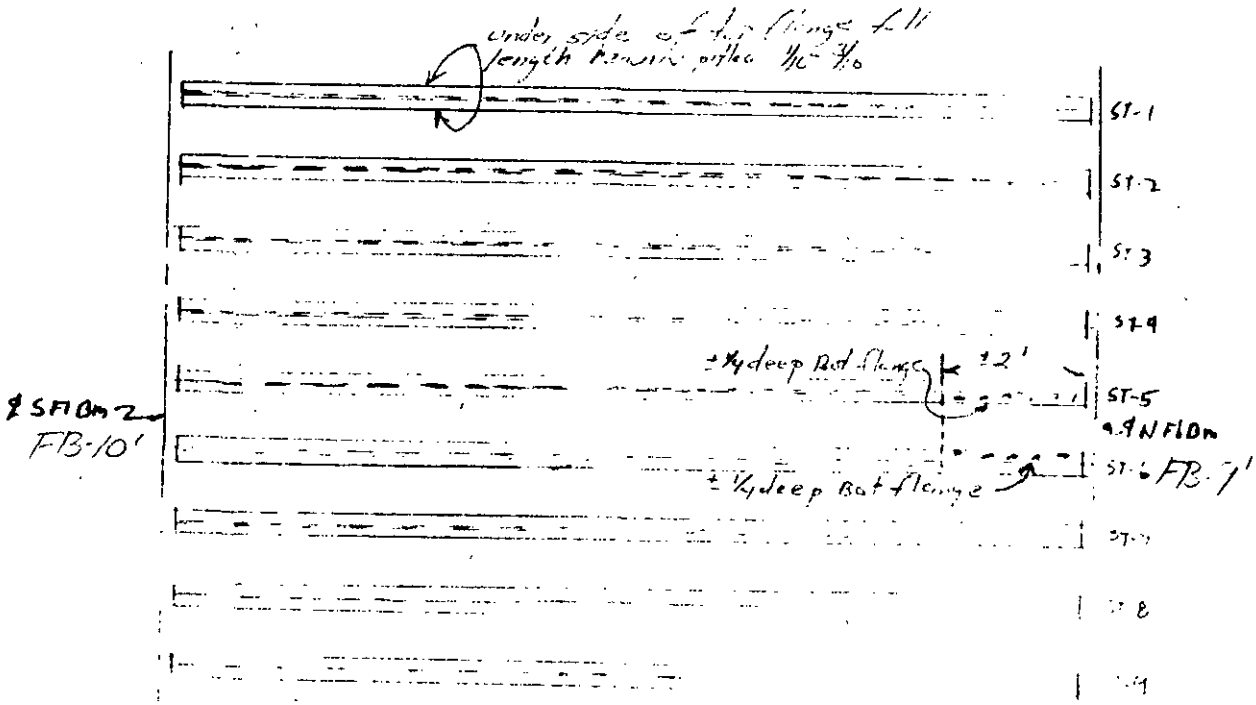
SKETCH 13/1/11-10'



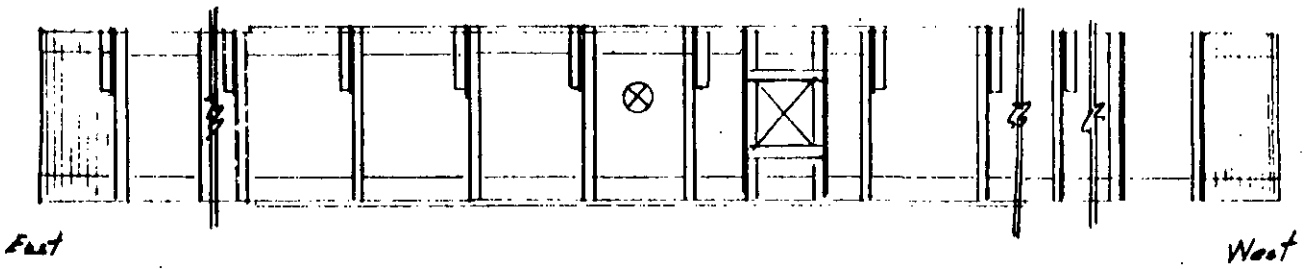
SOUTH FLOOR BEAM (Looking South)



NORTH FLOOR BEAM (Looking North)



SKETCH B/1/10'-9'



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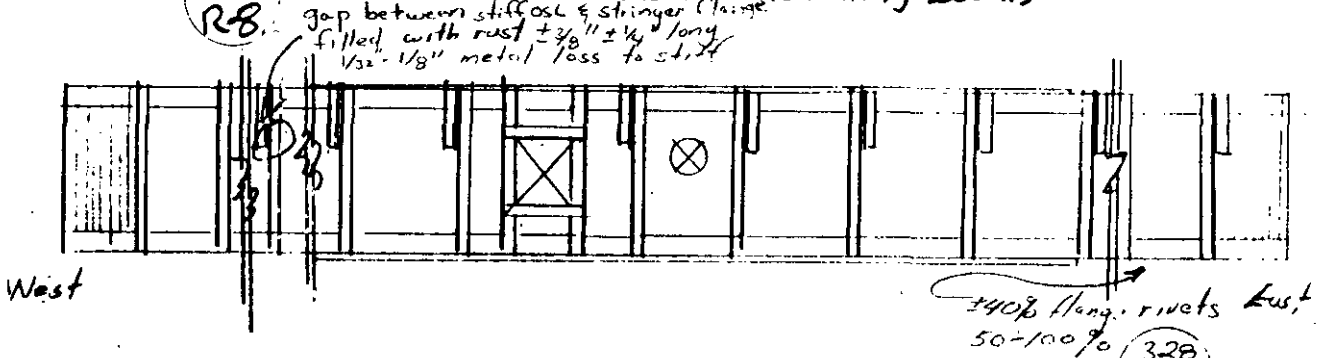
SOUTH FLOOR BEAM (Looking South)



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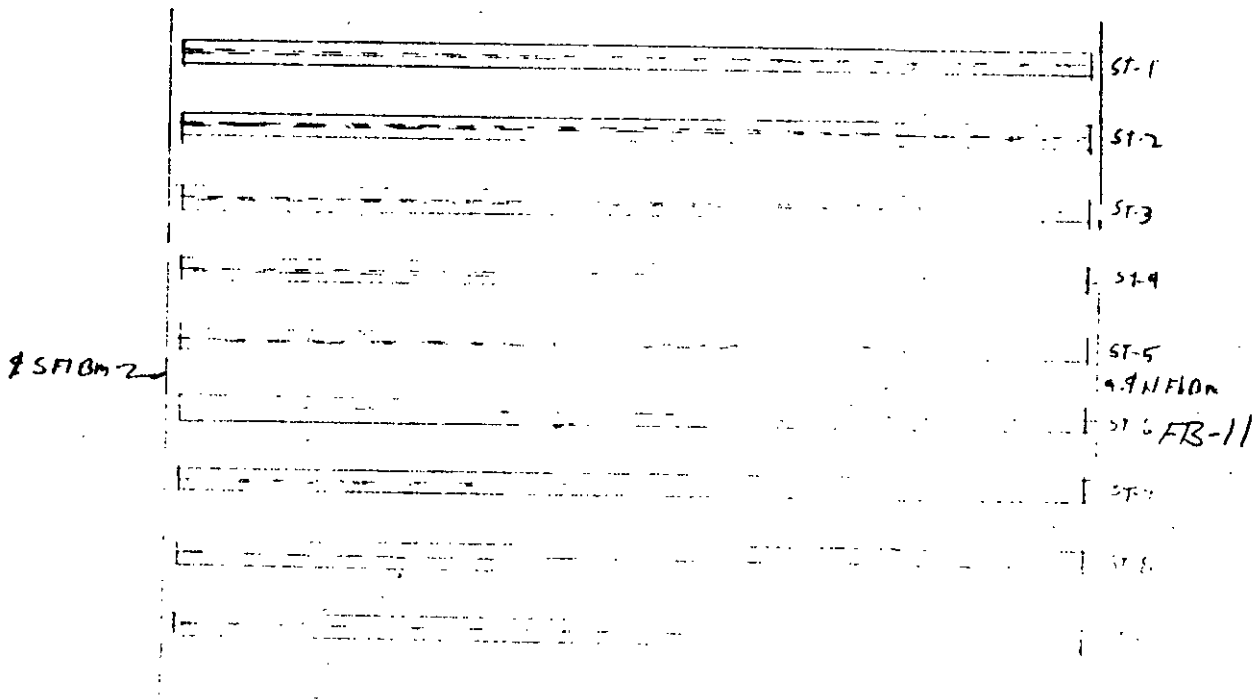
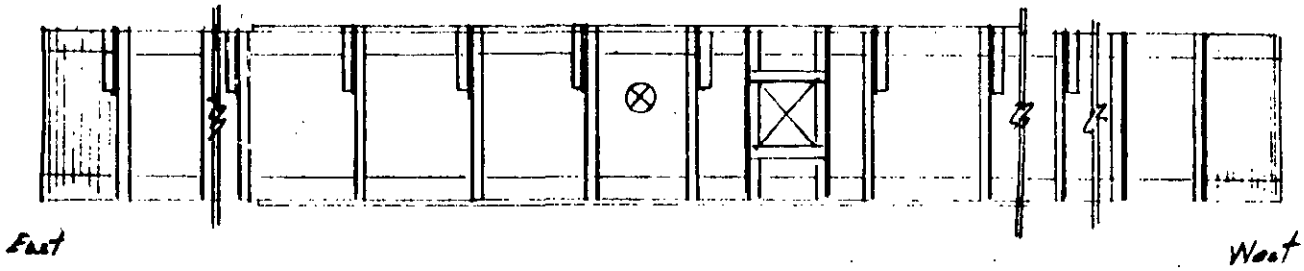
R-1

NORTH FLOOR BEAM (Looking North)



SKETCH 5/2/98



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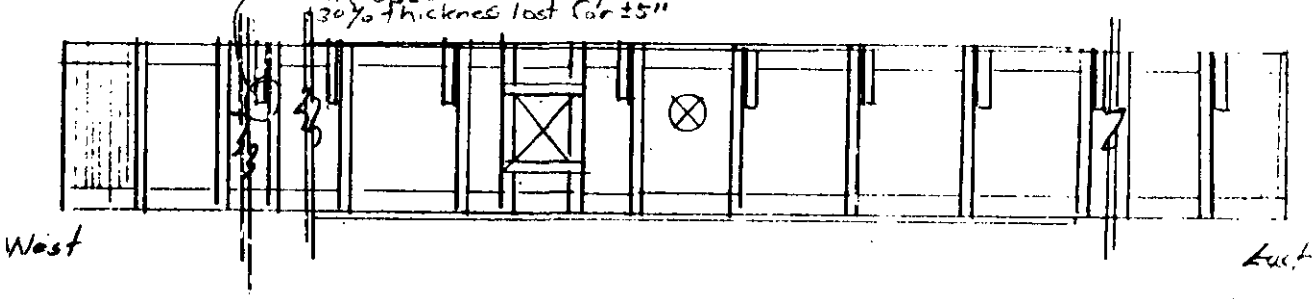
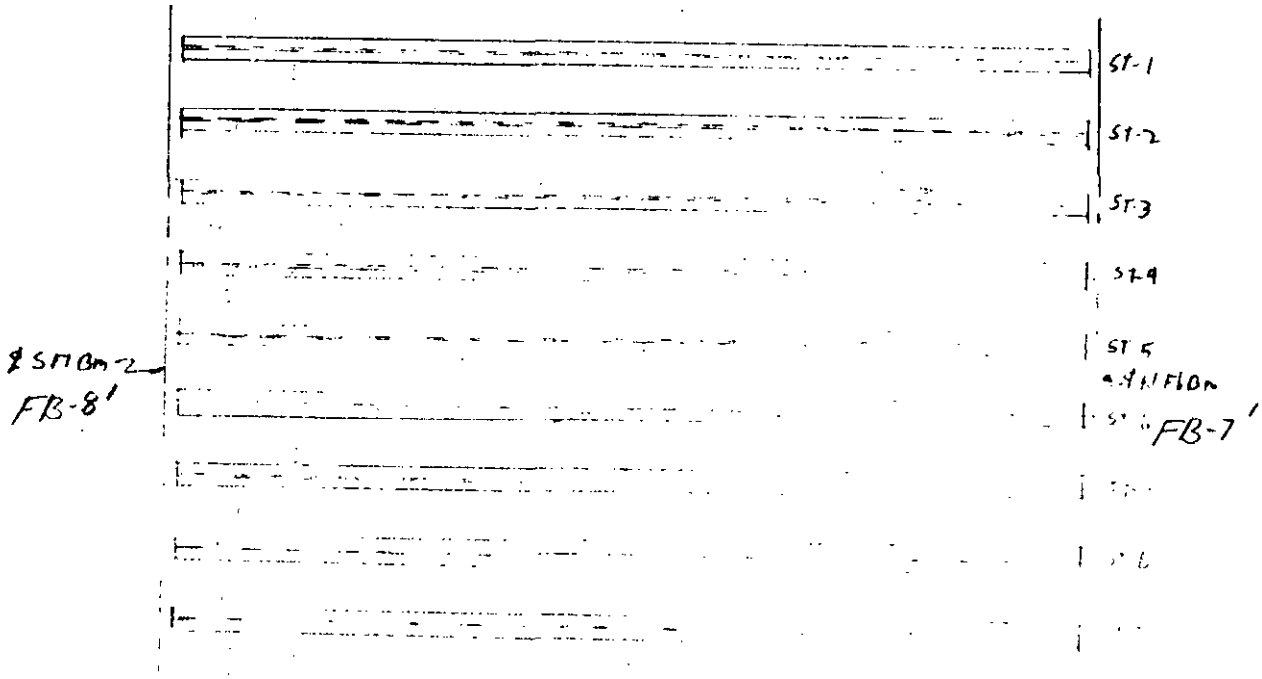
R8

SOUTH FLOOR BEAM (Looking South)

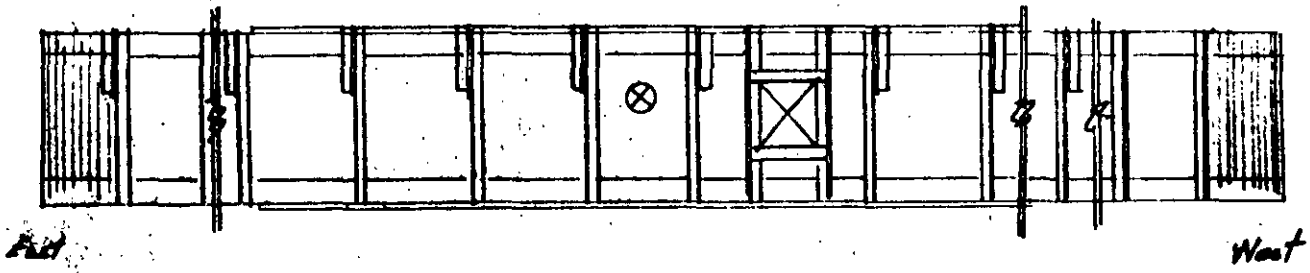
±3/4" gap between stringer web and ss stiff with layered rust 30% thickness lost (or ±5"



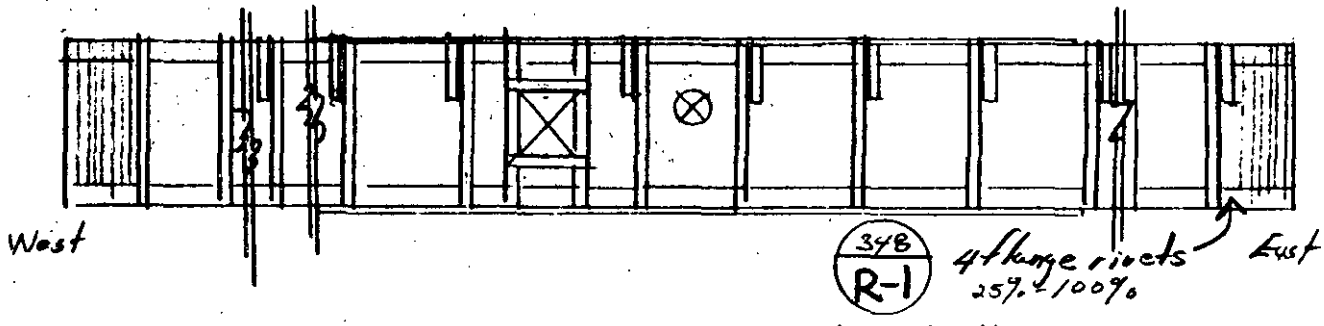
NORTH FLOOR BEAM (Looking North)



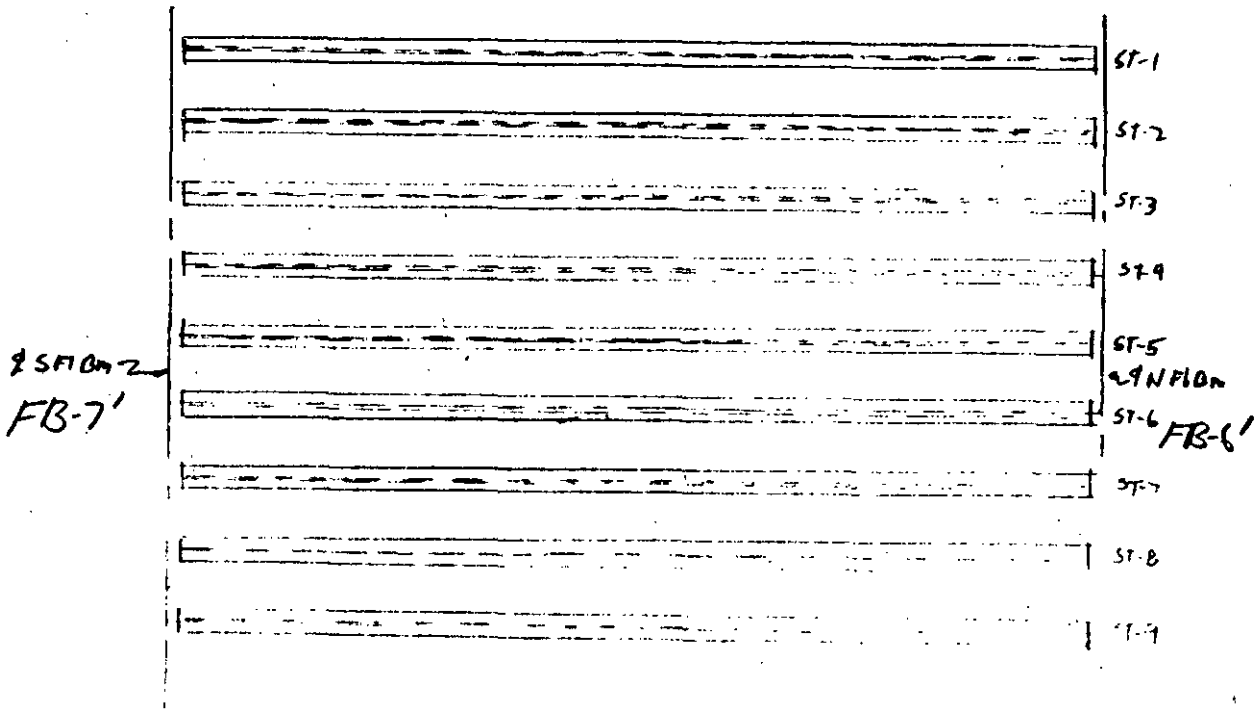
SKETCH B/2/8L7'



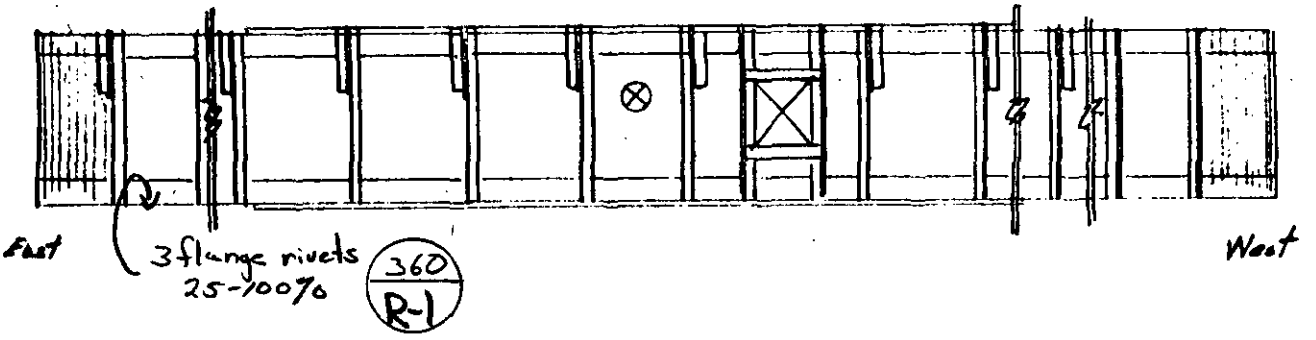
SOUTH FLOOR BEAM (Looking South)



NORTH FLOOR BEAM (Looking North)

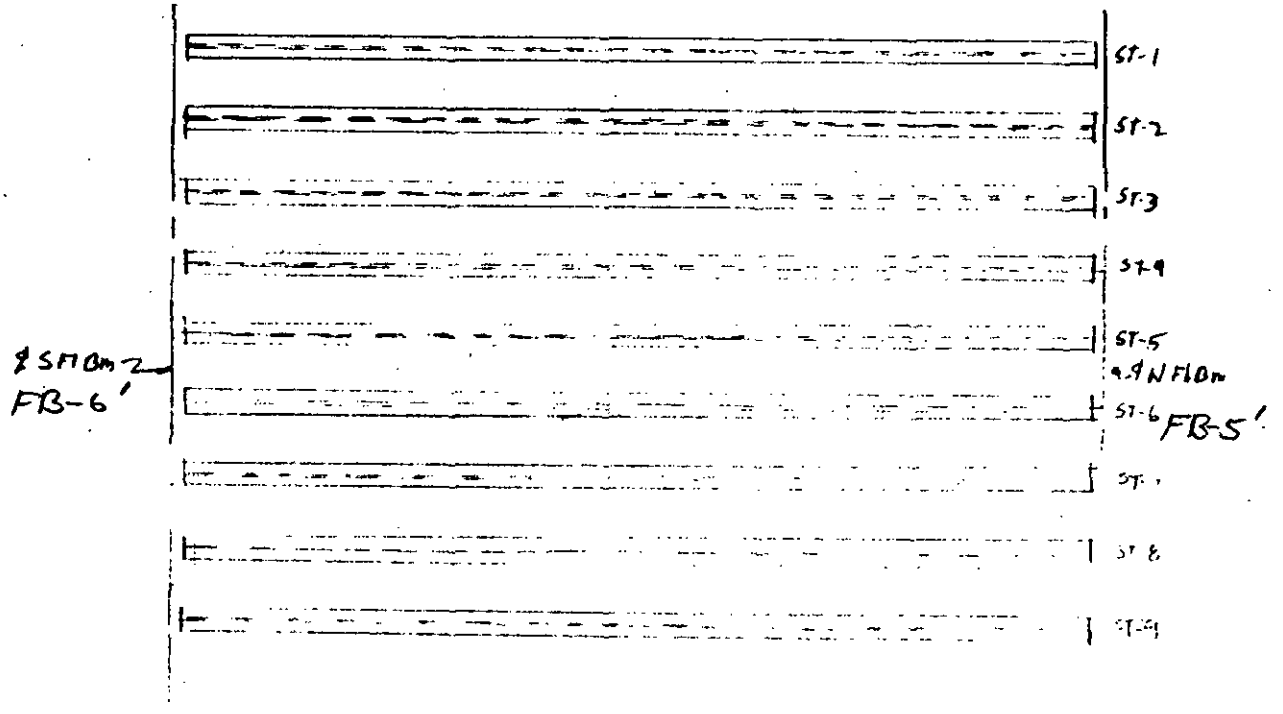


SKETCH B/2/7'-6'

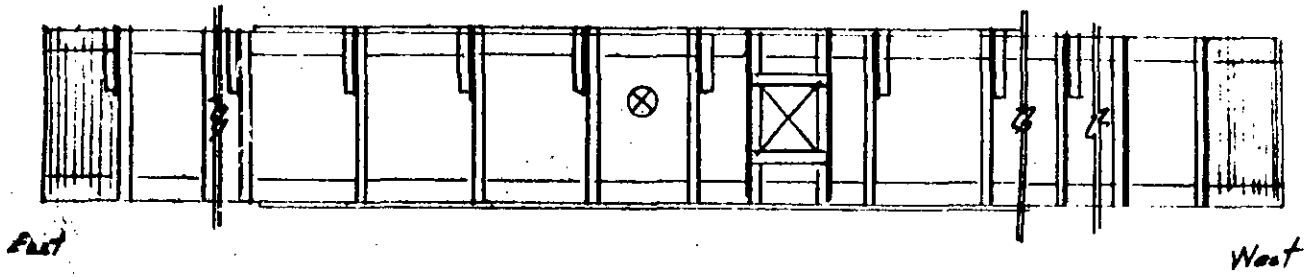


SOUTH FLOOR BEAM (Looking South)

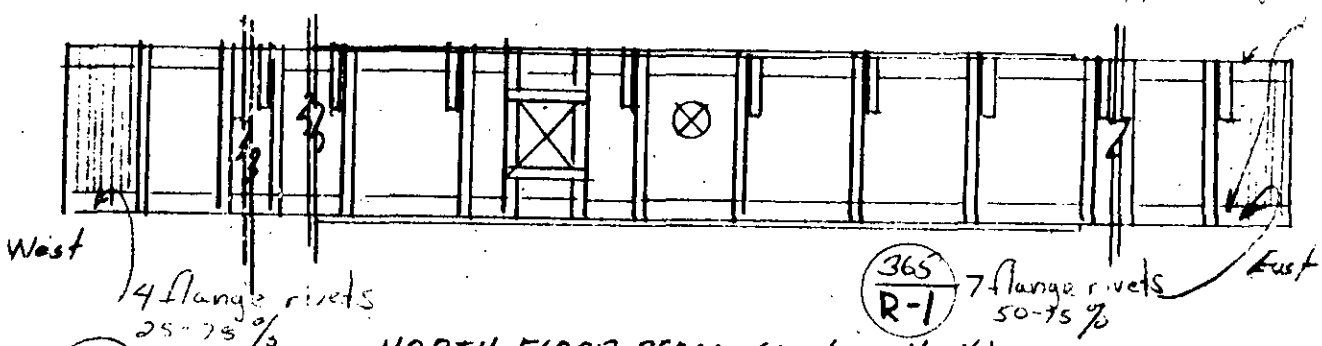
NORTH FLOOR BEAM (Looking North)



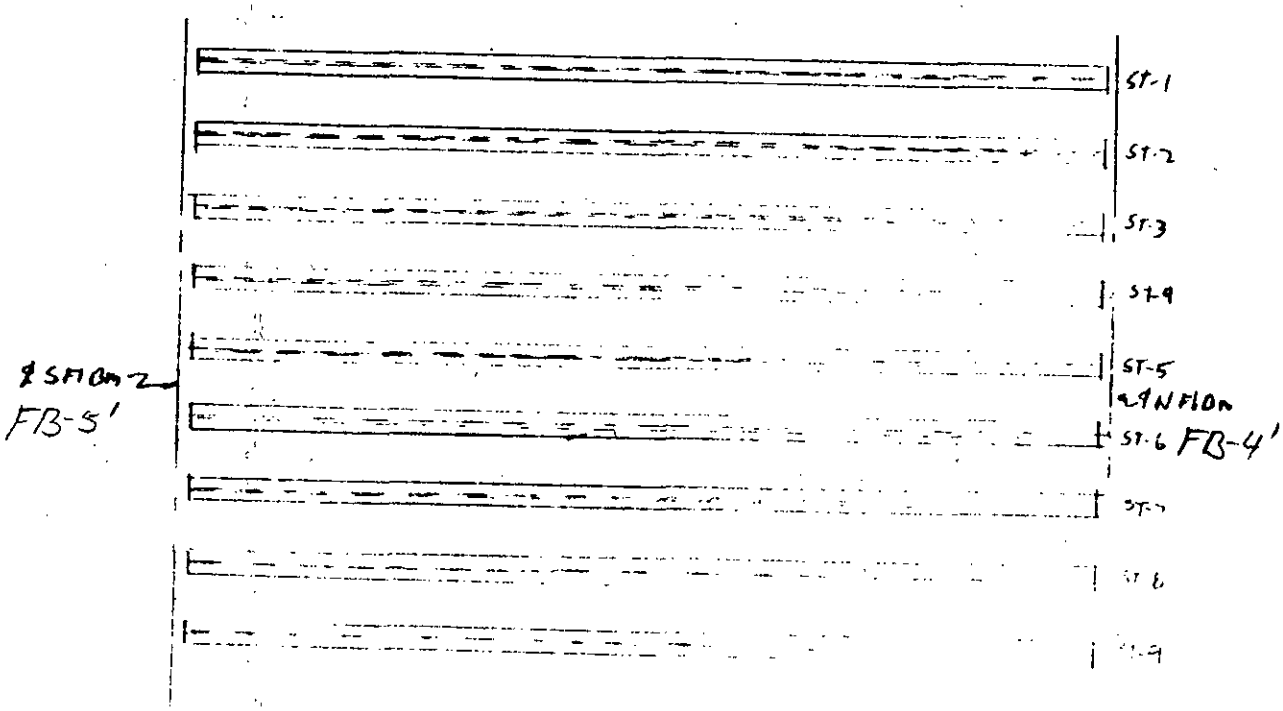
SKETCH B/2/6'-5'



SOUTH FLOOR BEAM (Looking South)

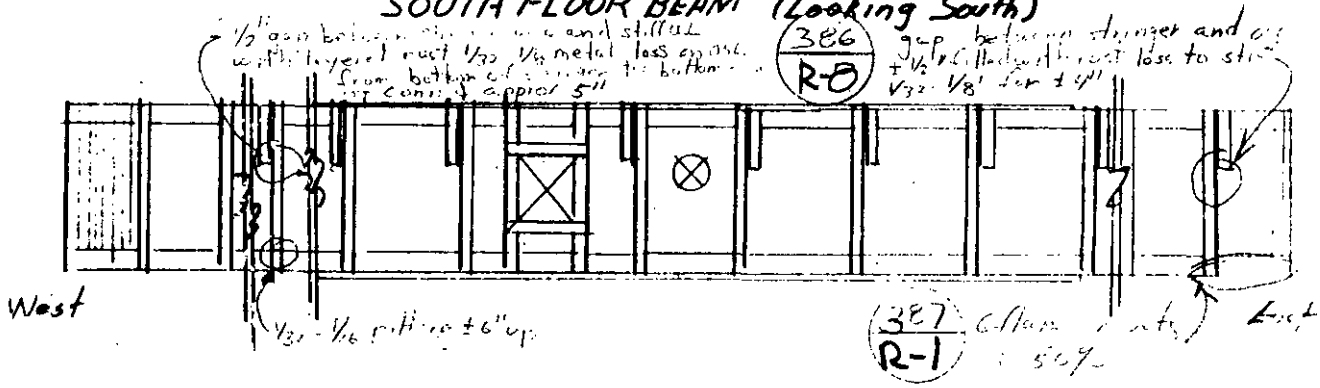


NORTH FLOOR BEAM (Looking North)

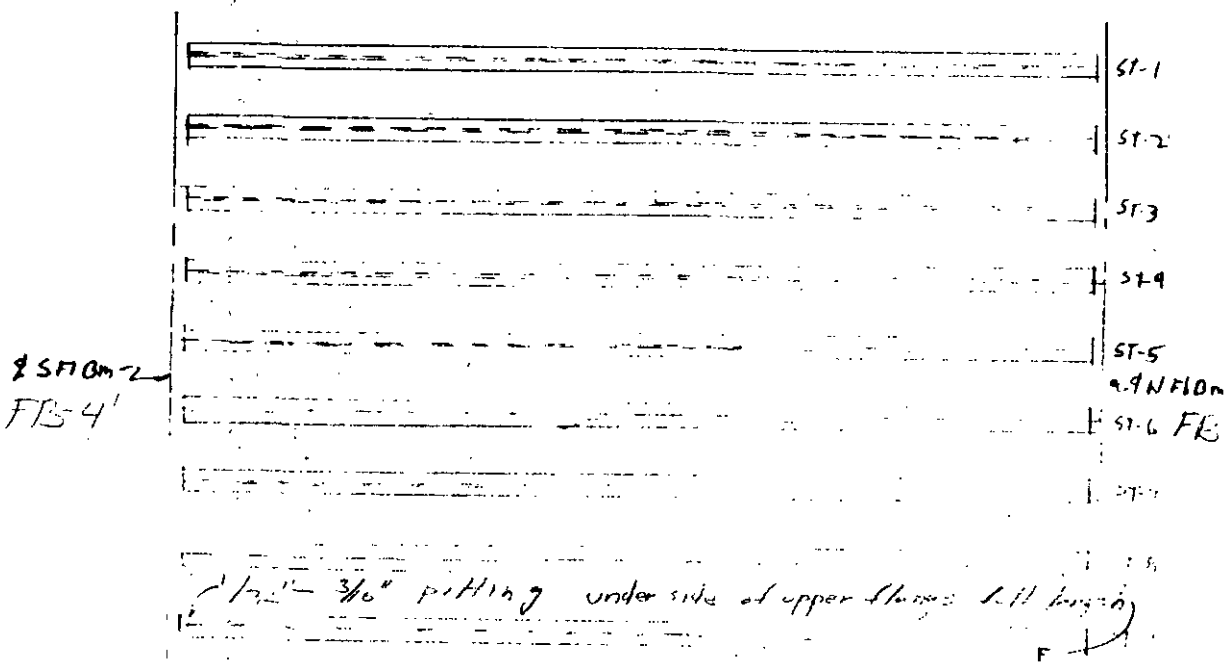


SKETCH B/2/5'-4'

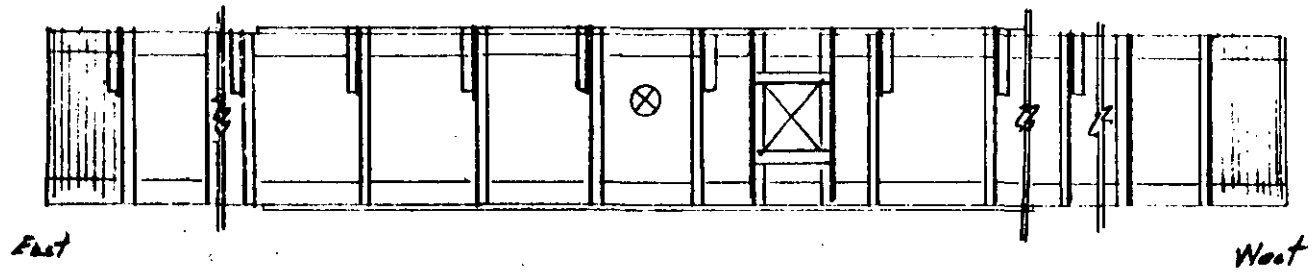
SOUTH FLOOR BEAM (Looking South)



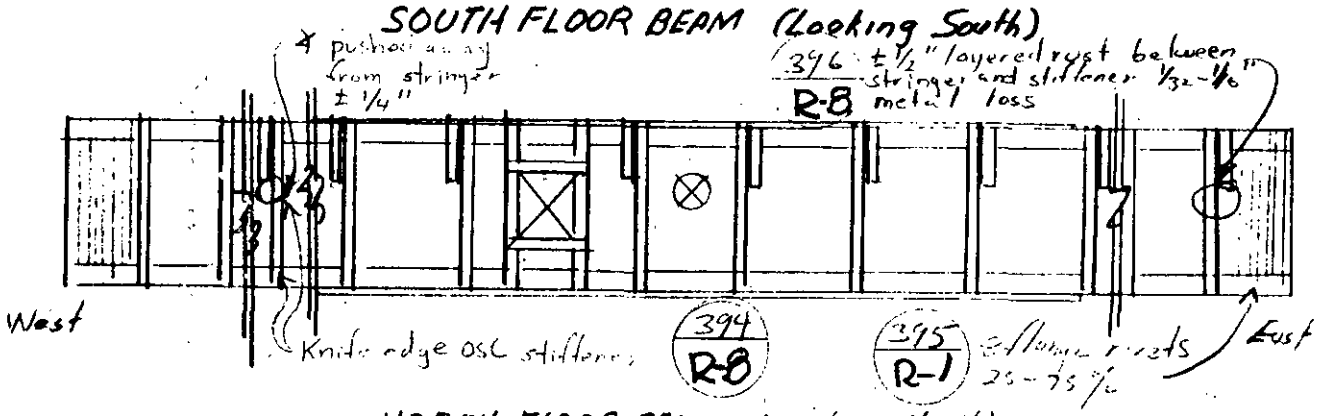
NORTH FLOOR BEAM (Looking North)



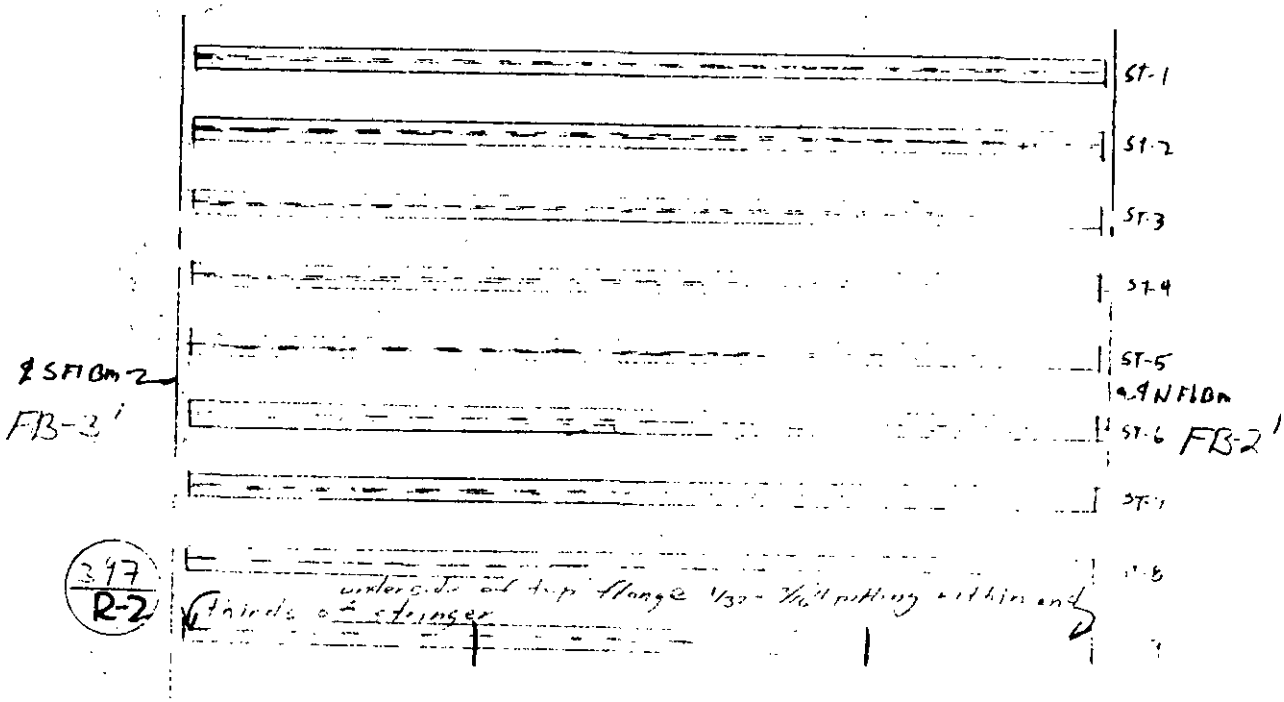
SKETCH B/2/4-3'



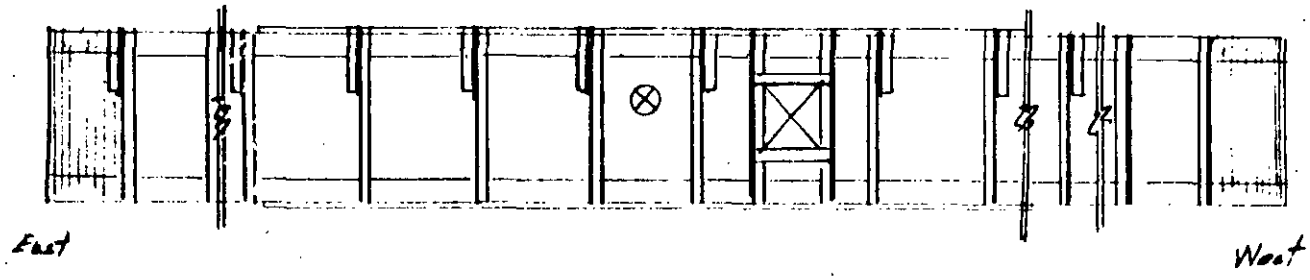
SOUTH FLOOR BEAM (Looking South)



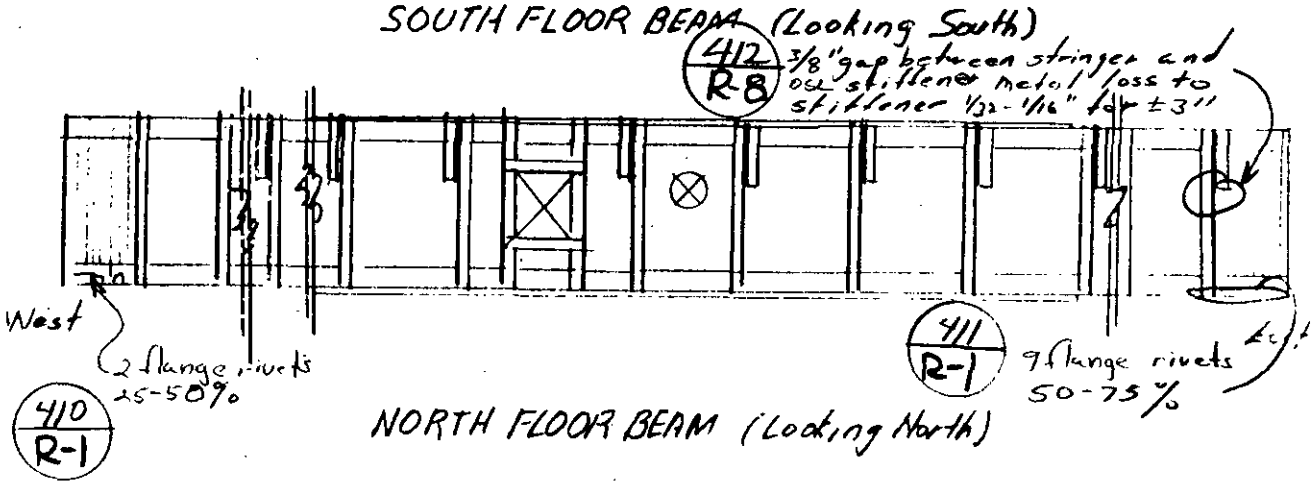
NORTH FLOOR BEAM (Looking North)



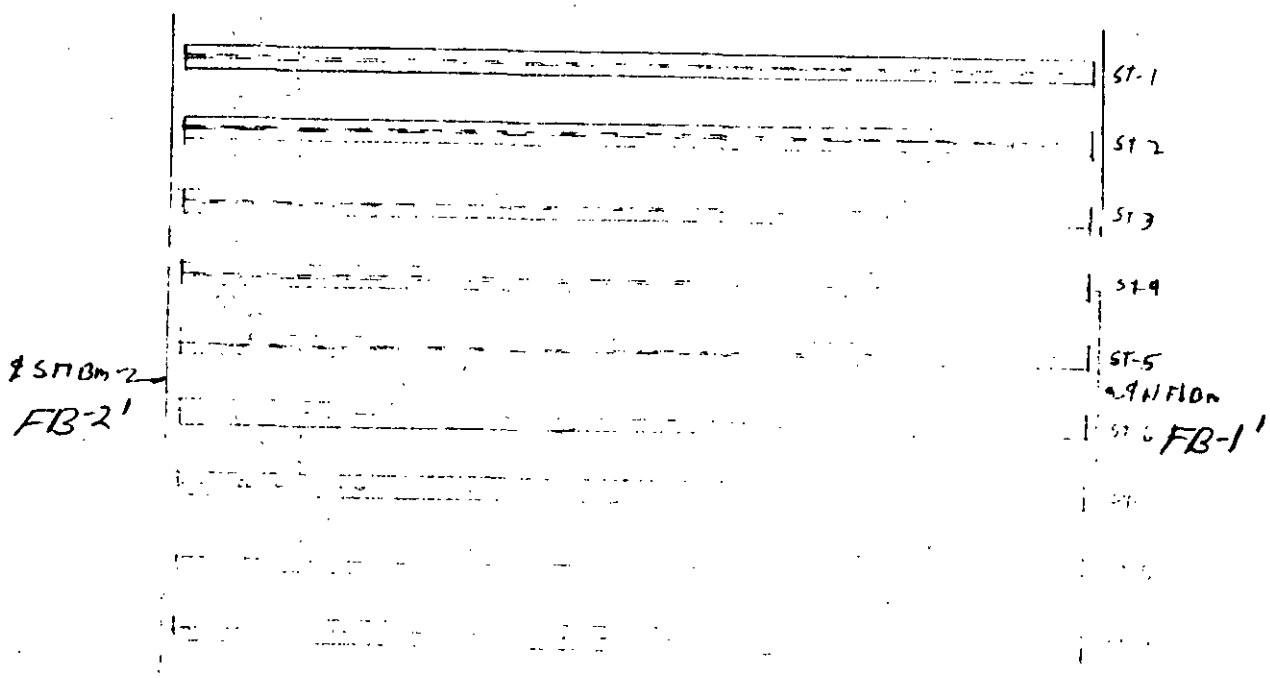
SKETCH B/2/3-2'



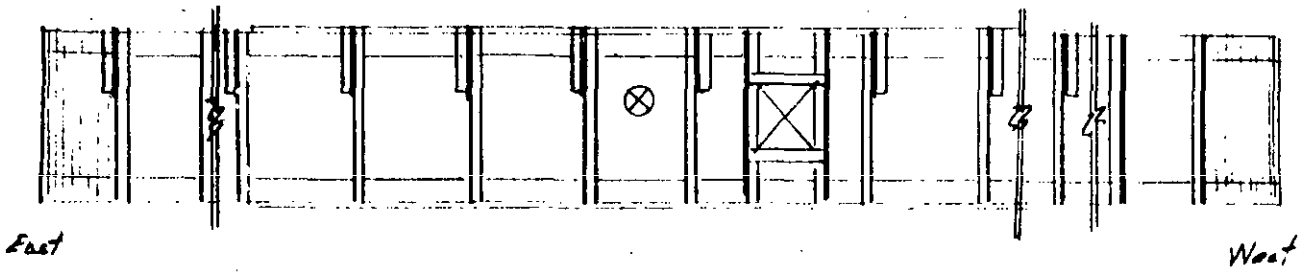
SOUTH FLOOR BEAM (Looking South)



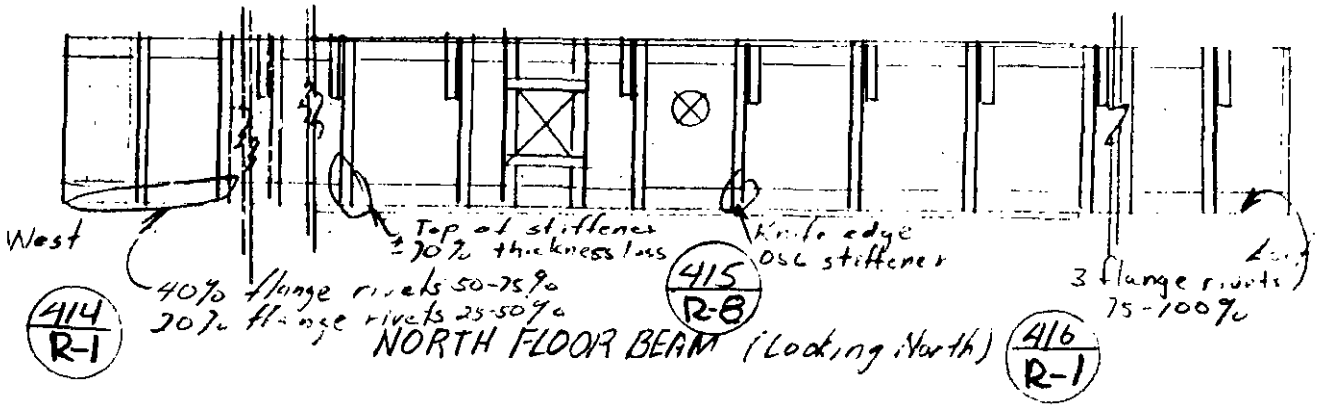
NORTH FLOOR BEAM (Looking North)



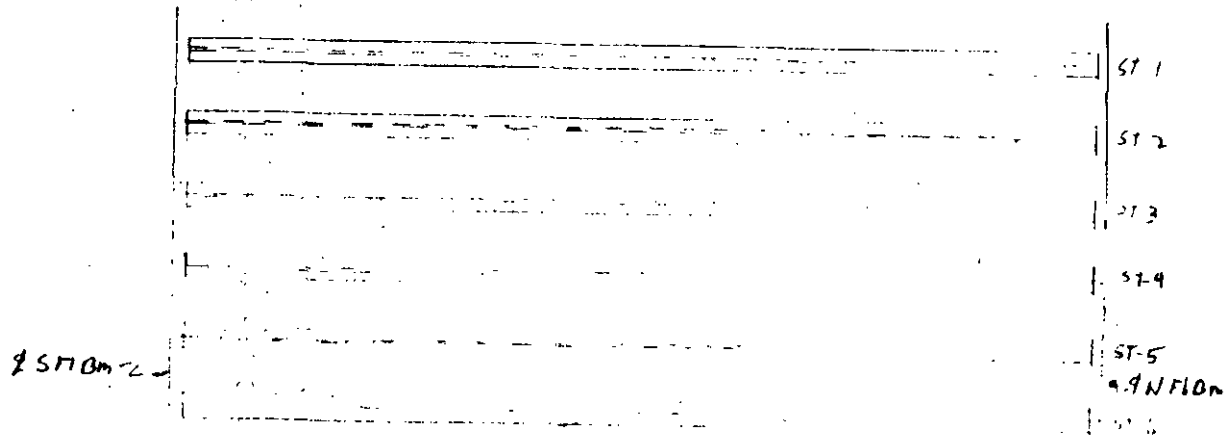
SKETCH 8/2/2L-1'



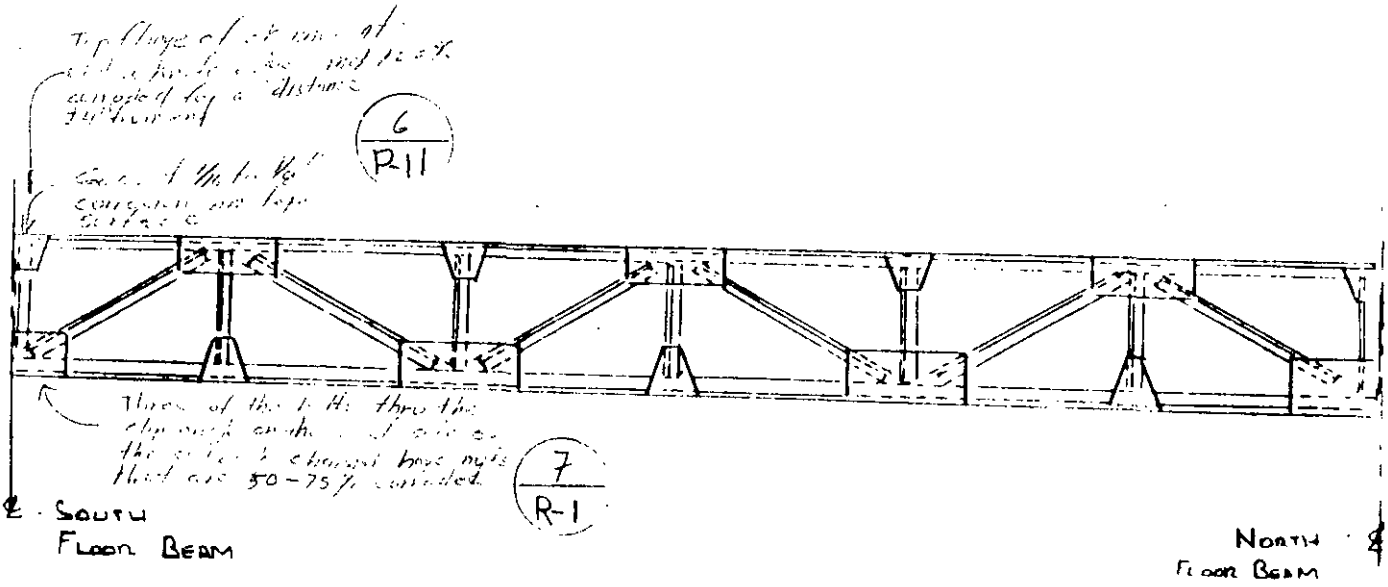
SOUTH FLOOR BEAM (Looking South)



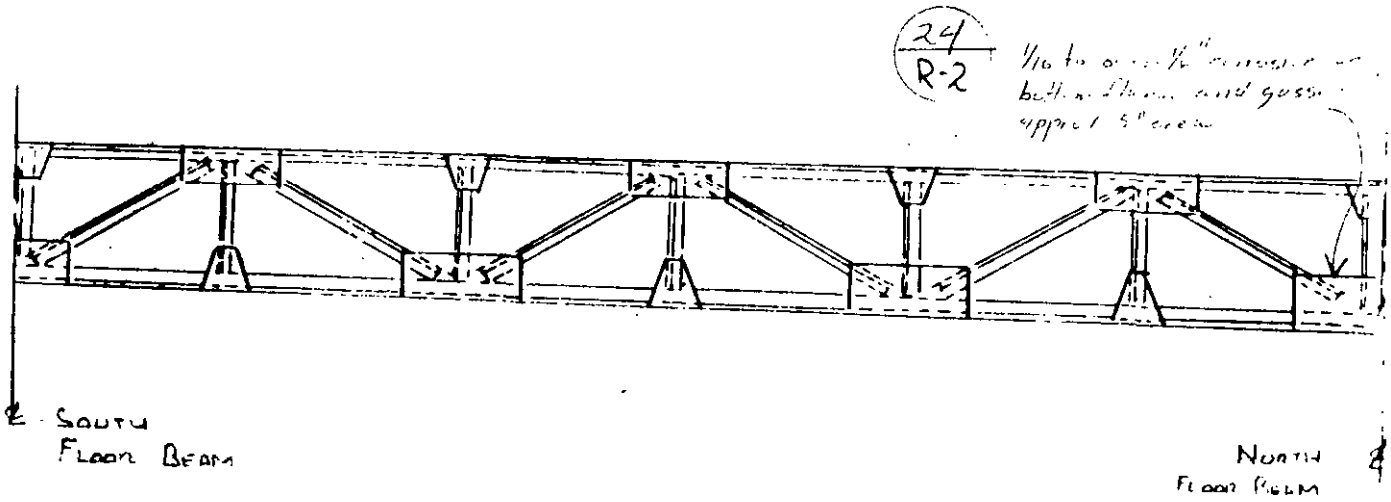
NORTH FLOOR BEAM (Looking North)



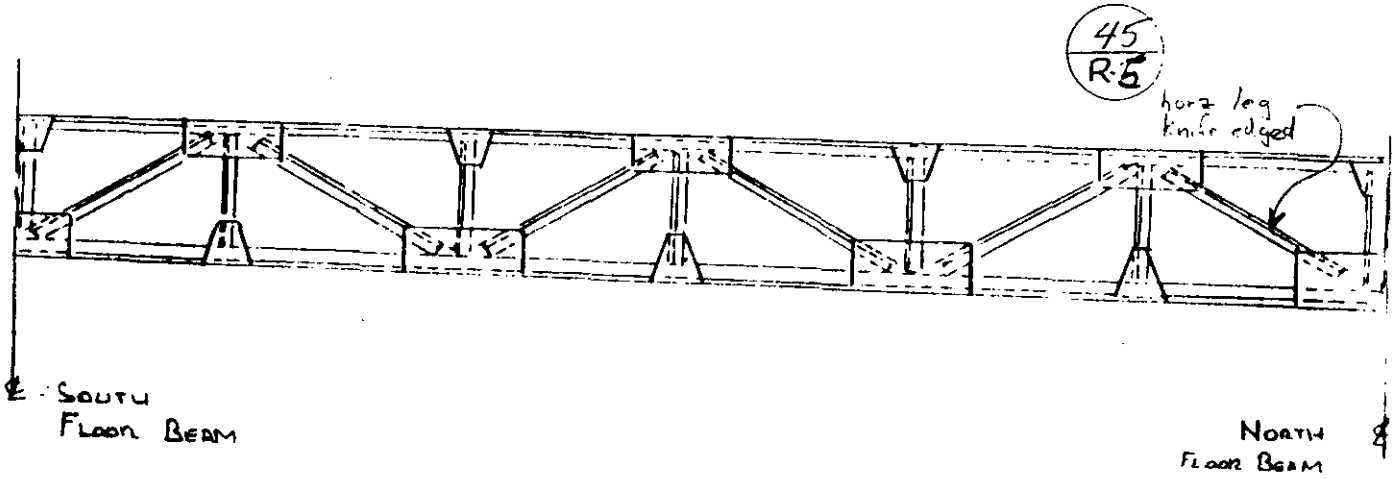
SKETCH B/2/1-0'



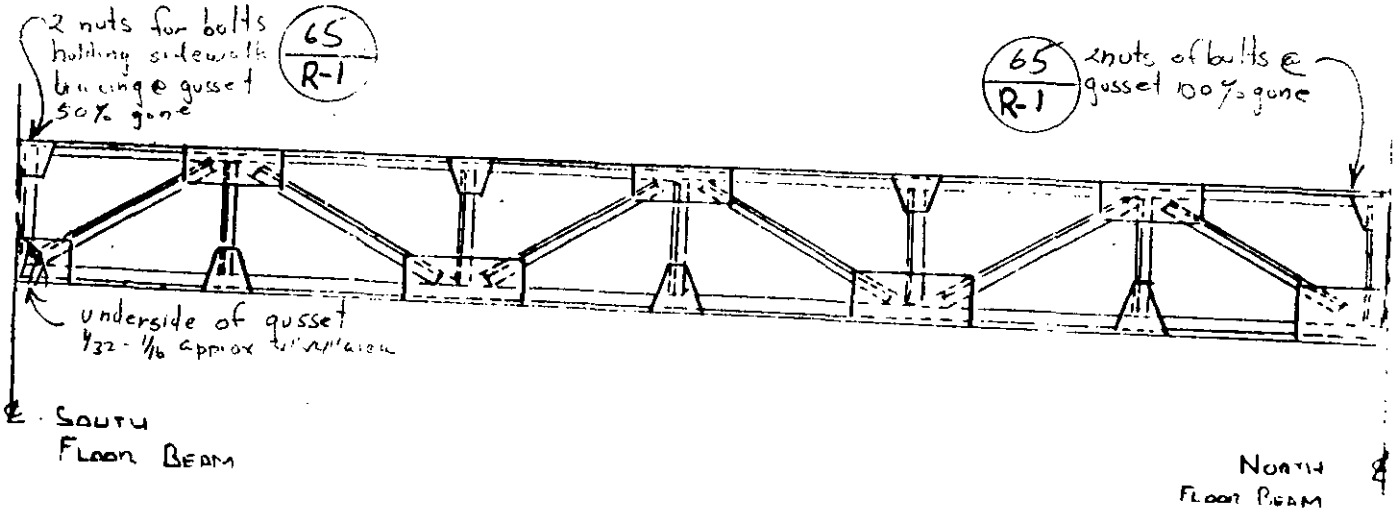
SKETCH C/3/a-1



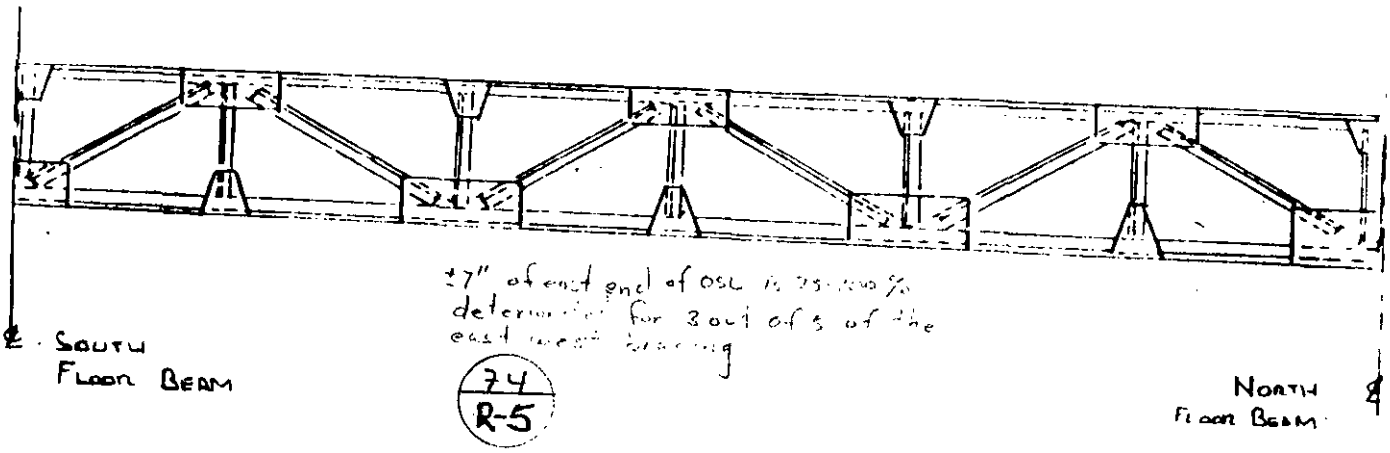
SKETCH C/3/1-2



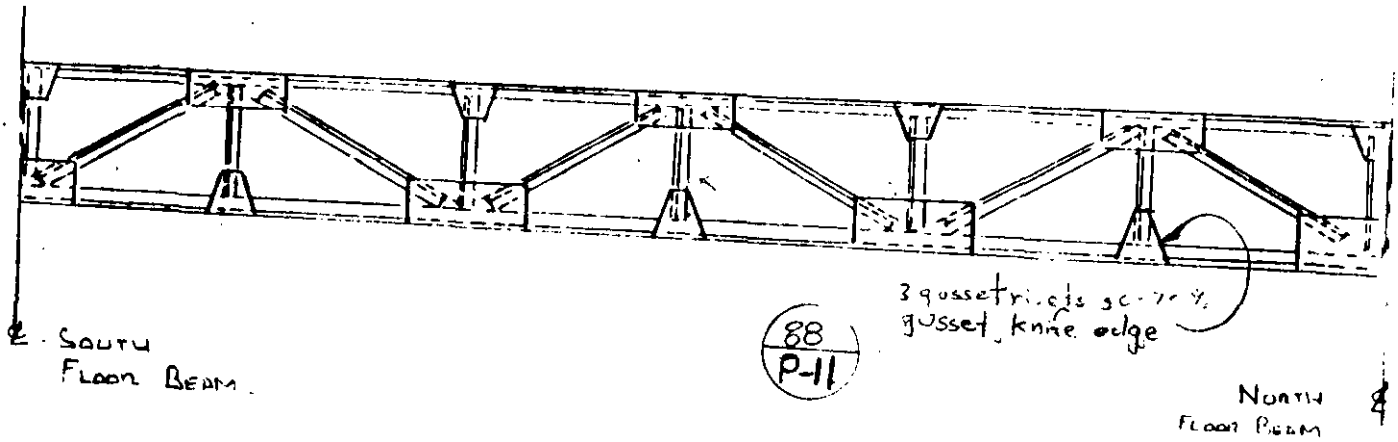
SKETCH C/3/4-5



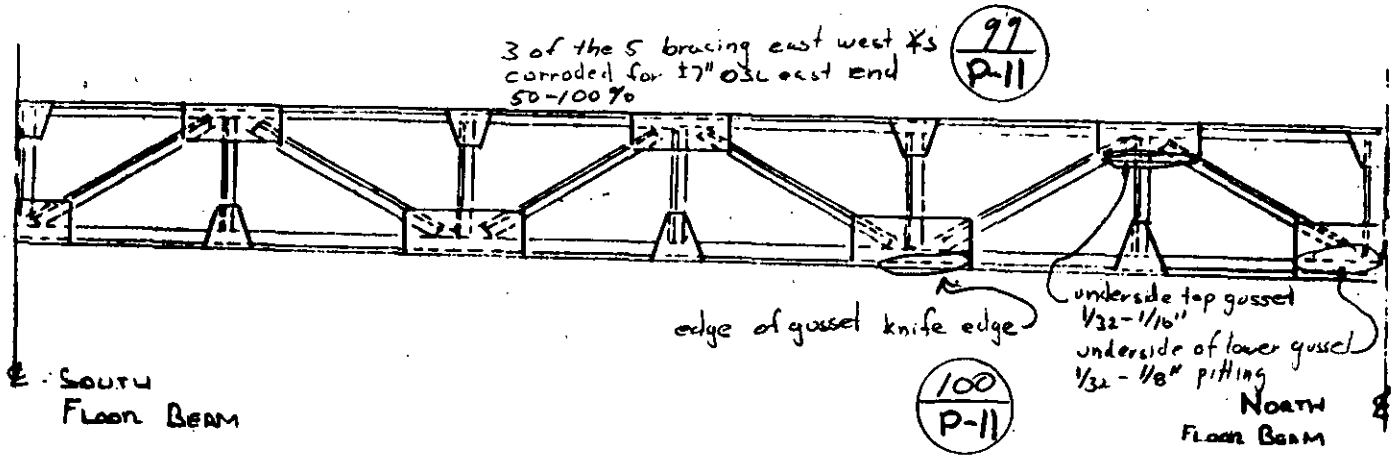
SKETCH C/3/5-6



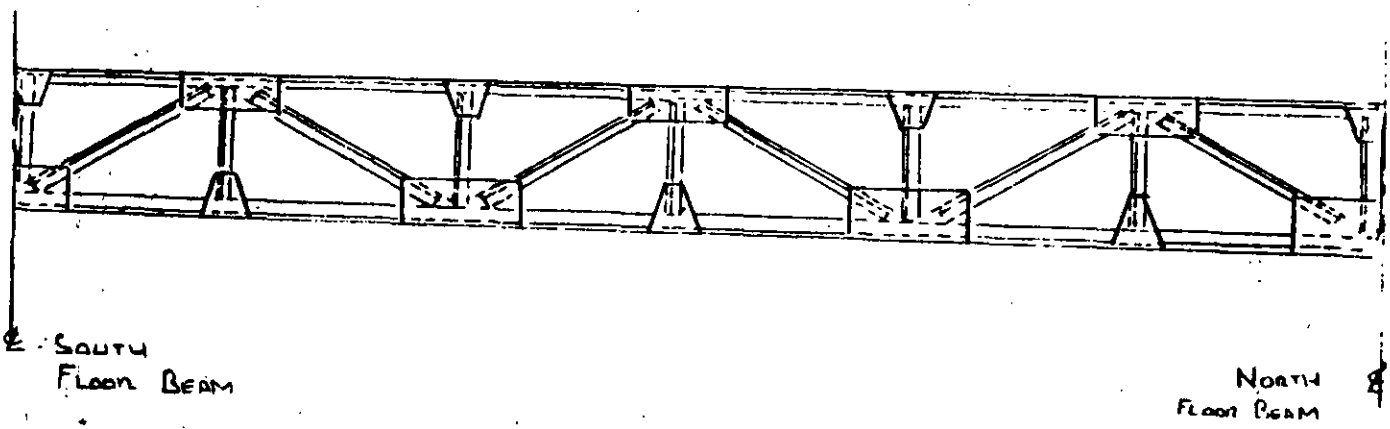
SKETCH C/3/6-7



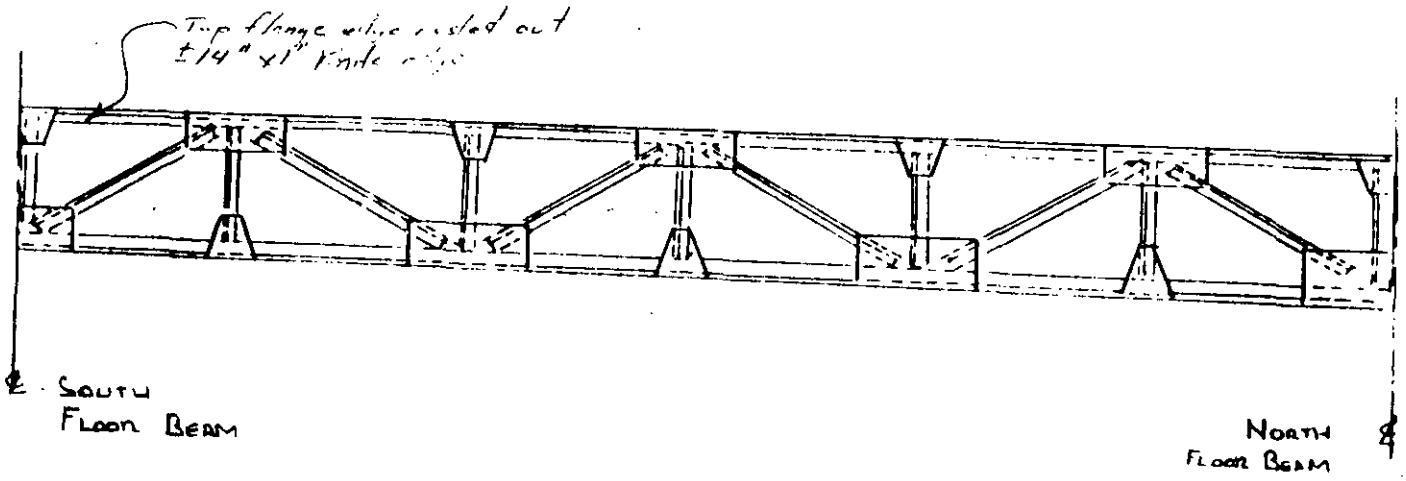
SKETCH C/3/7-8



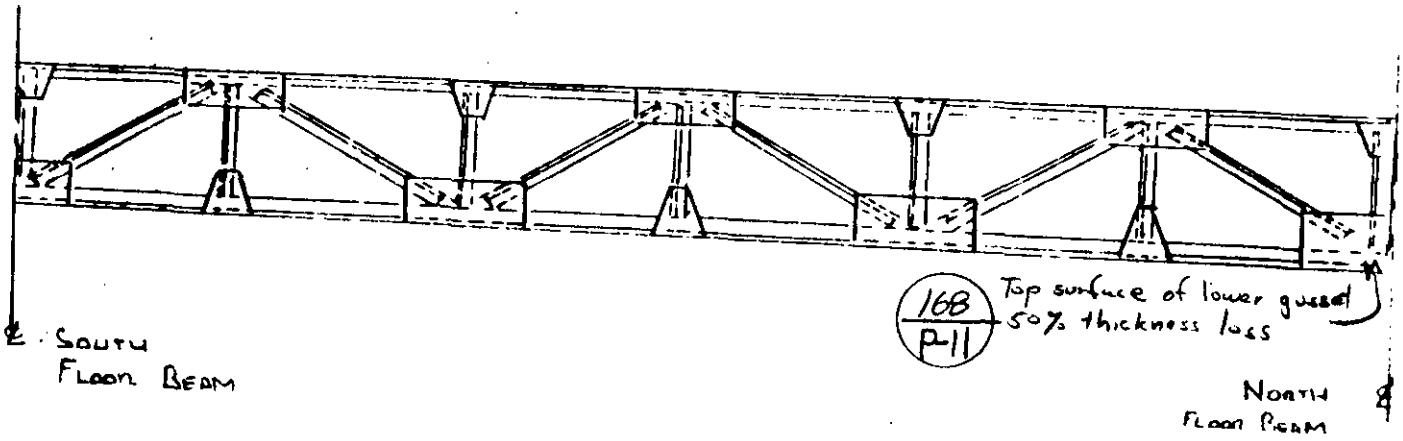
SKETCH C/3/8-9



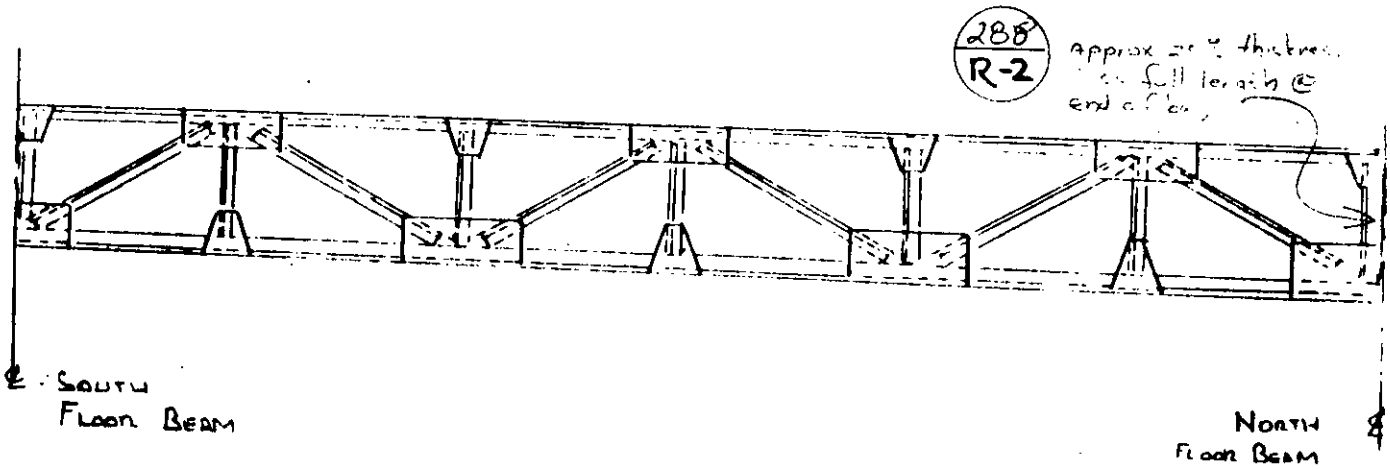
SKETCH _____



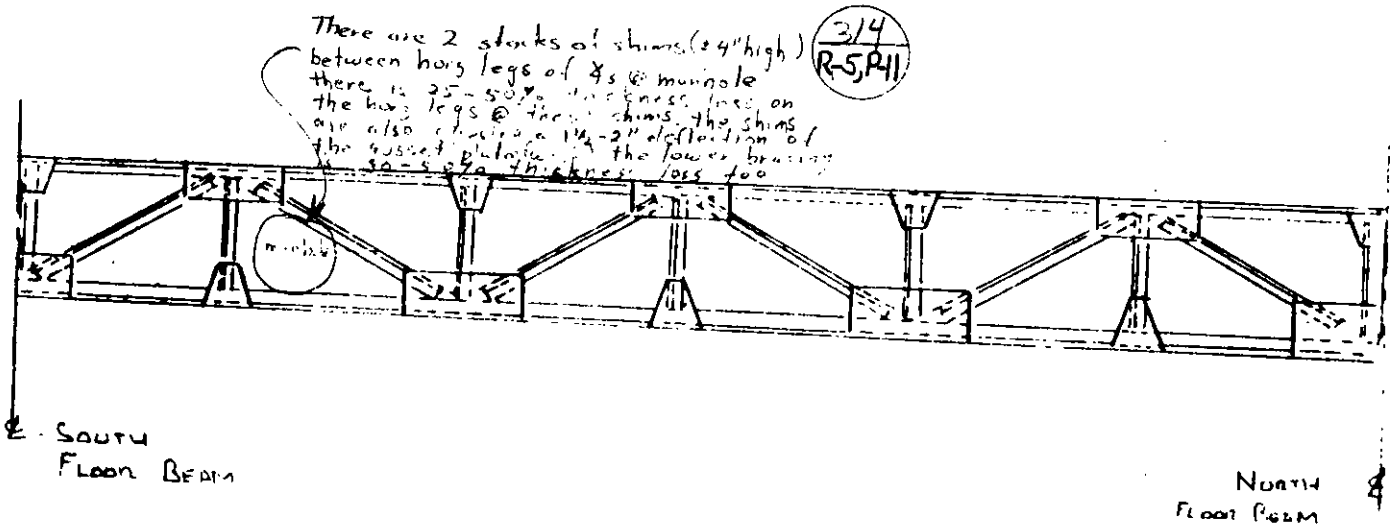
SKETCH C/1/9-10



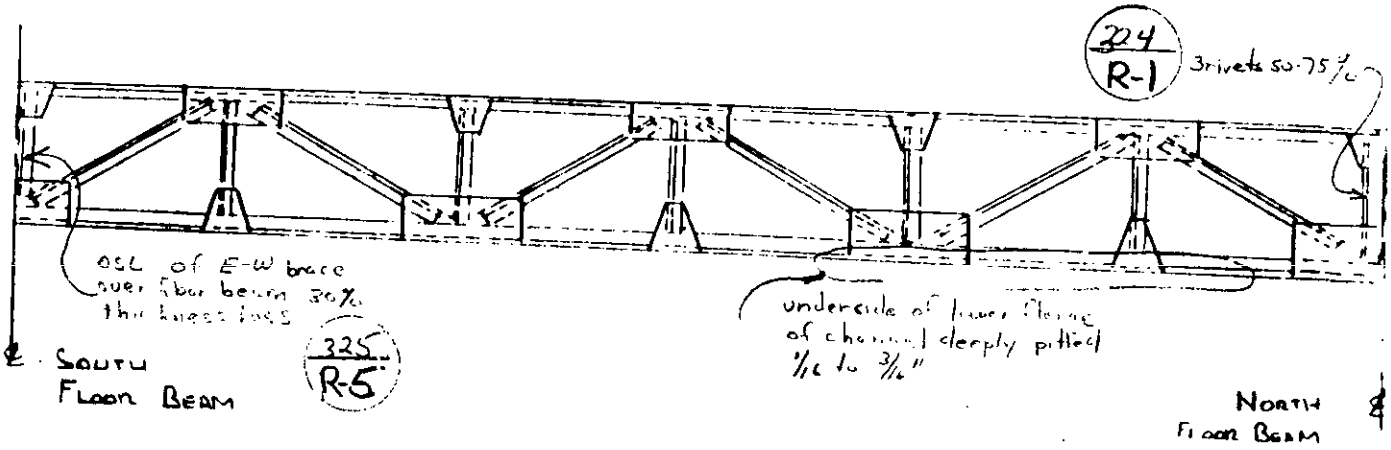
SKETCH C/1/12-13



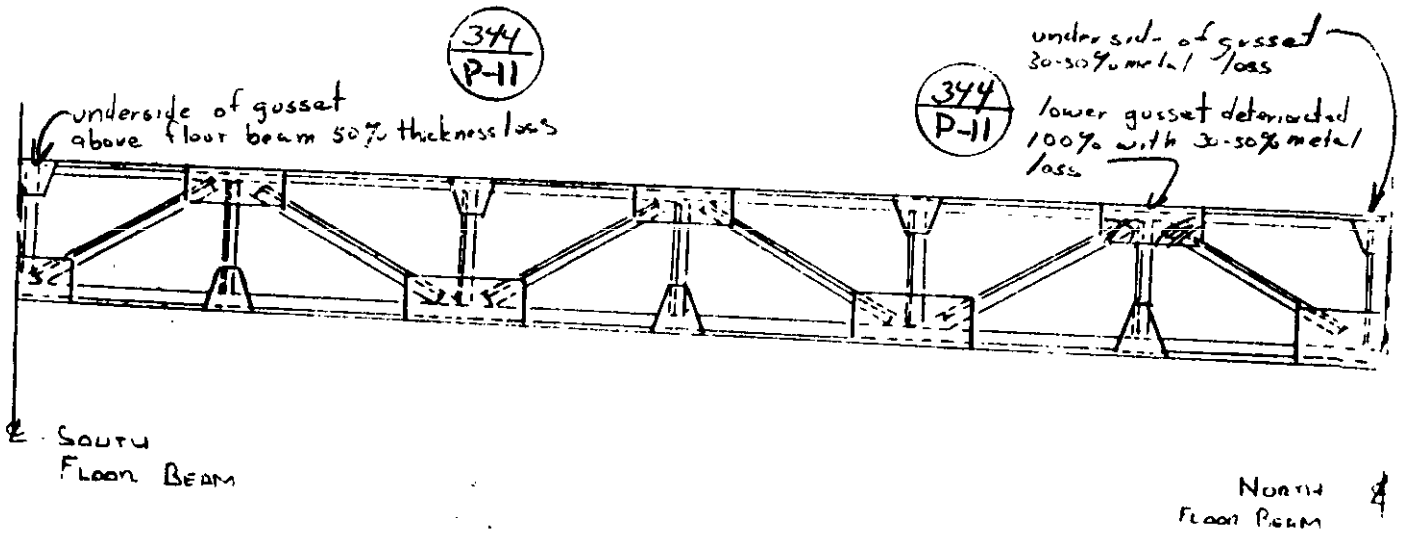
SKETCH C/1/11'-10'



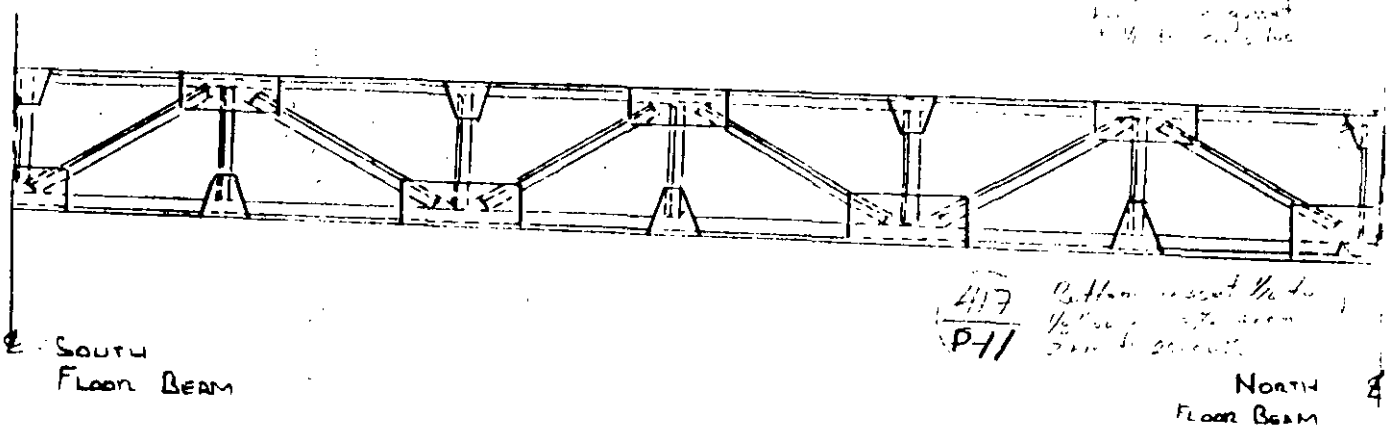
SKETCH C/1/10'-9'



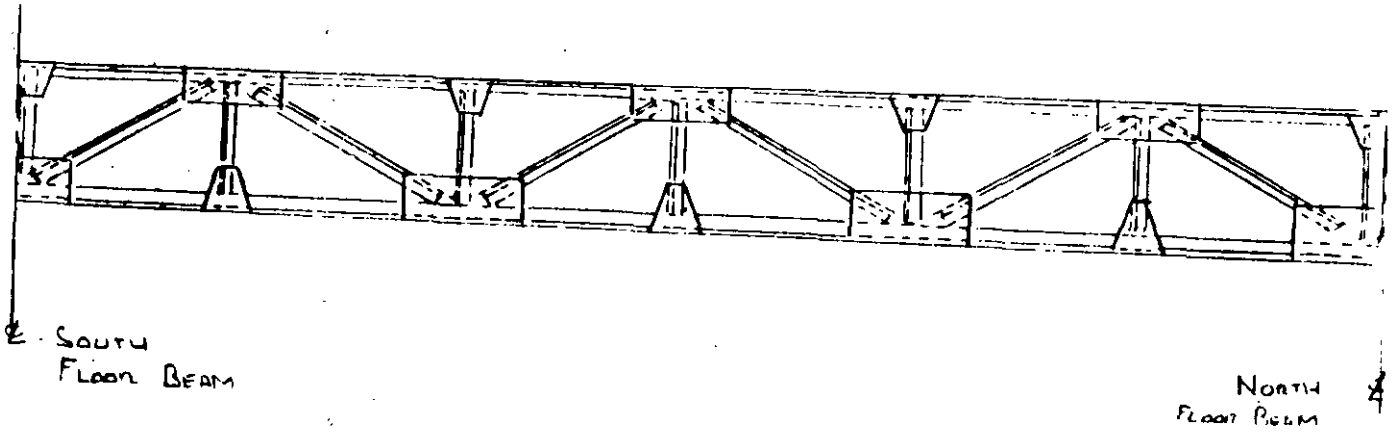
SKETCH C/2/9'-8'



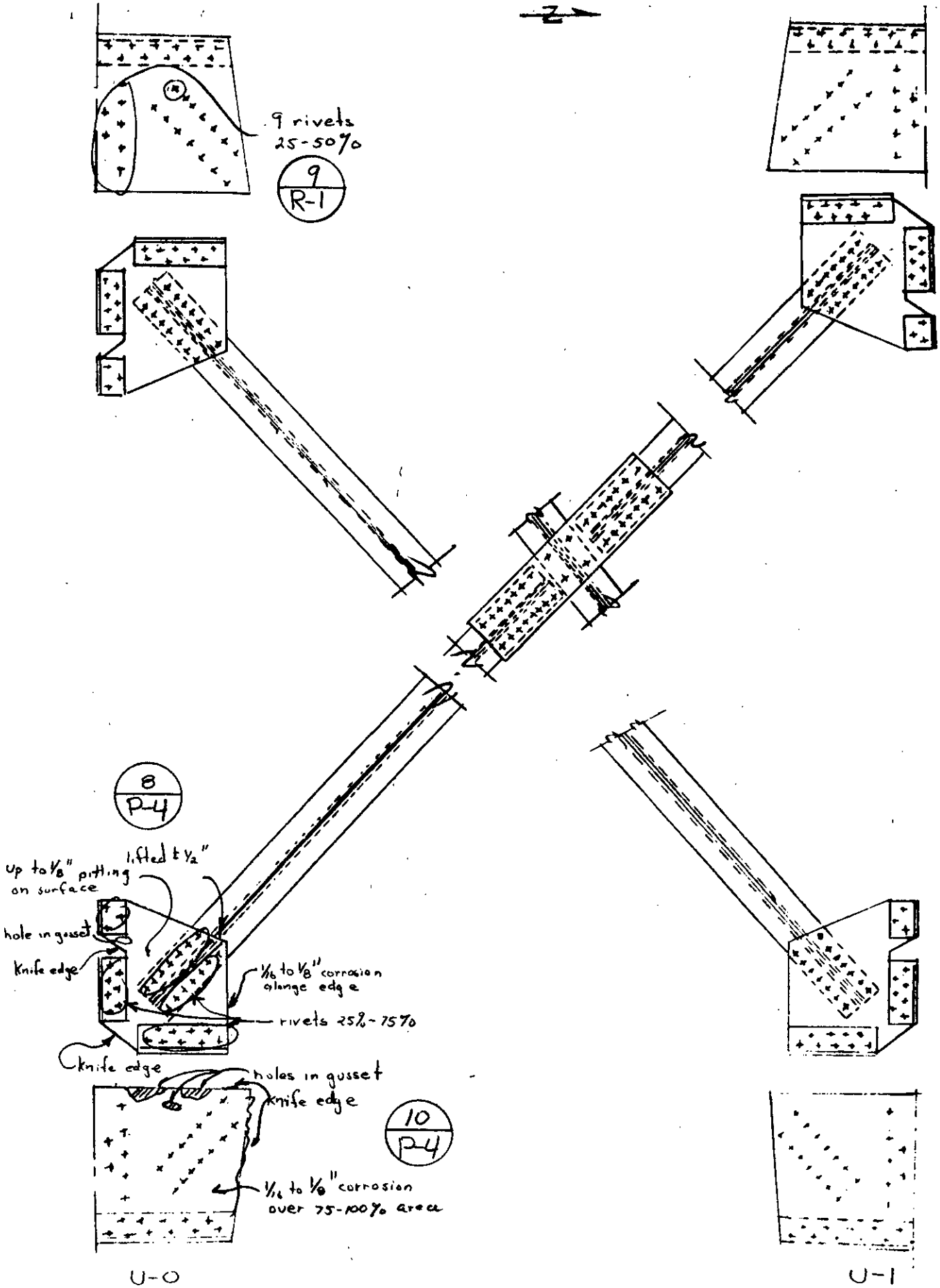
SKETCH C/2/8'-7'



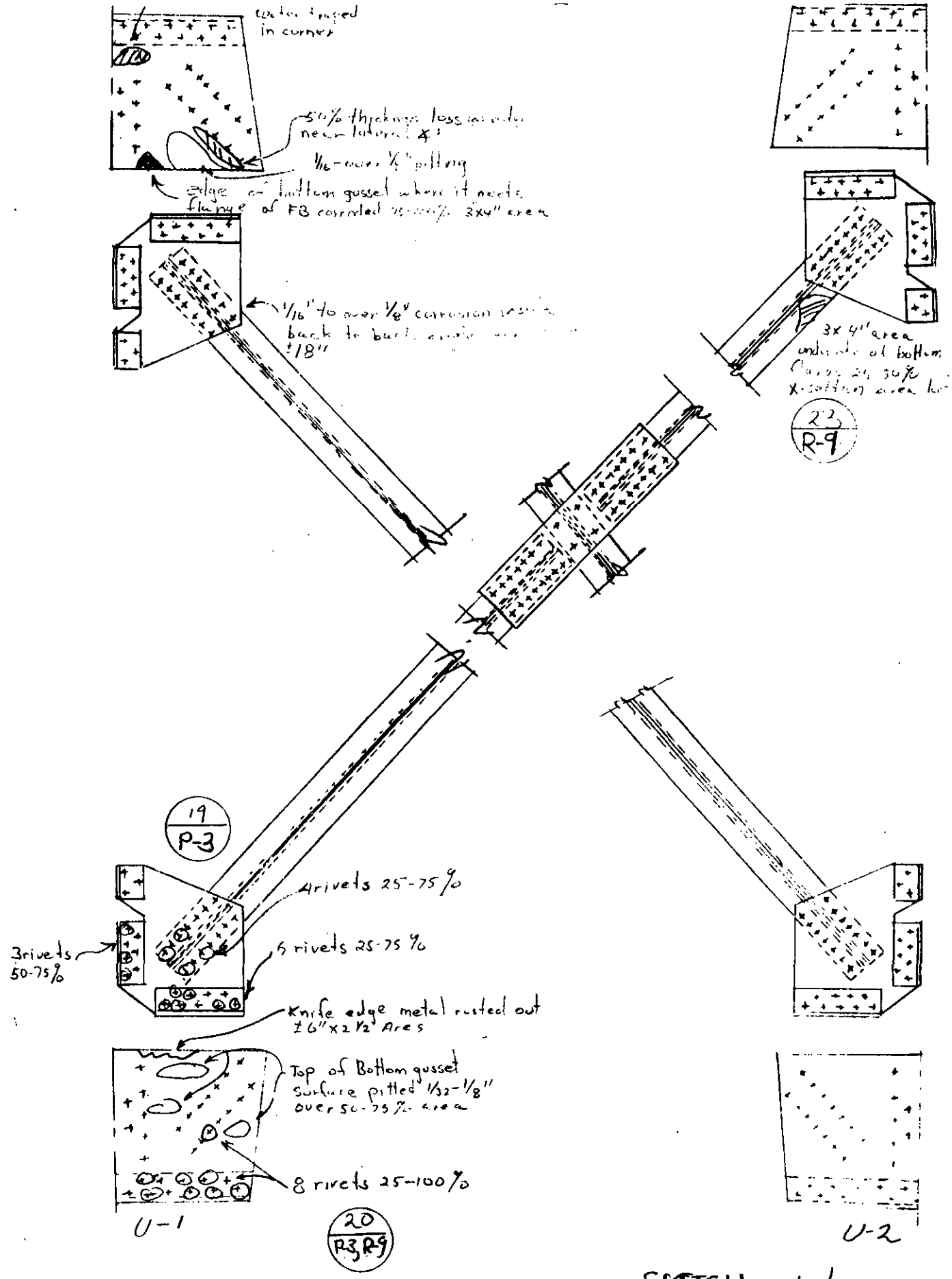
SKETCH C/2/1-0'



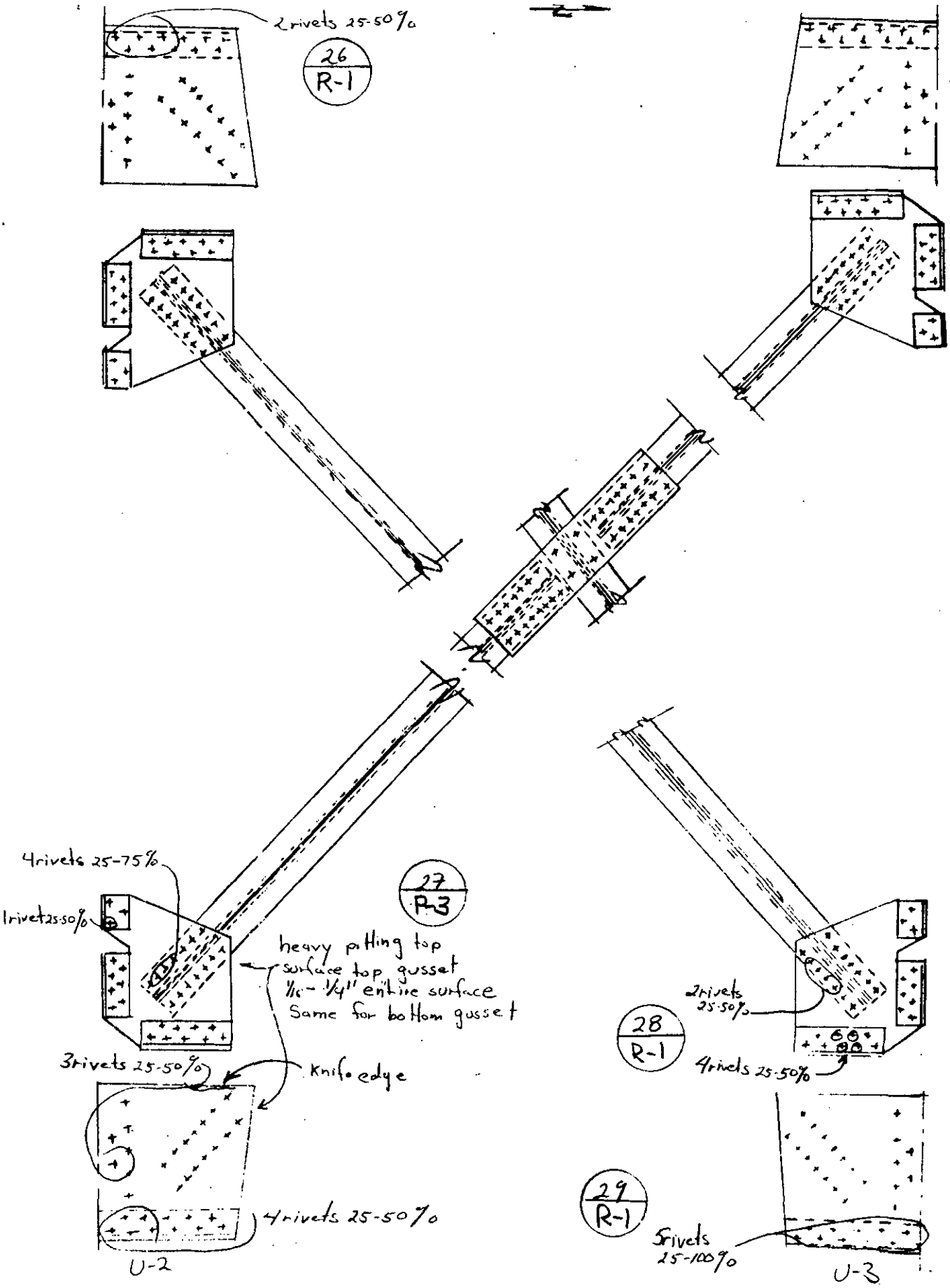
SKETCH


9 rivets
25-50%
9
R-1
8
P-4
lifted t 1/2"
up to 1/8" pitting
on surface
hole in gusset
Knife edge
1/16 to 1/8" corrosion
flange edge
rivets 25%-75%
knife edge
holes in gusset
knife edge
10
P-4
1/16 to 1/8" corrosion
over 75-100% area
U-0
U-1

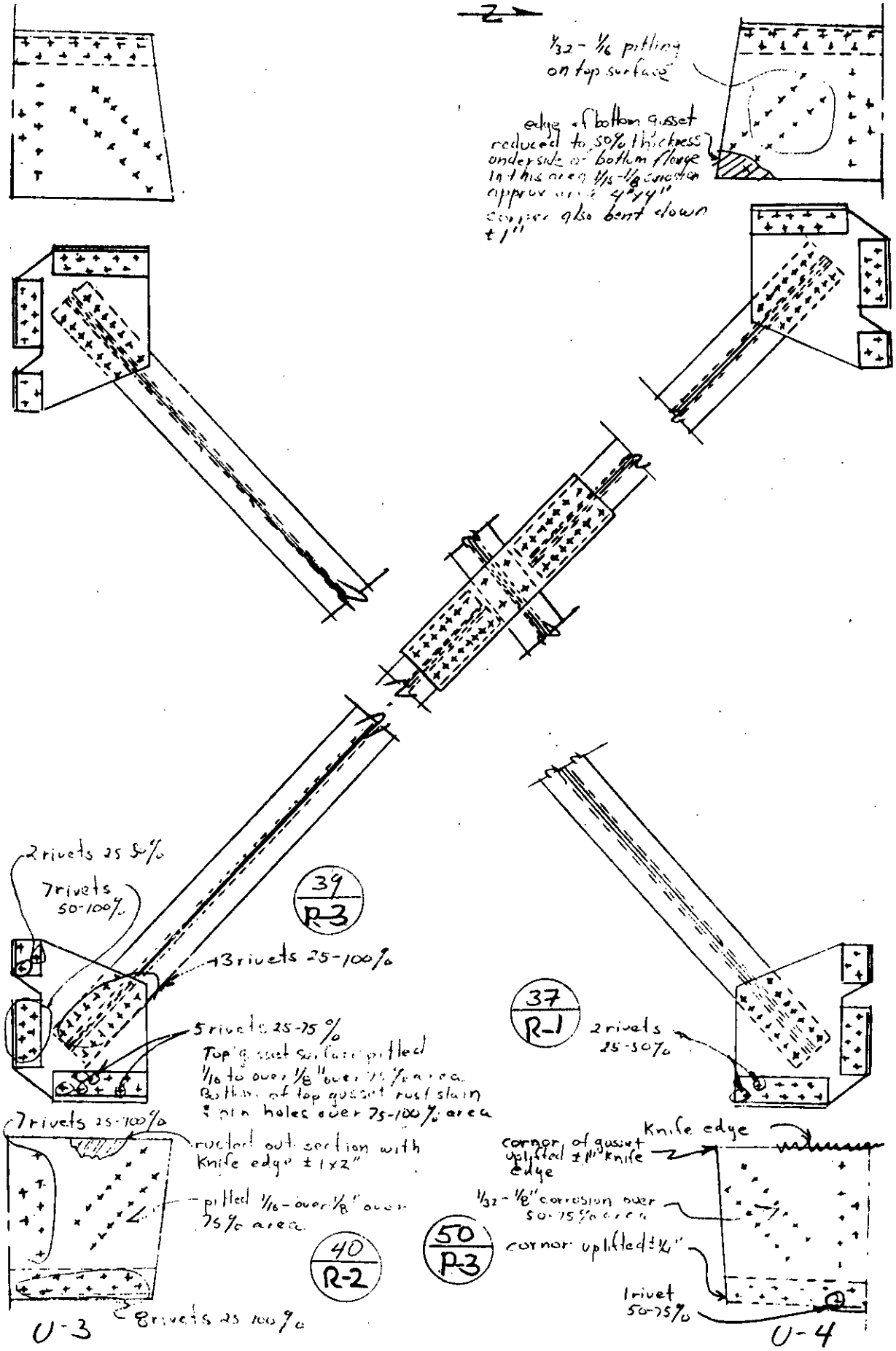
SKETCH D/3/0-1


water traged in corner
50% thickness loss
near lateral ∡
1/16 - over 1/4" pitting
edge of bottom gusset where it meets flange of FB corroded
3x4" area
1/16" to over 1/8" corrosion
back to back
±18"
3x 4" area
underside of bottom
X-section area
23
R-9
19
P-3
4 rivets 25-75%
3 rivets 50-75%
6 rivets 25-75%
Knife edge metal rusted out ±6"x2 1/2" Ares
Top of Bottom gusset surface pitted 1/32-1/8" over 50-75% area
8 rivets 25-100%
U-1
20
P3, R9
U-2

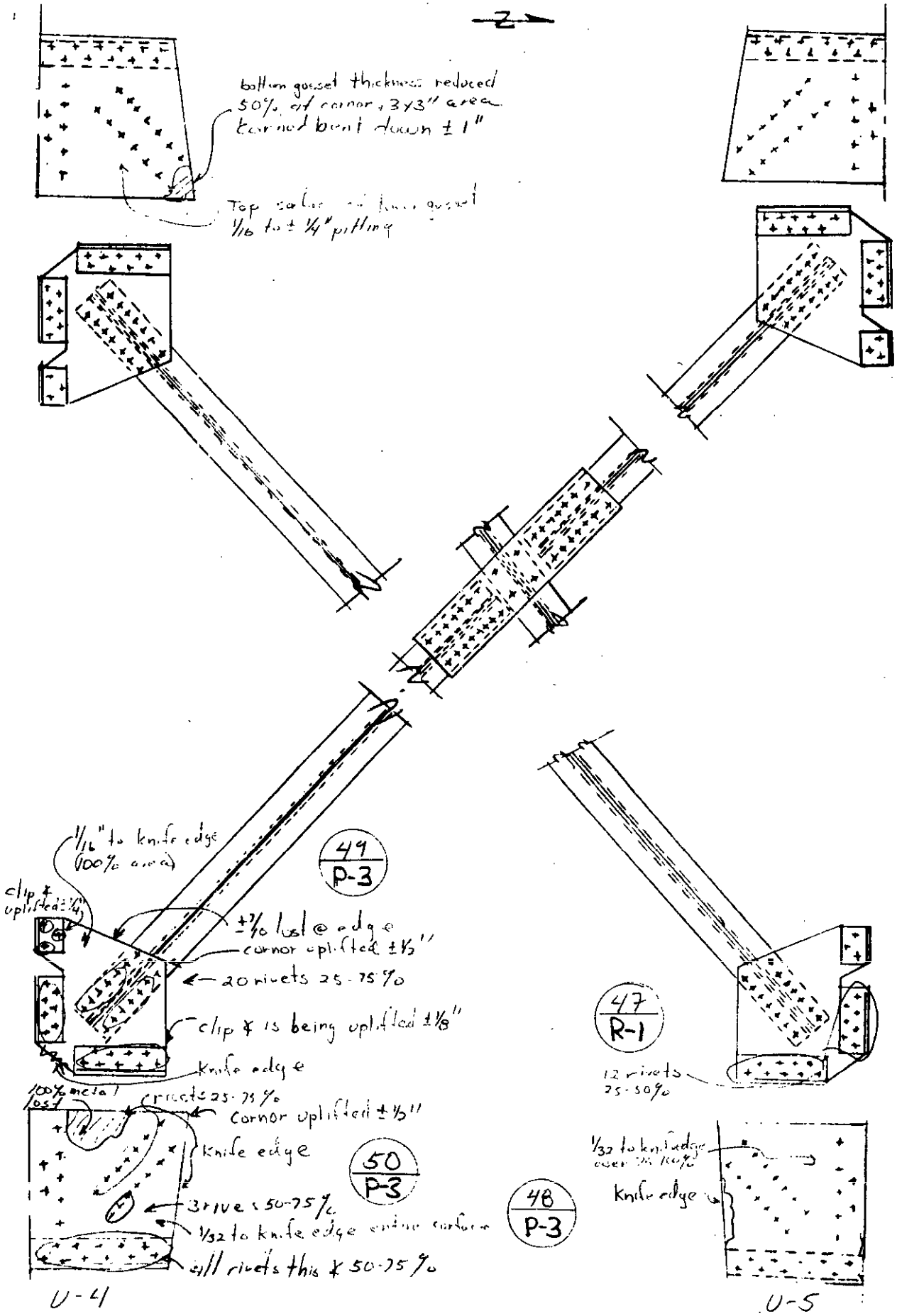
SKETCH D/3/1-2


2 rivets 25-50%
26
R-1
4 rivets 25-75%
1 rivet 25-50%
27
R-3
heavy pitting top surface top gusset 1/16 - 1/4" entire surface Same for bottom gusset
3 rivets 25-50%
Knife edge
4 rivets 25-50%
U-2
2 rivets 25-50%
28
R-1
4 rivets 25-50%
29
R-1
5 rivets 25-100%
U-3

SKETCH D/3/2-3

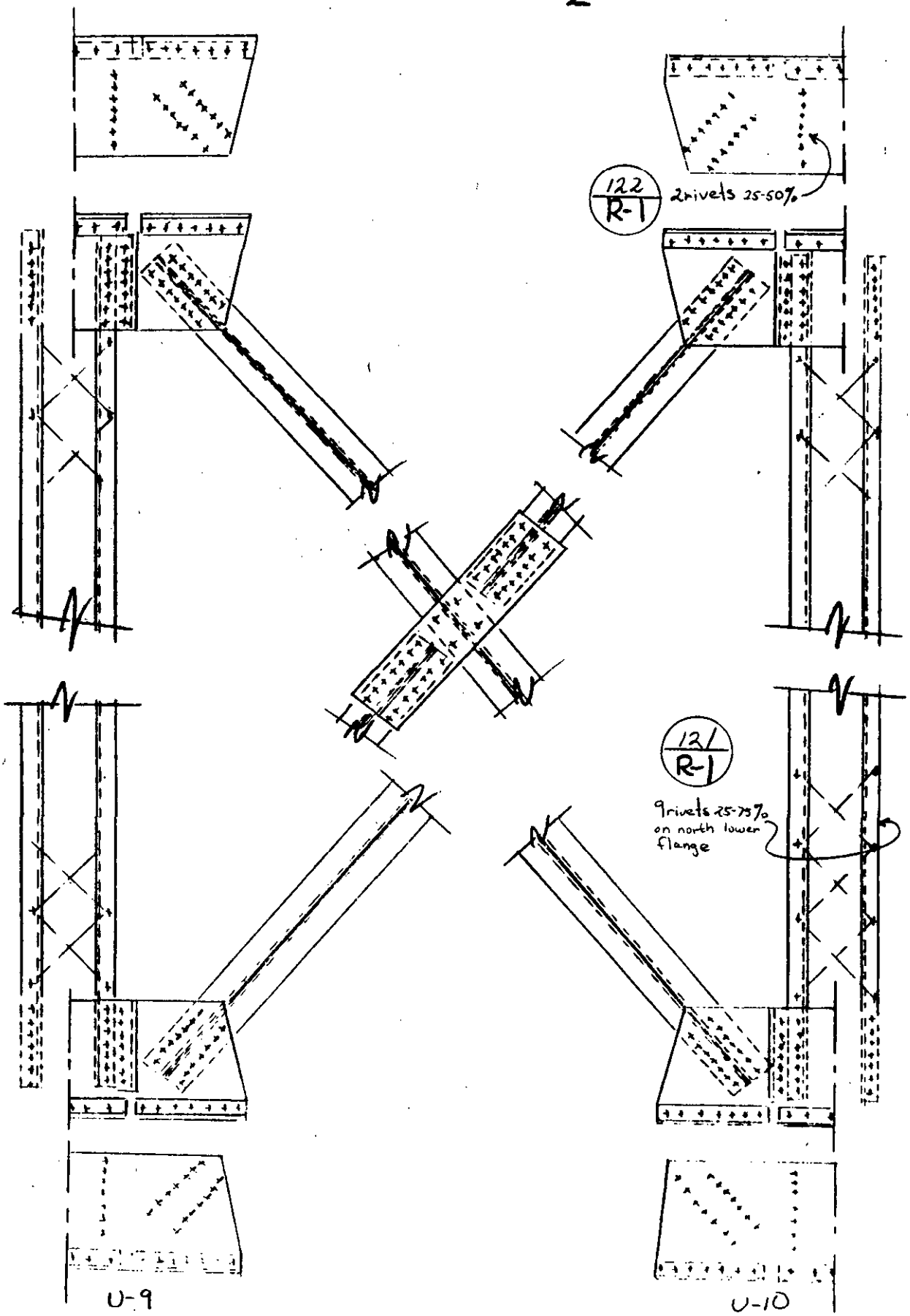

1/32 - 1/16 pitting on top surface
edge of bottom gusset reduced to 50% thickness underside of bottom flange in this area 1/8-1/4 corrosion approx area 4"x4" corner also bent down ±1"
2 rivets 25-50%
7 rivets 50-100%
39
R-3
13 rivets 25-100%
5 rivets 25-75%
Top gusset surface pitted 1/16 to over 1/8" over 75% area
Bottom of top gusset rust stain & pin holes over 75-100% area
37
R-1
2 rivets 25-50%
7 rivets 25-100%
ructed out section with knife edge ±1x2"
pitted 1/16-over 1/8" over 75% area
40
R-2
8 rivets 25-100%
U-3
corner of gusset uplifted ±1" knife edge
Knife edge
1/32 - 1/8" corrosion over 50-75% area
50
P-3
corner uplifted ±1/4"
1 rivet 50-75%
U-4

SKETCH D/B/3-4

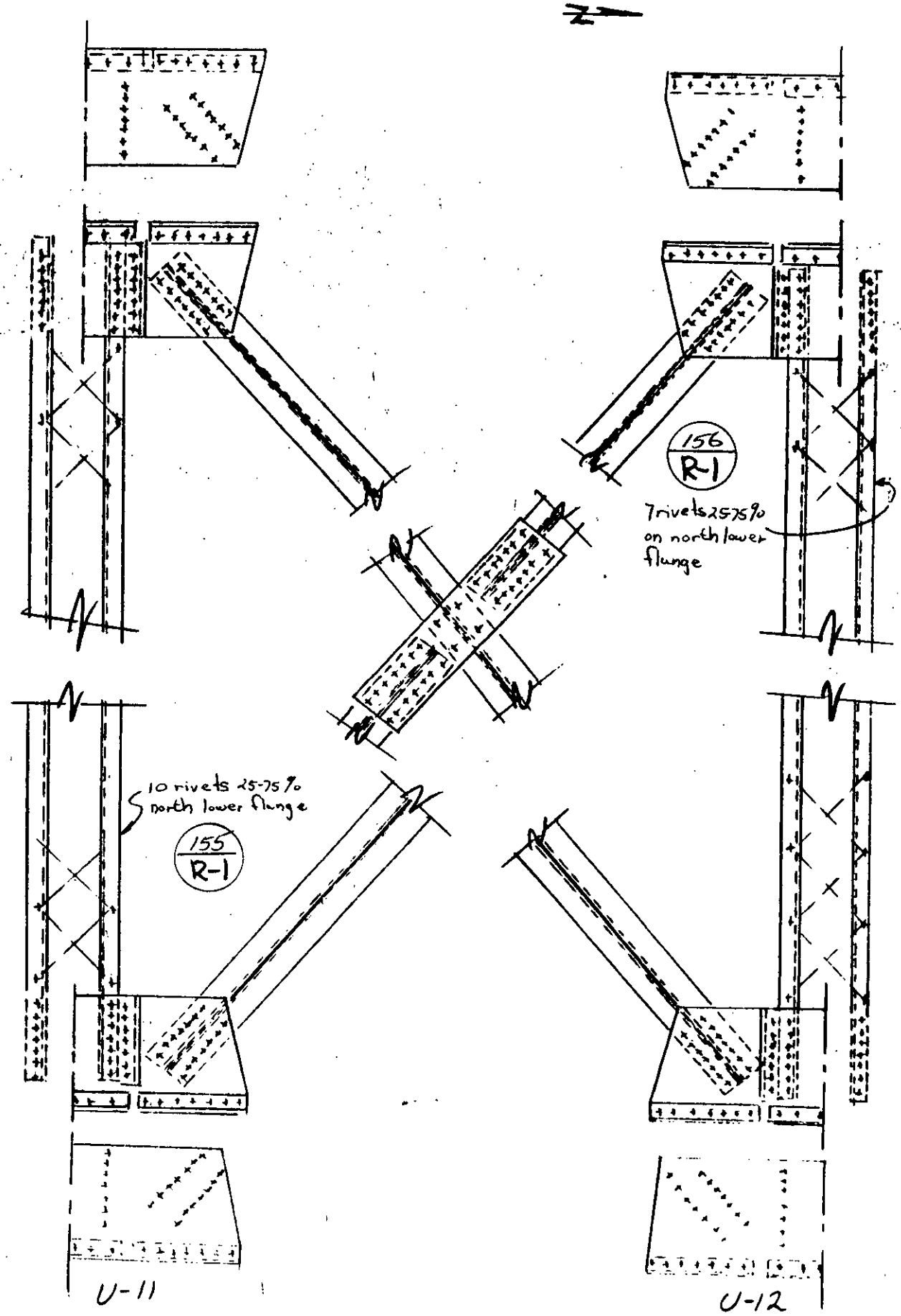


bottom gusset thickness reduced 50% at corner, 3x3" area
corner bent down ± 1"
Top surface of lower gusset 1/16 to ± 1/4" pitting
1/16" to knife edge (100% area)
clip ∡ uplifted ± 1/4"
±7/10 lost @ edge
corner uplifted ± 1/2"
20 rivets 25-75%
clip ∡ is being uplifted ± 1/8"
knife edge
100% metal lost
rivets 25-75%
corner uplifted ± 1/2"
knife edge
3 rivets 50-75%
1/32 to knife edge entire surface
all rivets this ∡ 50-75%
49
P-3
50
P-3
48
P-3
47
R-1
12 rivets 25-50%
1/32 to knife edge over 75-100%
knife edge
U-4
U-5

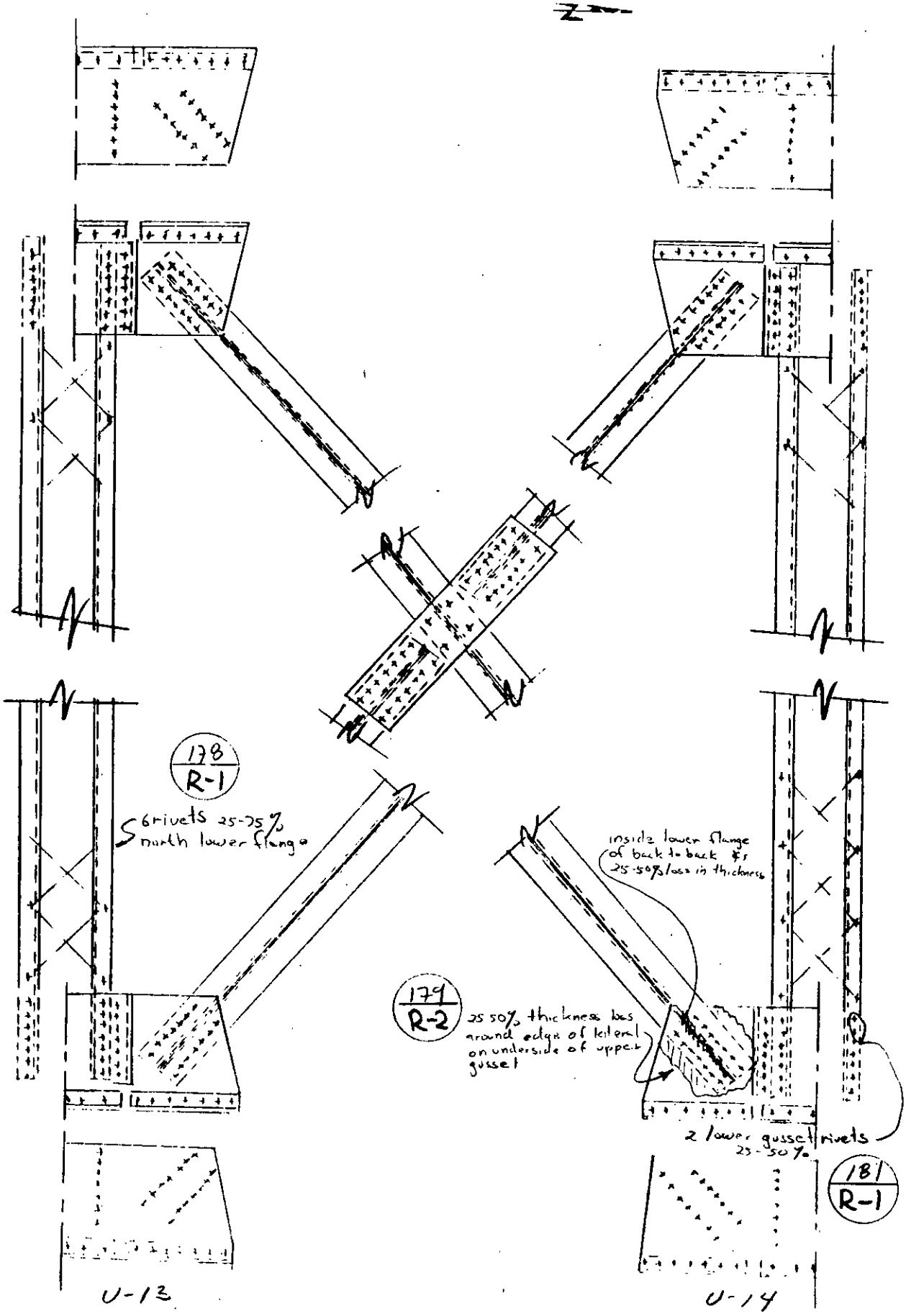
SKETCH D/3/4-5



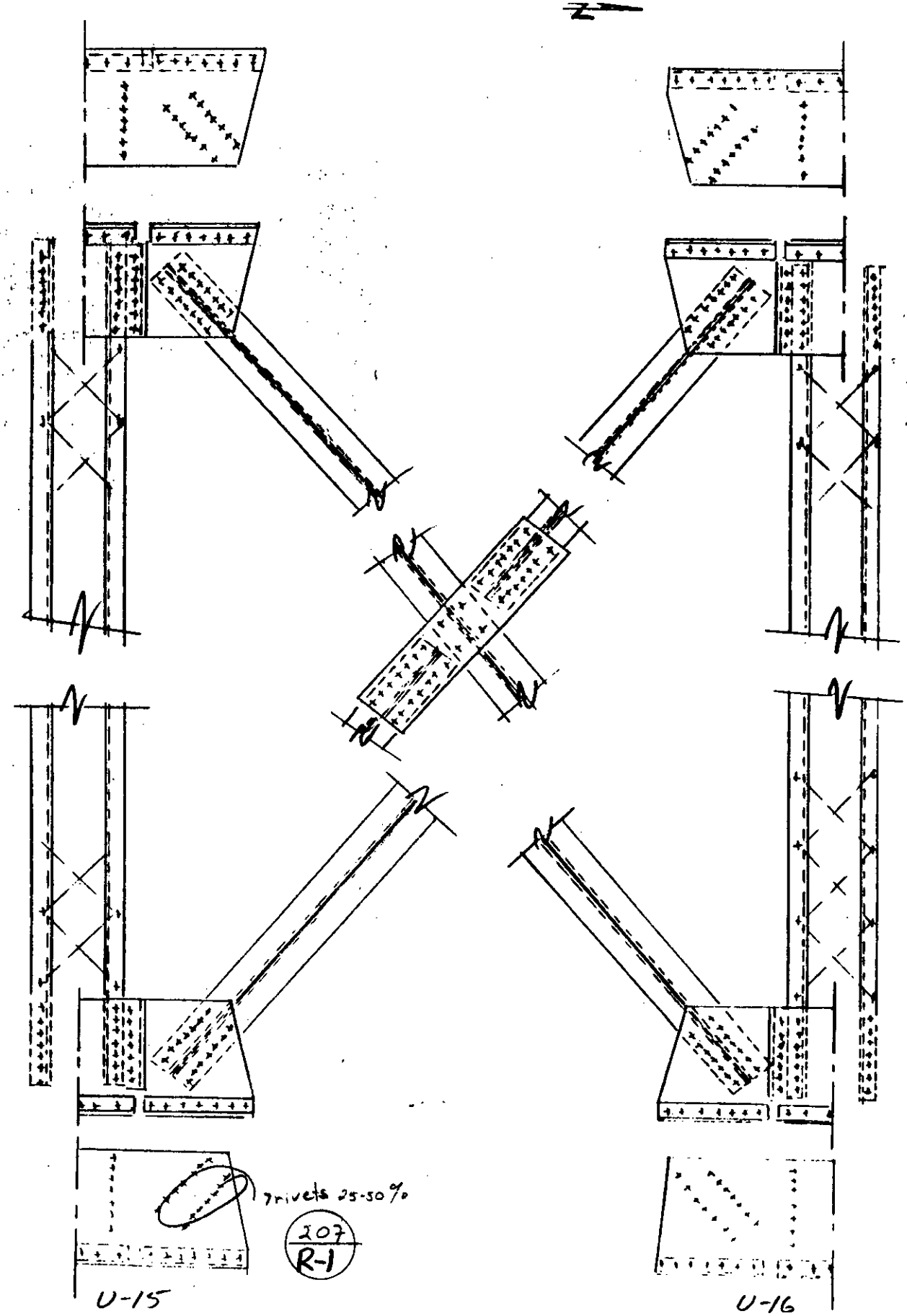
SKETCH D/1/9-10



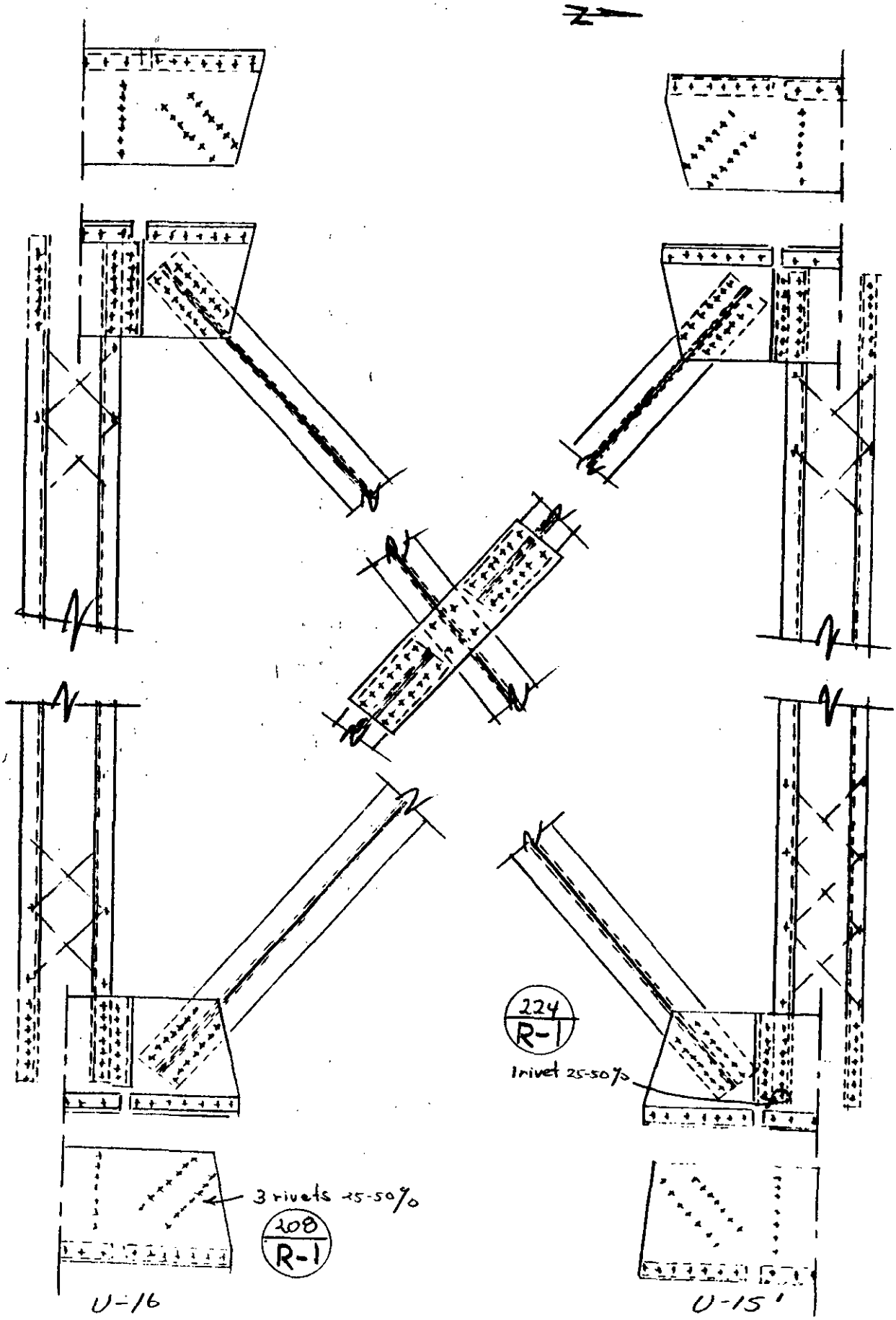
SKETCH D/1/11-12



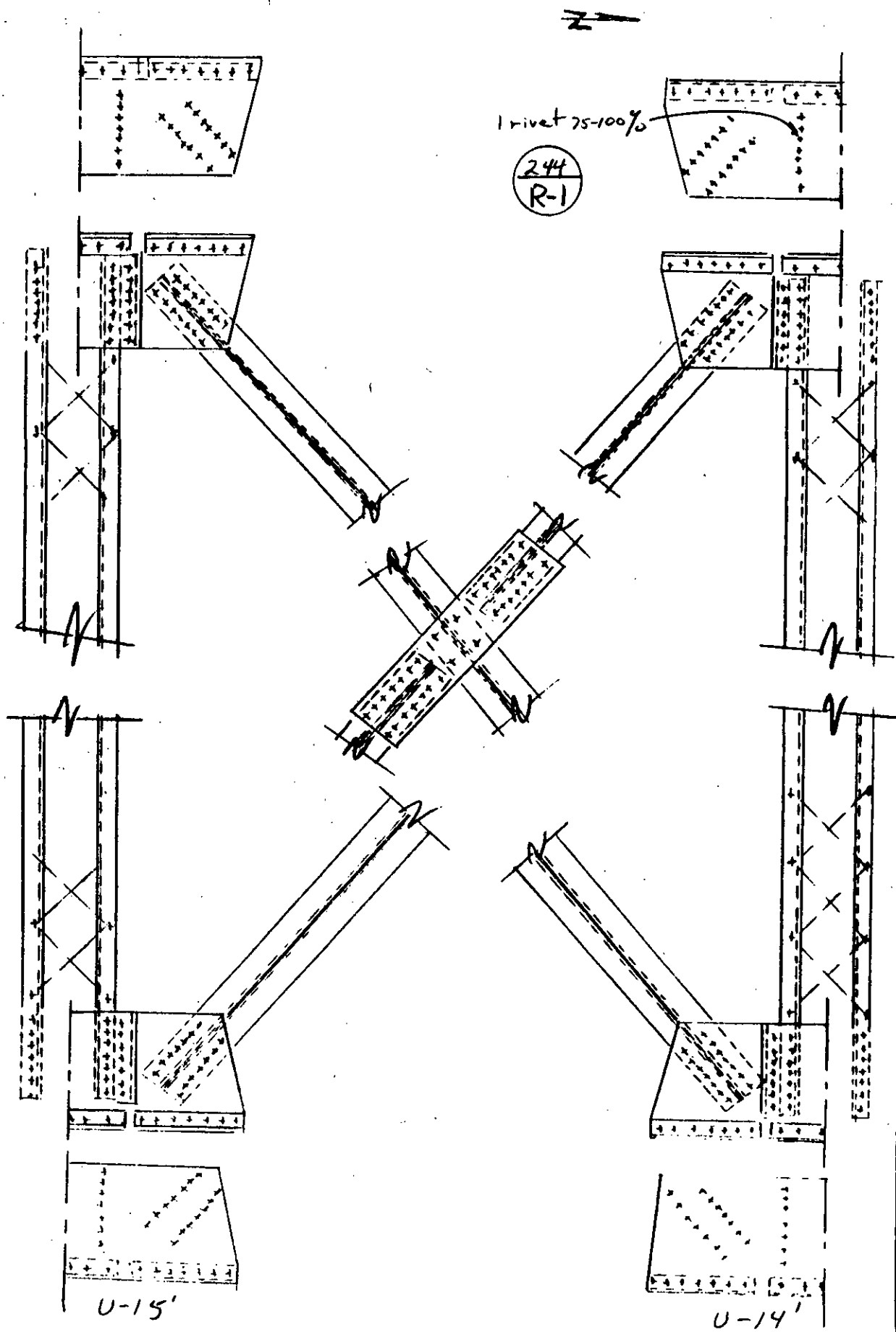
SKETCH D/1/13-14



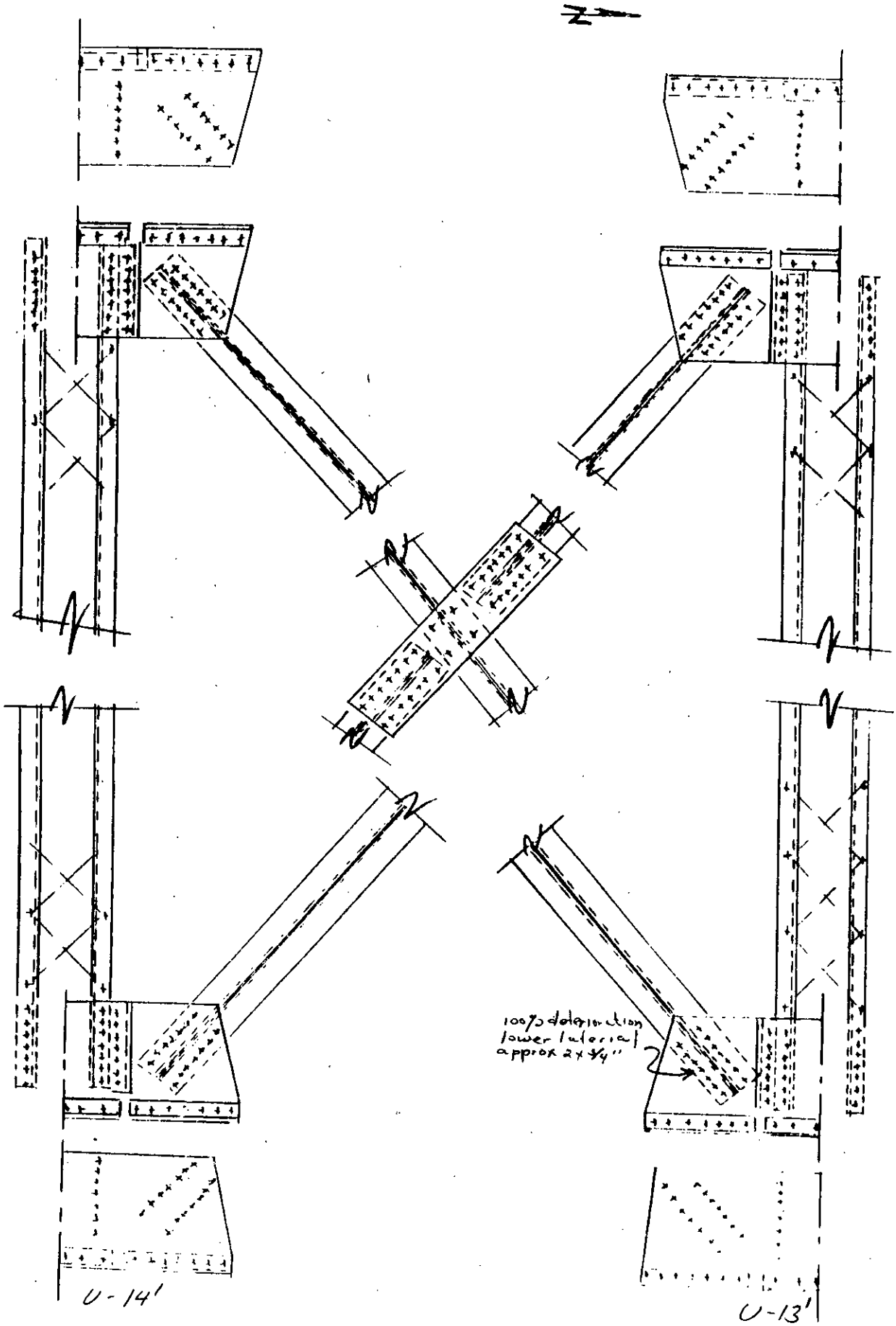
SKETCH D/1/15-16



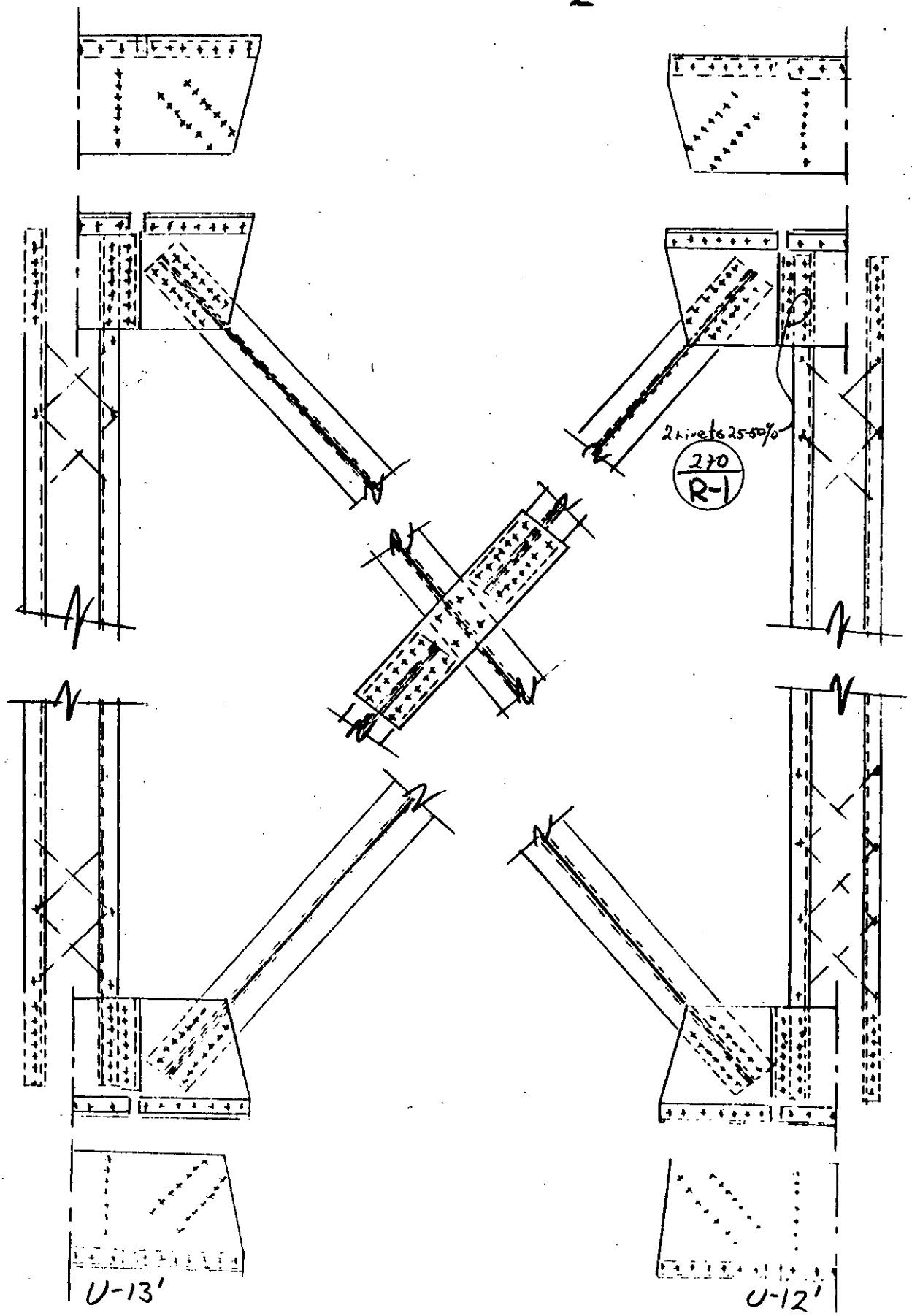
SKETCH D/1/16-15'



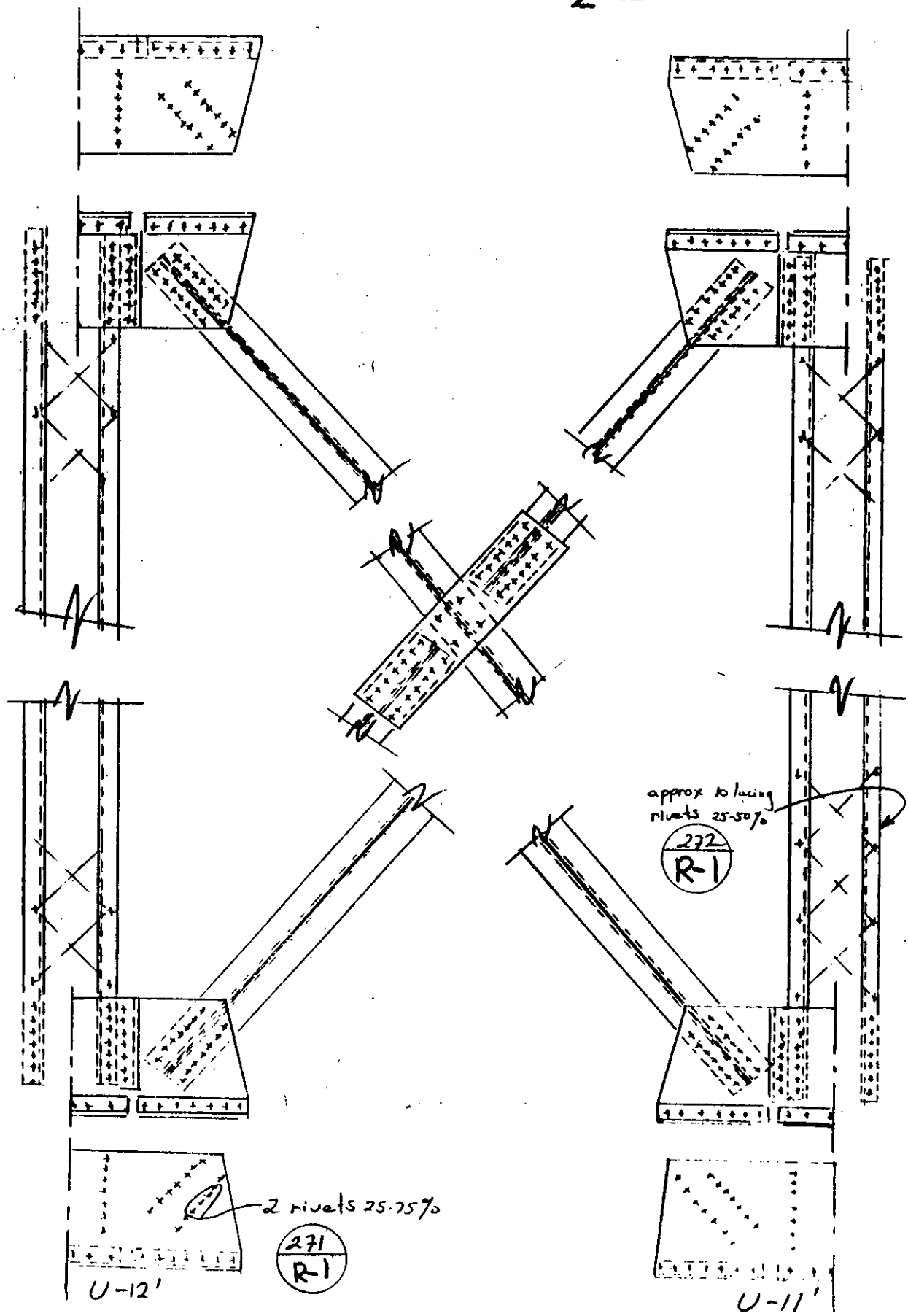
SKETCH D/L/15'-14'



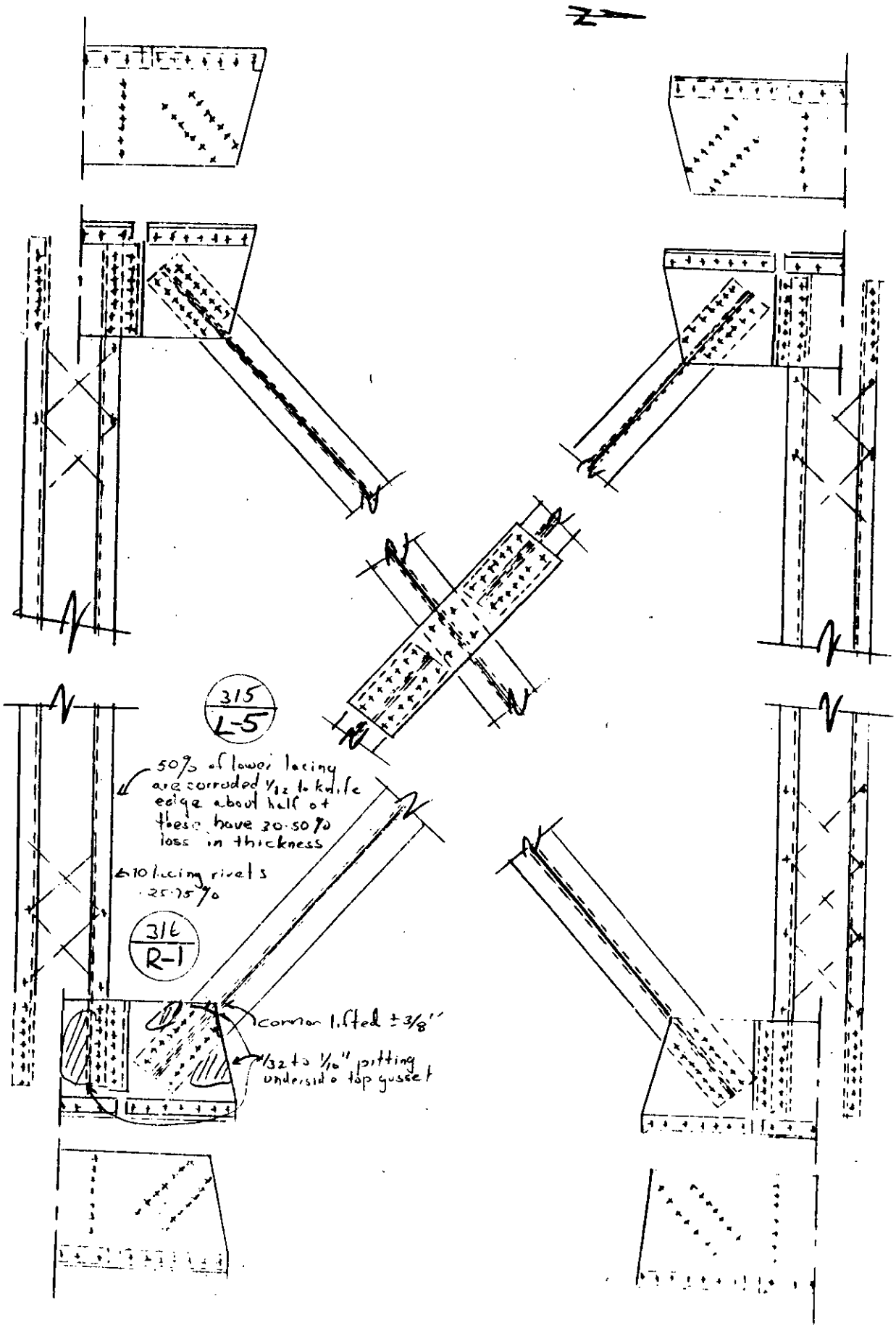
SKETCH D/1/14'-13'



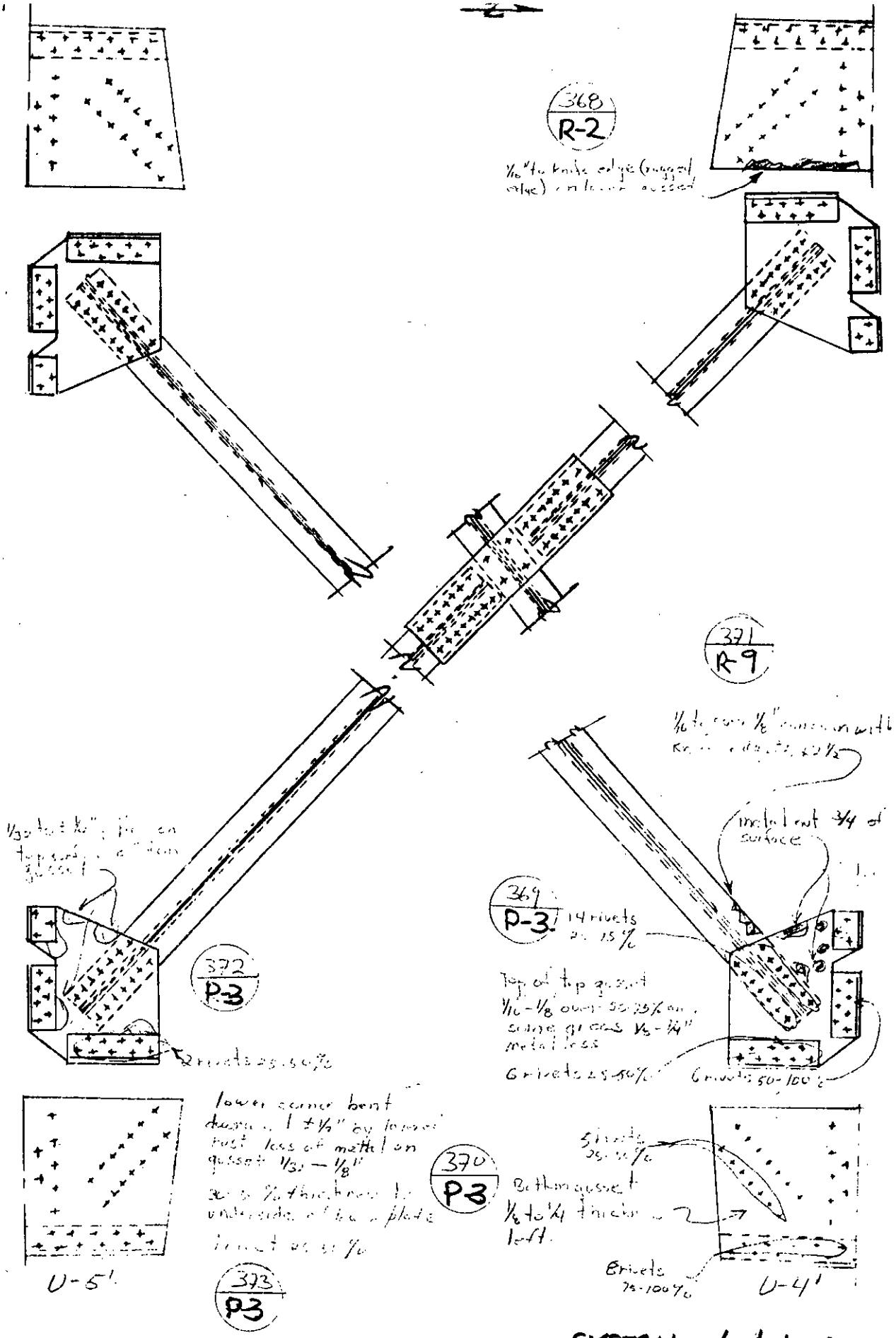
SKETCH D/1 /13'-12'



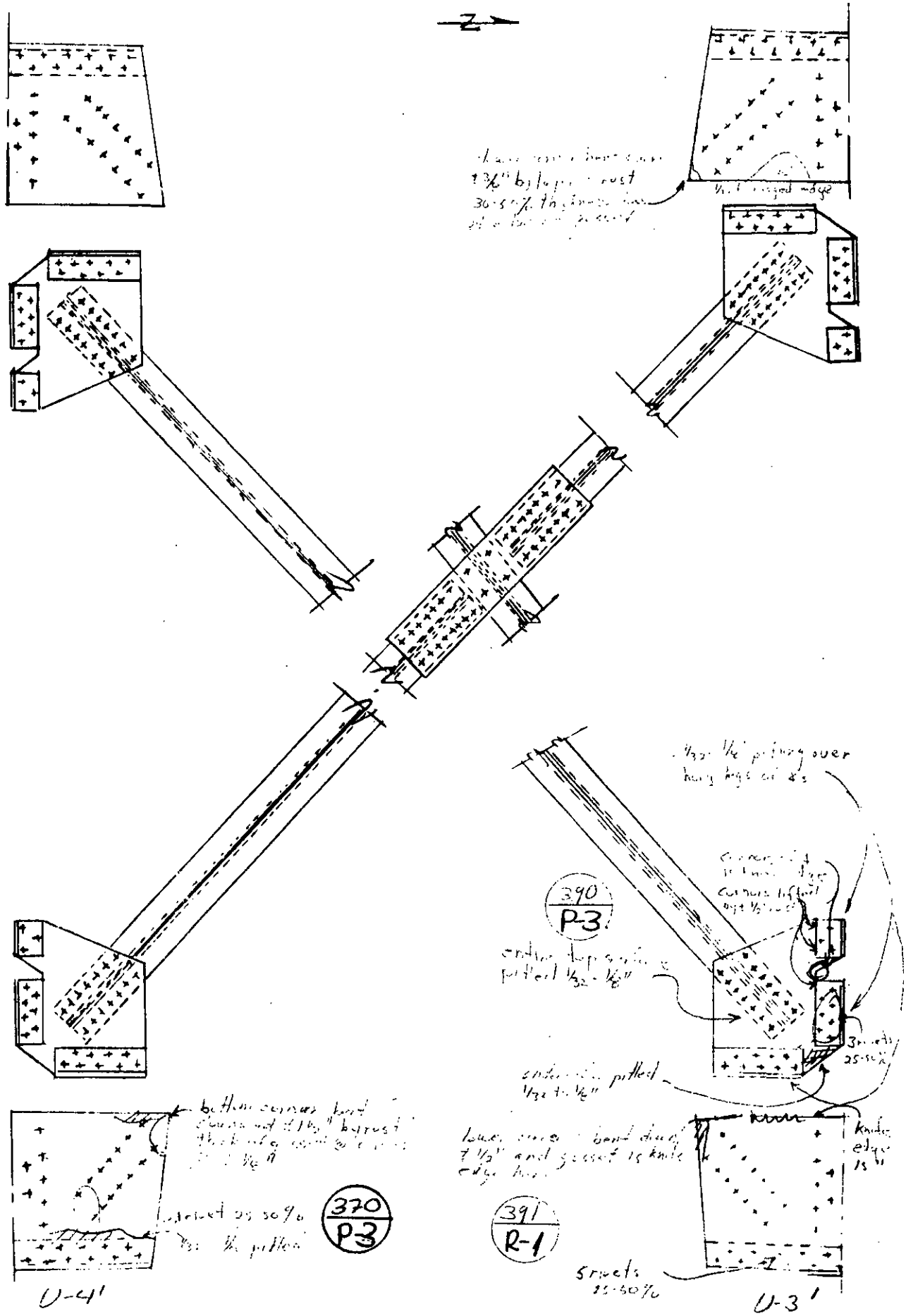
SKETCH D/1/12'-11'



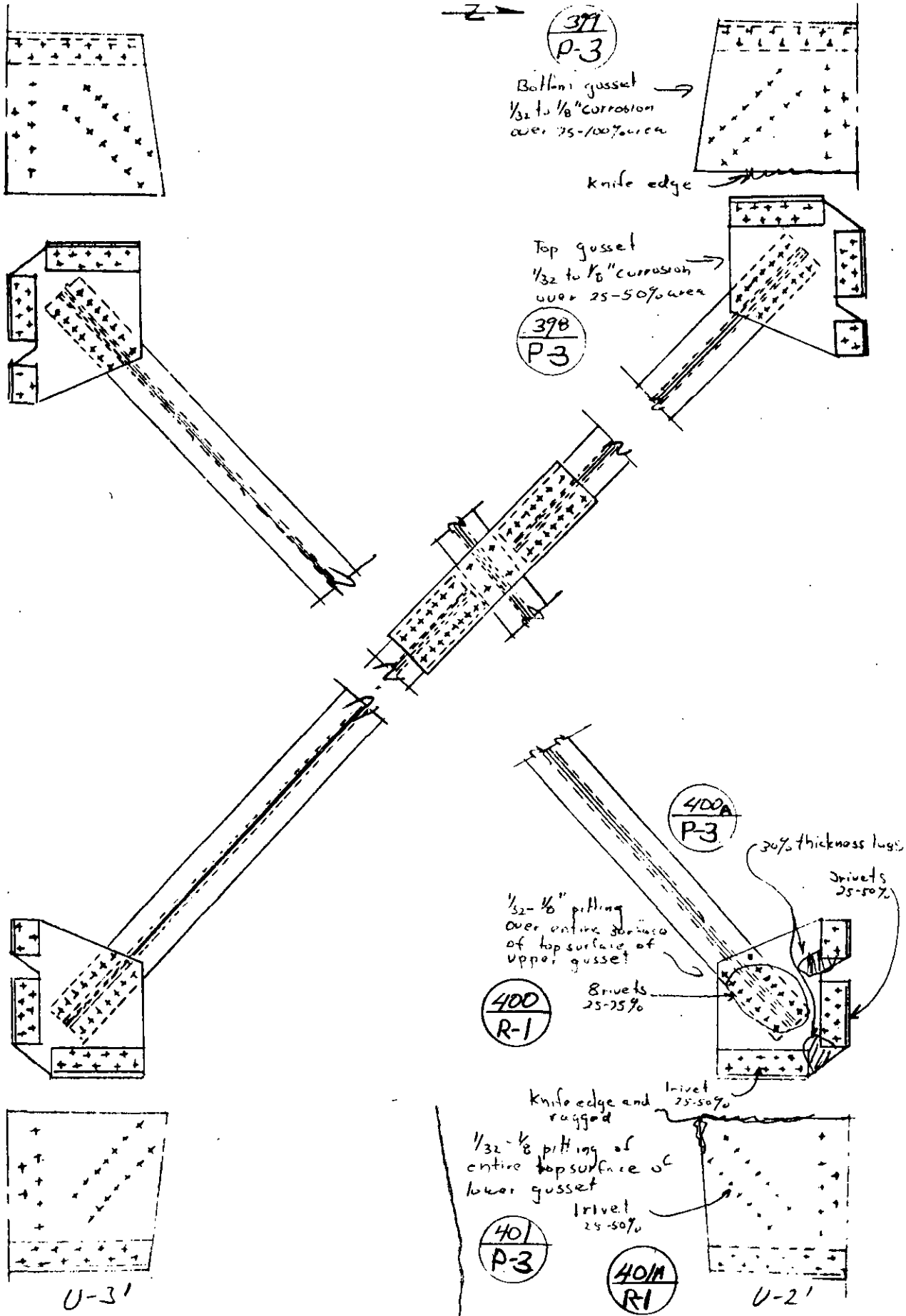
SKETCH D/1/10'-9"



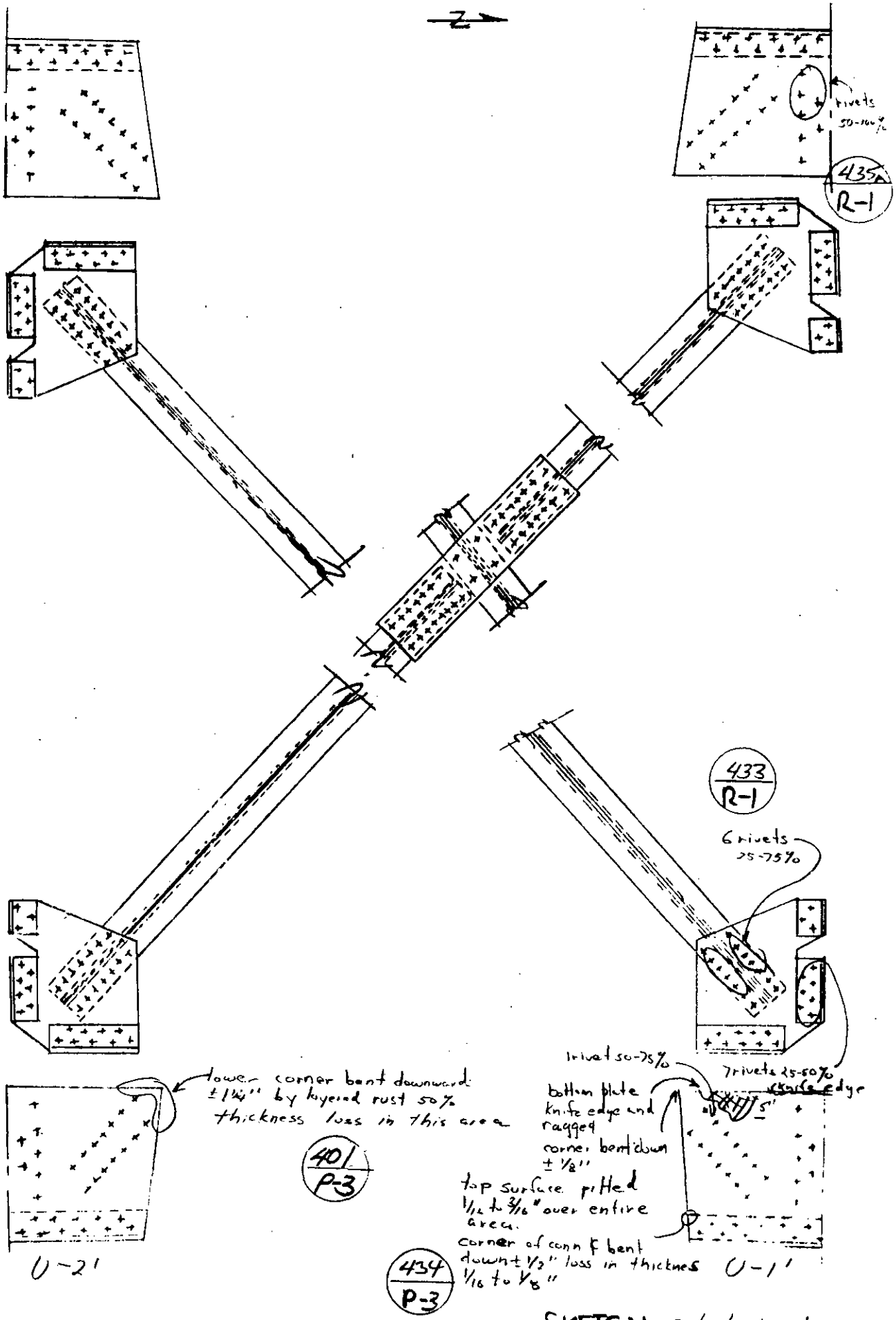
SKETCH D/2/5'4'



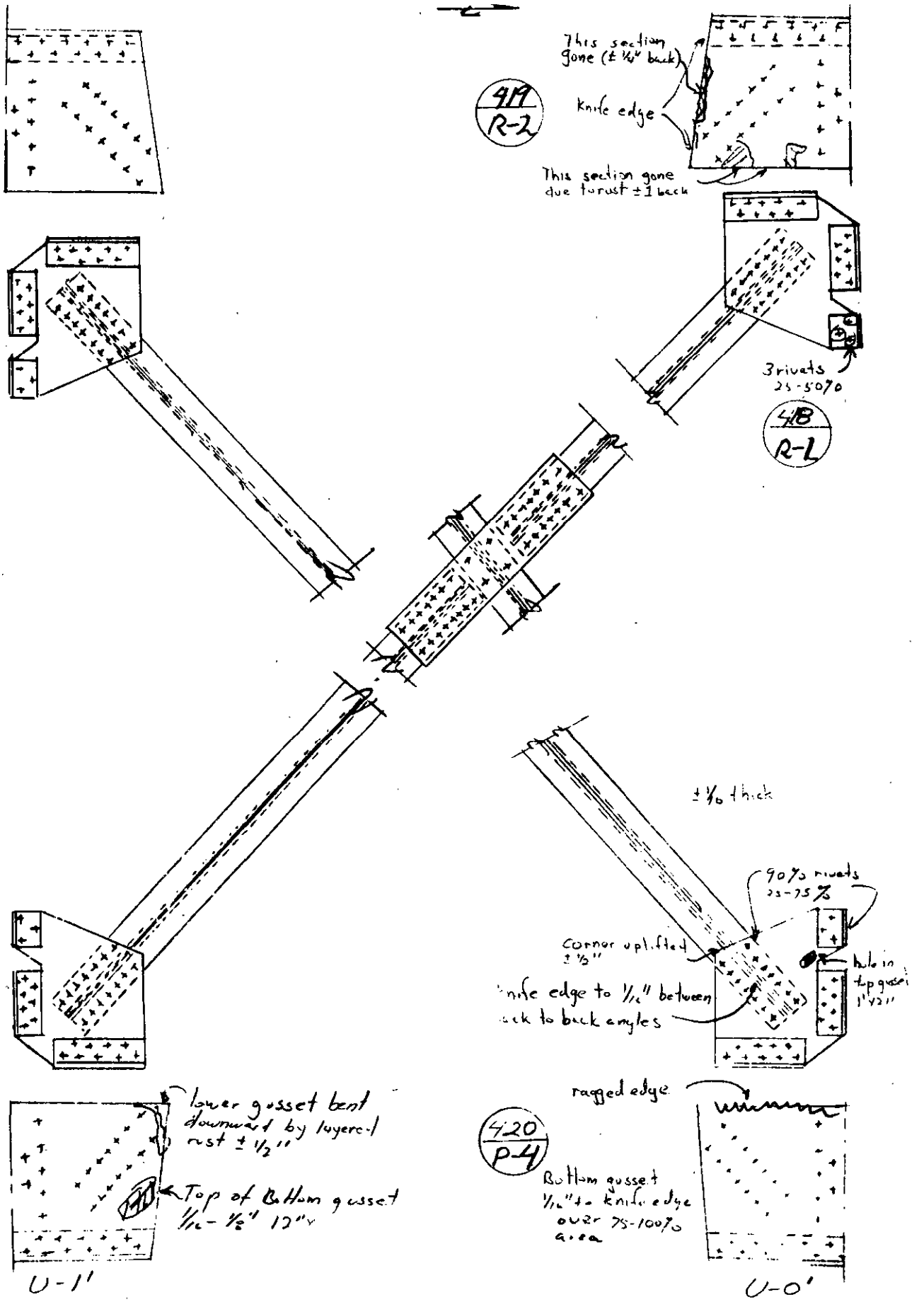
SKETCH D/2/4'-3"


Z
399
P-3
Bottom gusset
1/32 to 1/8" corrosion
over 75-100% area
knife edge
Top gusset
1/32 to 1/8" corrosion
over 25-50% area
398
P-3
400A
P-3
30% thickness lugs
Drivets
25-50%
1/32-1/8" pitting
over entire surface
of top surface of
upper gusset
8 rivets
25-75%
400
R-1
knife edge and
ragged
1 rivet
25-50%
1/32-1/8 pitting of
entire topsurface of
lower gusset
1 rivet
25-50%
401
P-3
401A
R-1
U-3'
U-2'

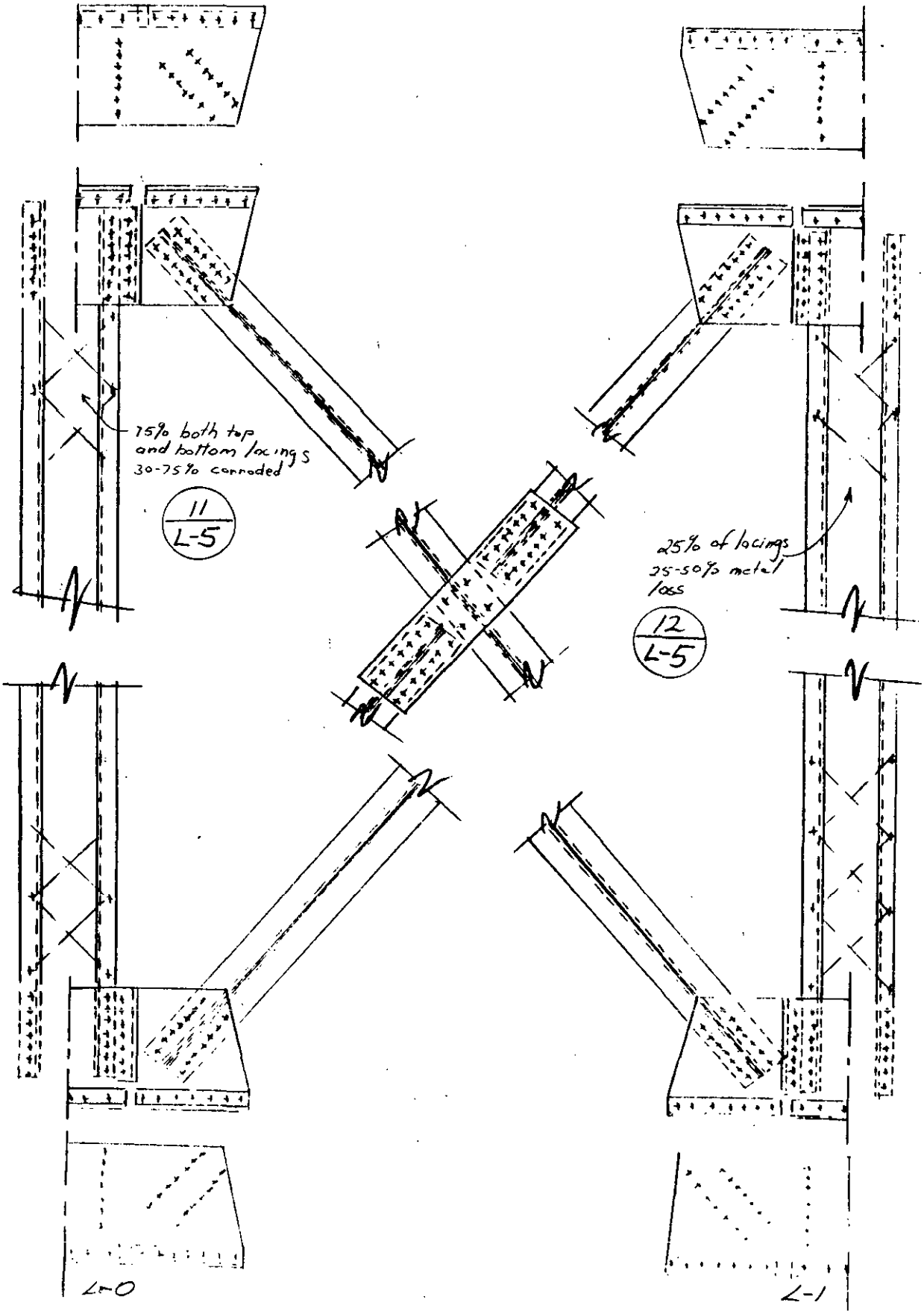
SKETCH D/2/3'-2'



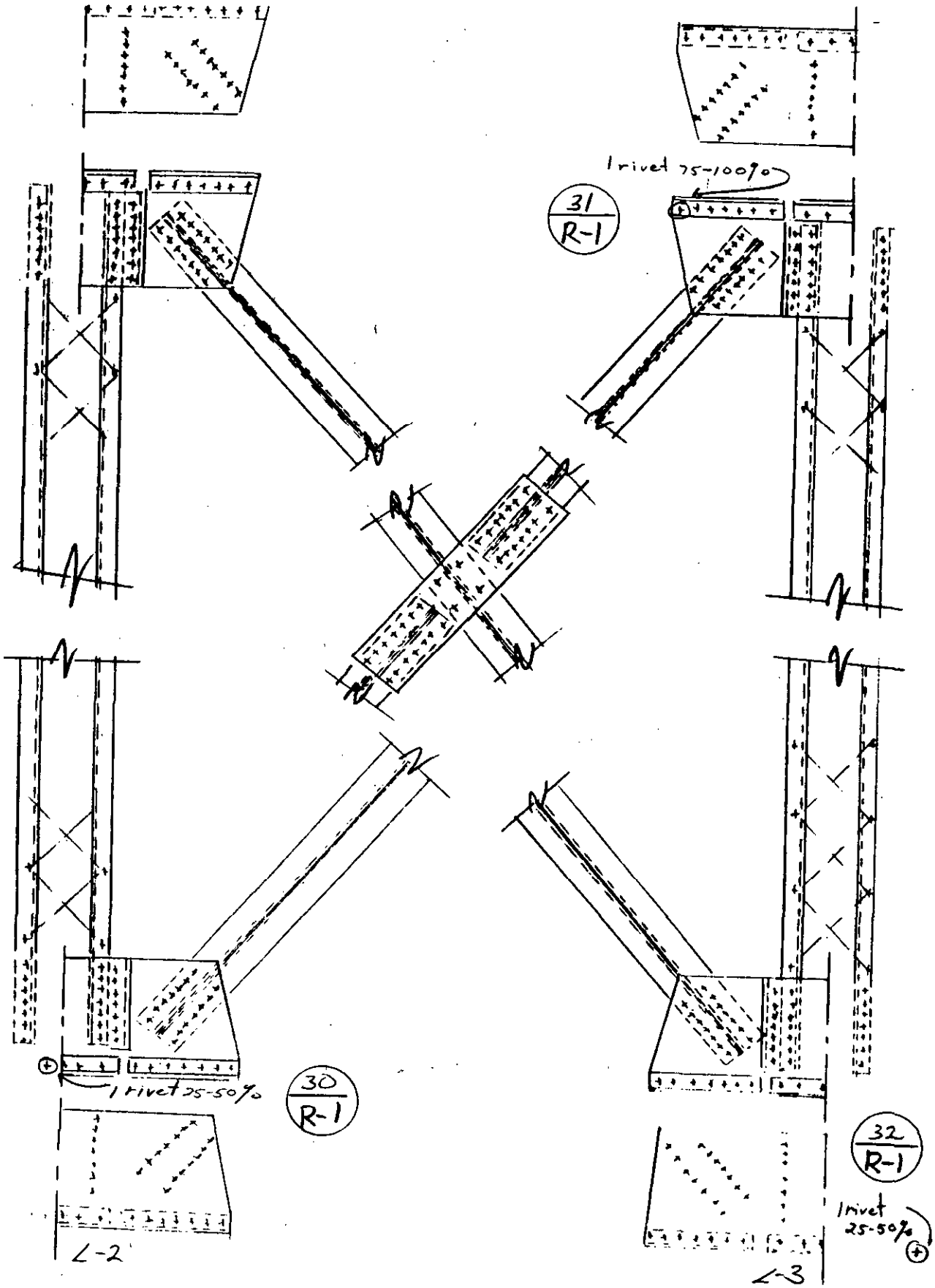
SKETCH D/2/2L-1'


This section gone (± 1/8" back)
Knife edge
This section gone due to rust ± 1 back
4M
R-2
3 rivets 25-50%
4B
R-2
± 1/8 thick
90% rivets 25-75%
Corner uplifted ± 1/8"
hole in top gusset 1"x2"
Knife edge to 1/16" between back to back angles
lower gusset bent downward by layered rust ± 1/2"
Top of Bottom gusset 1/16-1/8" 12"v
U-1'
ragged edge
4-20
P-4
Bottom gusset 1/16" to knife edge over 75-100% area
U-0'

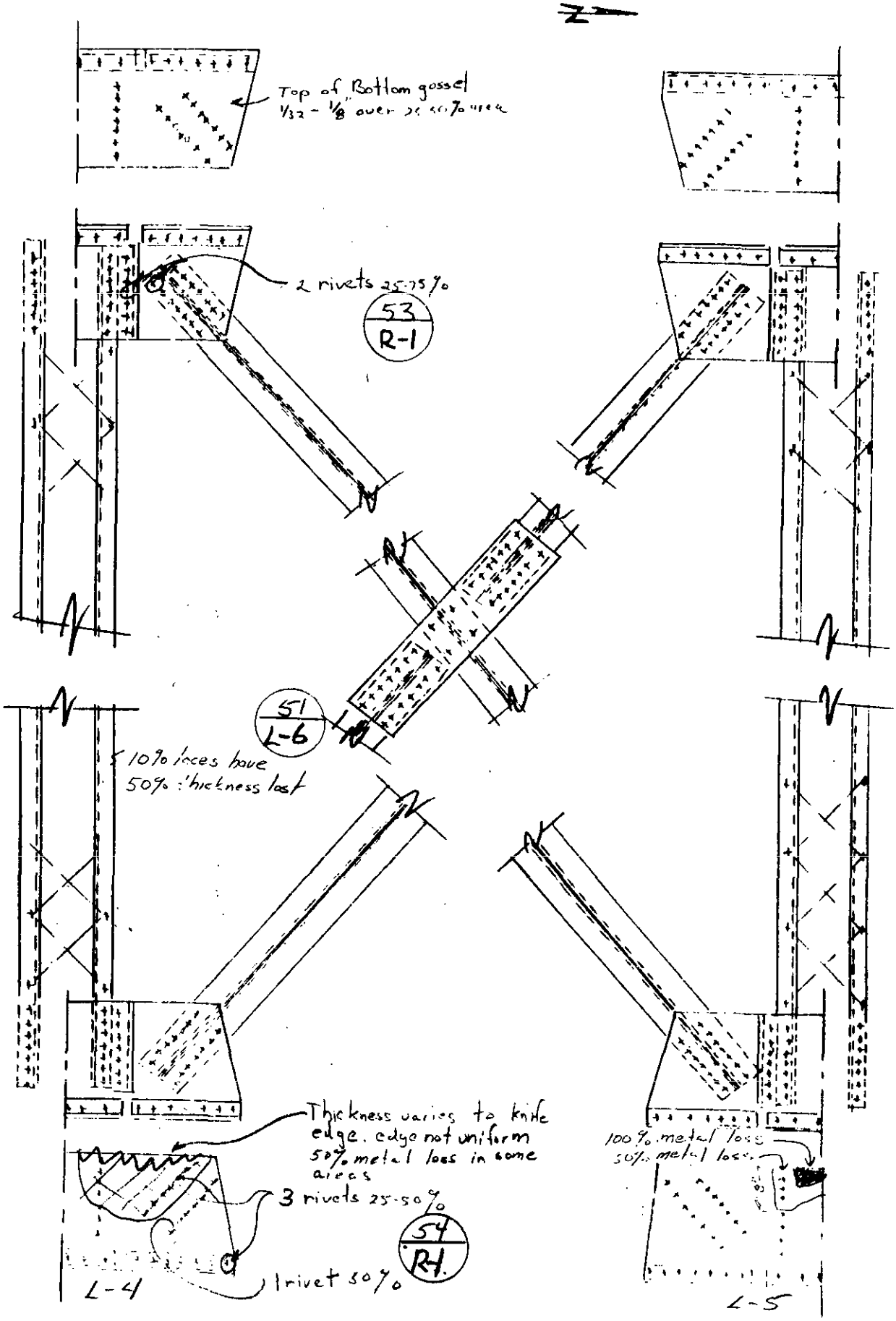
SKETCH D/2/1-0'


75% both top
and bottom lacings
30-75% corroded
11
L-5
25% of lacings
25-50% metal
loss
12
L-5
L-0
L-1

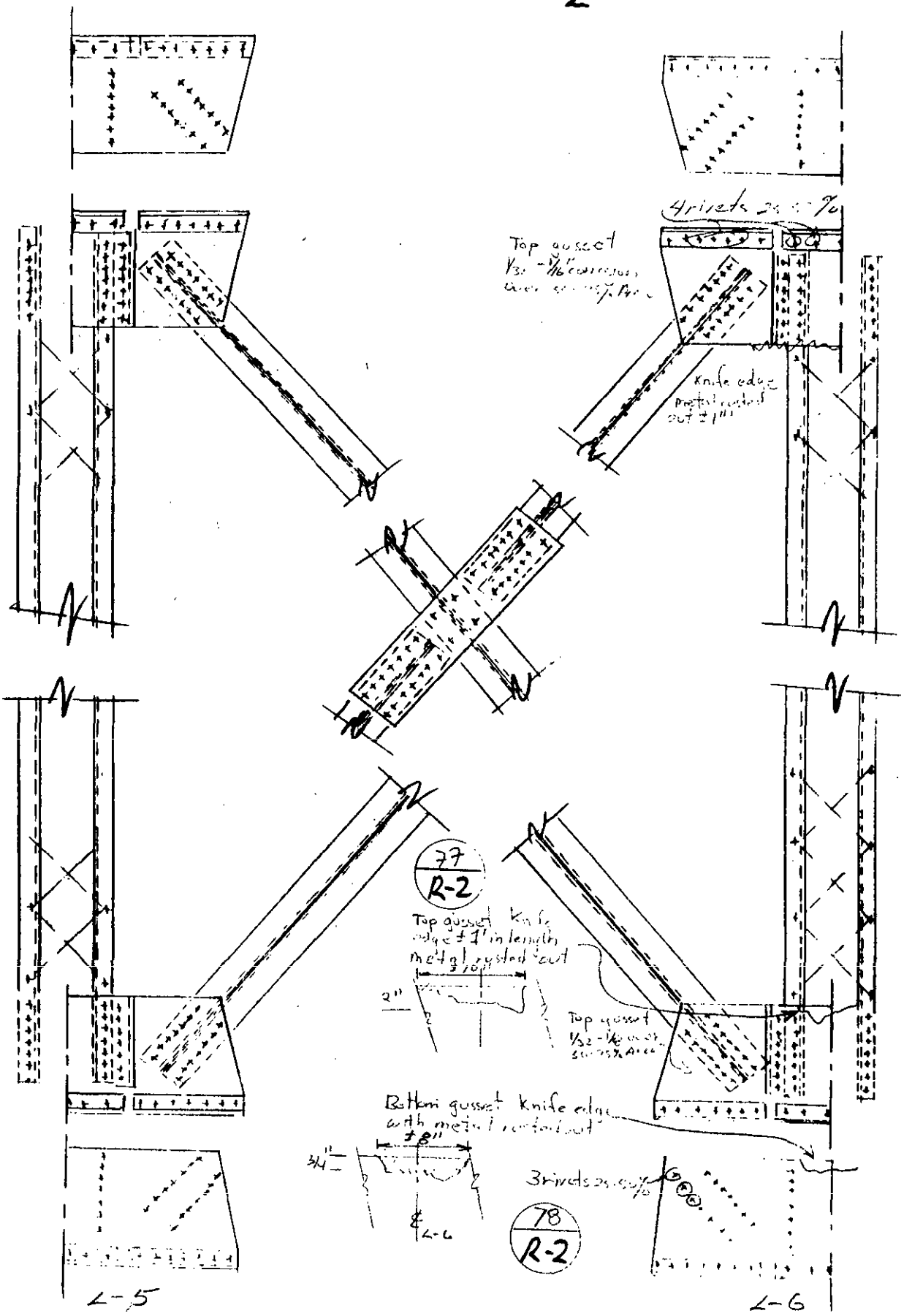
SKETCH E/3/0-1



SKETCH E/3/2-3

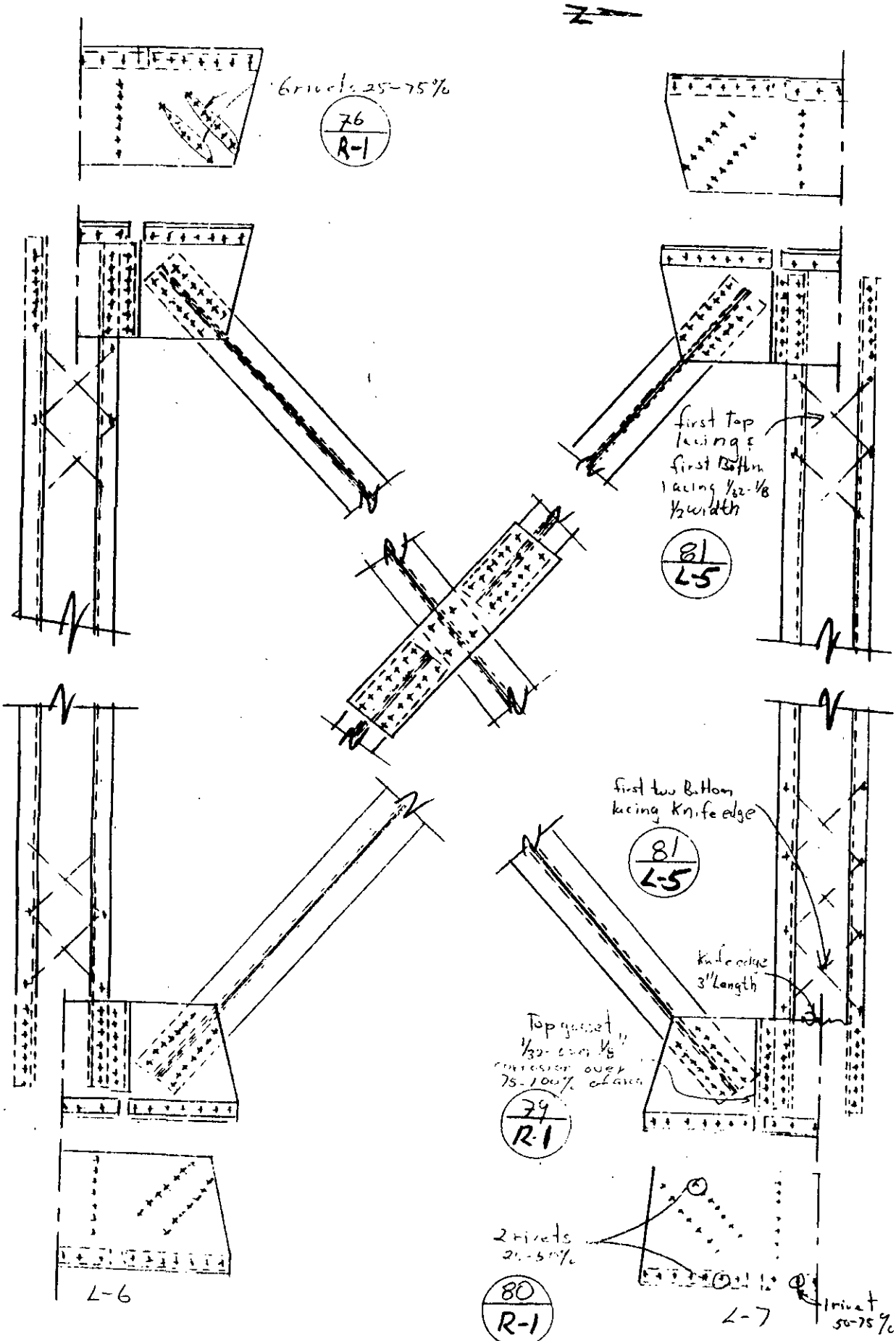

Top of Bottom gosset
1/32 - 1/8" over 25-50% area
2 rivets 25-75%
53
R-1
51
L-6
10% laces have
50% thickness lost
Thickness varies to knife
edge. edge not uniform
50% metal loss in some
areas
3 rivets 25-50%
54
R-4
1 rivet 50%
L-4
100% metal loss
50% metal loss
L-5

SKETCH E/3/4-5

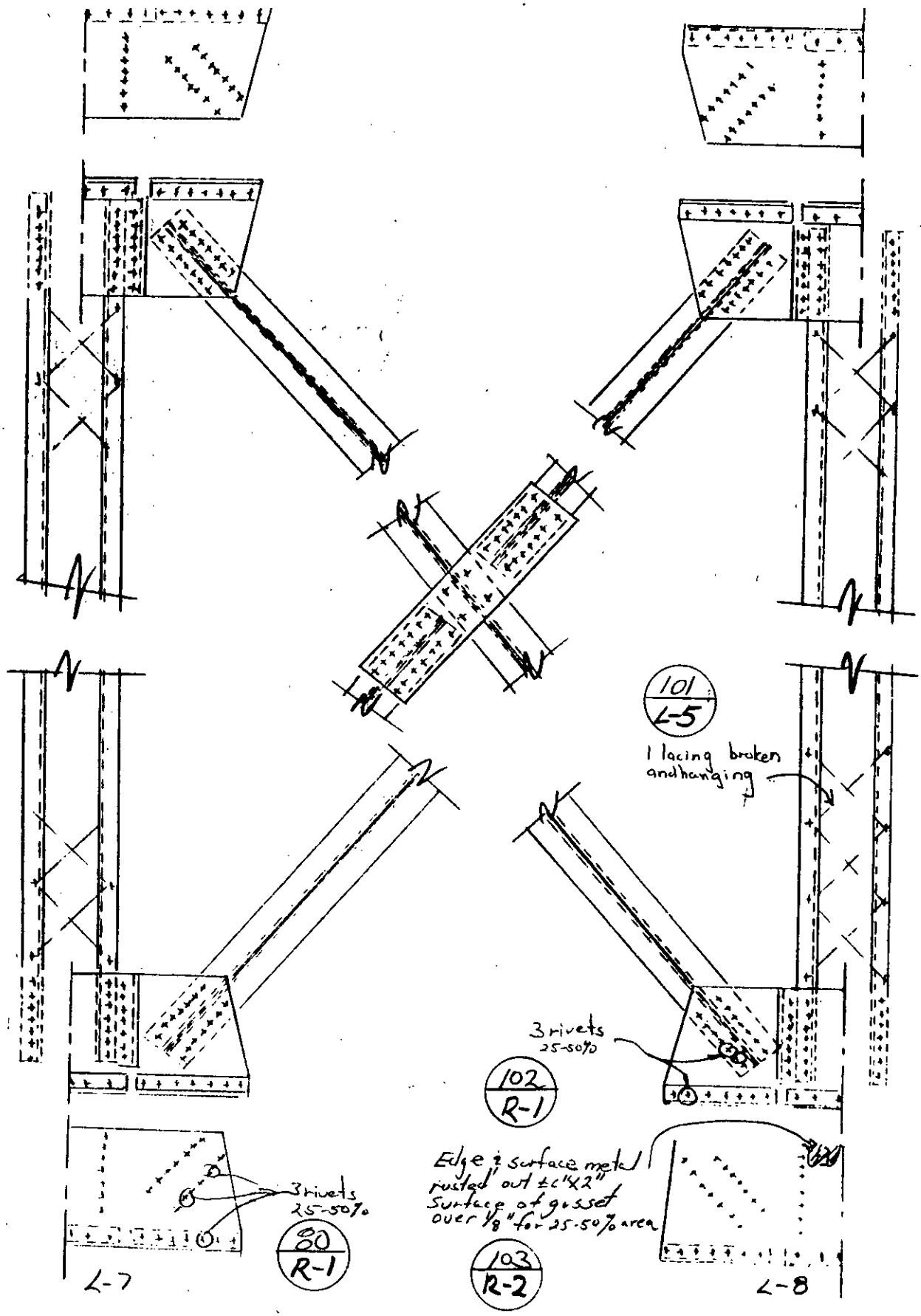


Top gusset
Knife edge
77
R-2
Top gusset knife edge ± 1' in length metal rusted out
Top gusset
Bottom gusset knife edge with metal rusted out
3 rivets
78
R-2
L-5
L-6

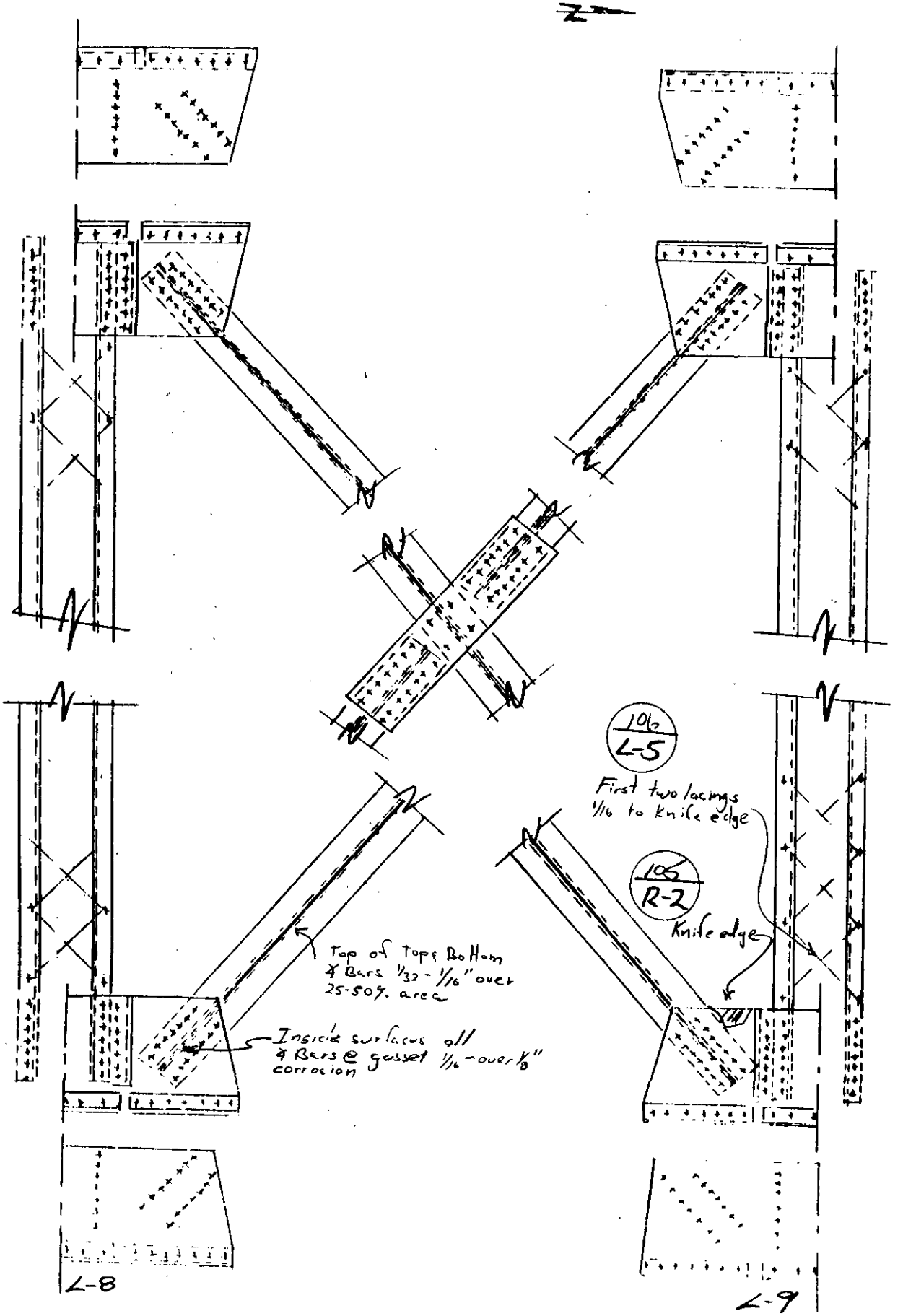
SKETCH E/3/5-6


6 rivets 25-75%
76
R-1
first top lacing & first bottom lacing 1/32-1/8 1/2 width
81
L-5
first two Bottom lacing Knife edge
81
L-5
Knife edge 3" Length
Top gusset 1/32-1/8" compression over 75-100% chord
79
R-1
2 rivets 25-50%
80
R-1
L-6
L-7
1 rivet 50-75%

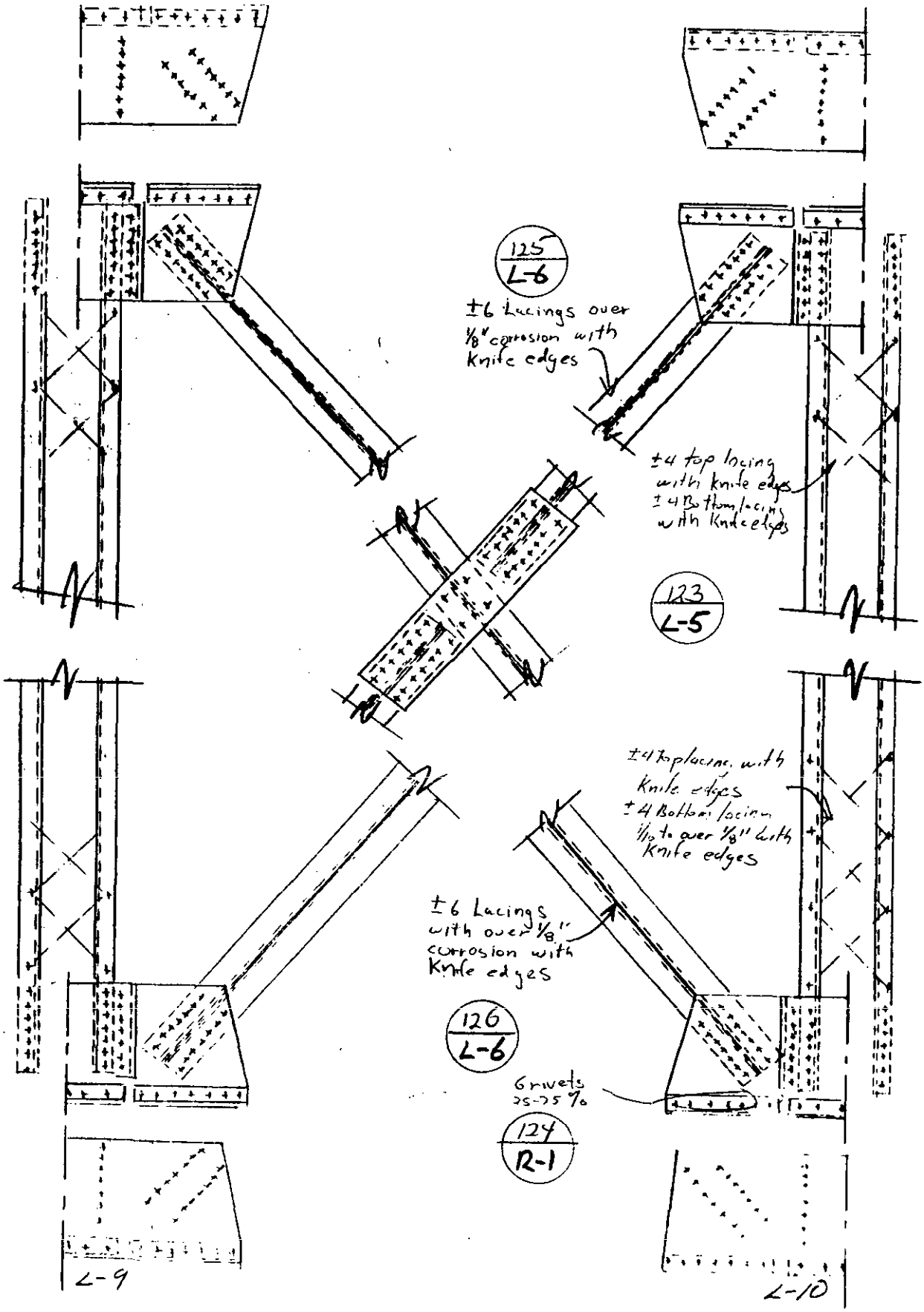
SKETCH E/3/6-7


101
L-5
1 lacing broken and hanging
3 rivets 25-50%
102
R-1
Edge & surface metal rusted out ±c 1"x2"
Surface of gusset over 1/8" for 25-50% area
3 rivets 25-50%
80
R-1
103
R-2
L-7
L-8

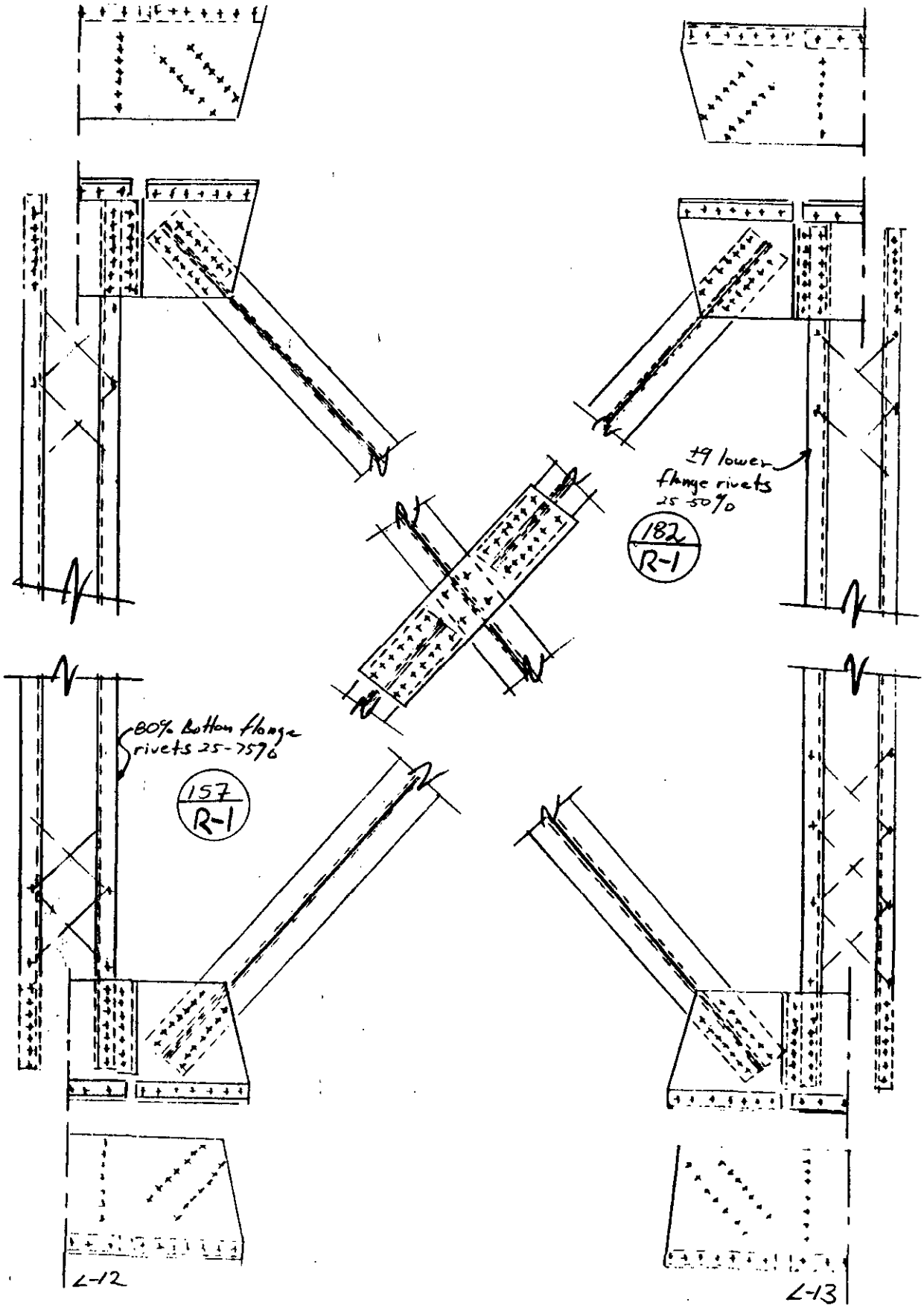
SKETCH E/3/7-8


10b
L-5
First two lacings
1/16 to knife edge
10b
R-2
Knife edge
Top of Tops Bottom
4 Bars 1/32 - 1/16" over
25-50% area
Inside surfaces all
4 Bars @ gusset 1/16 - over 1/8"
corrosion
L-8
L-9

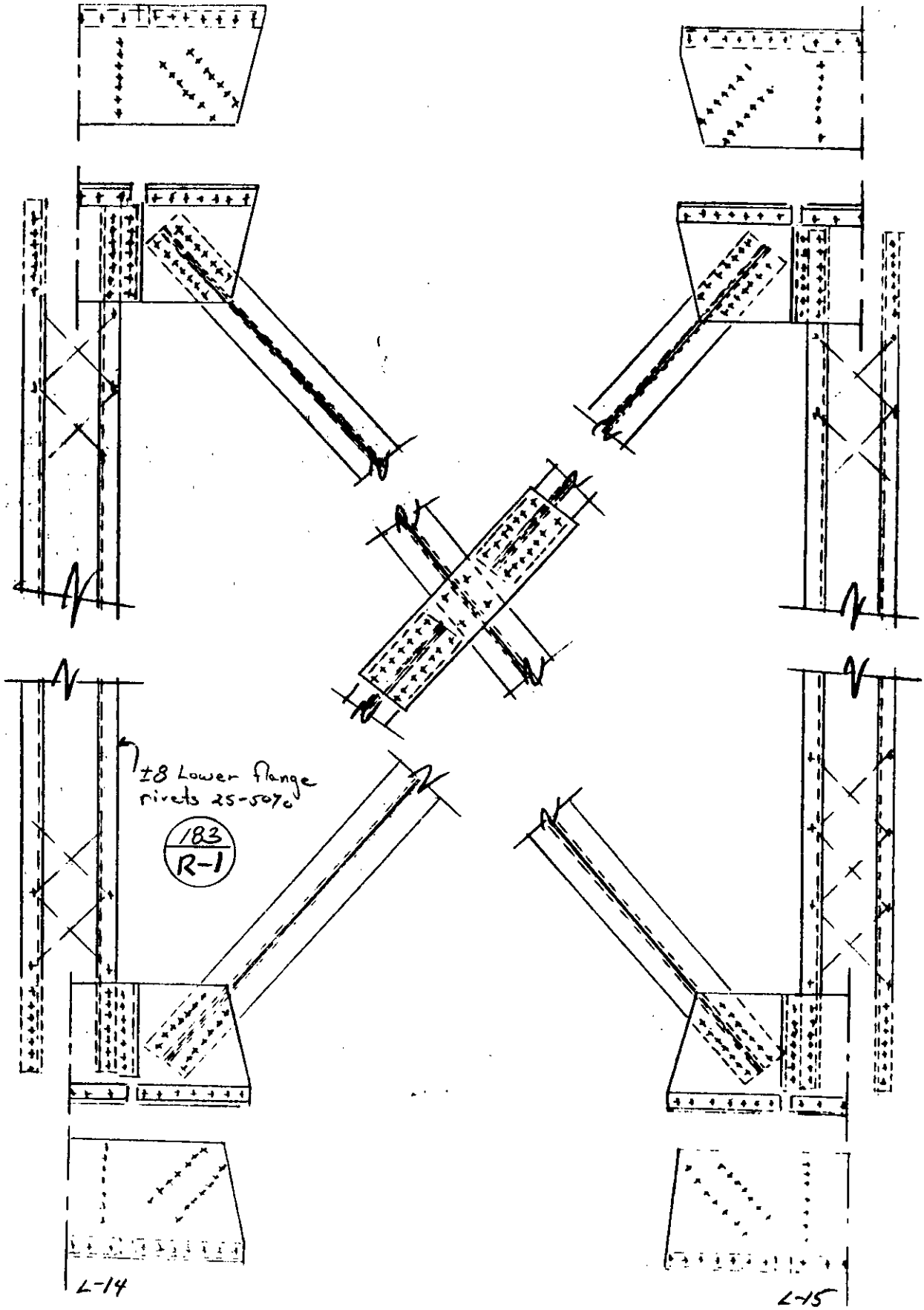
SKETCH E/3/8-9



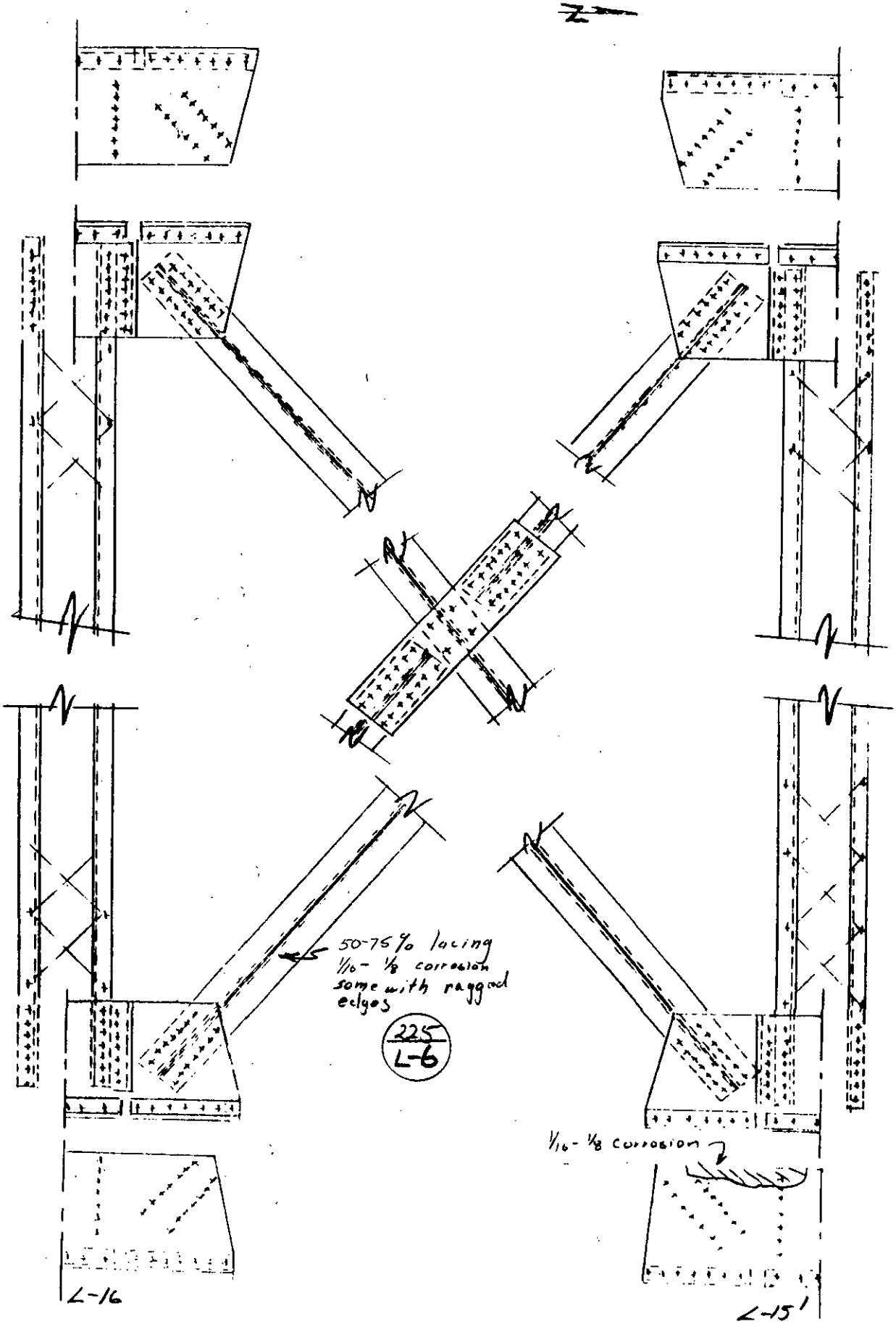
SKETCH E/1/9-10



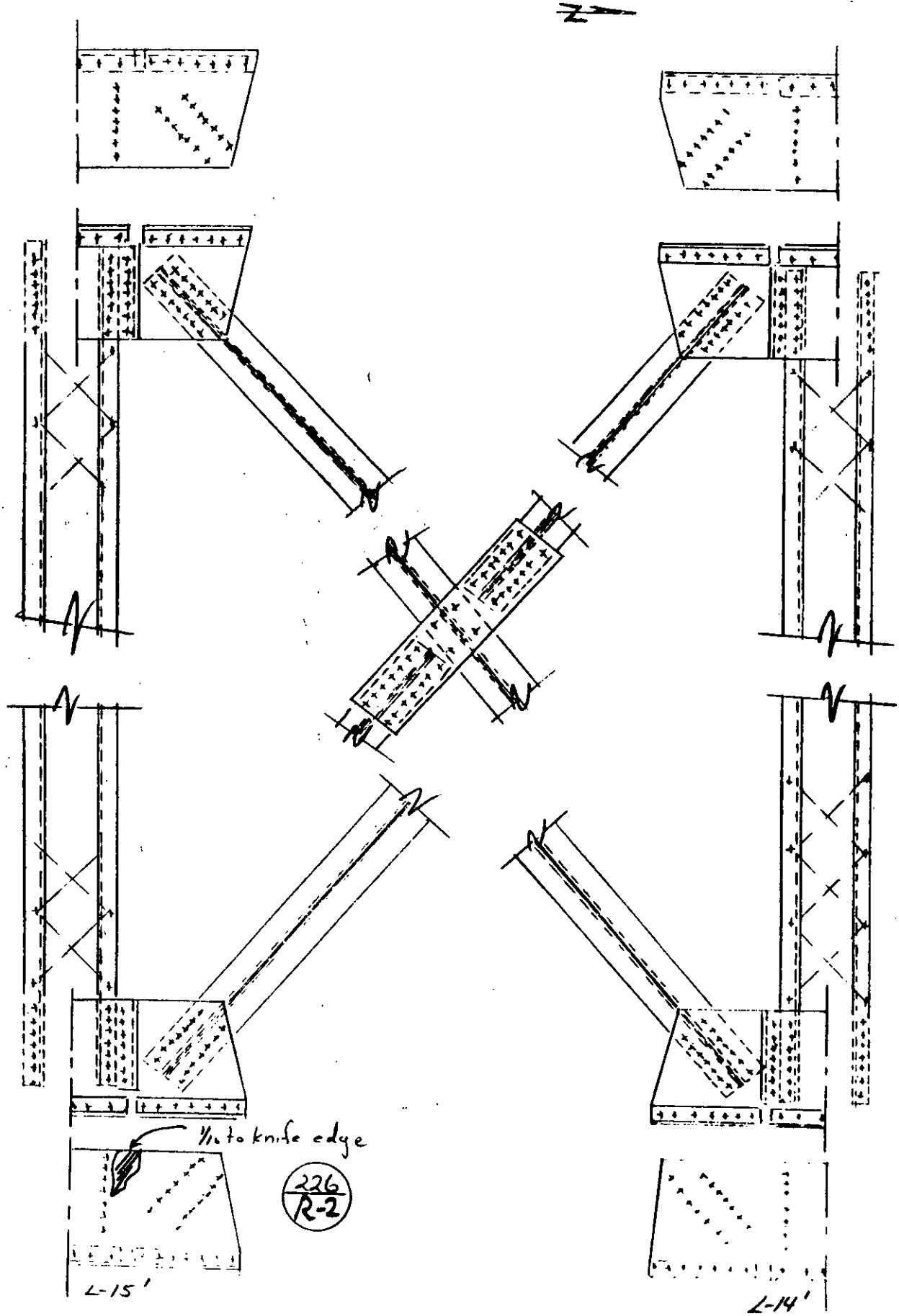
SKETCH #11/12-13



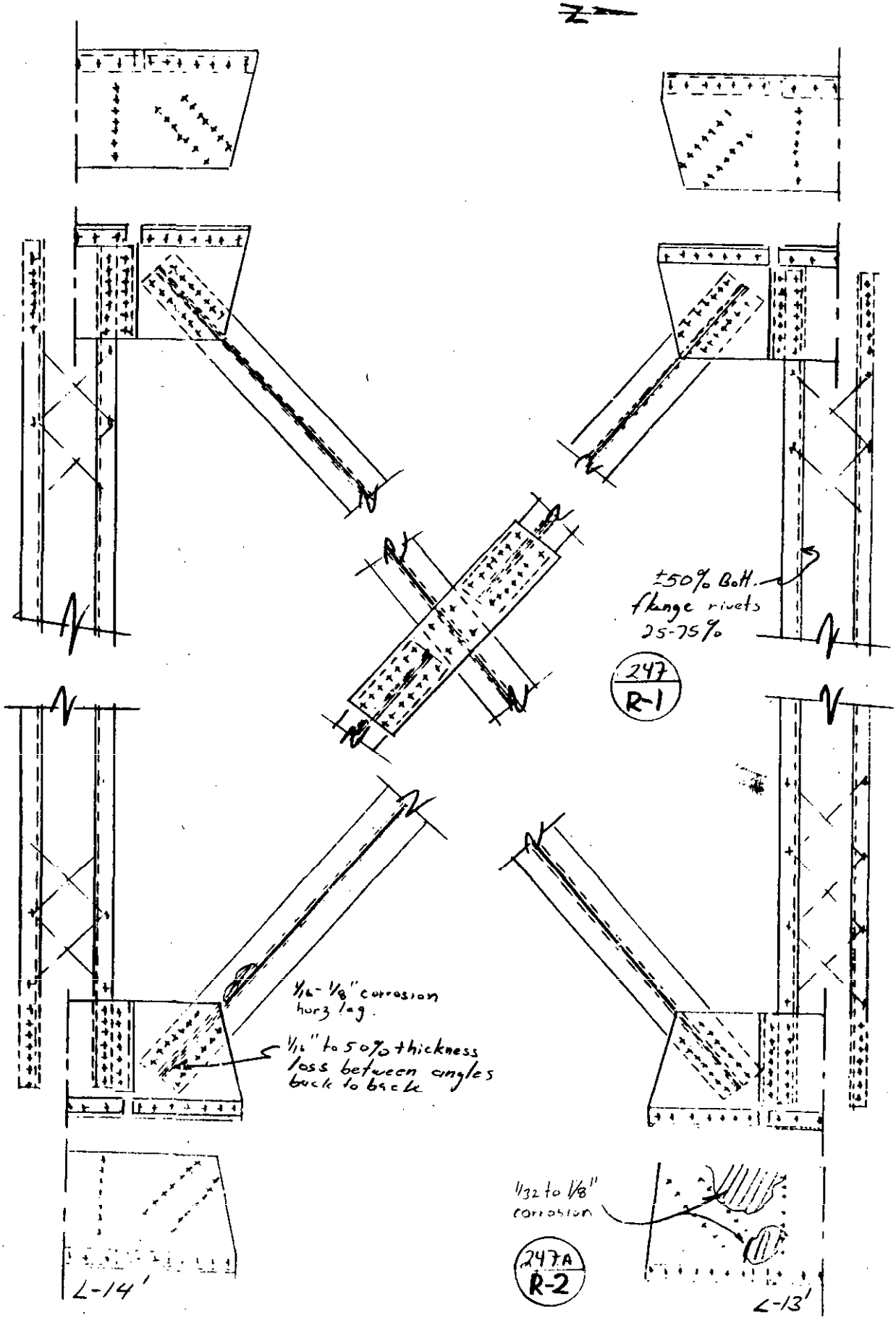
SKETCH E/1/14-15



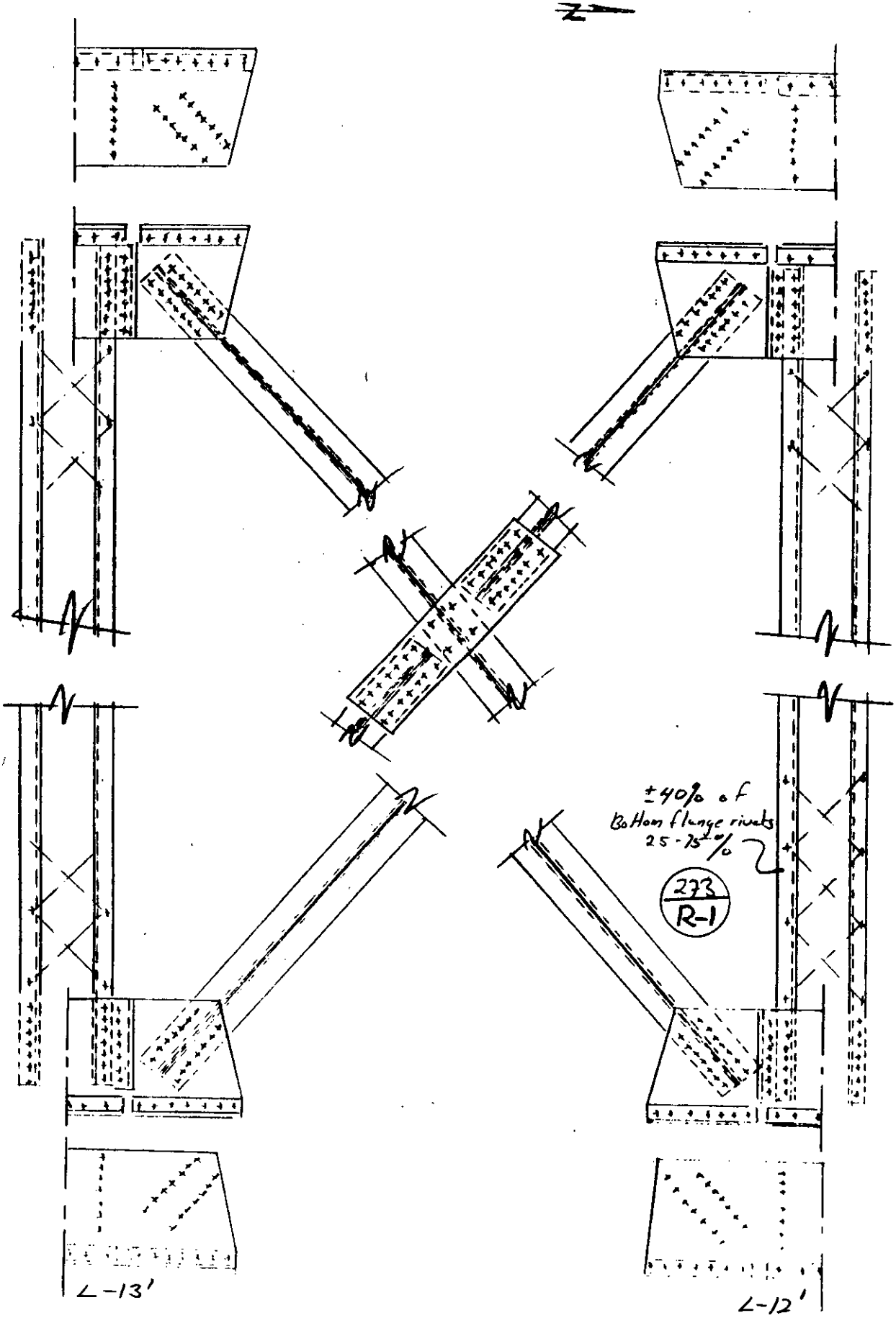
SKETCH E/1/16-15'



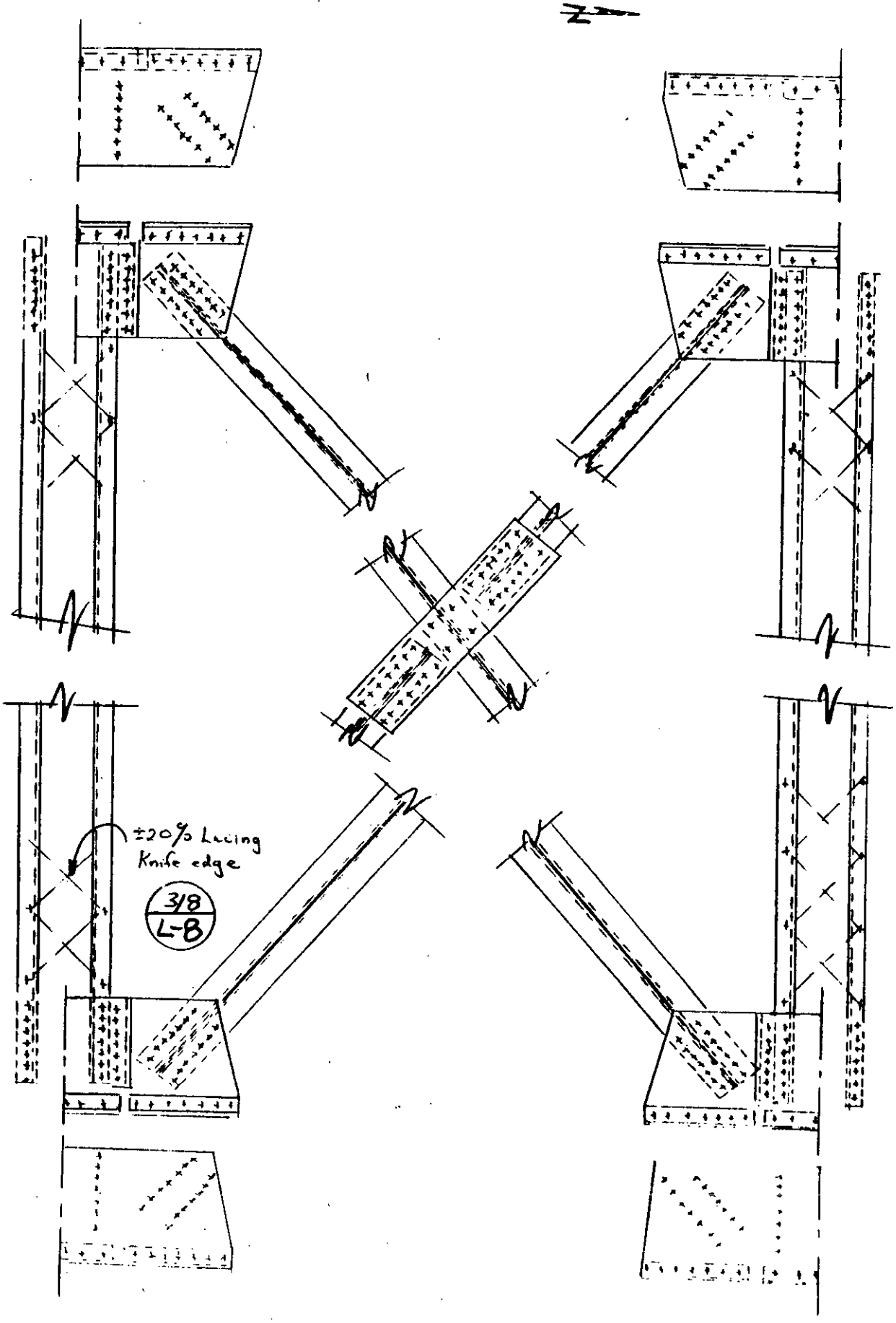
SKETCH E/1/15'-14'



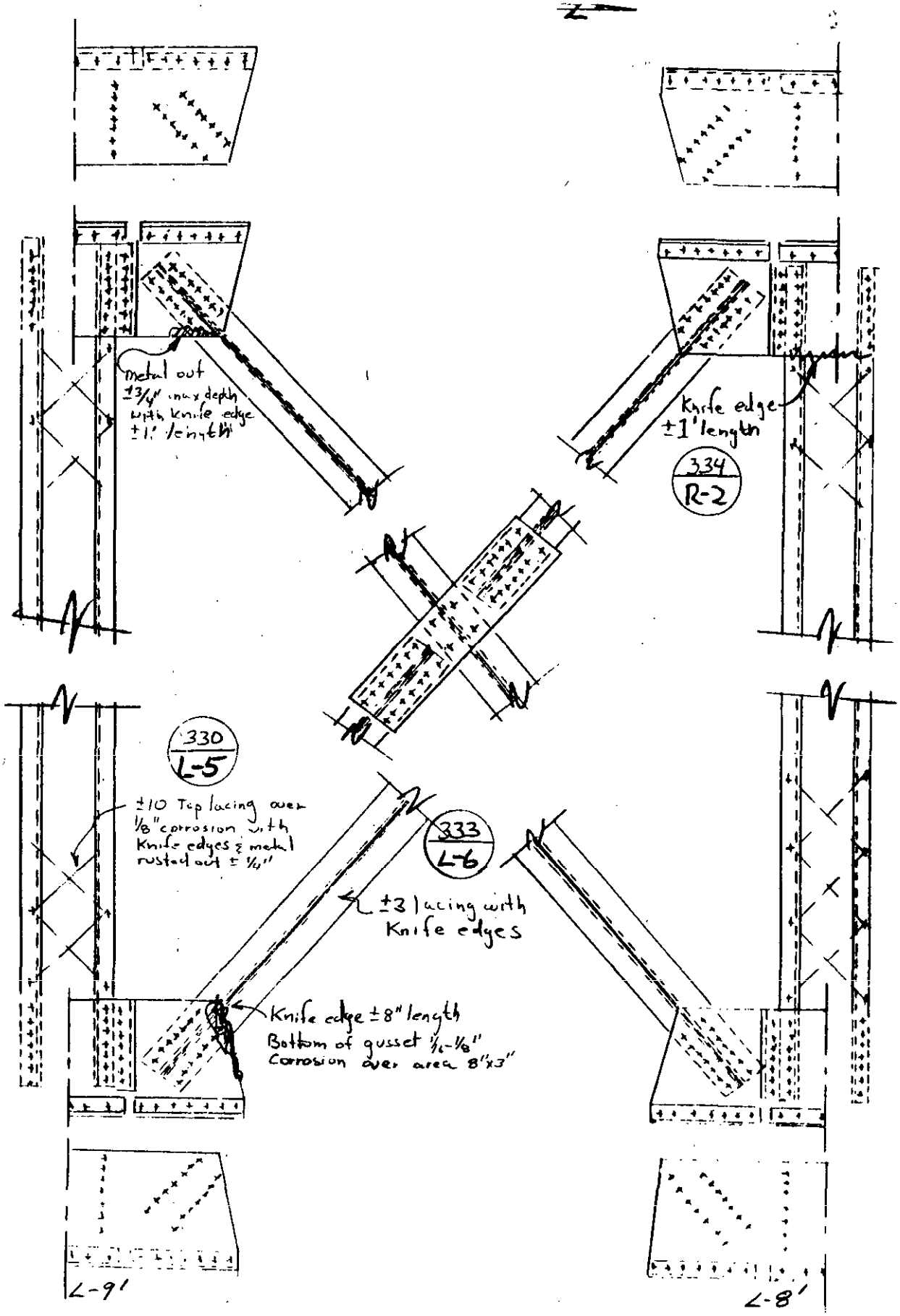
SKETCH E/1/14-13'



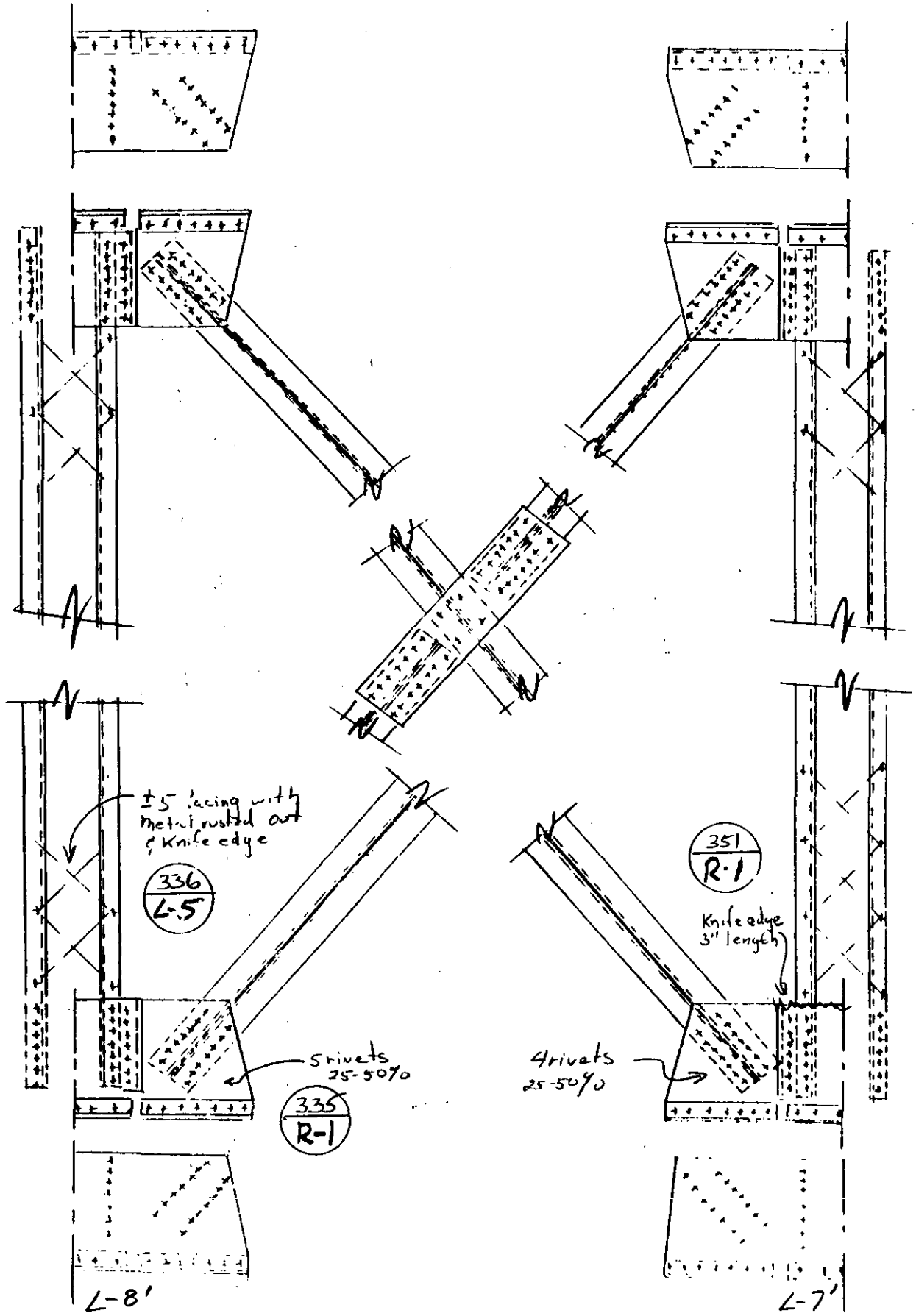
SKETCH E/1/13'-12'



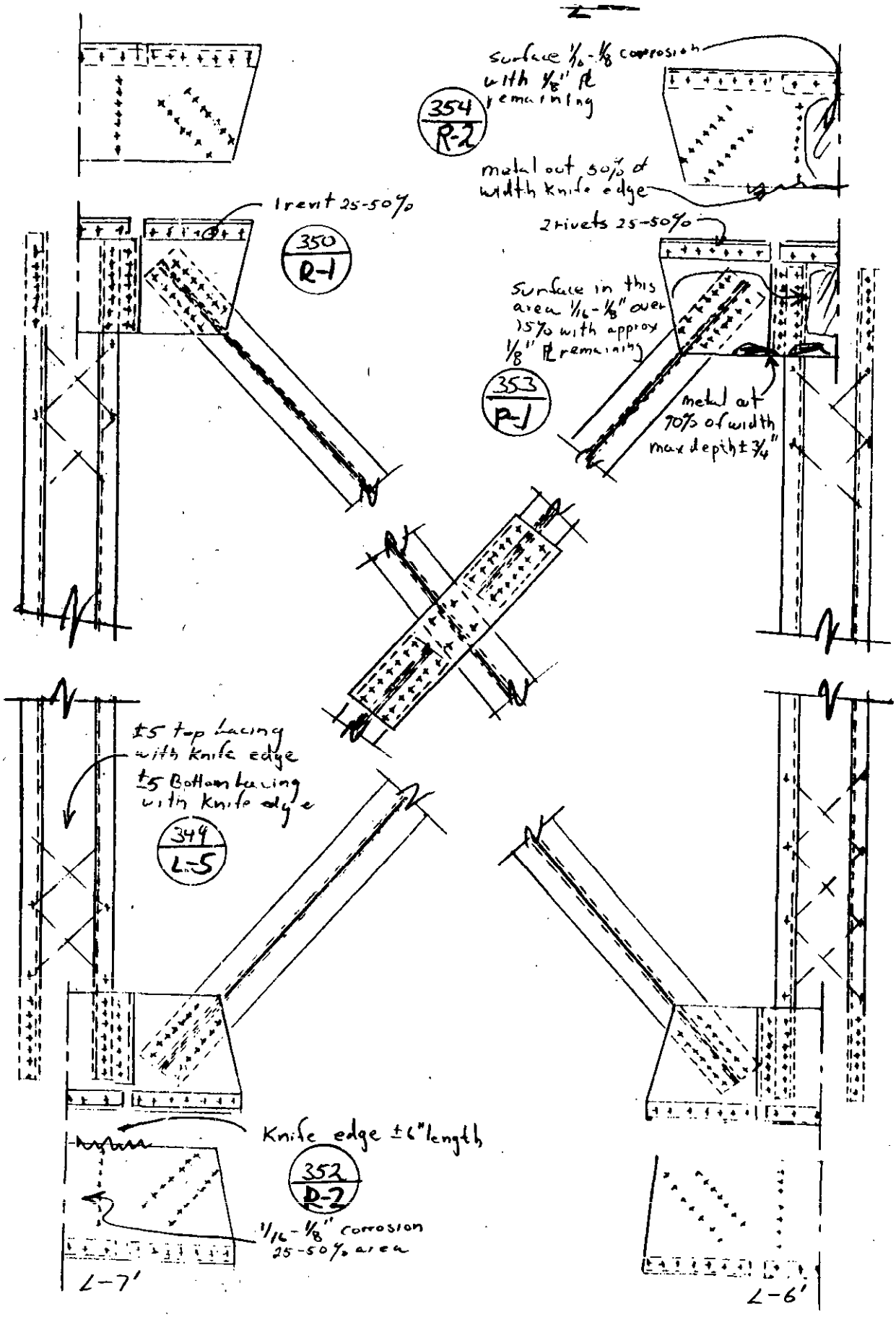
SKETCH E/1/10'-9'


metal out
±3/4" max depth
with knife edge
±1' length
Knife edge
±1' length
334
R-2
330
L-5
±10 Top lacing over
1/8" corrosion with
Knife edges & metal
rusted out ± 1/16"
333
L-6
±3 lacing with
Knife edges
Knife edge ±8" length
Bottom of gusset 1/16-1/8"
Corrosion over area 8"x3"
L-9'
L-8'

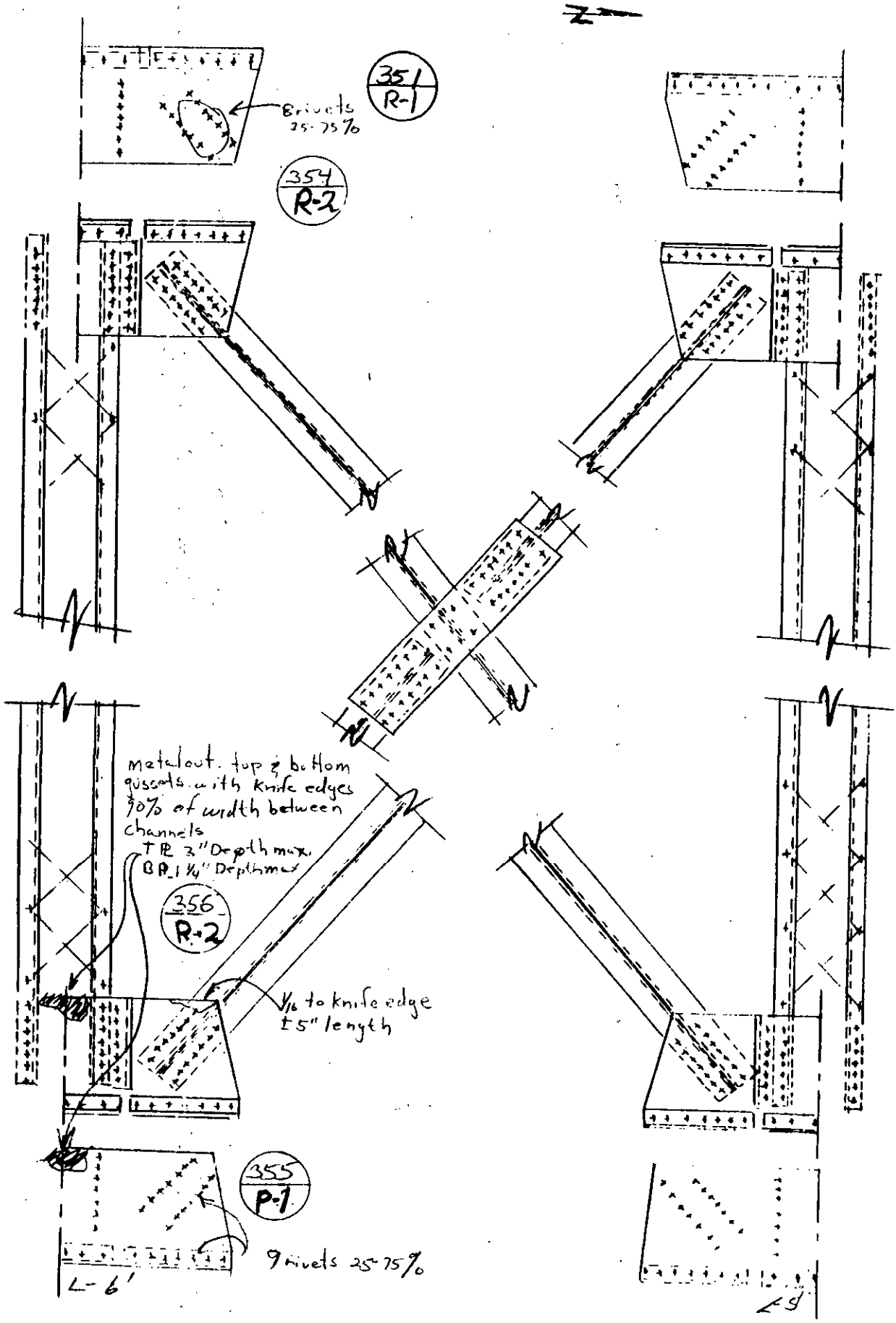
SKETCH E/2/9'-8'


±5' lacing with metal rusted out & Knife edge
336
L-5
5 rivets 25-50%
335
R-1
351
R-1
Knife edge 3" length
4 rivets 25-50%
L-8'
L-7'

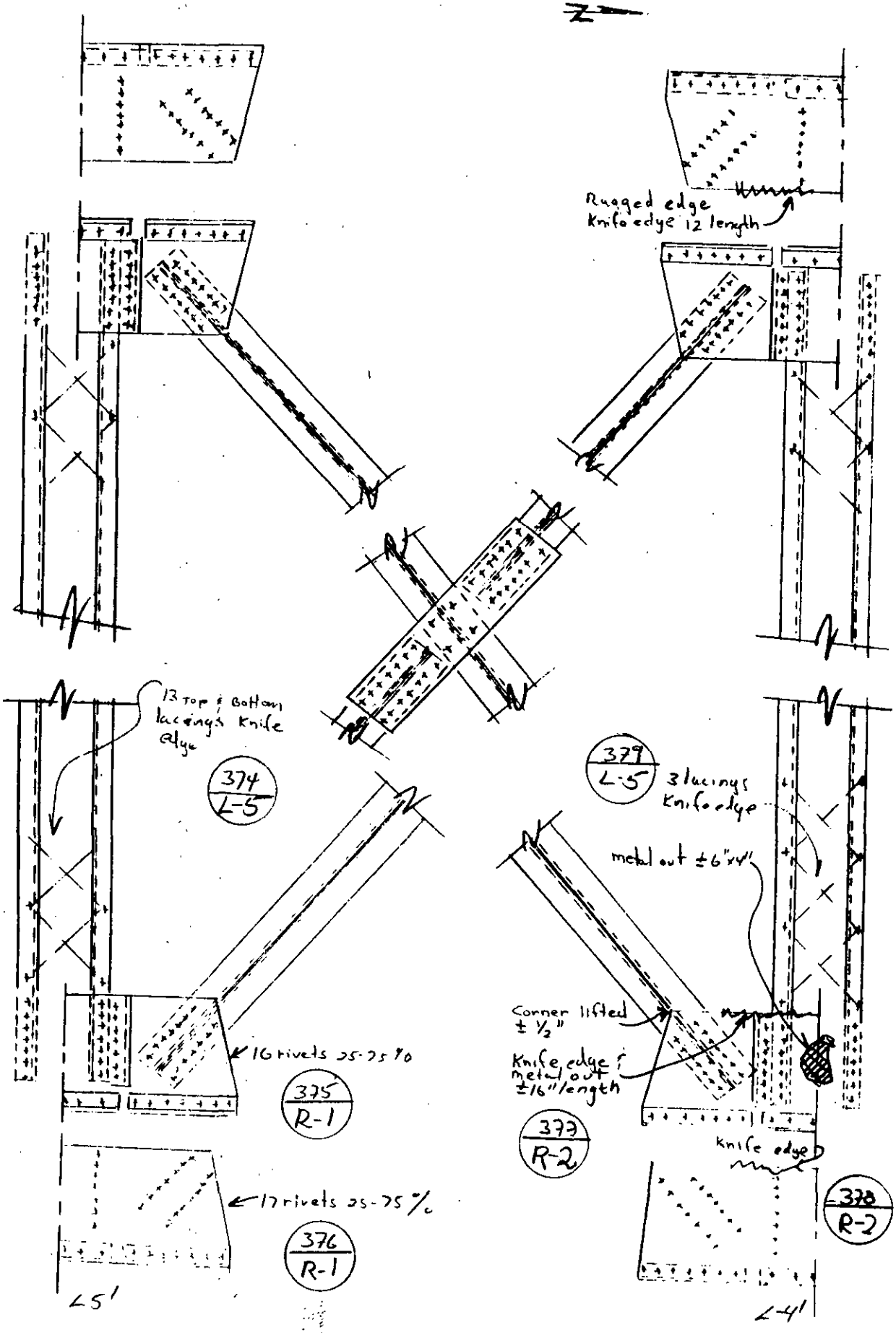
SKETCH E/2/8'-7'


surface 1/16-1/8 corrosion with 1/8" PL remaining
354
R-2
metal out 50% of width knife edge
2 rivets 25-50%
1 rivet 25-50%
350
R-1
surface in this area 1/16-1/8" over 15% with approx 1/8" PL remaining
353
R-1
metal out 70% of width max depth ±3/4"
±5 top lacing with knife edge
±5 Bottom lacing with knife edge
349
L-5
Knife edge ±6" length
352
R-2
1/16-1/8" corrosion 25-50% area
L-7'
L-6'

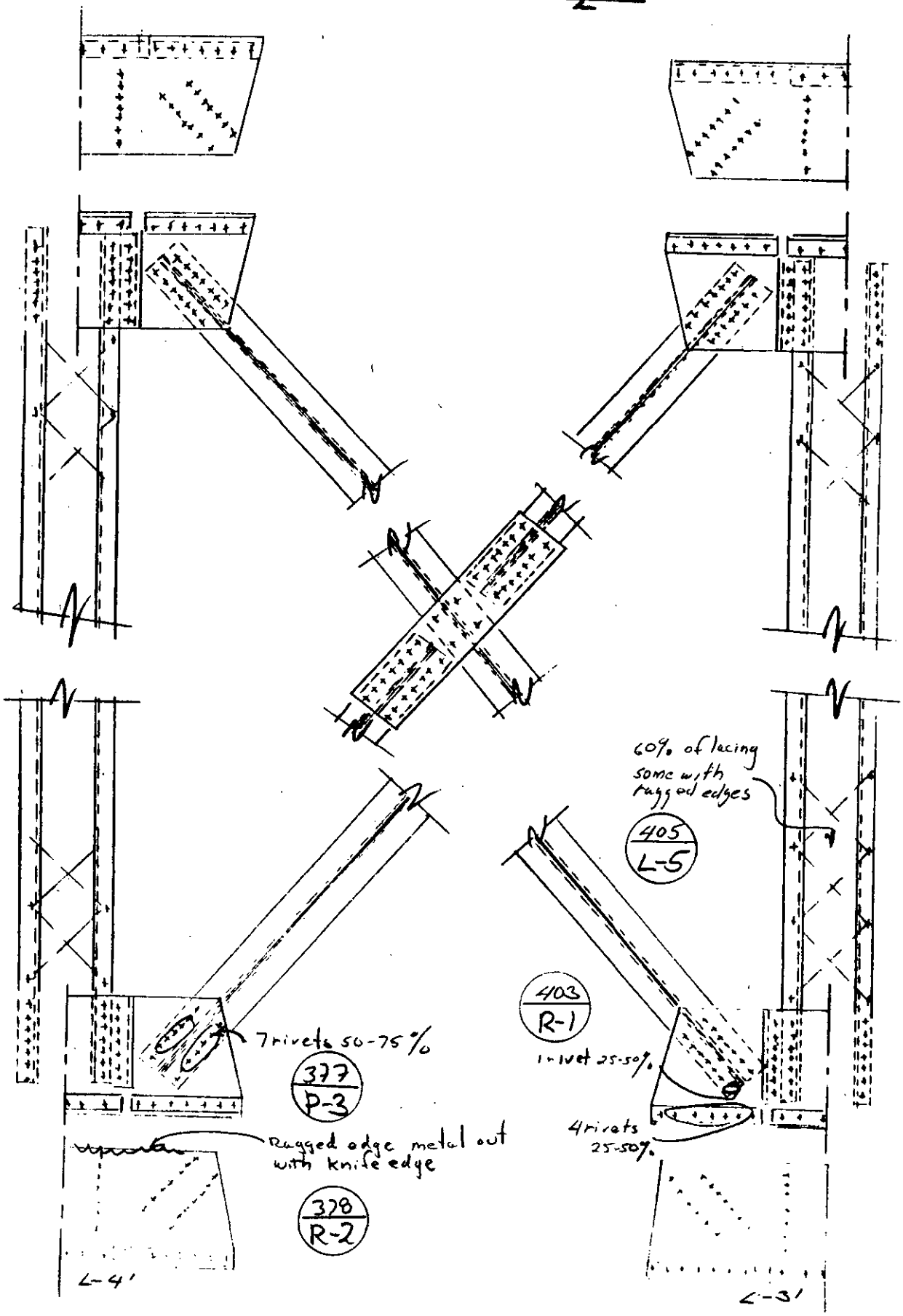
SKETCH E/2/7'-6'


Z
351
R-1
Rivets
25-75%
354
R-2
metal out. top & bottom
gussets with knife edges
90% of width between
channels
TR 3" Depth max.
BR 1 1/4" Depth max
356
R-2
1/16 to knife edge
± 5" length
355
P-1
9 rivets 25-75%
L-6'
L-9'

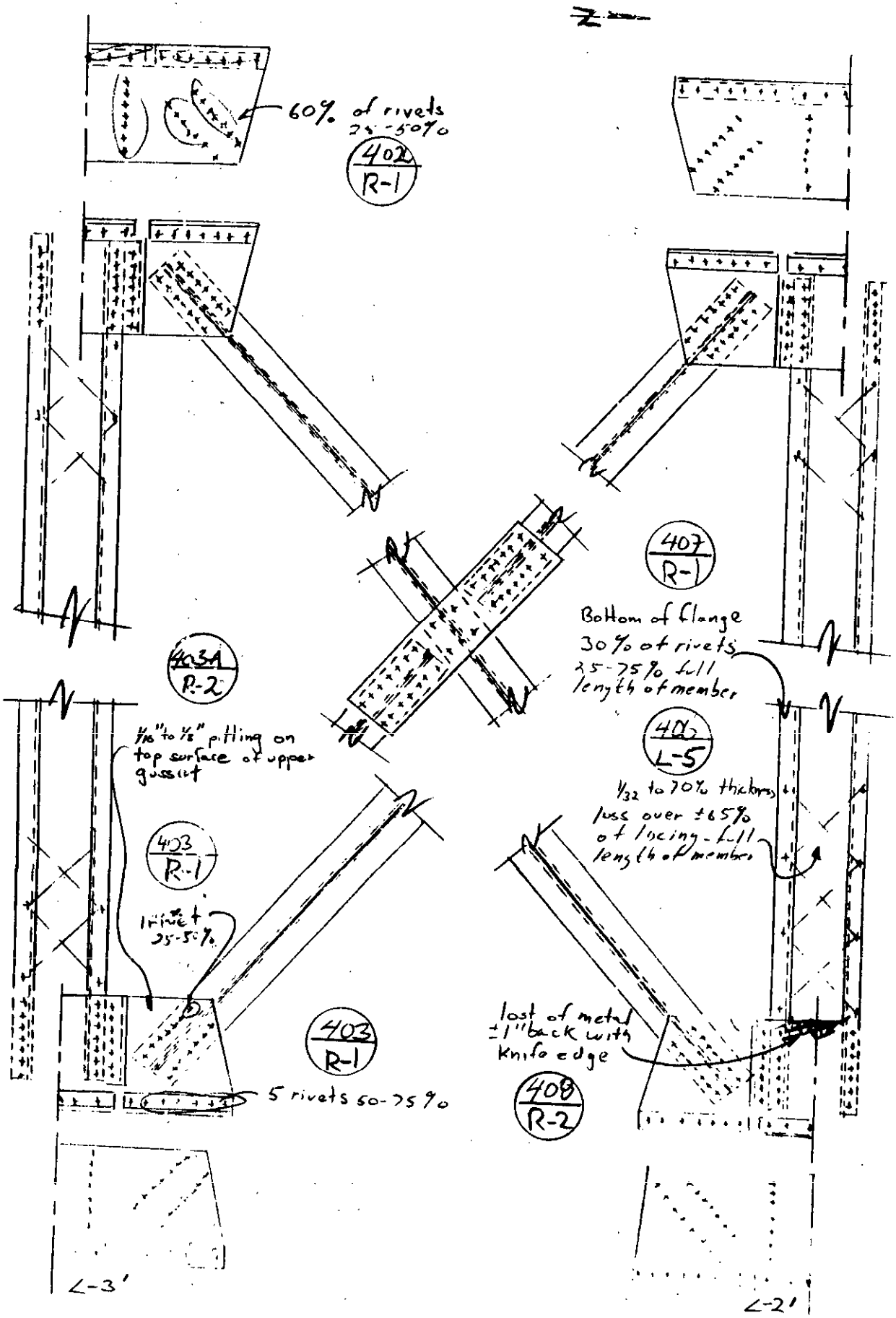
SKETCH E/2/6'-5'


Rugged edge
Knife edge 12 length
13 top & Bottom lacings knife edge
374
L-5
379
L-5
3 lacings knife edge
metal out ±6"x4"
Corner lifted ± 1/2"
Knife edge & metal out ±16" length
16 rivets 25-75 %
375
R-1
377
R-2
knife edge
378
R-2
17 rivets 25-75 %
376
R-1
L5'
L4'

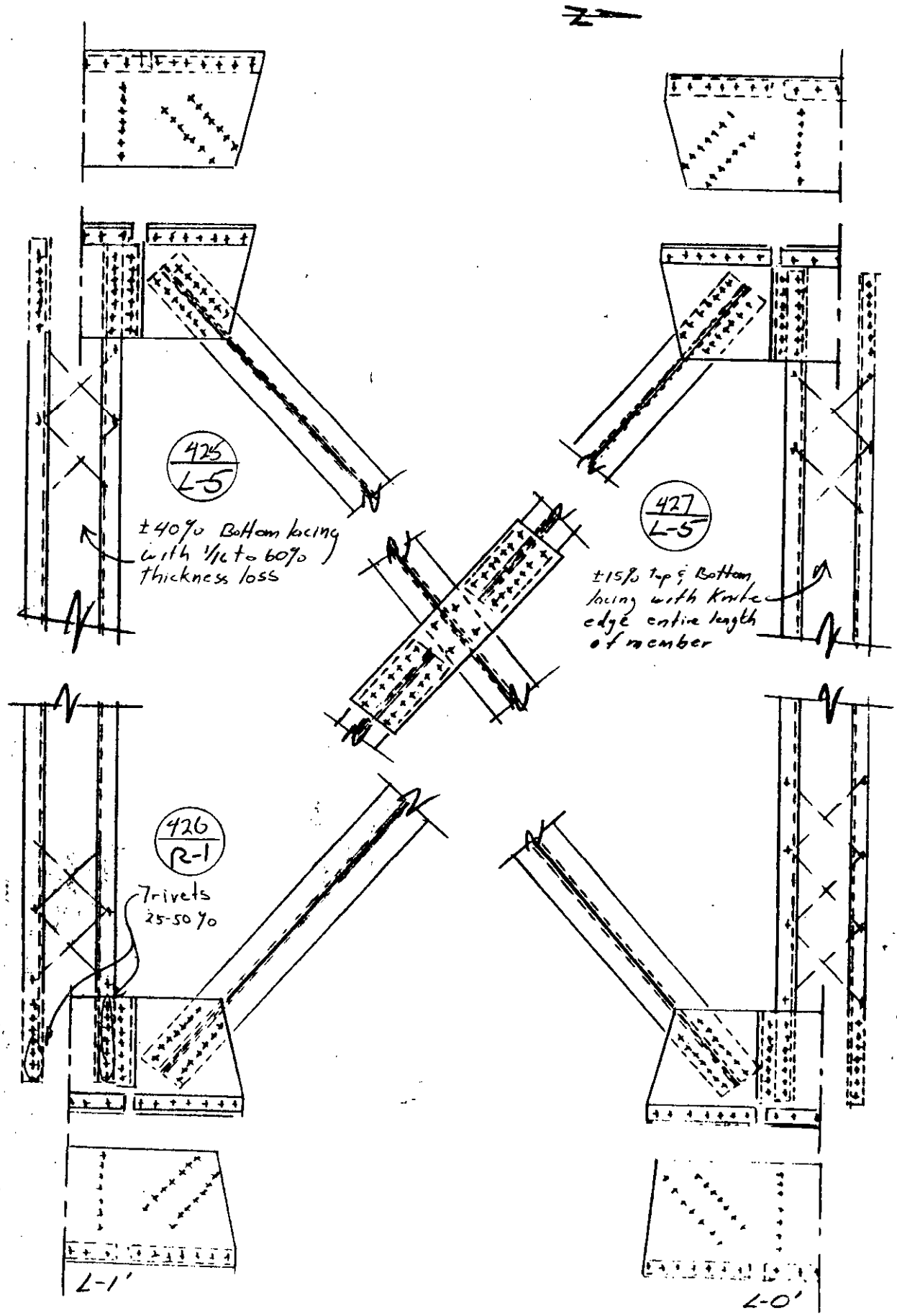
SKETCH E/2/5-4


60% of lacing
some with
rugged edges
405
L-5
403
R-1
7 rivets 50-75%
377
P-3
1 rivet 25-50%
4 rivets
25-50%
Rugged edge metal out
with knife edge
328
R-2
L-4'
L-3'

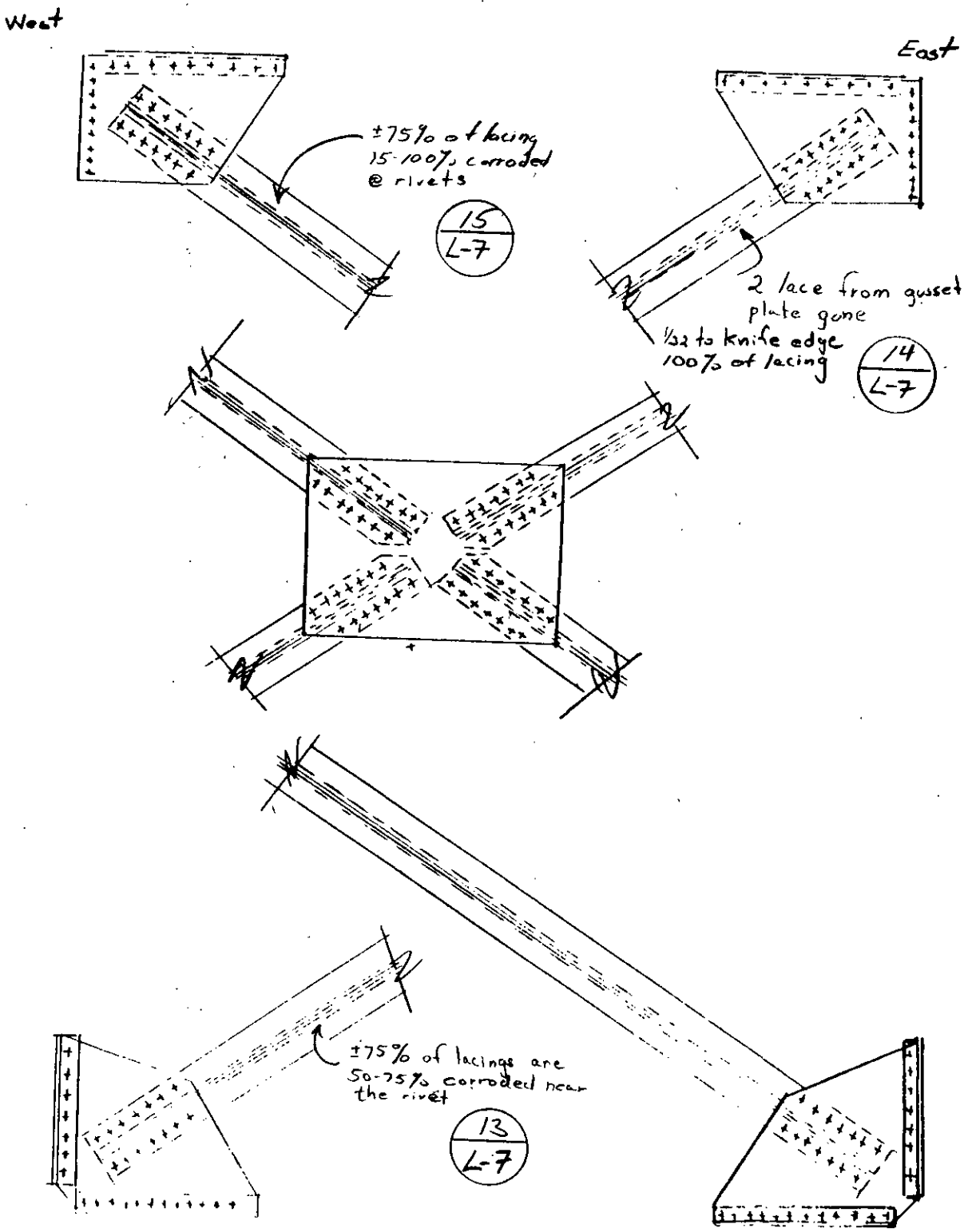
SKETCH E/2/4'-3'


60% of rivets 25-50%
402
R-1
407
R-1
Bottom of flange 30% of rivets 25-75% full length of member
403A
R-2
1/16" to 1/8" pitting on top surface of upper gusset
402
L-5
1/32 to 70% thickness loss over ±65% of lacing - full length of member
403
R-1
1 rivet 25-50%
403
R-1
5 rivets 50-75%
lost of metal ±1" back with knife edge
408
R-2
L-3'
L-2'

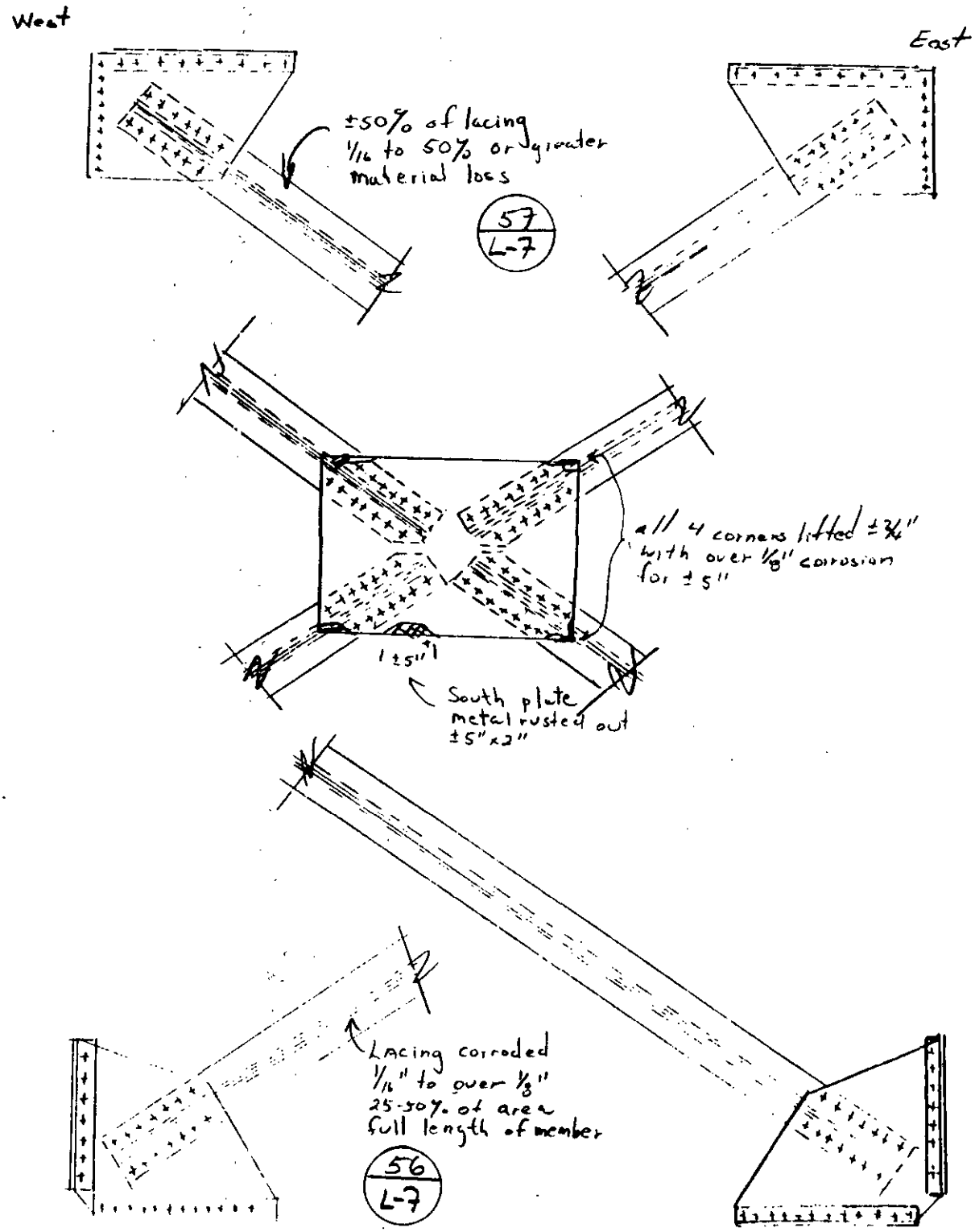
SKETCH E/2/3'-2'


425
L-5
±40% Bottom lacing with 1/16 to 60% thickness loss
427
L-5
±15% Top & Bottom lacing with Knife edge entire length of member
426
R-1
7 rivets 25-50%
L-1'
L-0'

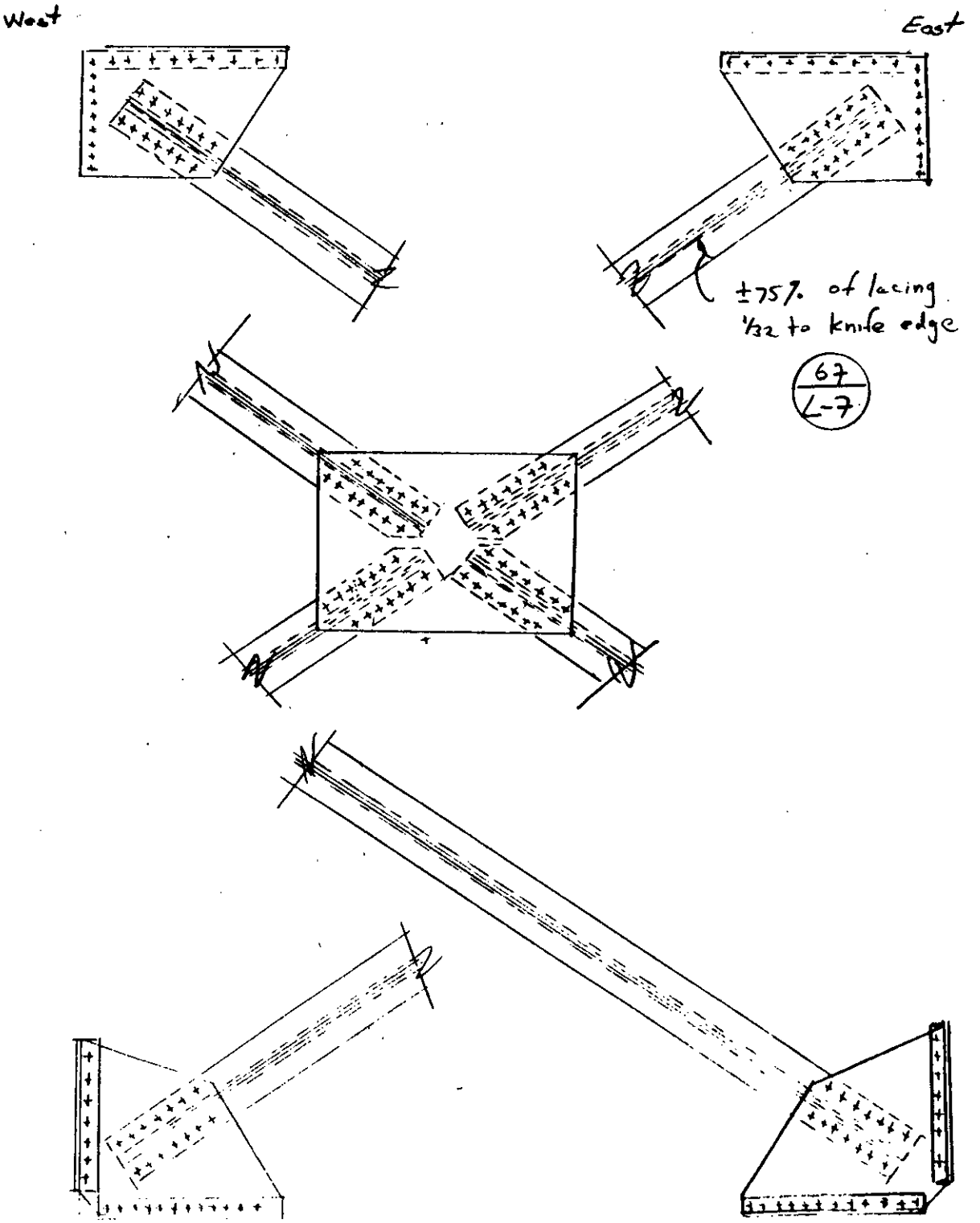
SKETCH E/3/1'-0"


West
East
±75% of lacing
15-100% corroded
@ rivets
15
L-7
2 lace from gusset
plate gone
1/32 to knife edge
100% of lacing
14
L-7
±75% of lacings are
50-75% corroded near
the rivet
13
L-7

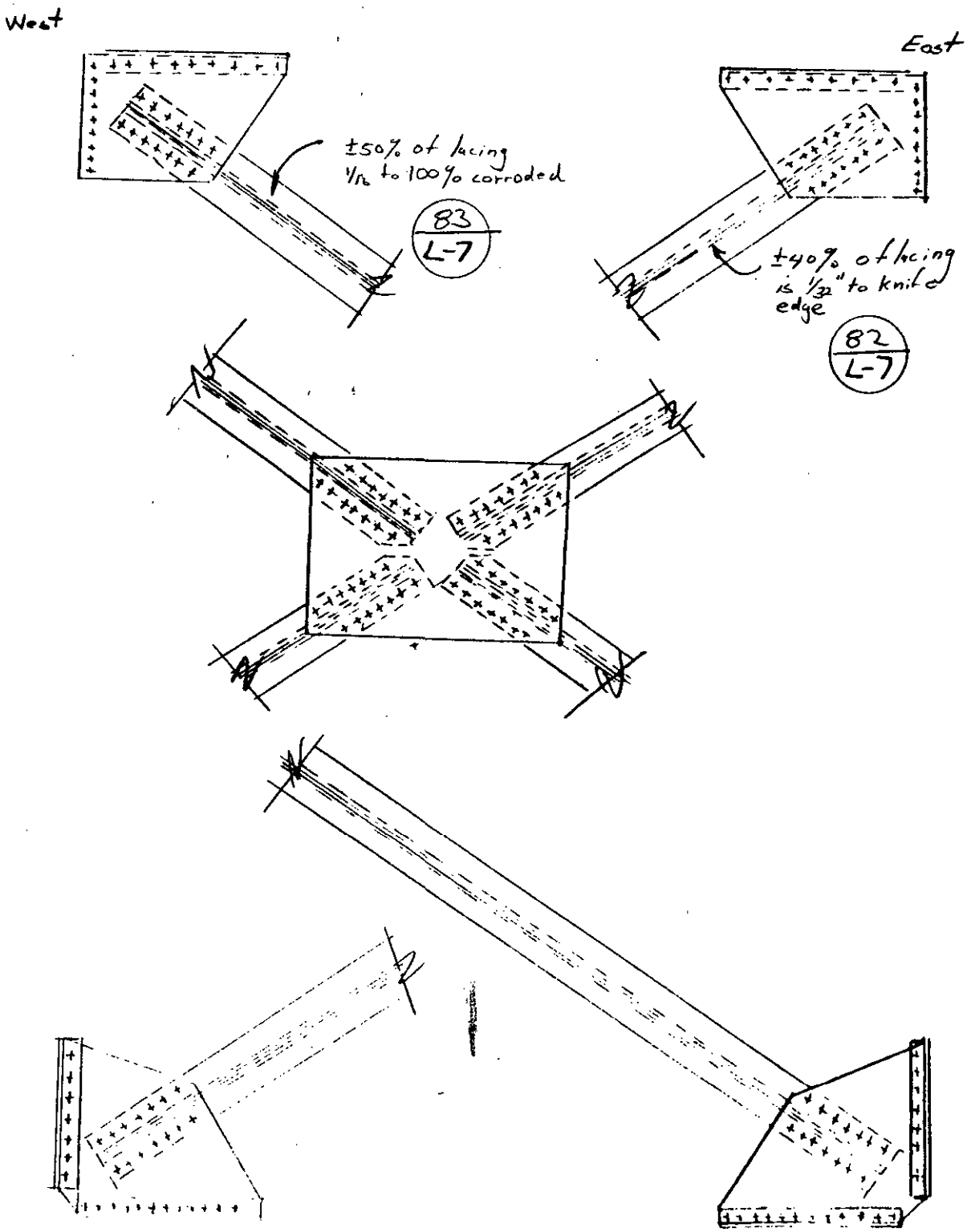
SKETCH F/3/0-1


West
East
±50% of lacing
1/16 to 50% or greater
material loss
57
L-7
all 4 corners lifted ±3/4"
with over 1/8" corrosion
for ±5"
1 ±5" 1
South plate
metal rusted out
±5"x2"
Lacing corroded
1/16" to over 1/8"
25-50% of area
full length of member
56
L-7

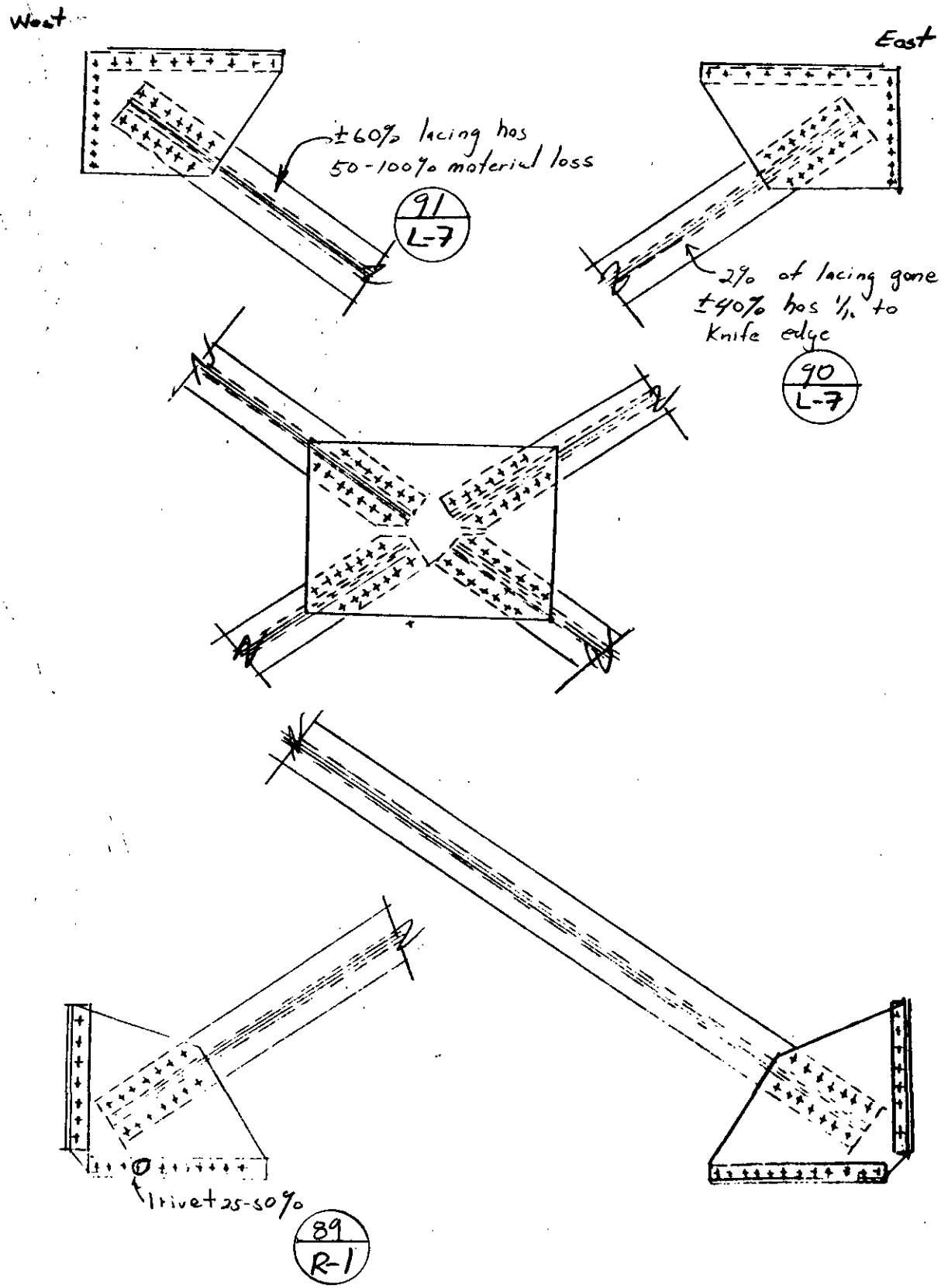
SKETCH F/3/4-5



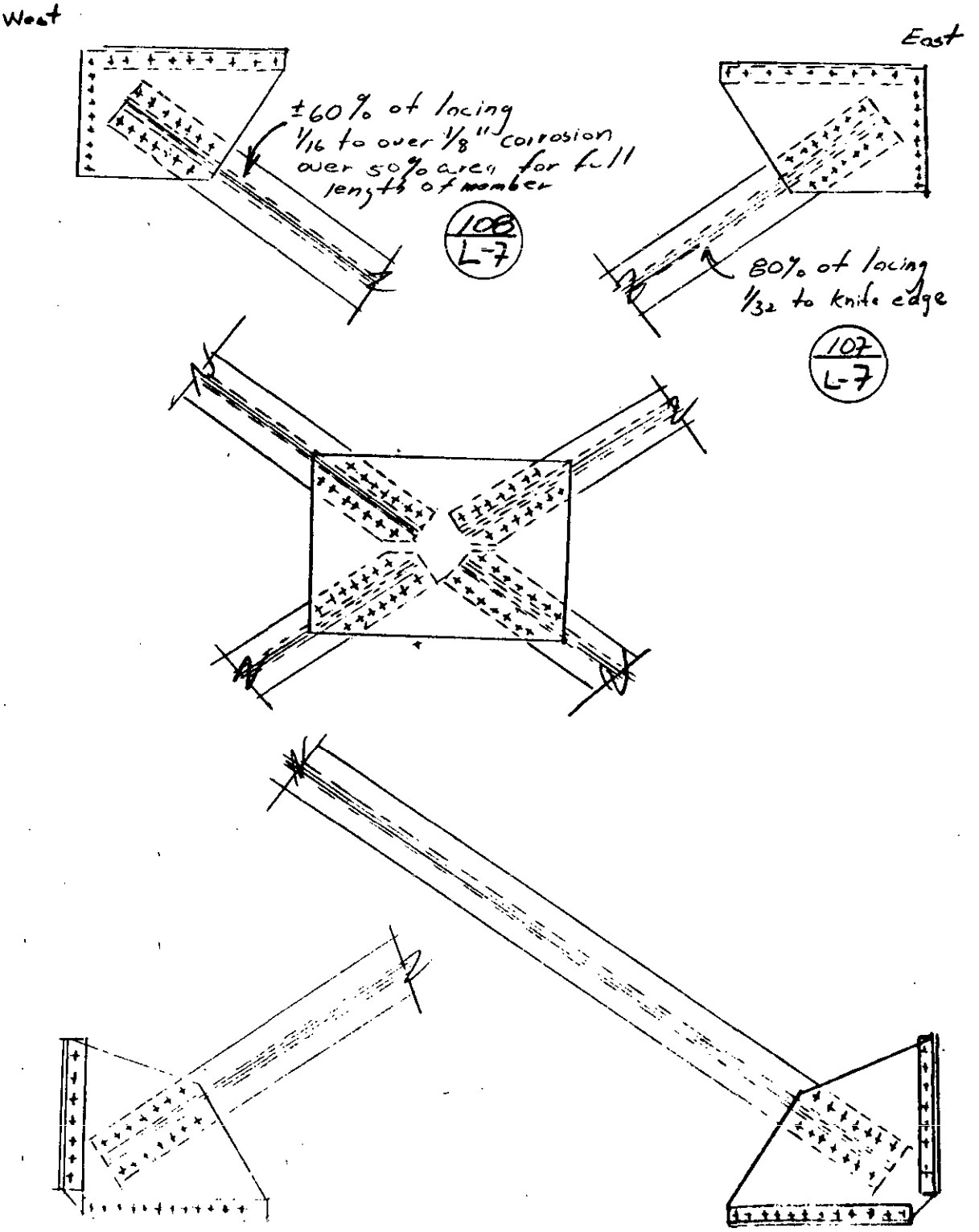
SKETCH F/3/5-6


West
East
±50% of facing
1/16 to 100% corroded
83
L-7
±40% of facing
is 1/32" to knife
edge
82
L-7

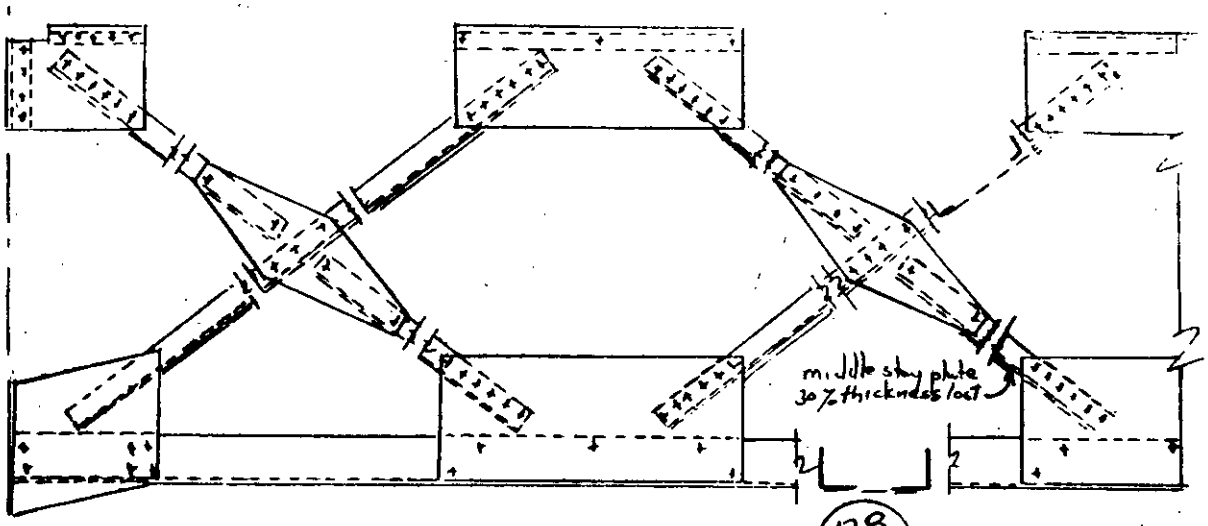
SKETCH F/3/67


West
East
±60% lacing has
50-100% material loss
91
L-7
2% of lacing gone
±40% has 1/4 to
knife edge
90
L-7
1 rivet 25-50%
89
R-1

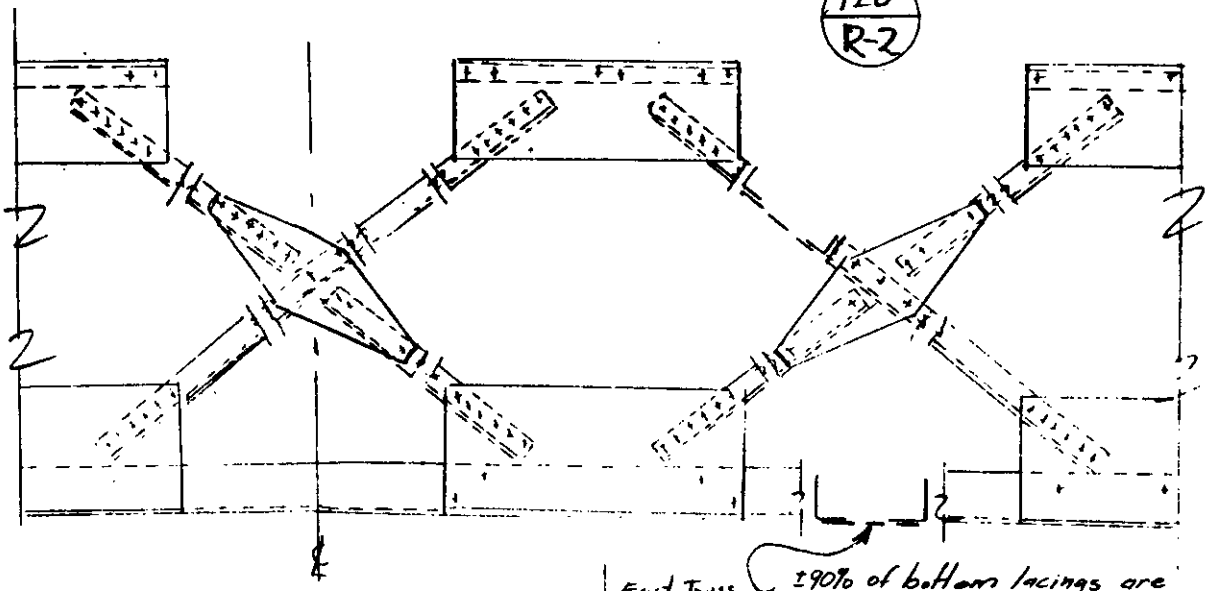
SKETCH F/3/7-8


West
East
±60% of lacing
1/16 to over 1/8" corrosion
over 50% area for full
length of member
106
L-7
80% of lacing
1/32 to knife edge
107
L-7

SKETCH F/3/8-9



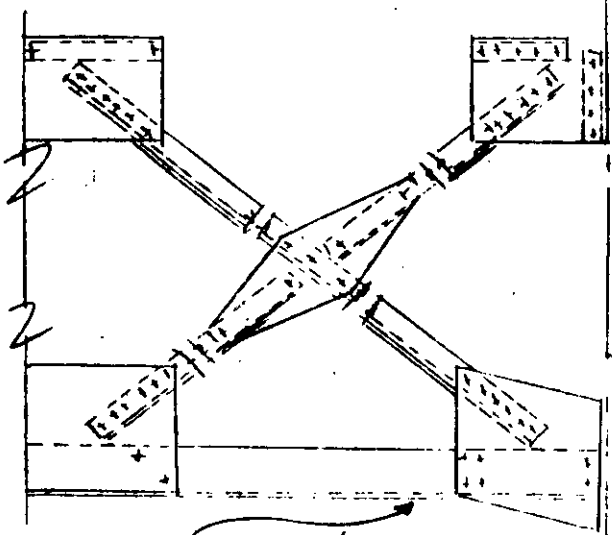
128
R-2



East Truss

±90% of bottom lacings are deteriorated anywhere from 50-100% the rivets holding the lacings are anywhere from 50-90% for approx 90% of the rivets

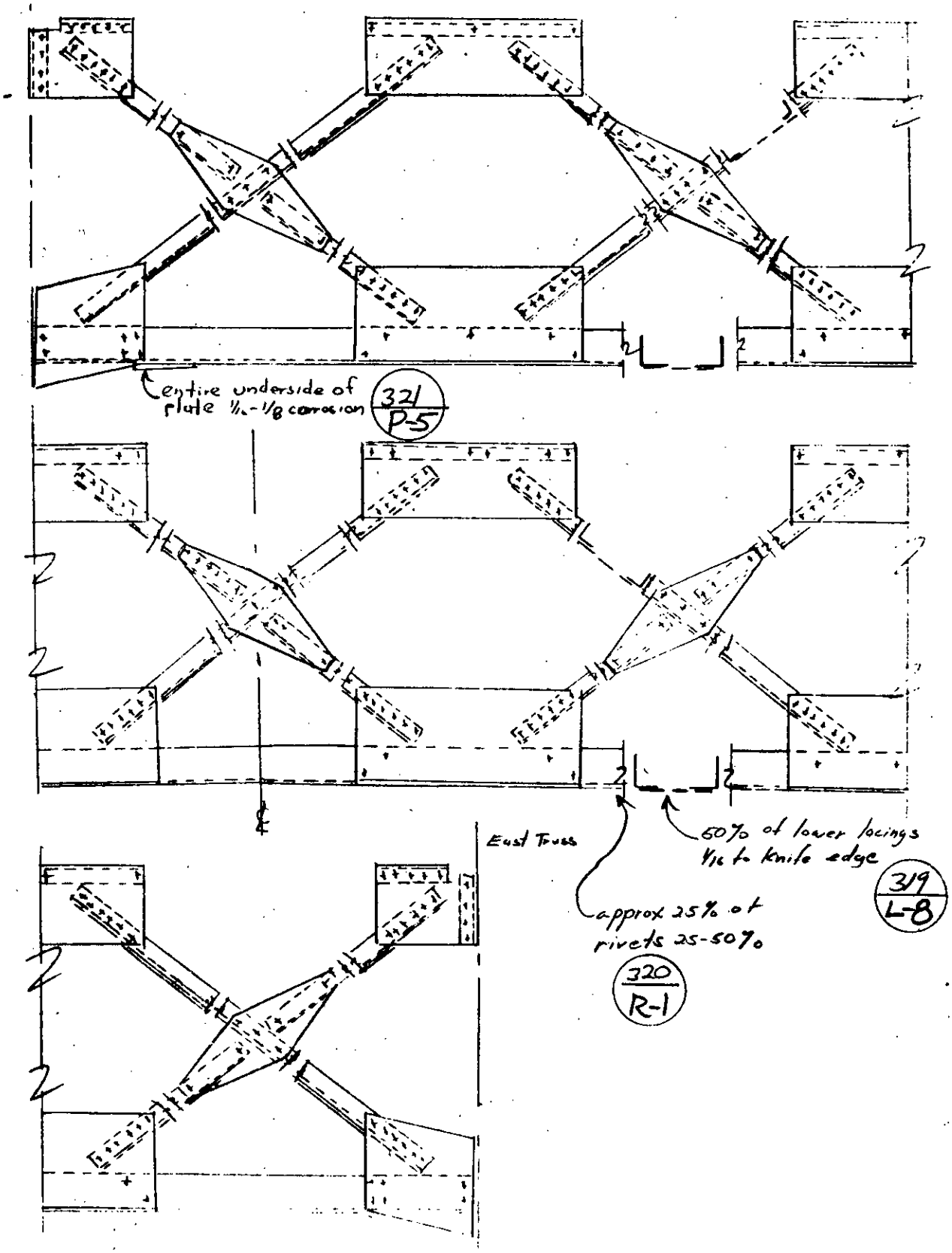
127
L-8



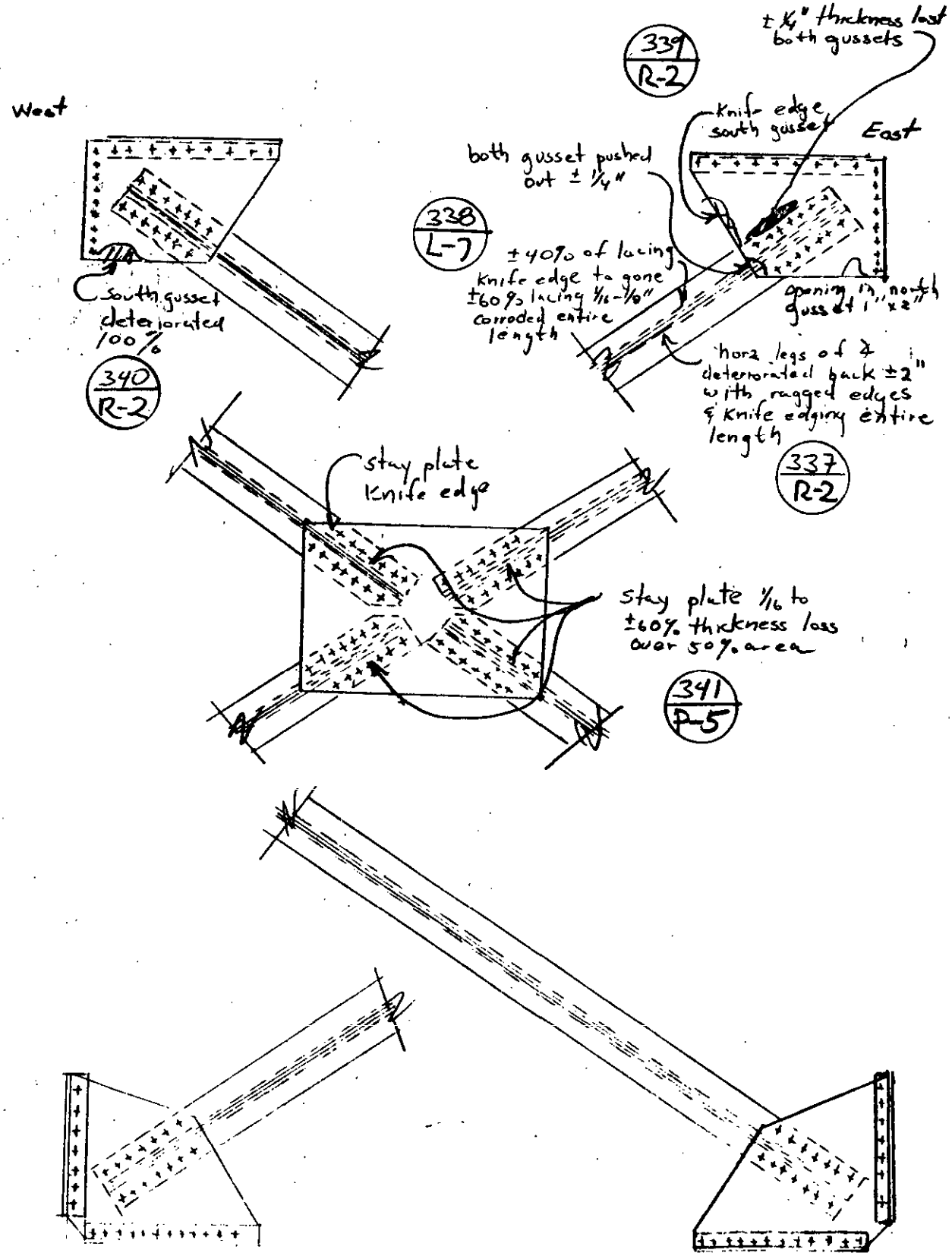
Stay Plate on bottom 100% corrosion

128
P-5

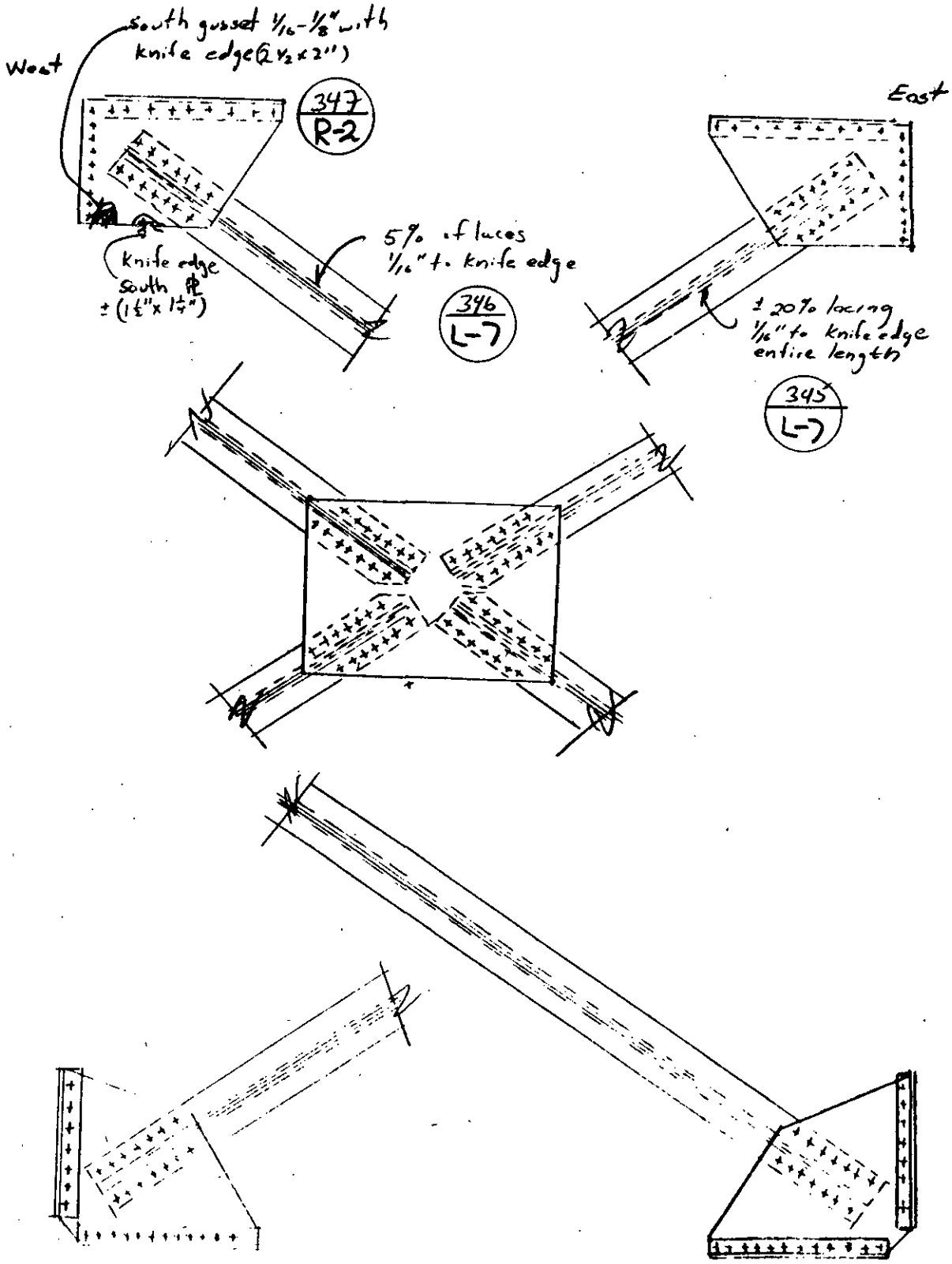
SKETCH F/1/9-10



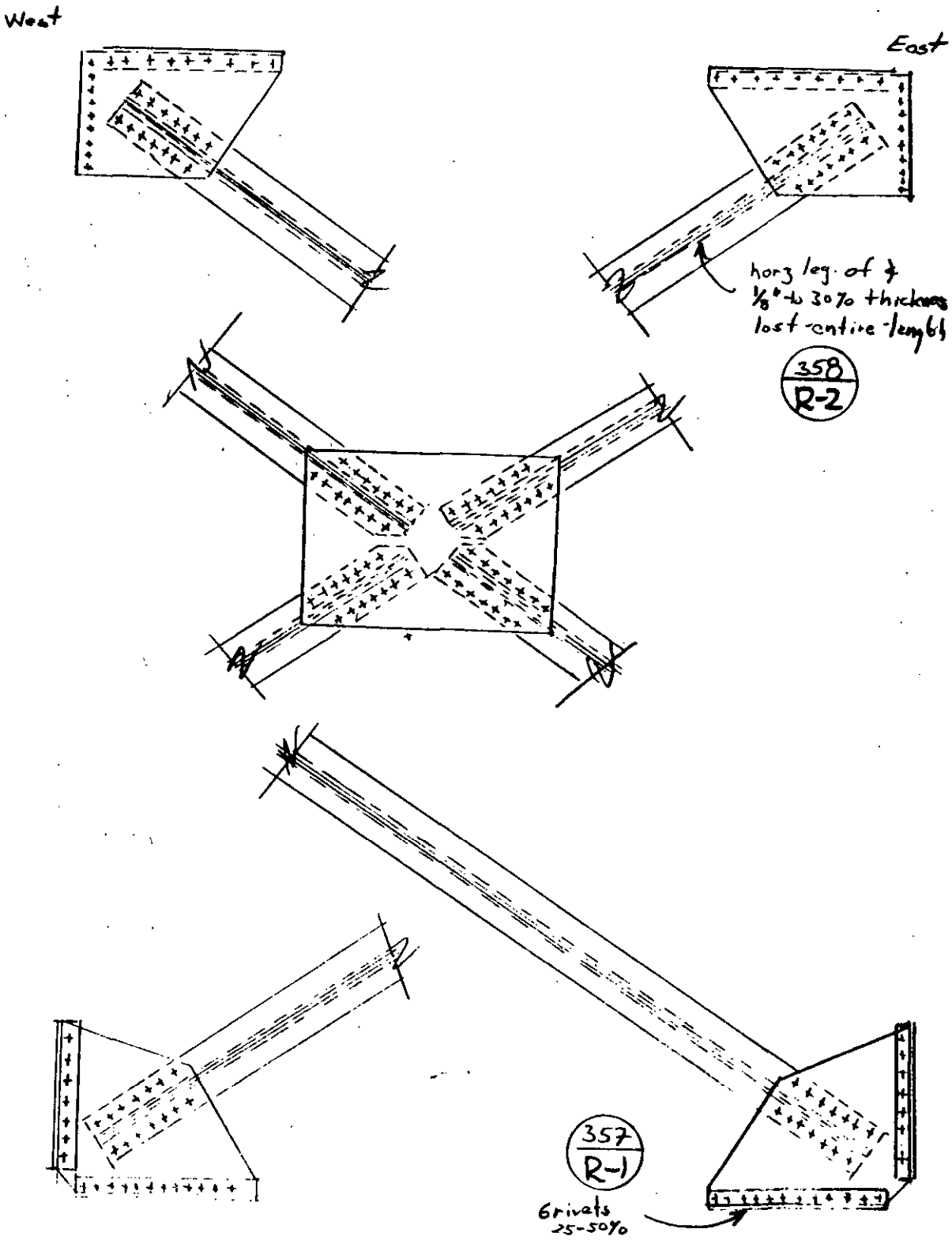
SKETCH E/1/10'-9'


West
East
339
R-2
± 1/4" thickness lost both gussets
Knife edge south gusset
both gusset pushed out ± 1/4"
338
L-7
± 40% of lacing knife edge to gone ±60% lacing 1/16-1/8" corroded entire length
south gusset deteriorated 100%
340
R-2
opening in north gusset 1" x 2"
horz legs of ∡ deteriorated back ±2" with ragged edges & knife edging entire length
337
R-2
stay plate knife edge
stay plate 1/16 to ±60% thickness loss over 50% area
341
P-5

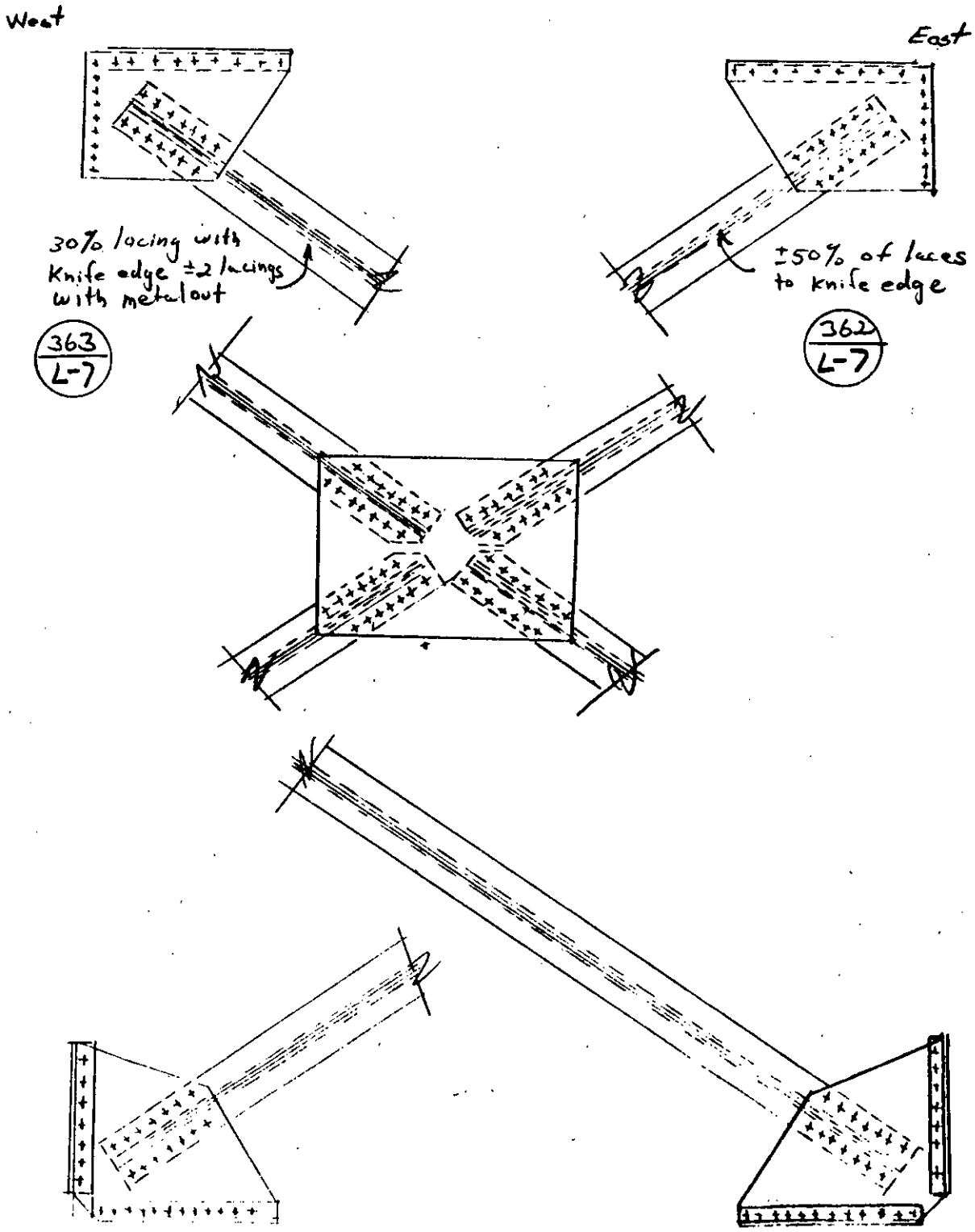
SKETCH F/2/9-8'


South gusset 1/16-1/8" with knife edge (2 1/2 x 2")
West
347
R-2
East
5% of laces 1/16" to knife edge
Knife edge South ℄ ± (1 1/8" x 1 1/4")
346
L-7
± 20% lacing 1/16" to knife edge entire length
345
L-7

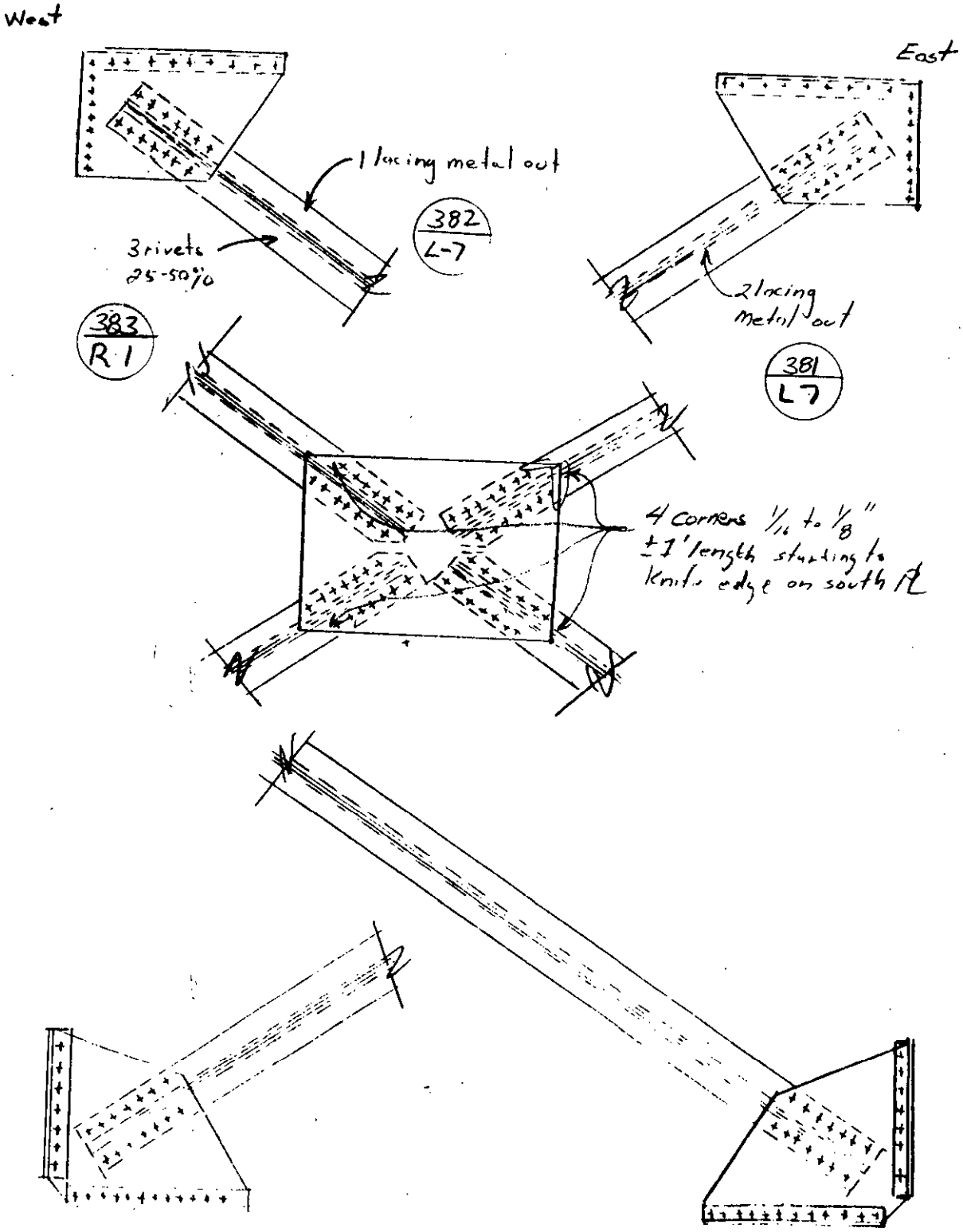
SKETCH F/2/8'-7'


West
East
horz leg of ∠
1/8" to 30% thickness
lost entire length
358
R-2
357
R-1
6 rivets
25-50%

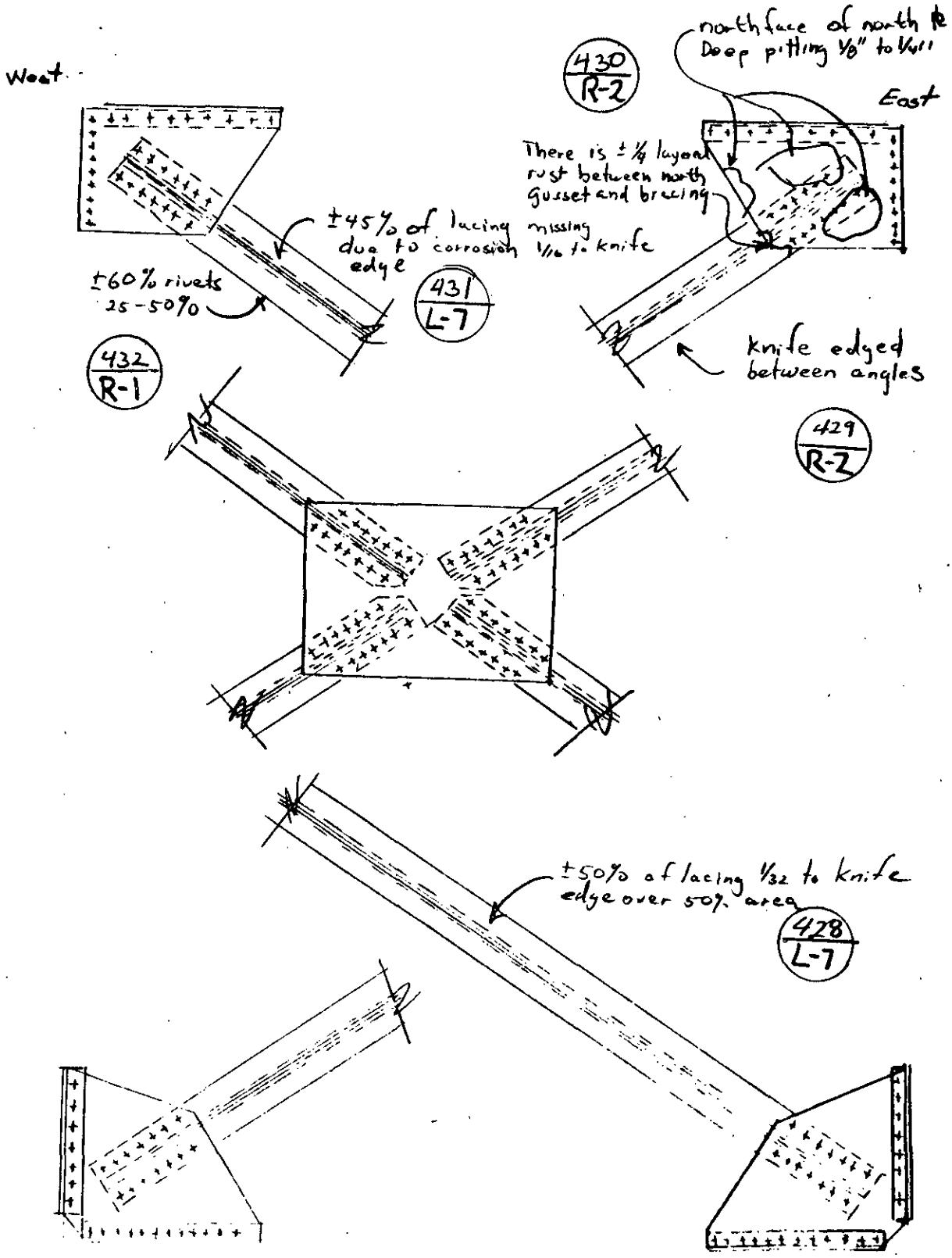
SKETCH F/2/7'-6'


West
East
30% lacing with
Knife edge ±2 lacings
with metal out
363
L-7
±50% of laces
to knife edge
362
L-7

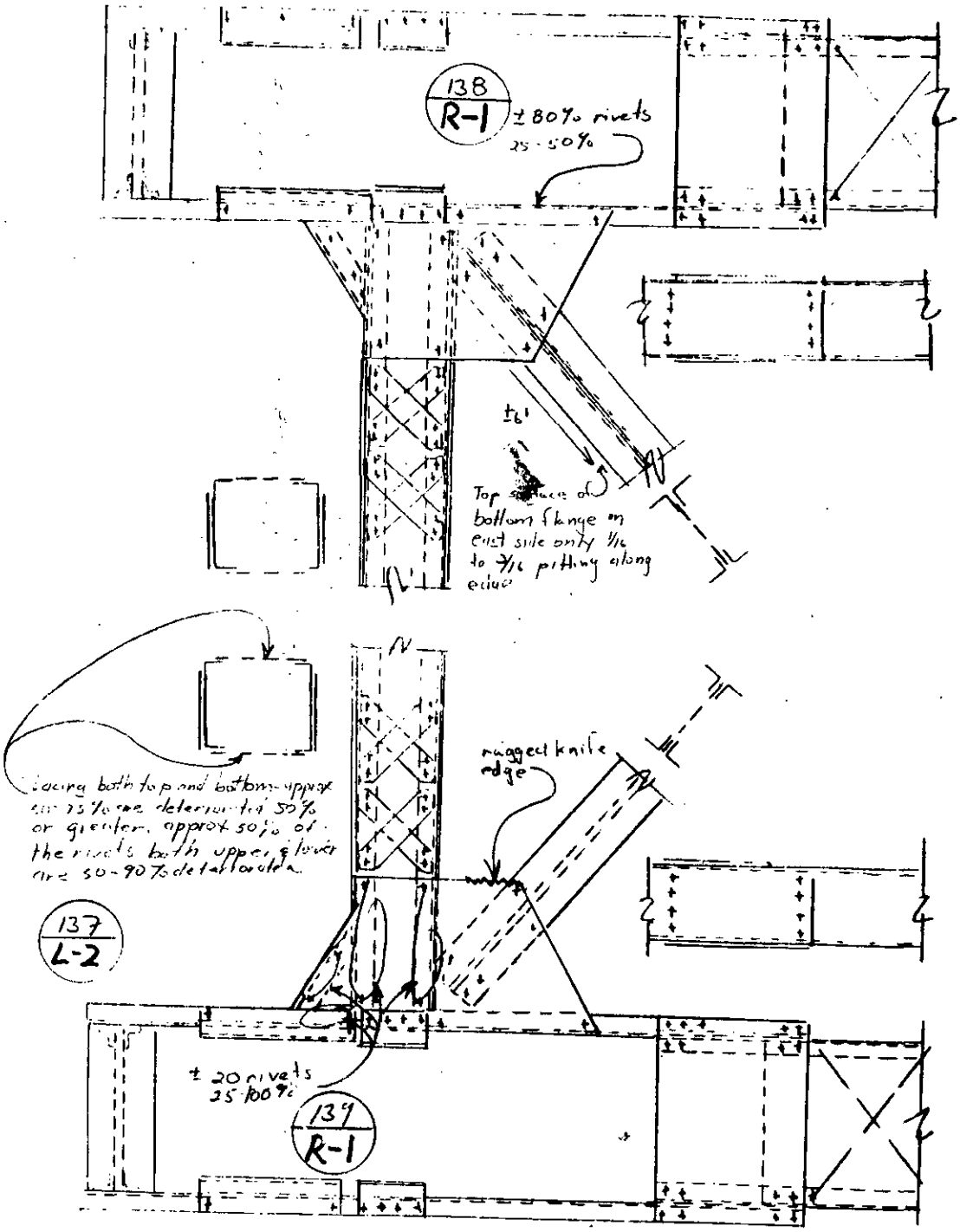
SKETCH #2/6'-5'


West
East
1 lacing metal out
382
L-7
3 rivets
25-50%
383
R 1
2 lacing metal out
381
L7
4 corners 1/16 to 1/8"
±1' length starting to
knife edge on south ℄

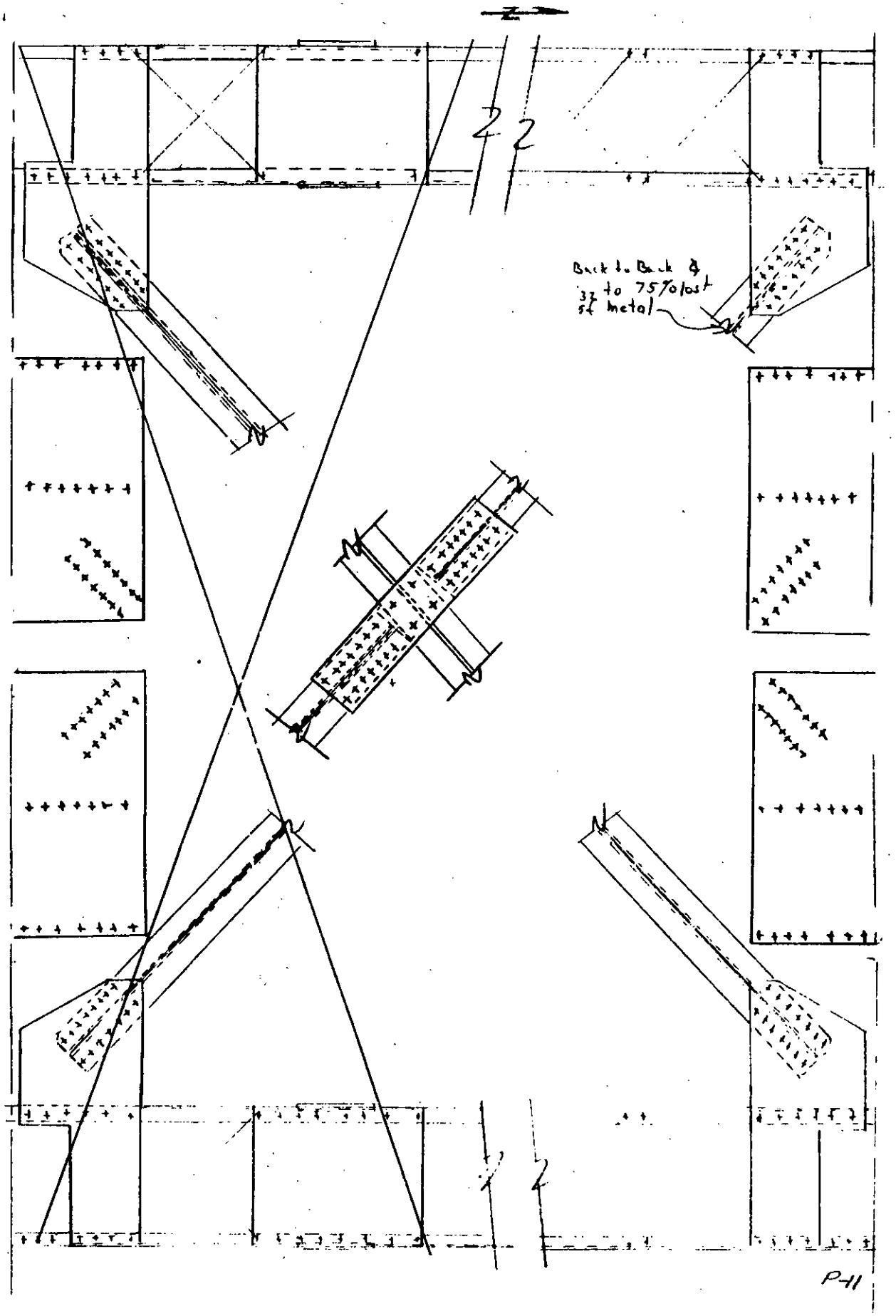
SKETCH F/2/5'-4'



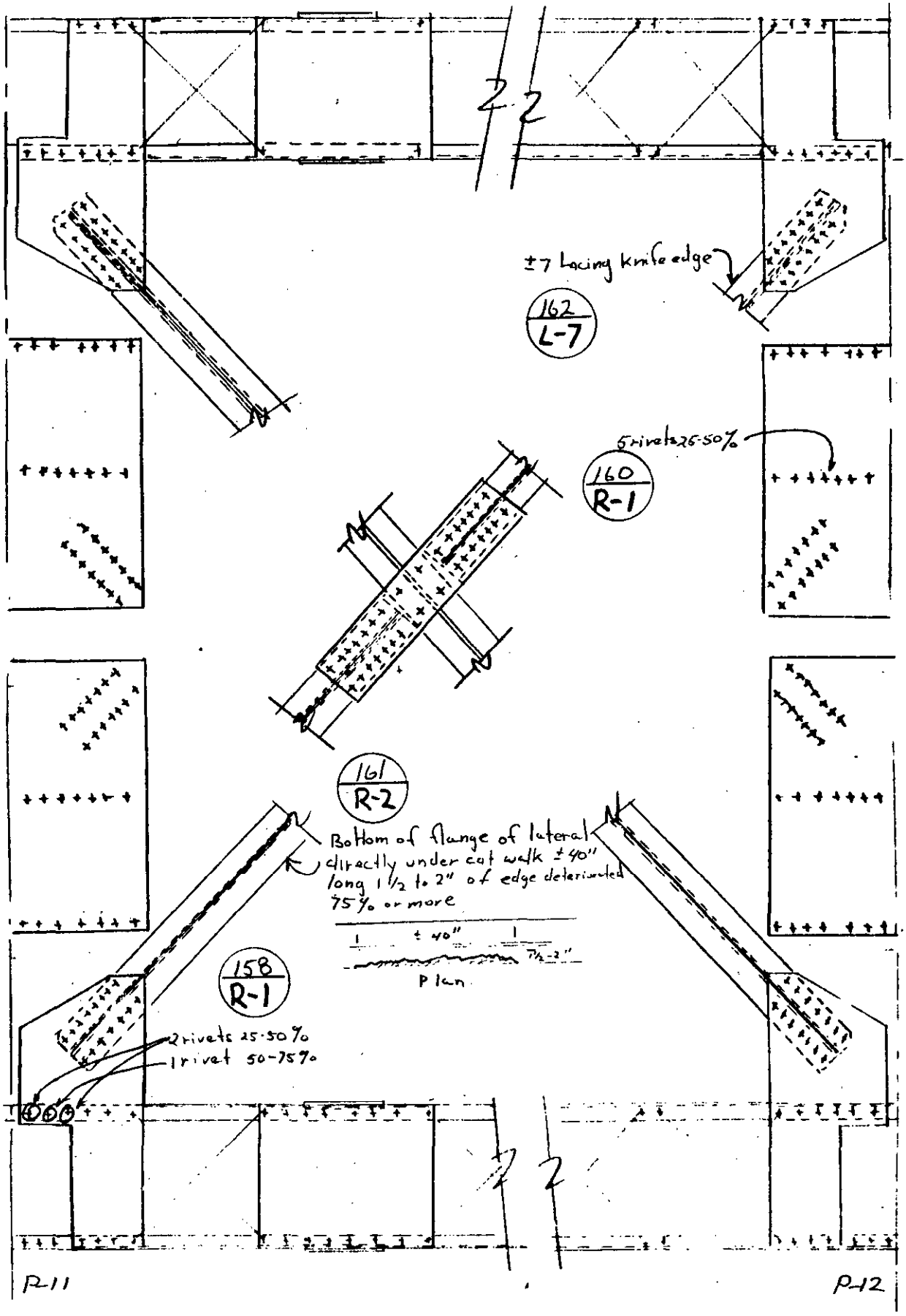
SKETCH F/2/1L-0'



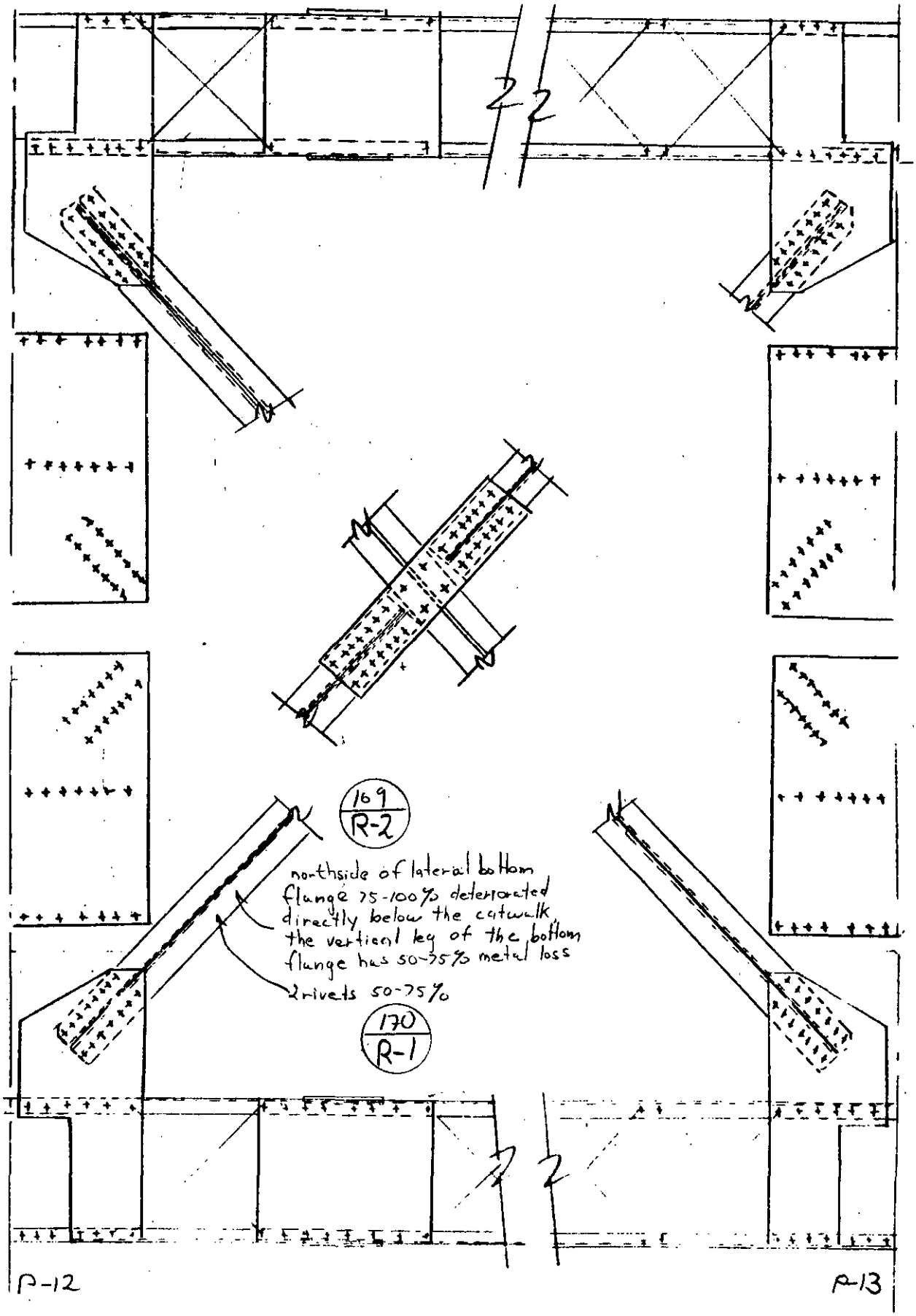
SKETCH G/1/10-11



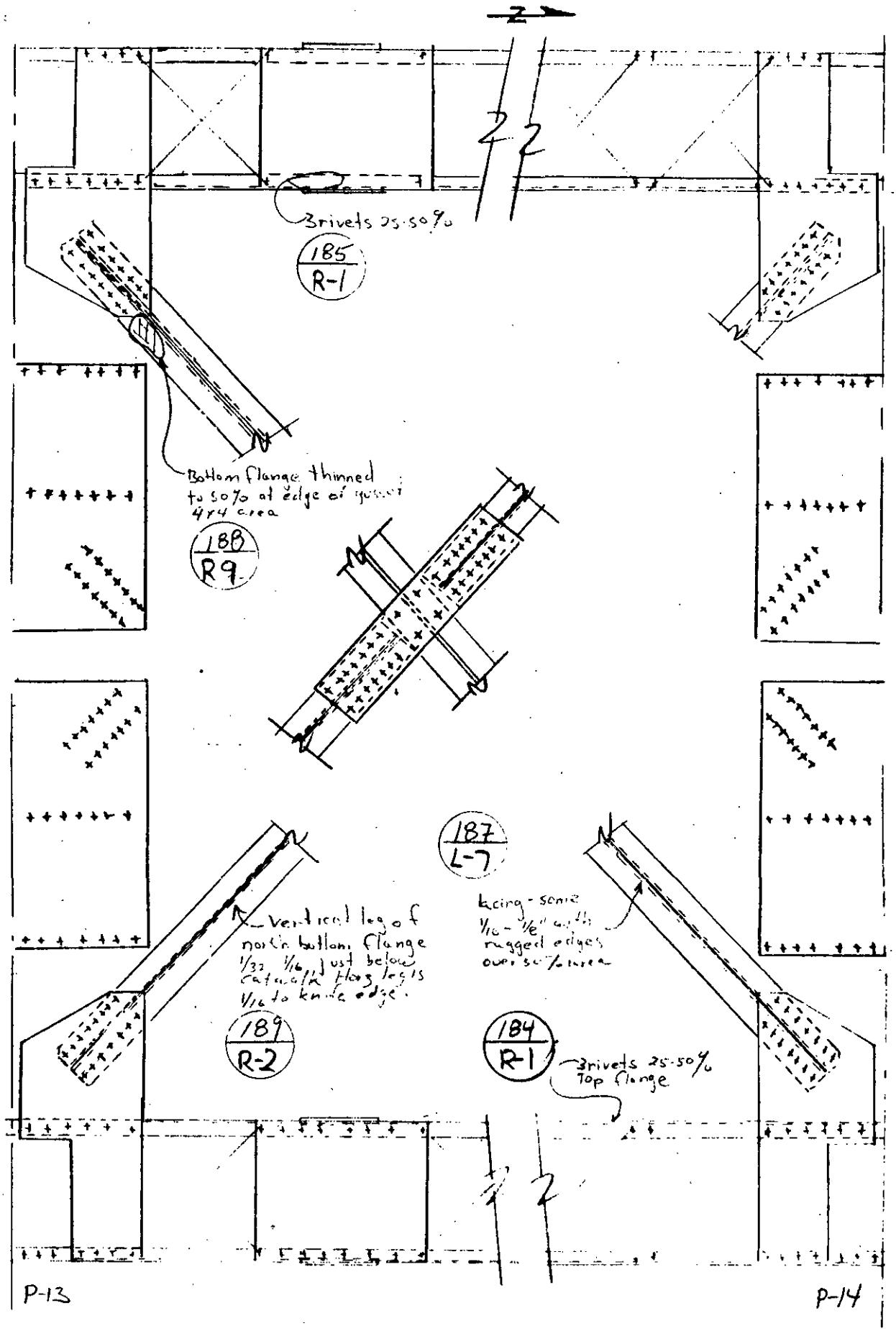
SKETCH G/1/10-11



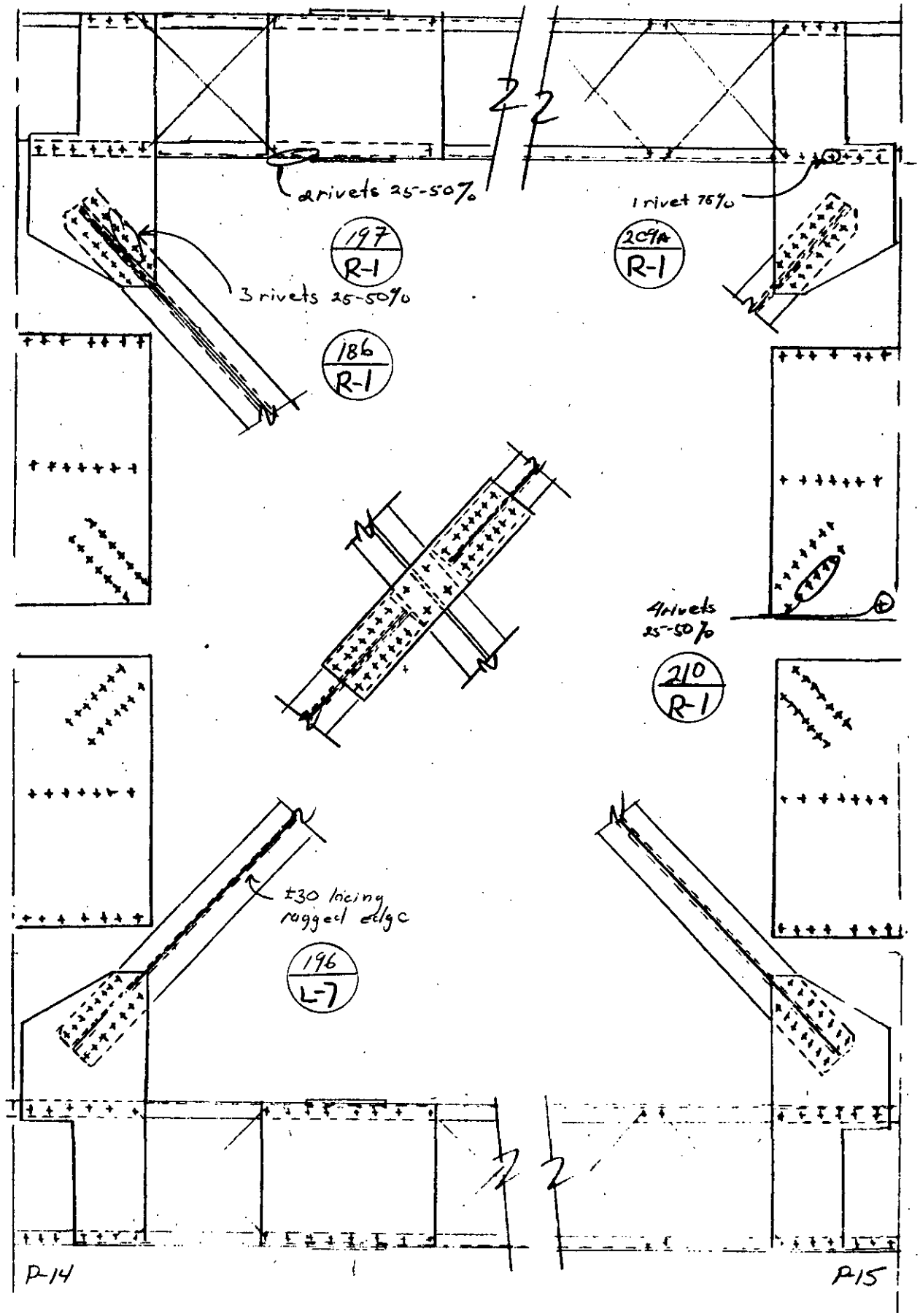
SKETCH 6/1/11-12



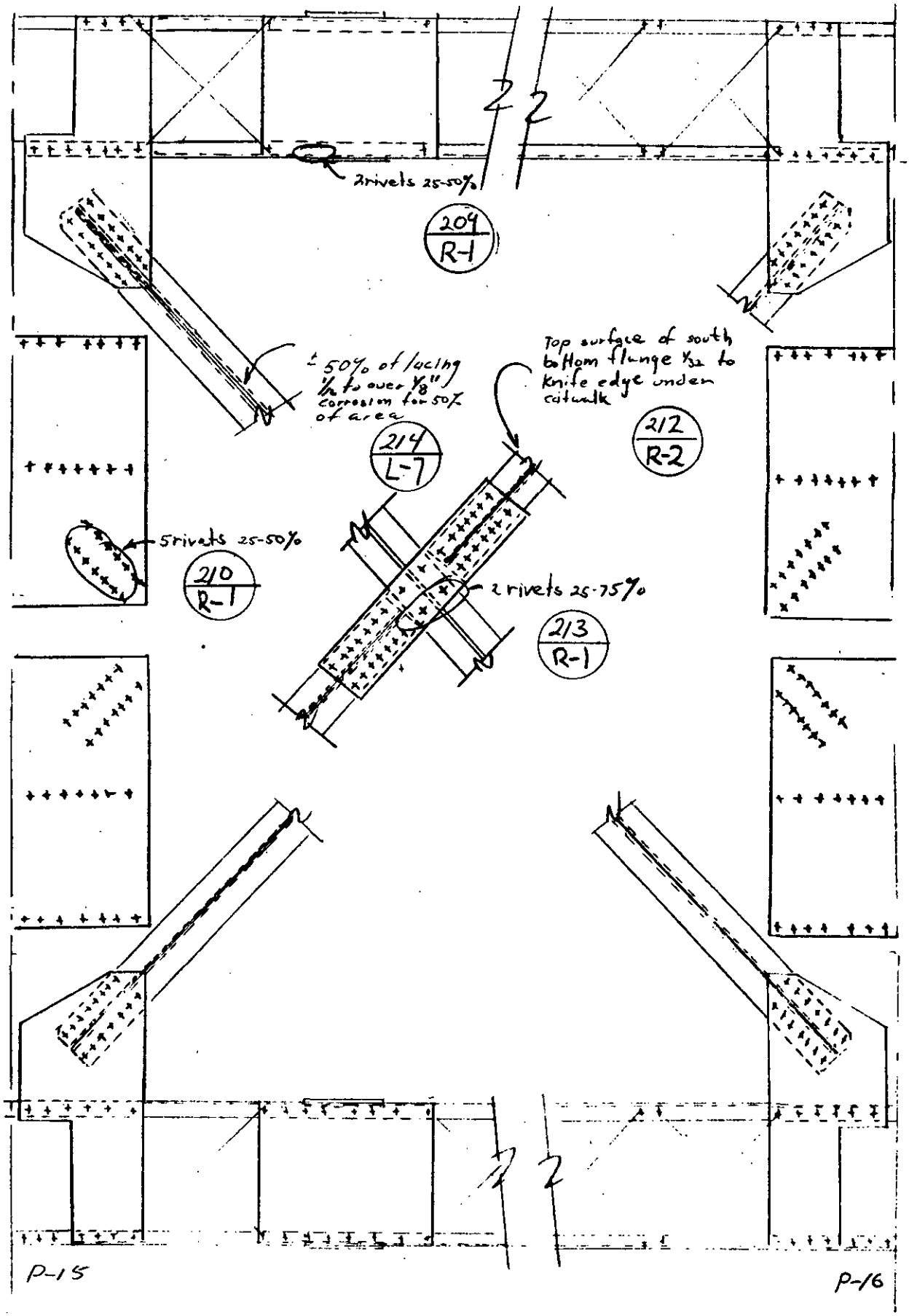
SKETCH G/1/12-13



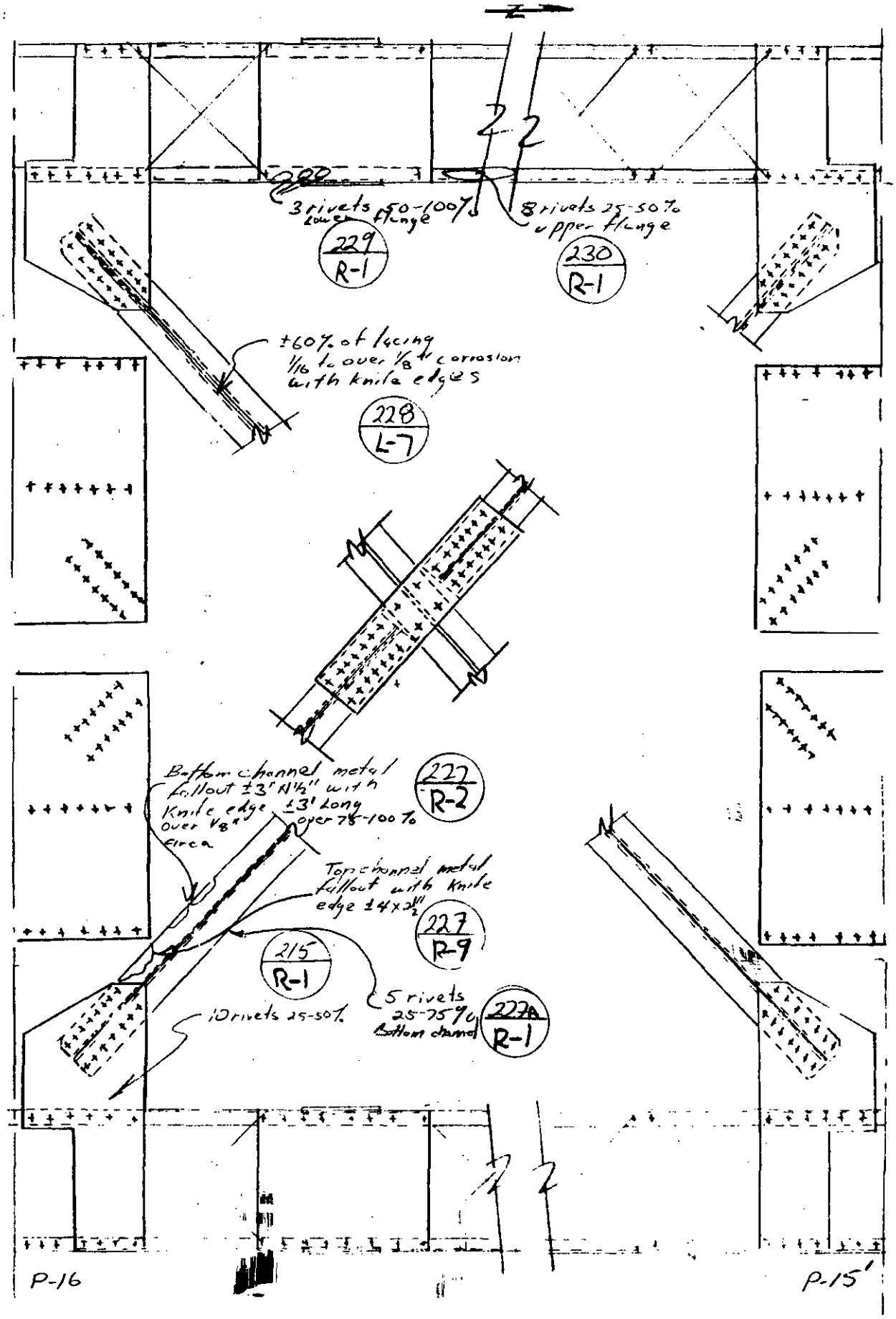
SKETCH 6/1/13-14



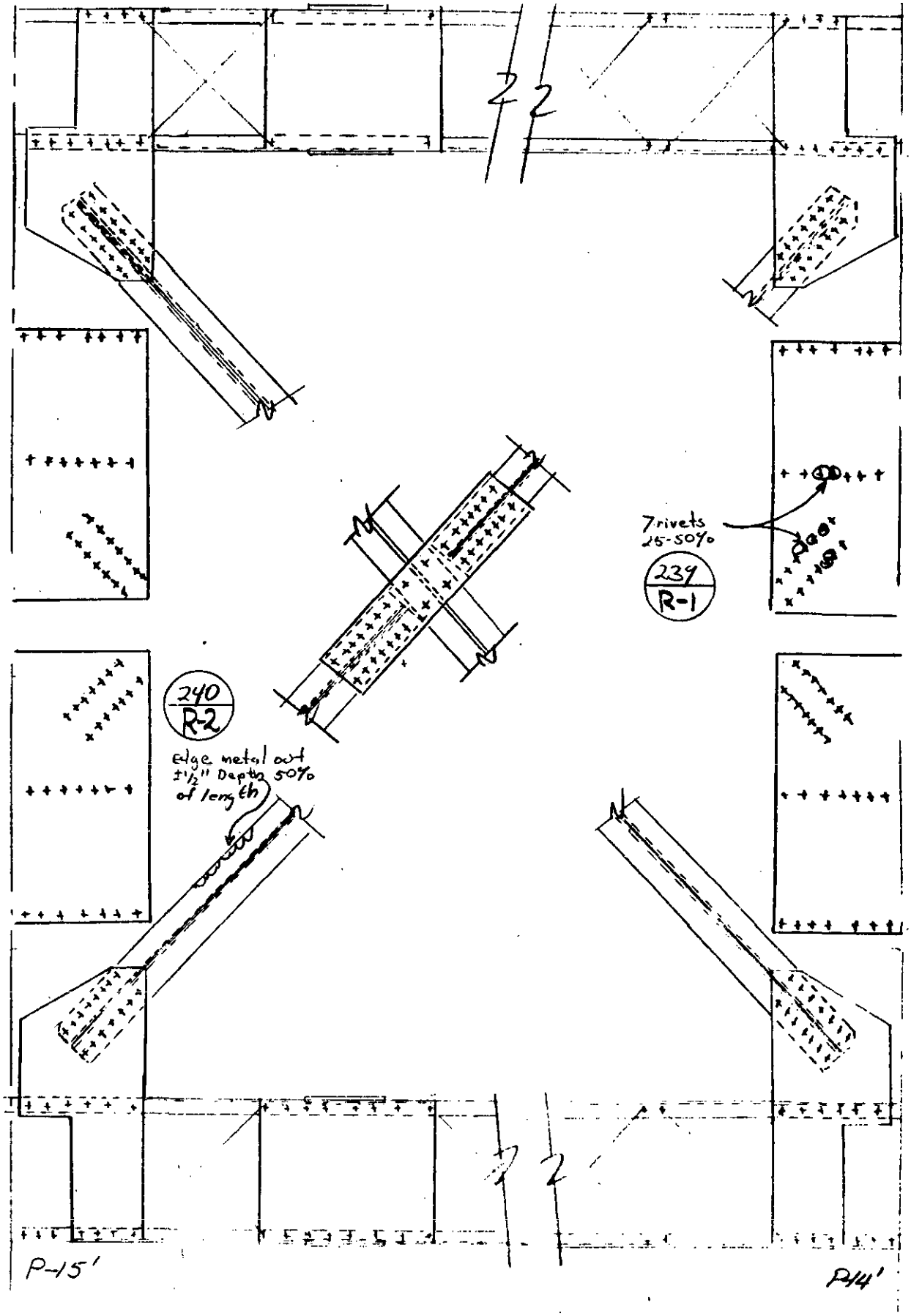
SKETCH G/1/14-15



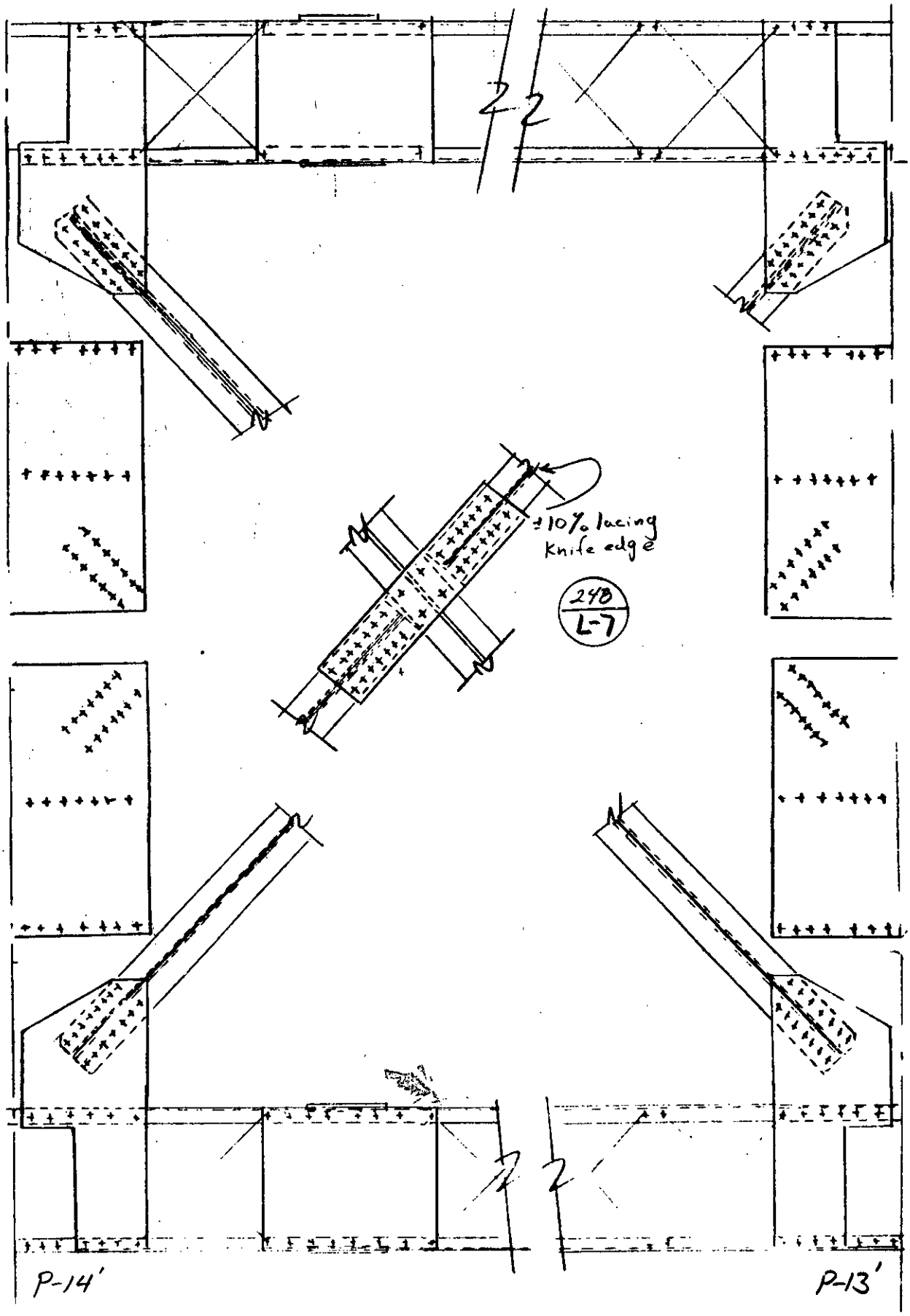
SKETCH G/1/15-16



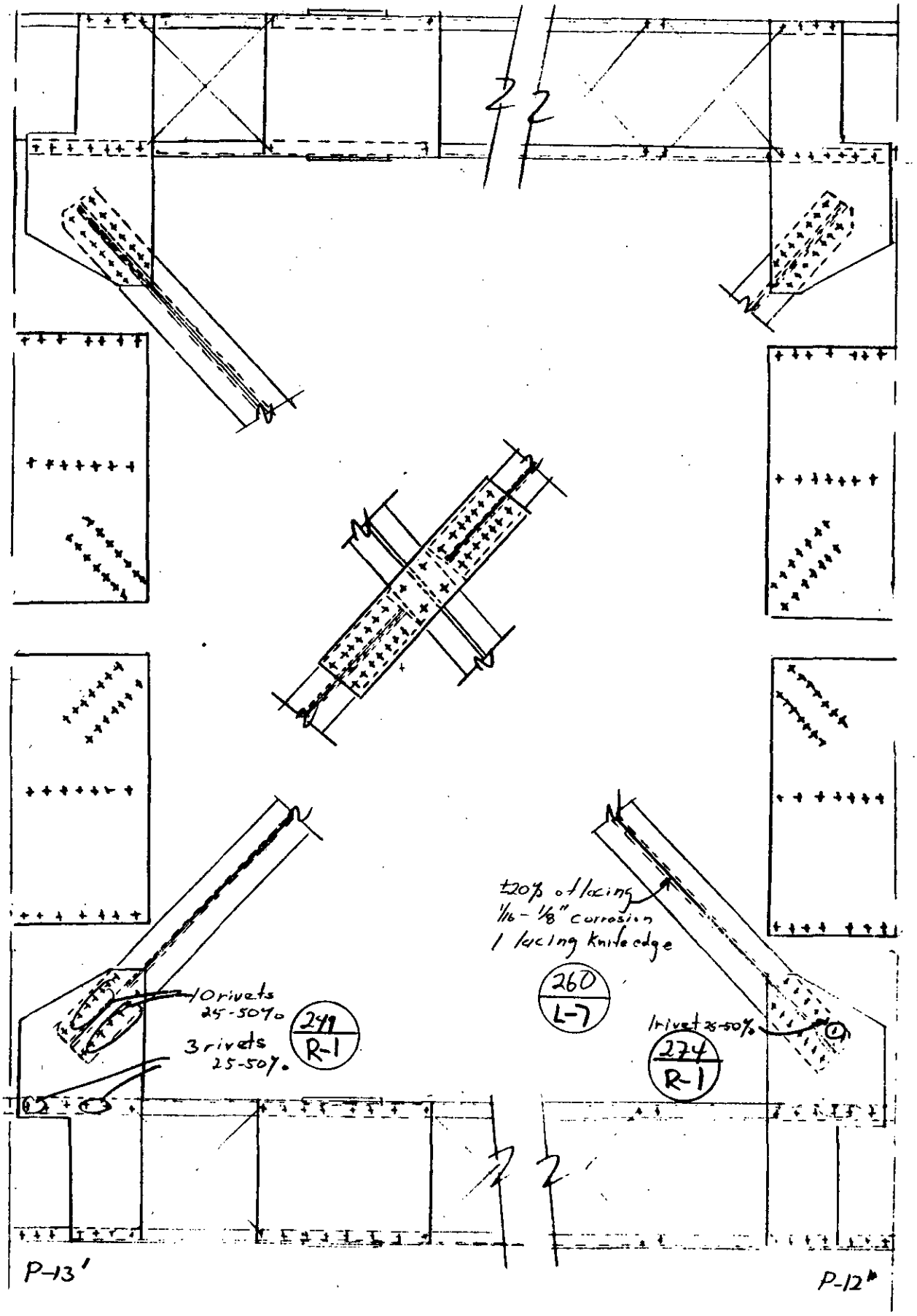
SKETCH G/1/16-15'



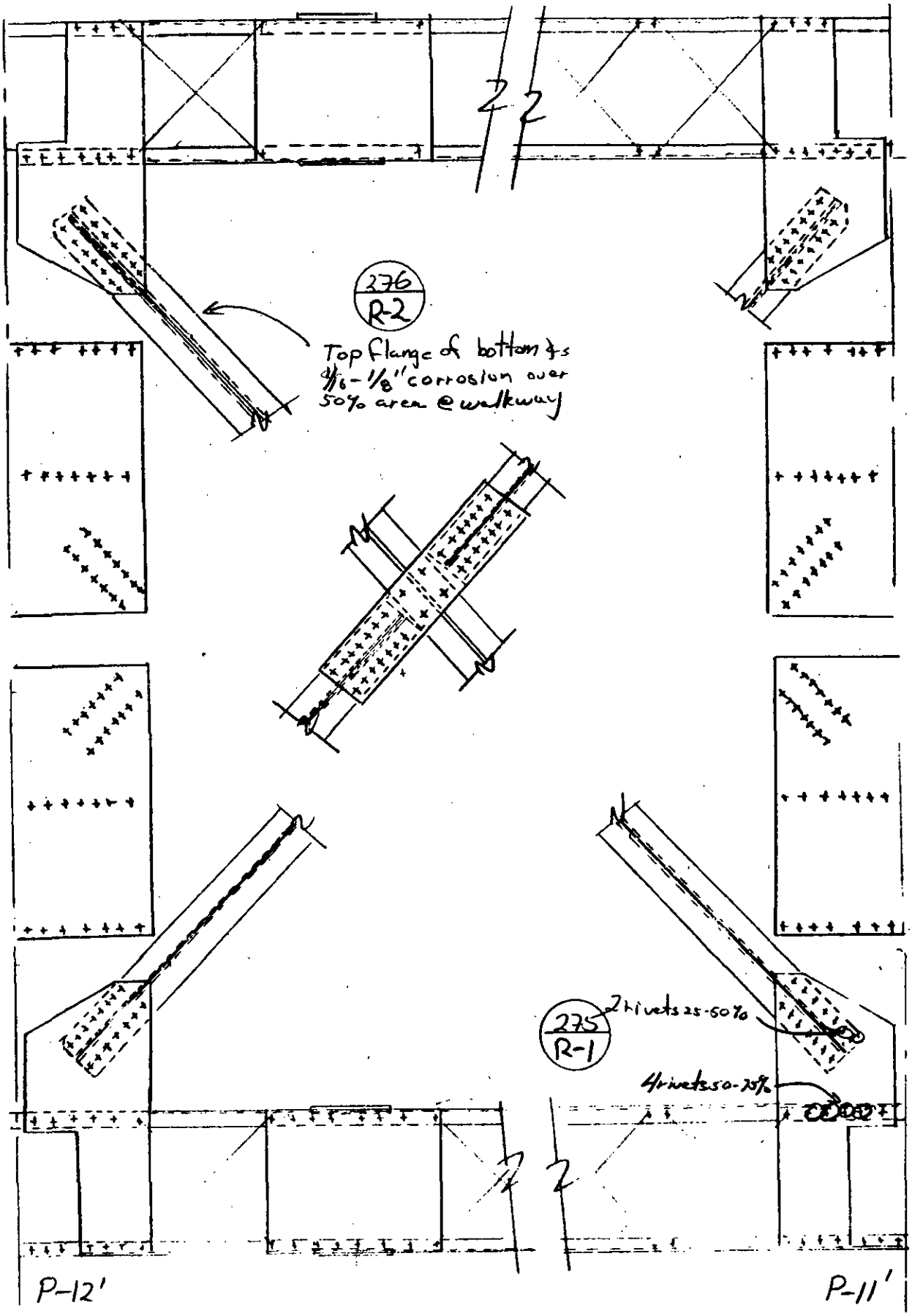
SKETCH G/1/15'-14'



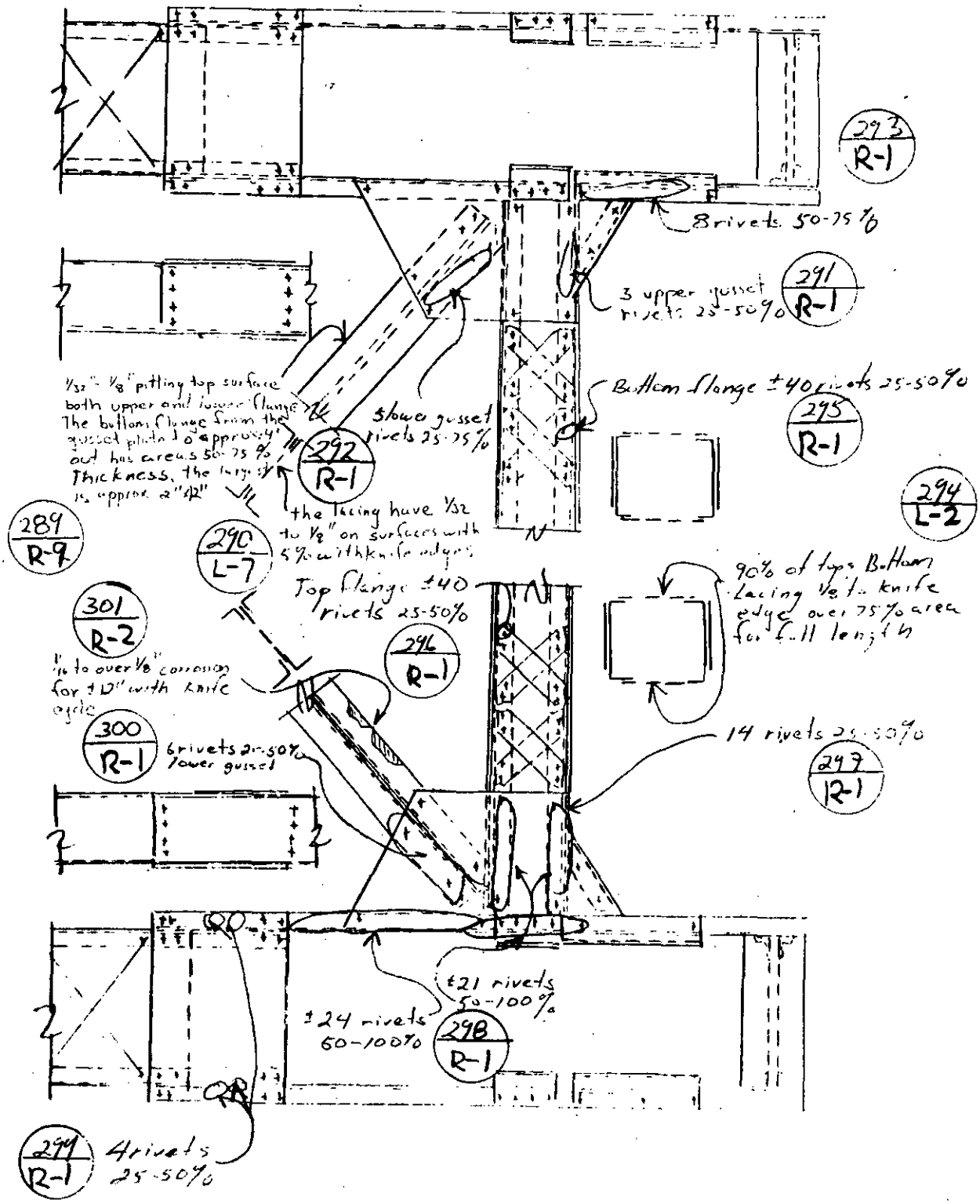
SKETCH 6/1/14'-13'



SKETCH G/1/13'-12'



SKETCH G/1/12'-11'



SKETCH 6/1/11'-10'