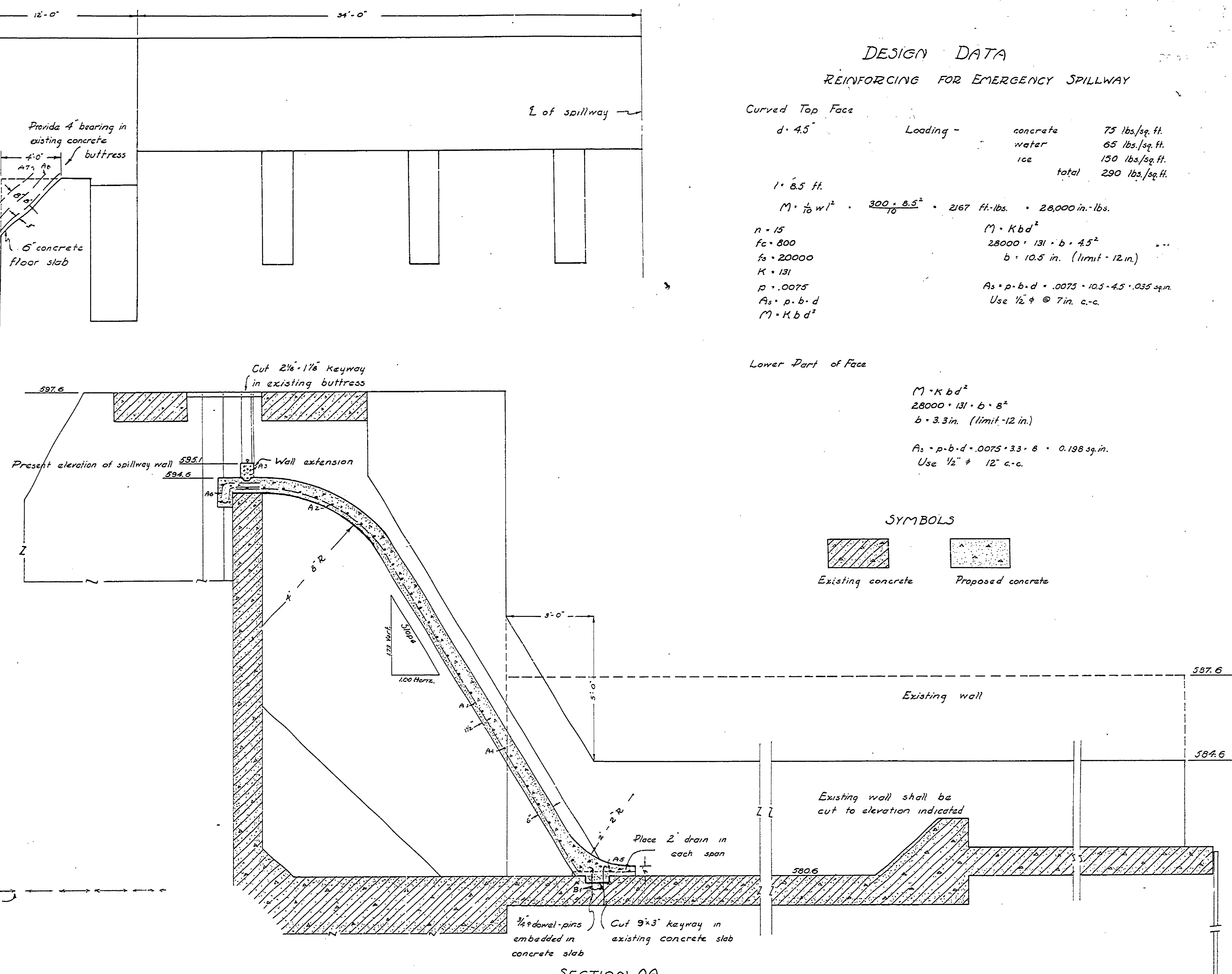


PLAN
Scale 1"=4'



SECTION AA
Scale 1"=2'

DESIGN DATA
REINFORCING FOR EMERGENCY SPILLWAY

Curved Top Face
d = 4.5'

1' 8.5 ft.
 $M = \frac{1}{10} w l^2 = \frac{300 \cdot 8.5^2}{10} = 2167 \text{ ft.-lbs.} = 28,000 \text{ in.-lbs.}$

n = 15
f_c = 800
f_s = 20,000
K = 131
p = .0075
A_s = p · b · d
M = K b d²

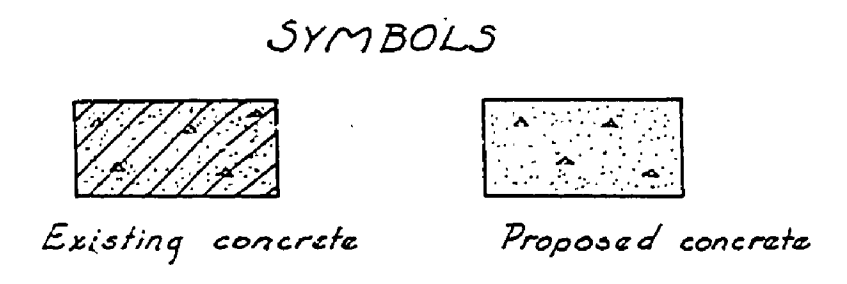
Loading -
concrete 75 lbs./sq. ft.
water 65 lbs./sq. ft.
ice 150 lbs./sq. ft.
total 290 lbs./sq. ft.

M = K b d²
28,000 = 131 · b · 4.5²
b = 10.5 in. (limit - 12 in.)

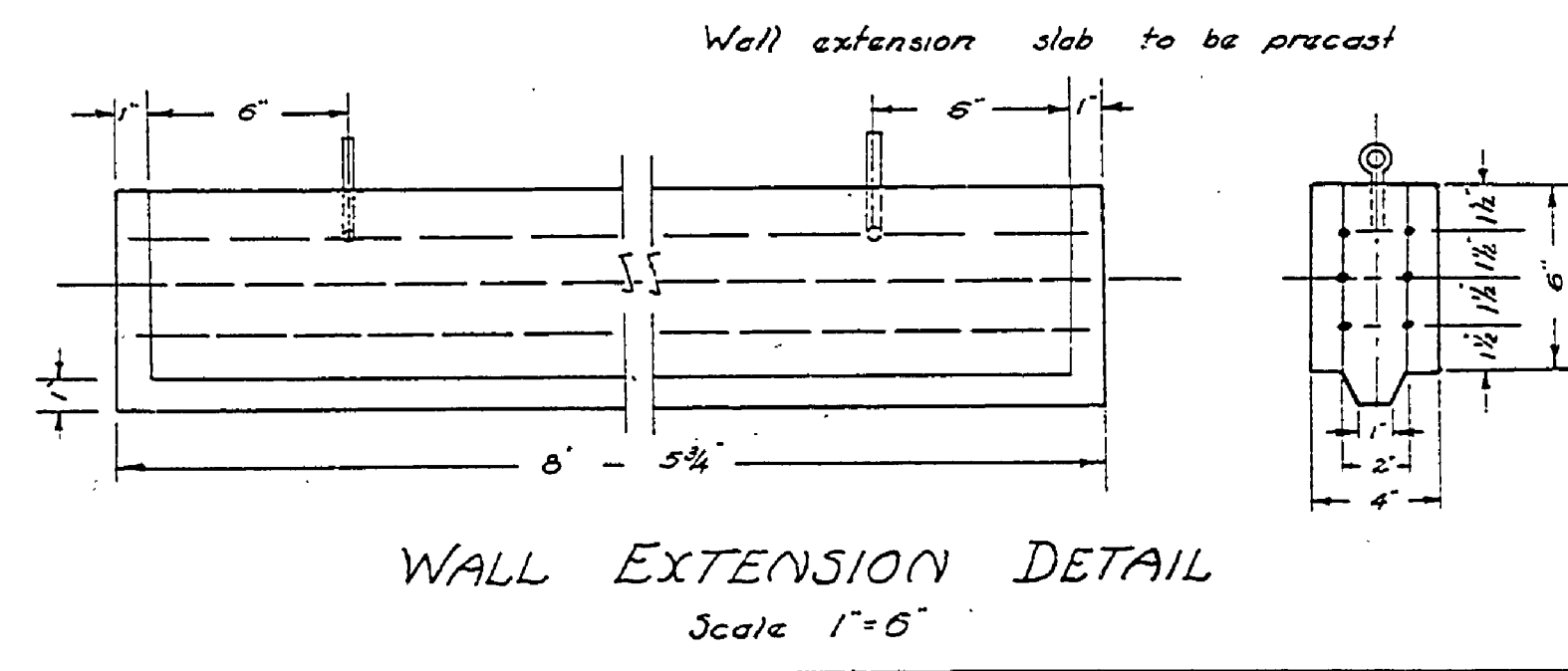
A_s = p · b · d = .0075 · 10.5 · 4.5 = .035 sq. in.
Use 1/2" φ @ 7 in. c-c.

Lower Part of Face
M = K b d²
28,000 = 131 · b · 8²
b = 3.3 in. (limit - 12 in.)

A_s = p · b · d = .0075 · 3.3 · 8 = 0.198 sq. in.
Use 1/2" φ @ 12" c-c.



MARK	SIZE	LENGTH	NO REQD	SPACING
A-1	1/2" φ	19'-0"	24 pcs.	16" c-c
A-2	1/2" φ	9'-6"	80 pcs.	7" c-c
A-3	1/2" φ	5'-2"	24 pcs.	as indicated
A-4	1/2" φ	9'-6"	52 pcs.	9" c-c
A-5	1/2" φ	9'-6"	16 pcs.	6" c-c
A-6	1/2" φ	4'-0"	54 pcs.	9" c-c
A-7	1/2" φ	1'-6"	1 pcs.	as indicated
A-8	1/2" φ	2'-6"	1 pcs.	as indicated
A-9	1/2" φ	3'-3"	1 pcs.	as indicated
B-1	3/4" φ	1'-3"	40 pcs.	12" c-c



BILL OF MATERIALS

1" 8" Shovelap	2000 bft.
2" 4" 2 Y.P.	2730 bft.
"9 Wire	200 lbs.
20# Nails	1 Keg
8# Nails	1 Keg
Cement	30 bbl.
Gravel	32 cu yd.
2" Cast iron pipe 4 pcs @ 2'-0"	8'-0"
4" Cast iron pipe 1 pcs @ 2'-0"	2'-0"

NOTES

Concrete shall be mixed in proportions of 1:2:4.

Coarse and fine aggregates are to be separated to insure proper proportioning in the mix.

Concrete must be packed carefully in forms and around reinforcing.

Maximum size of coarse aggregate to be 1".

UNITED STATES
DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
COOPERATING WITH
MICHIGAN
DEPARTMENT OF CONSERVATION

LUDINGTON STATE PARK
DAM,
EMERGENCY SPILLWAY

DATE AUG. 12, 1937

PREPARED BY: *[Signature]* DATE: 10/11/37
RECOMMENDED BY: *[Signature]* DATE: 10/13/37
APPROVED: *[Signature]* DATE: