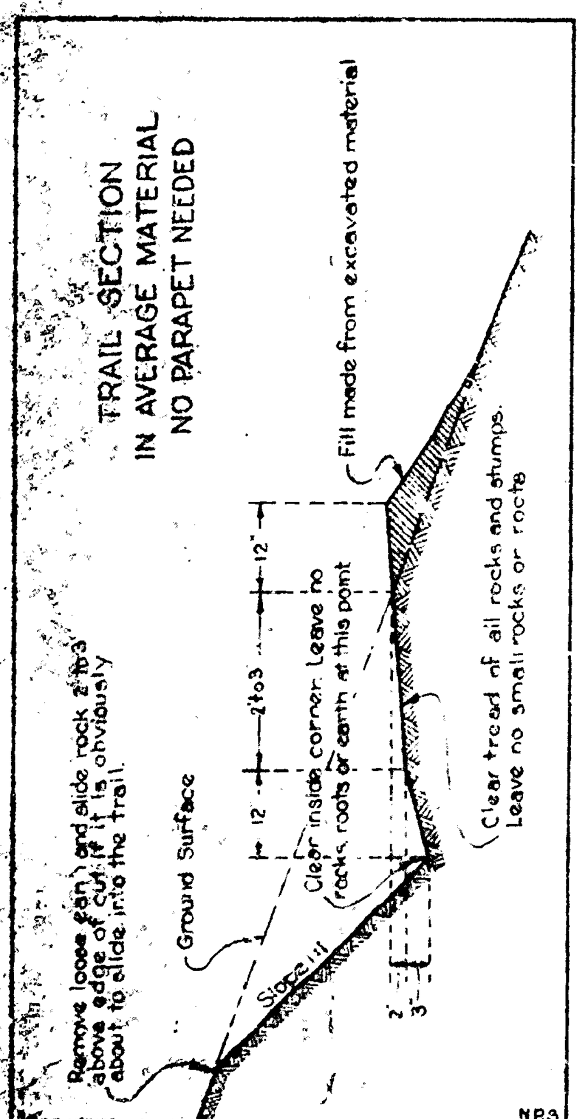
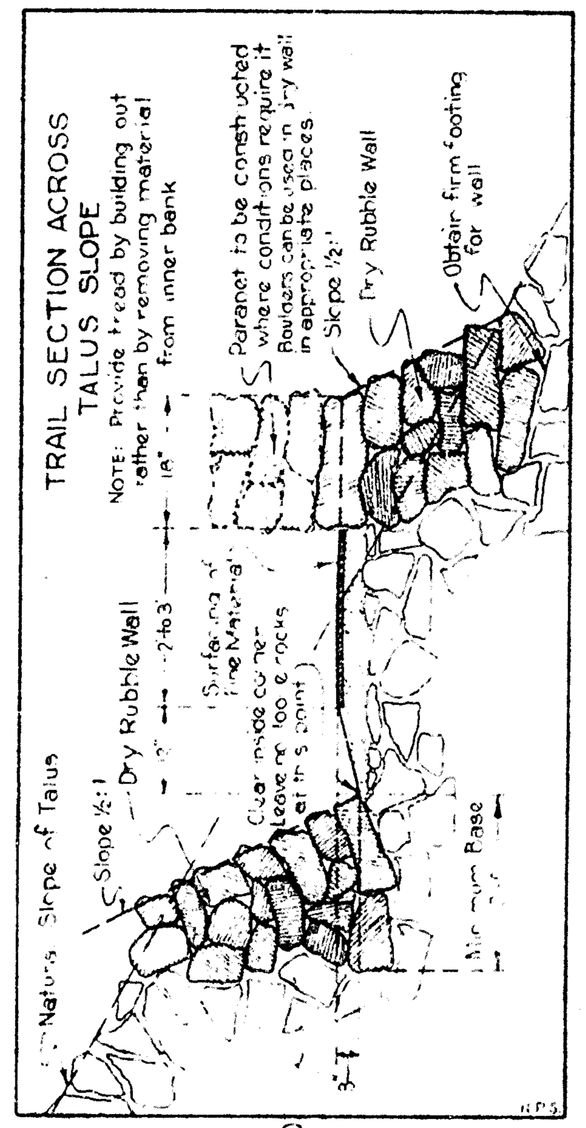
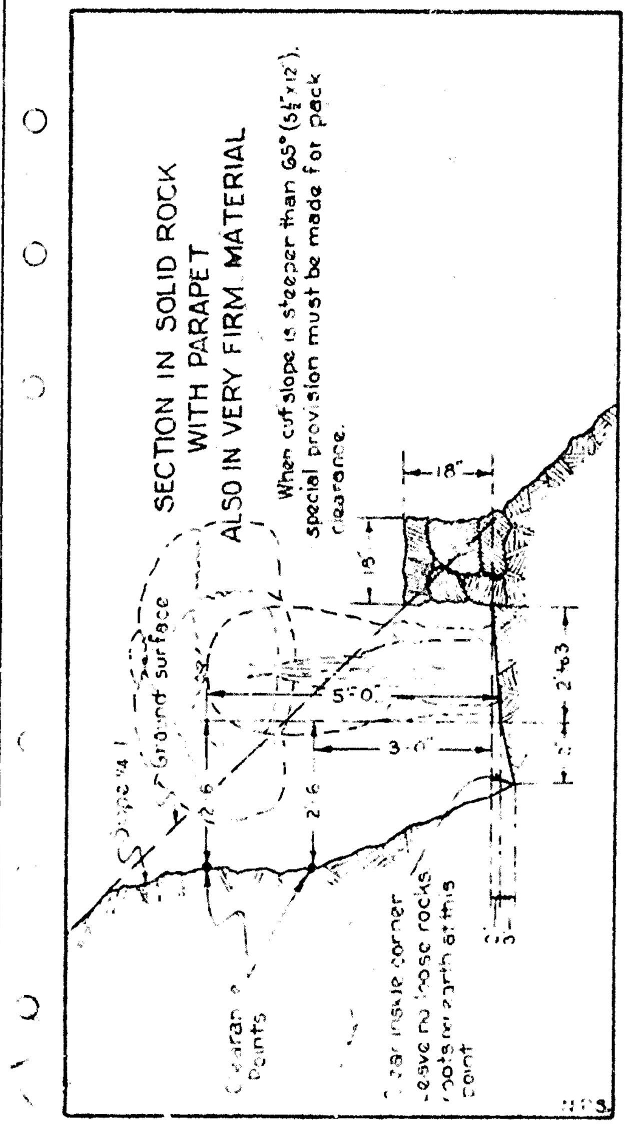


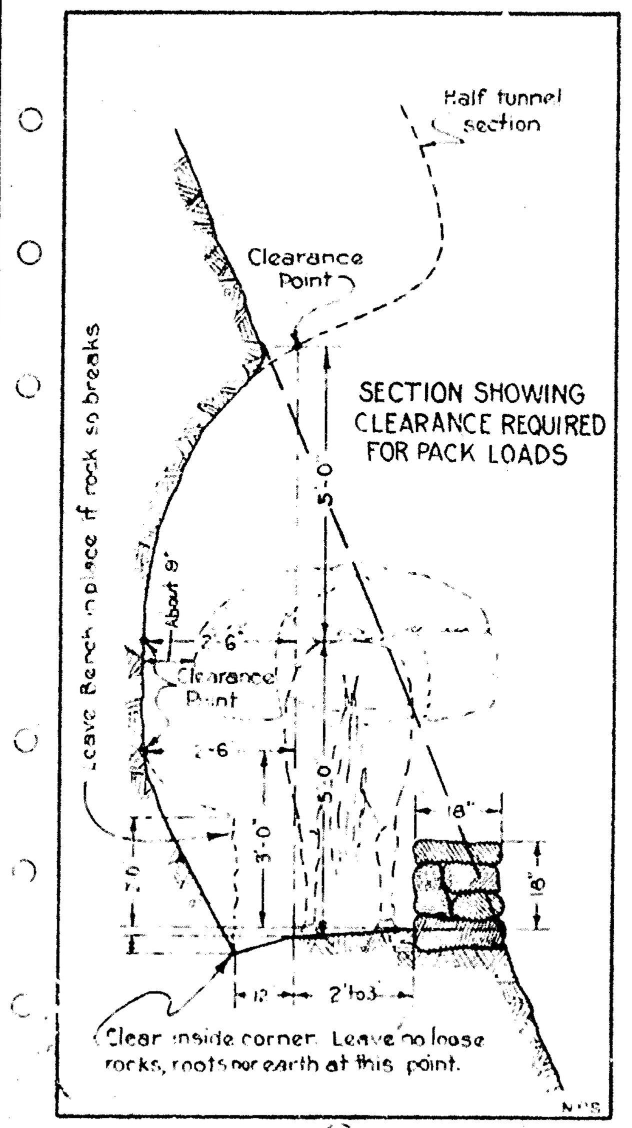
①



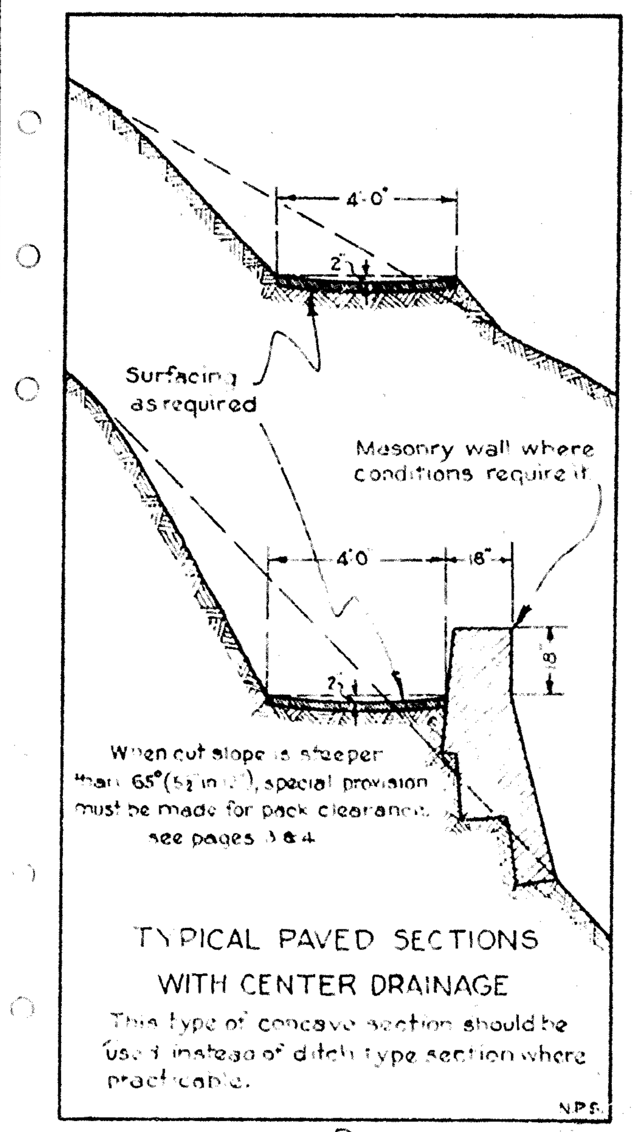
②



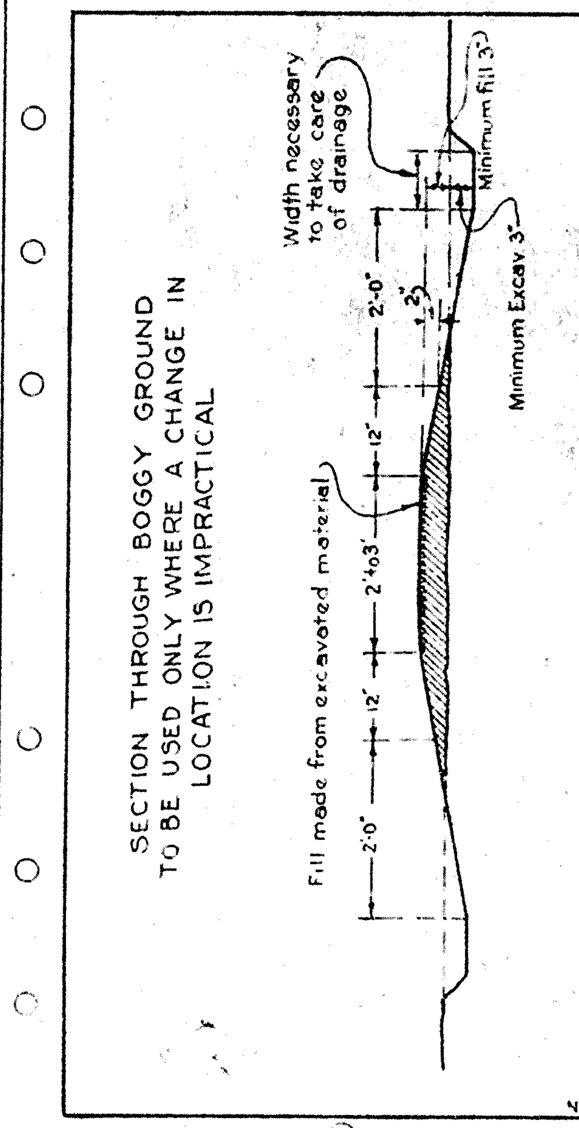
3



④



⑤



⑥

YARDAGE TABLE
BACK SLOPE 1 to 1 - 4º BASE
24" TREADS - 12" SHOULDER

BACK SLOPE 1 to 1			
SLOPE IN DEGREES	CU. YDS PER STATION	SLOPE IN DEGREES	CU. YDS PER STATION
10	6.7	26	22.7
11	7.3	27	24.5
12	7.9	28	26.6
13	8.5	29	29.0
14	9.2	30	31.6
15	10.0	31	34.6
16	10.7	32	38.1
17	11.6	33	42.2
18	12.5	34	46.9
19	13.4	35	52.6
20	14.4	36	59.6
21	15.5	37	68.3
22	16.7	38	79.4
23	18.0	39	94.2
24	19.4	40	115.0
25	21.0		

NPS

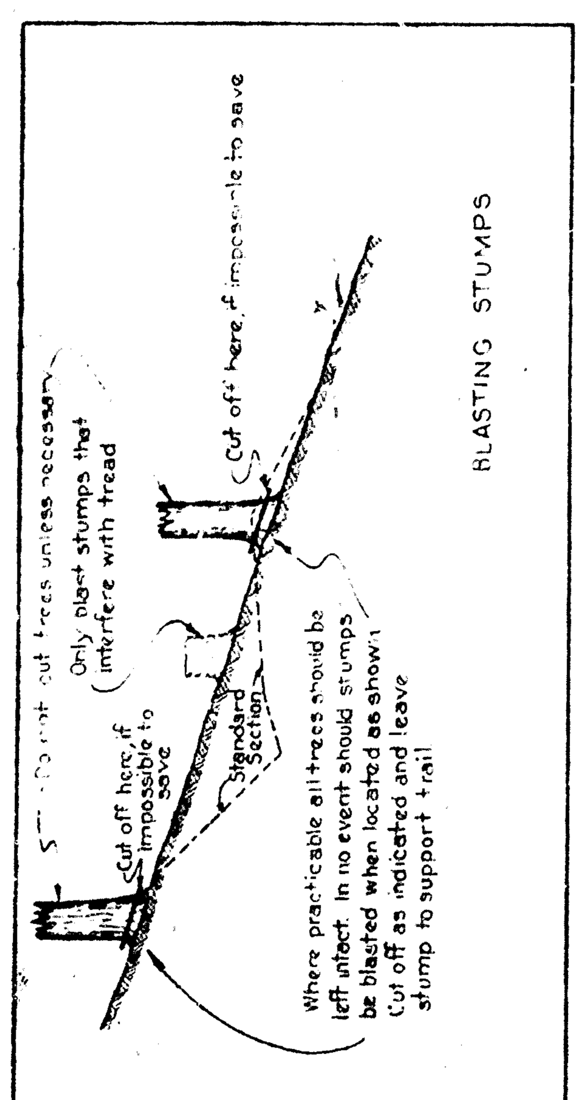
⑩

YARDAGE TABLES
4º BASE-BACK SLOPE ½:1 & ¼:1
24" TREAD 12" SHOULDER

BACK SLOPE ½ to 1		BACK SLOPE ¼ to 1	
SLOPE IN DEGREES	CU. YDS PER STATION	SLOPE IN DEGREES	CU. YDS PER STATION
34	21.4	42	22.5
36	23.6	44	24.5
38	26.3	46	26.7
40	29.4	48	29.2
42	33.1	50	32.1
44	37.5	52	35.3
46	42.8	54	39.3
48	49.5	56	43.8
50	58.1	58	49.4
52	69.7	60	56.3
54	88.1	62	65.1
56	111.2	64	76.9
58	154.7	66	93.2
60	248.5	68	117.7

N.P.S.

⑪



⑫

SPECIFICATIONS FOR TRAILS

Trail Section

The trail will be of the standard 4'-0" width. The slope of the cut will vary according to the hardness of the ground on which the trail is constructed.

Any part or all of the width may be carried on a wall built of large stones, the supporting ground being benched as necessary to afford a stable foundation.

Where necessary to retain material on steep slopes a dry random rubble wall may be built along the downhill side of the trail. When crossing talus slopes it may also be necessary to construct a suitable dry random rubble wall on the up hill side to retain slide material above the trail. Surface of trail on talus slopes should be covered with dirt or other fine material.

Clearing

Clear trees and brush to a sufficient width and height to provide an unobstructed passage of loaded pack animals and horsemen, even when the trees are loaded down with snow. Excessive clearing is not desired but should extend to a point at least one foot beyond the limits of the excavation or fill, or wider if required by the needs of the Park Service. Clearing shall in all cases extend to a height of 10 feet above trail grade. Cut large trees only where it is impracticable to build around them, but not until after the Branch of Plans and Design has reviewed the situation.

Brush and logs from clearing are to be piled and burned under the direction of the Park Superintendent.

Landscaping.

All phases of trail location and construction features affecting landscaping will be reviewed and approved by the Branch of Plans and Design before construction is undertaken. It is also essential that all evidence of construction outside the trail prism be reduced and held to a minimum.

N.P.S.

⑬

SPECIFICATIONS con't.

Grade.

A dip in the grade should be provided wherever possible, to dispose of drainage water. If conditions are such that it is inadvisable to use the slack grade necessary for a series of dips, water breaks or under drainage should be provided.

The rate of grade should not be steeper than 15% except in extreme cases, and should be as much less than 15% as possible without unduly extending the trail length. (See note page 15)

In short stretches of not over 160 feet, a grade of 18% may be used, providing a considerable saving in cost can be effected. In very exceptional cases a grade up to 20% may be permitted, but only after a showing has been made that so steep a grade is essential to avoid very excessive construction cost.

Drainage.

Dips, water brakes, culverts or bridges should be provided where necessary to dispose of drainage water. Particular attention should be paid to so locating the points for cross drainage that shoulders or fills will not be washed out. When suitable conditions do not exist at a point at which cross drainage must be provided, the trail surface and embankment must be adequately protected by rip rap. A special study of the precipitation and run off characteristics of a locality should be made to properly determine the type and spacing best suited to the conditions.

Generally speaking, dips or water breaks are to be preferred to culverts or bridges, these latter two being considered only where appropriate and necessary.

Drainage from switchbacks will require care to prevent the discharge of a stream of water into the trail below.

Switchbacks.

Switchbacks are not desired if support can be obtained for a curve.

N.P.S.

⑭

SPECIFICATIONS con't

When a switchback is used ample room should be provided for the turn to be made upon level grade if at all practicable. See page 8.

Dry Rubble Wall.

Much of the masonry walls for trail construction can be built as dry rubble walls. It is only occasionally that a wall of higher type will be necessary.

Footing for a dry rubble wall must be carried down to a satisfactory and firm foundation, and in all cases have a slope toward the mountain of at least [illegible]. The outer face of the wall shall not have a batter steeper than ½ to 1.

Bedding joints shall slope toward the mountain at least 1" in 12". The stone shall be selected and carefully bedded to prevent rocking after being placed in the wall.

In all cases a wall having a height of two feet or over, shall have a top width not less than 18". All walls supporting a new fill will be built with a full gravity section. Where a wall is built to support a compact bank on a talus slope a lighter section is permissible, but in no case lighter than two foot base.

Grade (continued)

Trail Locator should so design grade as to vary the percentage of grades at appropriate intervals, in order to avoid all the strain being confined to a certain few leg muscles.

N.P.S.

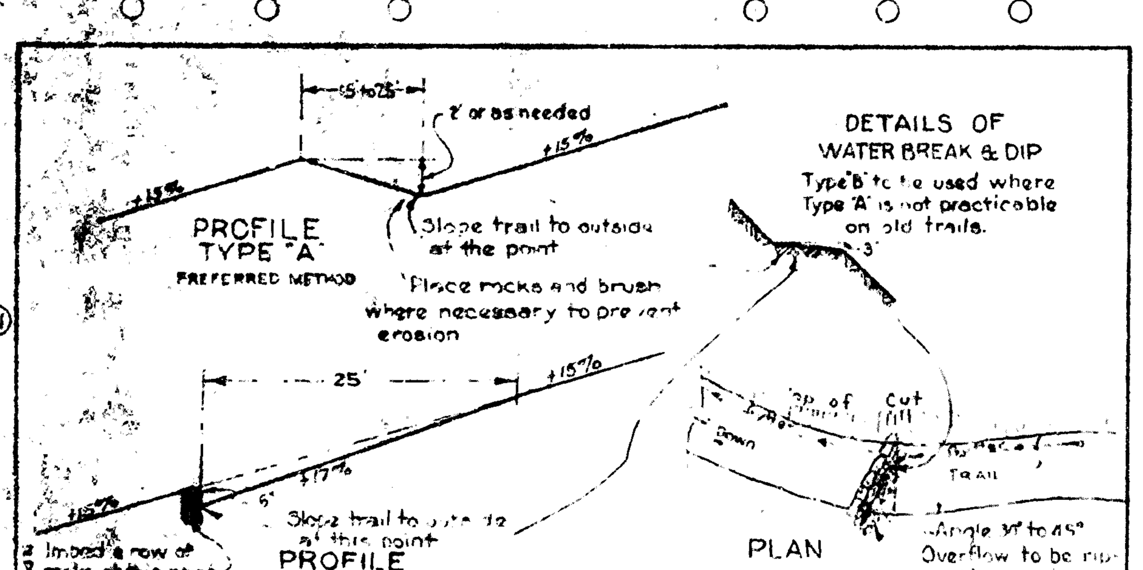
⑮

DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

STANDARDS FOR TRAIL CONSTRUCTION

OFFICE OF THE CHIEF ENGINEER
SAN FRANCISCO, CALIFORNIA
OCTOBER 1934

RECOMMENDED BY [signature] CHIEF ENGINEER 11/6/34



⑦

SWITCHBACK

Guard rail or rock wall 10' to 15' long and 1½' to 2' high. Rock wall may taper from 2' high at turn to about 0" at end. To prevent cross cutting at turns.

Grade should be slacked to 10% within 5' of turn and turn itself should be level if at all practicable.

PLAN

⑧

DRAINAGE

When crossing a ravine or gully give trail a dip centering on water course to avoid washout.

Place rocks and brush where necessary to prevent erosion

5' 5'

6" to 24" depending on runoff

Section at low point of dip

⑨

DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

STANDARDS FOR TRAIL CONSTRUCTION

OFFICE OF THE CHIEF ENGINEER
SAN FRANCISCO, CALIF.
OCT. 1934

PG-5088	Compiled By	Drawn By	Traced By	Checked By	Revised
	B.F.M. A.D.Q.	A.D.Q. Sept. 1934	A.D.Q. Oct. 1934	C.L.C. Oct. 1934	A.D.Q. Apr. 1935

Sheets 1 & 2

PG-5088