HINTS ON CAMPING ARRANGEMENTS FOR SANITARY OFFICERS.¹

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This paper is more especially applicable to camps in England, and is divided into four parts:—
(1) Selection of camp site.
(2) Duties before arrival of troops.
(3) The camp.
(4) Details of sanitary methods.

PART I.
SELECTION OF CAMP SITE.

If possible, select the site in company with the Royal Engineer officer, the Army Service Corps officer, and the Adjutant and Quartermaster of the regiment concerned.

It may also be of advantage if the local medical officer of health, and the owner of the likely ground, or his representative, are present.

The chief things to be considered are:—
(1) Is the ground suitable, having regard to the following points:—
(a) Size.
(b) Soil, subsoil and surface drainage.
(c) The water supply.
(d) The latrines.
(e) Facilities of approach.
(f) Facilities for obtaining shelter, food, fuel and straw.
(2) The waste water.
(3) Position of cook-houses, institutes and messes.

(a) Is the Ground large enough?

Extract from Field Service Pocket Book:—

<table>
<thead>
<tr>
<th>Unit</th>
<th>Minimum camping space in yards.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Length</td>
</tr>
<tr>
<td>Army Headquarters</td>
<td>100 x 100</td>
</tr>
<tr>
<td>Divisional Headquarters</td>
<td>50 , 100</td>
</tr>
<tr>
<td>Brigade Headquarters</td>
<td>30 , 50</td>
</tr>
<tr>
<td>Cavalry Regiment</td>
<td>161 , 150</td>
</tr>
<tr>
<td>Cavalry Squadron</td>
<td>55 , 150</td>
</tr>
<tr>
<td>Battery or Ammunition Column</td>
<td>75 , 150</td>
</tr>
</tbody>
</table>

¹ This paper has been written with a view of giving medical officers of the Territorial Force practical hints on camp sanitation.
R. Tilbury Brown

Unit

Minimum camping space in yards.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Length</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field Troop</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Field Company</td>
<td>35</td>
<td>150</td>
</tr>
<tr>
<td>Battalion Mounted Infantry</td>
<td>200</td>
<td>150</td>
</tr>
<tr>
<td>Infantry Battalion</td>
<td>65</td>
<td>150</td>
</tr>
<tr>
<td>T. and Supply Company (I. company)</td>
<td>75</td>
<td>150</td>
</tr>
<tr>
<td>Divisional T. and S. Column</td>
<td>225</td>
<td>150</td>
</tr>
<tr>
<td>Army Troops T. and S. Column</td>
<td>150</td>
<td>150</td>
</tr>
<tr>
<td>Field Ambulance</td>
<td>120</td>
<td>200</td>
</tr>
<tr>
<td>Cavalry Field Ambulance</td>
<td>63</td>
<td>122</td>
</tr>
<tr>
<td>An Infantry Brigade in one Line</td>
<td>280</td>
<td>150</td>
</tr>
<tr>
<td>A Cavalry Brigade in one Line</td>
<td>515</td>
<td>150</td>
</tr>
<tr>
<td>General Hospital</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Horses require each 6 feet x 18 feet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mules &quot; 4 &quot; x 15 &quot;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The minimum spaces given above are only applicable when the ground is particularly suitable for a camp; if the ground is not very good they are insufficient.

If shallow latrine trenches are to be dug, add to the above depths: Number of probable days of occupation × 2-3rds = extra number of yards required.

Example:

Infantry battalion camp for fifteen days.

Minimum space (per table) = 65 × 150 yards (depth).

Depth of trenching ground for fifteen days = 15 × 2-3rds = 10 yards. Therefore, total minimum space = 65 × 160 yards.

(1) (b) As regards Soil, Subsoil and Surface Drainage.

A most important point to consider is the surface drainage.

Choose level ground on the top of a rise, or a gentle slope from the top of a rise. Grass-covered ground is the best. Choose drained grass land, if possible; this may be indicated by the presence of ridges and furrows, running parallel.

Avoid flat ground at the base of a slope, but if this is unavoidable a ditch should be present or a surface channel must be made between the slope and the camp.

Avoid a steep slope, newly turned soil, low meadows and clay soil.
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Avoid a recent camping ground, but if this is unavoidable, keep clear of old latrine sites, burn the ground over old latrines or urinals, and clear away and burn all refuse.

Plans of camping grounds should be kept in the Brigade Office, or office of the local District Officer, Royal Engineers, showing the exact position of latrines, refuse pits, &c. Should a camp have to be pitched on previously used ground, the plans should be consulted in order to avoid the old latrine sites, &c.

(1) (c) The Water Supply.

Ascertain the nature of the water supply of the adjacent town or village, and the relation of the site to it. Take care that the site is not on the collecting area, whether for a town or for the wells of adjacent houses.

If there is a municipal water supply it may be possible to get the water piped to the camp. Place the site as near as possible to existing pipes.

If the supply is from wells: (a) See that there is no obvious pollution. If pollution is possible take care that the site is not on ground sloping towards the wells. Arrange with Royal Engineers to have the wells fenced off and covered, and any special precautions taken that may be required to prevent surface pollution (see Part II.). Later arrange with the General to have the wells guarded by a sentry.

(b) Take samples of water for analysis in the manner described in Royal Army Medical Corps Regulations, Appendix No. 3.

(c) Ascertain amount of water in the wells.

(d) Obtain local information as to effect of pumping on the level of well water. This is necessary in order to know the daily supply available.

(e) In case of wells running out, note likely situations to obtain water by sinking Norton's tubes. These may be indicated by midges swarming over certain spots; by grass being long, luxuriant, and darker; by mist rising over certain places in the evening, and by any obviously damp ground.

If the supply is from a spring: (a) Ascertain whether the spring is intermittent or constant, shallow or deep.

The temperature of the water from a shallow and intermittent spring varies with the atmospheric temperature; whereas the water from a deep and constant spring is comparatively cold in hot weather and hot in cold weather. The flow from a shallow and
intermittent spring varies with the local rainfall; whereas the flow from a deep and constant spring does not.

(b) Note likely causes of contamination on the collecting area.

(c) Measure the rate of supply. If the spring is small, collect the water in vessels of known capacity for a certain time. If the spring is large measure the flow in the manner described as for streams.

(d) Fence in the spring-head, clear away undergrowth and rubbish, and later, if necessary, place a sentry at it.

If the camp is for temporary occupation level off and drain the surrounding ground, so as to give the water parties a dry ground to work on and prevent pollution of the spring.

Render the water easily obtainable by cutting away the ground under the spring so that buckets can be placed to catch the water or sink a barrel or box at the spring-head into which buckets can be dipped.

If the camp is intended for prolonged occupation sink at the head a barrel from which the water can be pumped to the camp.

If the supply is from a stream or river: (a) Go up the stream
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for at least a mile; note any obvious pollution, and ascertain if there is any possible source of contamination.

Practically no rivers in England are fit for drinking purposes without treatment, and most streams are unfit.

(c) If the stream is small measure its supply. Pace out 10 to 40 feet where the flow is uniform, where there are no eddies, and where the depth is fairly constant. Measure the width and depth, then float a light piece of stick or paper over this measured area and note the time taken. Take four-fifths of the surface velocity as representing the average flow.

Water Supply for Ablution.—Ablution water should be taken from the same source as the drinking water, but this is seldom possible unless the water is obtained from a municipal supply or from large springs or wells. If a separate water for ablution purposes is pumped to the camp it should be stored in tanks and piped to the ablution benches. River water must be clarified before storage or use.

If water taken directly from a stream or river must be used for ablution purposes; note the best position for this purpose and also select a place further up-stream for watering the horses (see Part II.).

Amount of Water Required.—The minimum is \( \frac{1}{2} \) gallon per head per day. For drinking and cooking 1 gallon per head per day should be allowed. For all purposes 5 gallons per head per day should be provided, but if baths are erected 10 gallons per head will be required. A horse, mule or bullock drinks \( 1\frac{1}{2} \) gallons at a time and takes three minutes over it. In standing camps 10 gallons per horse should be provided.

(1) (d) The Latrines.

Method of the Disposal of Excreta.—(1) If the site is near a town and the camp is to be occupied for some time, the disposal will probably be by the dry-earth removal system. Under these circumstances a contractor is usually employed by the Army Service Corps, and the following conditions should be observed:

(a) The number of buckets provided to be double the number of latrine seats in camp.
(b) Removal to be daily after 10 p.m.
(c) When buckets in use are removed clean ones containing a little dry earth and lime to be placed in position.
(d) The earth to be dry and sifted through a \( \frac{1}{4} \)-inch mesh.
(e) The supply of earth to be kept in camp under a covered shed, which must have two compartments for storing earth. (This allows one supply to get properly dry before the other is used.)

(f) Receptacles to be provided for earth.

(g) A scoop to be provided for each receptacle.

(h) Excreta to be removed at least 1 mile from the camp. Latrines should be placed 100 yards from tents or kitchen, and to leeward of the camp.

(2) The Shallow Trench System. This is the best all round, and the amount of ground required is very small.

The frontage varies with the number of men. It is usual to have a trenching ground for each unit and to dig trenches for 5 per cent. of the men. The more men there are the smaller the percentage of trenches it is necessary to have; 3 per cent. is ample for 500 men. Calculating on the basis of 5 per cent., to obtain the frontage of ground, multiply the "hundreds" of men by 6; this gives the frontage in yards, but only holds good when trenches are dug with a 2 feet 6 inches interspace.

If latrines are to be placed in rear of the units, there is always enough frontage, even with the minimum camping area, so that the depth only has to be considered. This varies with the length of occupation of the camp. When trenches are dug in the manner described in Part IV., to find the "depth" of trenching ground required take two-thirds of the probable number of days of occupation, this gives the depth in yards, and the actual amount of ground which will be trenched; but it is well to allow a few yards in each direction as a margin for errors. On irregular ground or in a wood a greater area must be allowed. Undergrowth, gorse, heather, &c., must be cleared before the trenches are made.

Officers and men require separate trenching grounds; one trench for field officers and four trenches for the remaining officers will usually be sufficient.

Trenches for N.C.O.'s should be calculated on 5 per cent. of the strength. Frontage: Two trenches require three yards; four trenches require five yards; six trenches require eight yards; eight trenches require ten yards. Depth as stated above.

Position of Trenching Ground.—The N.C.O.'s and men's trenches are generally placed close together. If units are isolated, place the trenches on the most suitable site irrespective of its relation to the aspect of the camp. If units are in line the trenching ground should be in rear of the camp. The officers' ground should be near
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their tents, if possible in front or to a flank of the camp. The nearest part of the trenching ground should not be less than 50 or more than 100 yards from the nearest tents or kitchen.

If dry-earth removal or shallow trenches are impracticable it may be necessary to have deep trenches. These should rarely be necessary, as practically the same amount of ground is required for deep as for shallow trenches. Successive deep trenches cannot be made close together. A deep trench (4 feet) has only 2 feet available for excreta, and if the ground is limited shallow trenches may be dug 2 feet deep. If deep trenches can be dug then shallow ones can, except perhaps in sand. Deep trenches take a long time to make and excrement is not readily broken up in them. They are more likely to pollute water supplies and are very difficult to keep free from odour and flies. In fact there are so many disadvantages connected with them that it is hoped the day of the deep trench is over.

Detail of Deep Trenches.—Deep trenches should seat 5 per cent. of troops, and 1 yard per man should be allowed. The greatest care should be taken to prevent the water supply being polluted by them, either directly by filtration or indirectly by surface water in wet weather flowing from the trench or its immediate neighbourhood to a water supply.

(1) (e) Facilities of Approach.

The camp must have good facilities for approach by foot and by wheeled vehicles, and the approach must be available for different parts of the camp, i.e., the various units.

(1) (f) Facilities for Obtaining Shelter, Food, Fuel and Straw.

Enquiries should be made from the Army Service Corps officer and the quarter-master as to the arrangements for these necessaries.

(2) Disposal of Waste Water.

The nature of the subsoil must be known. The Geological Survey map (Drift series) of the district will be of great assistance, and information may be obtained from the owner of the land or from the local medical officer of health, but it is best to have trial holes dug 4 feet to 5 feet deep in several parts of the camp.

The waste water to be dealt with consists of: The waste ablution water; the waste water from washing cooking utensils; the waste water from washing clothes.

It is difficult to give an estimate of the amount of waste water,
as so much depends on the manner in which water is supplied to the camp, whether bathing sheds are erected, a sail bath is provided, or shower baths are used, &c.

There is always a needless waste in camps, which greatly adds to the difficulties of sanitation and can be largely prevented.

The questions to be considered are: (a) Where is the water supply? If the camp is on the watershed the disposal should be by trenches which lead away off the watershed to a safe soakage area. If the camp is not on the watershed, the disposal should be by surface soakage, or soakage from pits. (b) What is the subsoil and its depth from the surface. If it is porous and far from an impervious layer, disposal may be carried out by pits. If it is not porous or close to an impervious layer, disposal must be by trenches which lead away to a soakage area at some distance from the camp, and away from the watershed. If a soakage area is not available, lead the trenches into a "common" pit and have the contents pumped out and distributed on roads or elsewhere, by pumping or by conveyance in water-carts.

The best means of disposal in order of merit are: (1) Direct fall on the side of a hill, but great care should be taken that the drinking water is not polluted.

Shallow trenches must be made so as to divert the waste water over a considerable area, and must be so arranged as to irrigate different portions on successive days.
(2) Collection from each ablution bench by a "common" drain, leading to a surface soakage area. The soakage area should be to leeward of the camp and be divided into irrigation areas. The "common" drain should be about 1 foot deep, should run along the natural slope of the land, and if there is to be traffic over it a pipe should be laid in it and covered with brushwood and earth; if a pipe is not available cover the drain with planks or stout branches, brushwood being placed across them and sods of turf on the top.

(3) Separate soakage pits for each ablution bench. These are rarely suitable, and only so in very porous soils. Sometimes two pits used on alternate days will be necessary, but if more than two are required it is generally best to adopt method (2) or (4).

(4) Collecting the water from each ablution bench by a "common" drain leading into a "common" pit, and then pumping out the contents. This is the least satisfactory of all the methods, but may be necessary when the ground is not porous and when no surface soakage area is available. The pumping should be done by a steam pump under supervision of the Royal Engineers, with a roster of fatigue parties from the various units to assist. This is much better than having the water pumped from separate pits,
as there is less spillage in camp and only one fatigue party at a time is required. If a steam pump is not available hand pumps will be necessary.

The difficulty is what to do with the water. It should be pumped into water-carts and distributed on roads or waste land. Carts available may be either old wooden service carts which are not used for drinking water, or arrangements may be made with a neighbouring town for the loan of their water-carts. A large tank or a boiler, or even barrels, might be placed in carts for the conveyance of the water; a large tarpaulin might be arranged as a tank in a cart. The times for fatigue parties and pumping should be arranged as is found necessary.

The waste water from washing of cooking utensils and clothes will join the ablution waste water, but the waste water from cooking must be strained first (see Part IV.).

Position of Ablution Benches.—The primary consideration is to place them so that the waste may be carried away easily. There will be a good deal of spilt water about the benches, so they should be placed on a slight slope if possible. If water is to be piped to the camp, place the benches as near existing pipes as possible to save length of piping.

(3) Position of Cook-houses, Institutes and Messes.

These should be 100 yards from latrines and urinals. There will be a great deal of waste water to be disposed of from these places, and a place for emptying this water must be close at hand.

(To be continued).