

# Image Cover Sheet

**CLASSIFICATION**

UNCLASSIFIED

**SYSTEM NUMBER**

126857



**TITLE**

AREA SHOOT WITH 5.5 INCH BE/CHEM. SHELL CHARGED HTV PLUS 0.1 PER CENT PERSPEX

**System Number:**

**Patron Number:**

**Requester:**

**Notes:**

**DSIS Use only:**

**Deliver to:**





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X
X EXPERIMENTAL STATION, SUFFIELD, ALTA. X
X
X SUFFIELD REPORT NO. 84. X
X
X SERIAL NUMBER 23 X
X
X DATE: 31 August 1943. X
X
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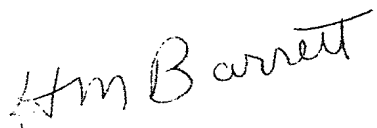
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AREA SHOOT WITH 5.5 INCH BE/CHEM. SHELL CHARGED HTV PLUS 0.1 PER CENT PERSPEX

SUMMARY

1. A trial has been carried out in warm weather with 5.5 inch BE/Chem shell charged HTV plus 0.1 per cent Perspex to assess:-
  - (a) The vapour danger on an area bombarded with the recommended minimum number of rounds.
  - (b) The anti-personnel performance of the shell with this charging against men in the open and in slit trenches.
2. 150 rounds were fired from 2 guns in 72 minutes and it was estimated that the amount of charging on the target area (100 yds x 100 yds) was equivalent to the total contents of 26 shell.
3. For the conditions of this trial, the ammunition expenditure would have caused troops occupying the target area during firing and for half an hour afterwards (in all 102 minutes) to suffer a serious risk of exposure to a CT. of 200 mg. min/cu. m. There is reason to suppose that such a dosage would produce casualties under tropical conditions, but would be of border line effectiveness under less severe conditions.
4. Under the conditions of this trial, the fall in vapour concentration on the target area was very rapid and some 30 minutes after firing had ceased, previously unexposed troops could have occupied the area for a prolonged period without incurring a serious proportion of casualties provided that their gas discipline was good and that frequent reliefs were made of men occupying the occasional more heavily contaminated areas if these could not be avoided.
5. The spray from 5.5 inch BE/Chem. shell charged HTV plus 0.1 per cent Perspex contains many large drops even in hot weather and will give much superior anti-personnel effect against troops in the open or in slit trenches than is obtainable from these shell charged HTV without the added Perspex.

Classific. / Classification \_\_\_\_\_  
 Changed to / Changé à \_\_\_\_\_  
 By Authority of / Par l'Autorité de \_\_\_\_\_  
 Signature L. Laforce  
 Date 29 Feb 98 Signature D. Kuseler  
 Appointment \_\_\_\_\_  
 Fonction \_\_\_\_\_

  
 (H.M. Barrett)  
 A/Chief Superintendent,  
 Experimental Station.

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 X EXPERIMENTAL STATION, SUFFIELD, ALTA X  
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 X SUFFIELD REPORT NO. 84. X  
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AREA SHOOT WITH 5.5 INCH BE/CHEM. SHELL CHARGED HTV PLUS 0.1

PER CENT PERSPEX

(F.E. 137)

OBJECTS OF TRIAL

1. The objects of this trial were:-
  - (a) To assess the vapour danger in warm weather on an area bombarded with 5.5 inch BE/Chem. shell at approximately the recommended minimum ammunition expenditure.
  - (b) To assess the anti-personnel performance of 5.5 inch BE/Chem. shell charged HTV plus 0.1 per cent Perspex against men in the open and in slit trenches.

AMMUNITION UNDER TRIAL

2. 150 x 5.5 inch BE/Chem. shell Mk. III charged 8 lb. 14 oz. HTV 12 p (chlorinated rubber) plus 0.1 per cent Perspex; headfilled 1 1/2 oz. G 40, 2 x 1 1/2 oz R.P. smoke boxes and 1 wood block; fuzed T and F No. 221, Mk. II.
3. The shell charging was prepared by adding chlorinated rubber and 0.1 per cent Perspex simultaneously to HT over a period of 1 1/2 hours. Total stirring time was 6 hours at 400 r.p.m. and 18°C. The viscosity of the charging was 15.2 poise at 10°C.
4. The temperature of the shell charging was 20°C at the start of the shoot and 28 C at the end of the shoot.

PROCEDURE

5. In Porton Memorandum No. 14 it is estimated that a vapour dosage sufficient to cause skin casualties in hot weather should be attained in a few hours on the downwind edge of a 100 x 100 yd area bombarded with 25 rounds of 5.5 inch BE mustard shell.
6. The method recommended for attacking a small target is to surround the target by a frame 200 yds deep for range and 100 yards wide for line and to cover this whole zone of attack by searching and sweeping. A total of 375 rounds would thus be expended over the whole zone of attack in order to ensure that a central target area of 100 x 100 yds. is engaged by 25 rounds.
7. On account of the excessive time required to fire 375 rounds from the two guns available at Suffield (about 3 hours), it was decided instead to engage the target area (100 yds x 100 yds) directly with 150 rounds, using the two guns laid parallel at a 50 yard interval with zero lines 25 yards each side of the centre of the layout.
8. Firing was at Charge IV, range 11,825 yards. Artillery details are given in Appendix I.
9. The terrain at the target was very dry and dusty, and was thinly covered with tufts of prairie grass. The layout consisted of an area 300 yards by 500 yards, with the longer side parallel to the line of fire, covered by a ten yard grid of small jump cards except for an area,

the actual target area, of 100 yards by 100 yards in the centre. This area was covered by a 5 yard grid of large jump cards (See Appendix VI).

10. Ten slit trenches (6 ft. x 3 ft. x 4 ft. deep) were dug within the target area and two small jump cards were placed at the bottom of each trench so that the shielding effect against the spray from the bursting shells could be assessed.
11. Injector-operated bubblers were spaced at 10 yard intervals along three sides of the target area, and at 25 yard intervals along two sides of the frame. These bubblers sampled at a height of 21 inches above ground.
12. Bubblers were also placed beside each trench, sampling at heights of 8 inches and 21 inches, and samples were also taken inside the trenches about 3 feet below ground level.
13. Vapour samples were taken:-
  - (a) over the period of the shoot,
  - (b) from the end of the shoot (zero for trial) to zero plus 30 minutes
  - (c) from zero plus 30 minutes to zero plus 90 minutes.
  - (d) from zero plus 4 hours to zero plus 4½ hours.
  - (e) from zero plus 24 hours to zero plus 25 hours.
14. Immediately after the shoot, 5 men wearing summer undervests, impregnated trunks, battle dress in drill order and respirators at the gas position, make 3 journeys onto the target area and carried Livens projector barrels (which had remained exposed on the target area during the shoot) from the area a distance of 150 yards. The men rubbed A.G. ointment on their hands before handling the barrels. They wore their clothes for the next 4 hours.
15. Immediately after the shoot, thirty men dressed as above occupied in pairs, positions along 3 sides of the central target area and, during their exposure, each pair remained in close proximity to a bubbler. The men were engaged in digging slit trenches, and were withdrawn from the area at times ranging from zero plus 40 minutes to zero plus 120 minutes, so as to give a range of exposures.
16. Nine men occupied the target area at zero plus 9 hours. They wore respirators and slept in three tents that they had erected on the target area.

#### METEOROLOGICAL CONDITIONS

17. The shoot was carried out on a warm day - mean air temperature 25°C (77°F) in a rather variable wind of 4.7 mi/hr. A full meteorological report is appended (Appendix III).

#### RESULTS

##### (a) Firing

18. Ranging was carried out down wind and off the layout and the fuzes adjusted to obtain bursts on the line of sight. The angle of sight was then raised 30 minutes, to give an average height of burst of 300 to 400 feet, and the line was switched 15 minutes right of zero to compensate for the effect of the wind on the falling drops. Four rounds were then fired over the layout as a check and an examination showed that good areas of contamination on the target area were obtained. The vapour sampling apparatus was then turned on and firing of the programme rounds began at as rapid a rate as was possible consistent with good gunnery. Times of firing and numbers of rounds were as follows:

<u>From</u>	<u>To</u>	<u>Rounds Fired</u>
11.12 hours	11.23 hours	45
11.33	11.43	38
11.53	12.05	32
12.10	12.24	<u>35</u>
Total		<u>150</u>

19. Of the 150 programme rounds 12 went to graze and 138 airburst. Estimated heights of burst of individual rounds are given in Appendix II.

(b) Contamination of the area.

20. Assessment of the jump card layout showed that 76.9 kg. (170 lb) of charging was deposited on the central target area, and 367.8 kg. (810 lbs) on the frame. The total contamination on the whole layout was thus, 444.7 kg. (990 lb) representing approximately 74 per cent of the total charging fired.

21. Taking the latter figure as the average percentage contribution of each shell to ground contamination, the contamination on the target area (100 x 100 yds) was equivalent to about 26 shell, so that the required expenditure of 25 rounds, per 100 x 100 yds. target area was closely approximated.

22. The distribution of the contamination in drops of various sizes is given in the following table as percentages of the total charging.

Range of drops in mass (mg).	0.03 to 0.1	0.1 to 0.5	0.5 to 1.25	1.25 to 2.5	2.5 to 5.0	5 to 10	10 to 20	> 20	Total
Target Area	2.3	3.2	1.9	1.2	0.9	1.1	0.6	0.4	11.6 per cent
Frame	11.5	18.5	9.5	6.2	4.3	4.5	2.1	4.1	60.7 per cent
Range of drops in diameter (mm)	0.35 to 0.53	0.53 to 0.90	0.90 to 1.22	1.22 to 1.54	1.54 to 1.94	1.94 to 2.45	2.45 to 3.09	> 3.09	72.3 per cent

(This distribution does not include small corrections for missing cards and a narrow unsampled strip of the layout, which were included in the 74 per cent recovery quoted above).

It will be noted that the drop spectrum from the charging used in this shell was very satisfactory and very much superior to that which would have resulted from HTV charging without the added Perspex.

23. The following table shows the areas contaminated to various densities by drops of 1 mm. and above.

Contamination density gm/sq. m.	Target Area		Frame	
	Mean Contamination density gm/sq. m.	Area Contaminated sq. m.	Mean Contamination density gm/sq. m.	Area Contamination sq. m.
Up to 1.0	0.5	1280	0.4	18200
1 - 5	2.7	3400	2.5	24500
5 - 10	6.9	1350	6.7	5190
10 - 50	17.0	610	20.8	2680
50 - 100	90.8	40	66.6	250
Over 100	nil	nil	nil	nil

24. Although it was clear from the uneven distribution of stains on the cards placed at the bottom of the trenches that the trench walls had some shielding effect, contamination densities well in excess of that required for producing casualties from drops falling on the clothed body were recorded in the trenches.

Trench No.	1	2	3	4	5	6	7	8	9	10
Average contamination density at bottom of trench in drops of 1 mm. and above. gm/sq. m.	0.3	1.4	0.3	1.8	1.0	4.0	0.0	0.1	0.0	0.0

Vapour concentrations on the bombarded area.

25. A complete record of the vapour concentration measured during and after the shoot is given in Appendix IV. The highest concentration recorded on the target area during the shoot was 6.0 mg/cu. m. at a height of 8 inches beside one of the trenches, while a value of 1 to 2 mg/cu. m. was attained at this height near most of the trenches on the area. At 21 inches at the same positions the average concentrations during the shoot was about 1 mg/cu. m.
26. Vapour concentrations recorded in the slit trenches during the shoot were on the whole very similar to those recorded at a height of 8 inches near the trenches.
27. Along the edge of the central target area (100 x 100 yds) the vapour concentrations at a height 21 inches averaged about 1 mg/cu. m. during the shoot with a maximum value of 2.5 mg/cu. m. while along the edge of the target frame the maximum value recorded during the shoot was 0.9 mg/cu. m.
28. Samples taken during the 30 minutes immediately following completion of the shoot showed in several cases an increased vapour concentration, the highest value recorded over this period being 11.3 mg/cu. m. at a height of 8 inches near one of the trenches.
29. Four hours after completion of the shoot, vapour concentrations at most points had fallen to less than 1/10 of the values recorded during the shoot.
30. Chemical samples taken in the tents at Zero plus 8.30 to Zero plus 9.30 indicated that there was a concentration of H of 0.05 mg/cu. m. in one tent. Nil results were obtained in the other two tents.

31. The results both on the target area and along its sides show a considerable scatter, and maximum figures are in no way related to wind direction (e.g. position 6 on the area is at the upwind end). In certain cases the concentration during the 30 minutes after firing is higher than that during firing. The most reasonable explanation is that the figures do not represent general concentrations, but those from localised contaminated patches.
32. The concentrations fell rapidly after Zero plus 30 minutes and it is possible to consider the vapour hazard in two periods.
33. The dosages obtained during firing and the subsequent 30 minutes are given in tabular form in Appendix V. In view of work carried out in India (India Rpt. No. 245) and elsewhere, it is considered that a dosage of 200 mg. min/cu. m. may be taken as a criterion indicating a serious vapour hazard for unprotected (other than by respirators) men in hot weather.
34. An inspection of the tables in Appendix V shows that this CT value is frequently either exceeded or closely approached during the period ending 30 minutes after firing ceased, particularly in and near the trenches.
35. The concentration after this period (See Appendix IV) should not, in general, constitute a serious hazard to freshly exposed troops, who took reasonable A/G precaution, and who were frequently relieved when occupying the worst zones, but, it should be noted, would augment the border line dosages of the first period to about the critical magnitude.

Effects on human observers.

36. For reasons of safety it was not possible to expose human observers on the target area during the bombardment, but men were positioned around 3 sides of the central target area immediately after firing ceased. The men were arranged in pairs and dug trenches. They were dressed as detailed in para 14 above.
37. Since the vapour concentration to which the men would be exposed was not known with accuracy it was decided to withdraw the men from the contaminated area at times ranging from Zero plus 40 minutes to Zero plus 120 minutes so as to give a broad range of dosages.
38. The men were all sweating from digging when removed from the area. They all wore their clothes for 4 hours in the open after leaving the contaminated area.
39. At 24 hours after exposure two men showed burns from liquid mustard on their wrists but there was no evidence of vapour burning. One man who had been burned several times previously showed a hypersensitivity rash but no vapour burns. At 48 hours no further lesions had developed and the rash had faded from the sensitive man.
40. On the evidence of the chemical samples the highest vapour dosage (CT) to which any of these men could have been exposed was about 180 mg. min/cu. m. Most of them experienced dosages of less than 50 mg. min/cu. m. which would not be expected to cause skin burning under the conditions of this trial.
41. A group of 5 men dressed as detailed in para 14 ~~used~~ <sup>were</sup> used in a test of the handling danger on the target area. After rubbing A/G ointment on his hands each man picked up a projector barrel which had been lying on the area during the shoot and carried it off the area. Each man did this three times and at the end of the task the mens' uniforms showed smears of (dyed) contamination and smelt strongly of mustard gas. They wore their clothes for the next four hours. One man showed some erythema of the scrotum at 24 and 48 hours, but no other lesions developed.
42. Nine men occupied the target area at Zero plus 9 hours. They were dressed as detailed in para 14 above and slept, wearing respirators, in three tents erected along the edges of the target area. None of these men showed any erythema at 24 or 48 hours. The maximum concentration recorded



was 0.05 mg/cu. m. in one of the tents at the commencement of occupation.

CONCLUSIONS

43. The spray from 5.5 inch BE/Chem. shell charged HTV - 0.1 per cent Perspex contains many large drops even in hot weather and will give superior anti-personnel effect against troops in the open or in slit trenches than is obtainable from these shell charged HTV without the added Perspex.
44. Judging from the results of this trial, carried out in warm weather, troops on the target area during firing and for half an hour afterwards (a total period of 102 minutes) will stand a serious risk of exposure to a CT of 200 mg. min./cu. m., from the recommended minimum ammunition expenditure for producing vapour casualties (25 rounds 5.5 inch BE/Chem. shell per 100 yards by 100 yards). There is reason to suppose that such a dosage would produce casualties under tropical conditions, but would be of border line effectiveness under less severe conditions.
45. Under the conditions of this trial the fall in vapour concentration on the target area was very rapid, and some 30 minutes after the bombardment had ceased, previously unexposed troops could have occupied the area for a prolonged period without incurring a serious proportion of casualties providing that their gas discipline was good and that frequent reliefs were made of men occupying the occasional more heavily contaminated areas if these could not be avoided.
46. The danger from handling stores heavily contaminated with spray from airburst mustard shell bombardment is a very small one provided that anti-gas ointment is rubbed on the hands before the contaminated stores are handled.

This report was written by Mr. <sup>X</sup>W.R. Lane, Experimental Station, Suffield, Alta.

*H.M. Barrett*

(H.M. Barrett)  
A/Chief Superintendent,  
Experimental Station.

WRL/SB

APPENDIX I

ARTILLERY DETAILS

Nature of Shell	5.5 HE/Chem Mk III
Chargings	HTV Plus 0.1 % Perspex
Headfilled	1 $\frac{3}{4}$ ozs. G40 2 - 1 $\frac{3}{4}$ ozs. R.P Smoke boxes and 1 wood block.
Fuzed	T and P No. 221 Mk II Sentenced Chemical lot 65 Maker R.C.
Charges	Charge IV 9 lb 3 ozs. Cordite W.M.109 Mk I Foil lot 2404.
Guns	Two 5.5 Guns No. L 228 and L 240 in the first quarter of life neither having fired more than 200 F.F.C.'s.
Firing Data	Bearing of Line of Fire 90° Charge Temperature 58°F A of S 5' EL. Ballistic Temp. 75°F " Wind 6 F.S. at 275 Ground Wind 8 F.S. at 150 Map Range 12330 <sup>x</sup> Correction of Moment -503 <sup>x</sup> Predicted elevation 11827 <sup>x</sup> Adjusted elevation 11825 <sup>x</sup>

APPENDIX II

HEIGHTS OF BURST OF (5.5 INCH ROW.)

No.	Height (ft)	No.	Height (ft)	No.	Height (ft)	No.	Height (ft)	No.	Height (ft)	No.	Height (ft)
1		29	230	57	360	85	100	113	270	141	300
2		30	190	58	150	86	110	114	230	142	86
3		31	160	59	505	87	-	115	390	143	465
4		32	-	60	360	88	410	116	130	144	360
5		33	-	61	760	89	505	117	380	145	60
6		34	-	62	290	90	340	118	135	146	215
7		35	-	63	-	91	100	119	335	147	215
8		36	93	64	-	92	24	120	245	148	-
9	665	37	290	65	470	93	245	121	245	149	89
10	500	38	-	66	345	94	400	122	70	150	420
11	310	39	170	67	130	95	-	123	-		
12	500	40	415	68	470	96	60	124	485		
13	545	41	-	69	50	97	-	125	440		
14	50	42	-	70	375	98	330	126	280		
15	-	43	-	71	-	99	520	127	66		
16	95	44	-	72	670	100	15	128	200		
17	250	45	355	73	190	101	107	129	315		
18	340	46	-	74	100	102	-	130	-		
19	-	47	-	75	330	103	125	131	65		
20	170	48	-	76	-	104	93	132	400		
21	95	49	-	77	135	105	220	133	280		
22	170	50	180	78	170	106	380	134	66		
23	-	51	390	79	-	107	25	135	200		
24	380	52	365	80	320	108	-	136	315		
25	-	53	190	81	495	109	340	137	-		
26	450	54	395	82	515	110	200	138	235		
27	-	55	140	83	66	111	-	139	120		
28	290	56	260	84	190	112	80	140	-		

APPENDIX III.

METEOROLOGICAL REPORT ON FIELD EXPERIMENT NO.137, TRIAL I.

Date: 28 Jun 43.

Time: 1005 hrs. M.D.T. to 1630 hrs. M.D.T.

Air Temperature: Mean 25.0°C (76.9°F) Maximum 26°C (79°F)

Surface Temperature: Mean 30.0°C (86.0°F) Maximum 34.5°C (94°F)

Wind Direction: S.S.W. to variable during second half.

Wind Speed: 4.7 mi/hr.

R: 1.10

Relative Humidity: 26%

Gustiness: Gy = .57  
Gz = .34

Temperature Gradient: (39 ft. - 4 ft.): -1.7°C.

Remarks: Sunshine intermittent to bright during second half.

APPENDIX IV

VAPOUR CONCENTRATIONS FROM 5.5 in. HE/CHEM SHOOT  
(Concentrations on Area in mg/cu m)

Pos.	During Shoot (72 min)		Zero (end of shoot) Zero + 30 min		Zero + 30 min Zero + 90 min		Zero + 4 hours Zero + 4 hours 30 mins.			
	in Trench	2l. min.	in Trench	2l. min.	in Trench	8 min.	2l. min.	in Trench	8 min.	2l. min.
1	1.4	1.5	-	0.6	0.2	0.1	0.1	0.2	0.1	0.02
2	2.0	1.3	1.3	0.9	0.3	0.3	0.2	0.3	0.1	0.05
3	1.1	1.7	-	1.3	0.3	0.3	0.2	0.1	0.2	0.1
4	2.0	2.2	2.8	2.0	0.6	0.6	0.2	0.3	0.2	0.1
5	3.0	0.8	nil	3.5	0.03	0.5	0.01	0.03	0.6	nil
6	-	4.0	-	11.3	1.0	0.8	0.8	0.7	0.6	0.2
7	4.0	6.0	3.4	5.0	1.0	-	0.5	0.8	0.3	0.15
8	1.6	2.5	0.9	1.3	0.2	0.4	0.2	0.2	0.2	0.1
9	0.7	1.2	0.02	0.3	0.01	0.05	0.05	-	0.3	0.02
10	-	0.7	0.3	0.3	0.1	0.04	0.01	0.2	nil	nil

CONCENTRATIONS IN TENTS in mg/cu m

	Tent No.1	Tent no.2	Tent No.3
Zero + 8 hours 30 min.	0.05	nil.	nil
Zero + 9 hours 30 min.	0.038	nil	nil
Zero +11 hours 30 min.	nil	nil	nil
Zero +12 hours 30 min.	nil	nil	nil
Zero +14 hours 30 min.	nil	nil	nil
Zero +15 hours 30 min.	nil	nil	nil

## Appendix IV. (cont)

### U - Line (Edges of target area)

Concentrations in mgm/cu.m.

<u>Position</u>	<u>Height above ground</u>	<u>During shoot</u>	<u>Zero to Z + 30 min</u>	<u>Z + 30 min to Z + 90 min</u>	<u>Z + 4 hr to Z + 4:30</u>
1.	21 in.	.60	1.75	.22	.05
2	21	2.50	4.50	.13	.10
3	21	1.20	4.50	.13	.04
4	21	2.00	1.75	.25	.075
5	21	1.20	1.50	.17	.05
6	21	.80	1.25	.17	.10
7	21	1.00	1.25	.17	.05
8	21	.80	.70	.125	.025
9	21	1.00	lost	.075	nil
10	21	.90	.92	.025	nil
11	21	.70	.60	.038	.05
12	21	.80	.57	.038	nil
13	21	1.60	.75	.05	nil
14	21	2.20	1.33	.025	nil
15	21	.40	nil	.02	nil
16	21	.60	.175	nil	nil
17	21	.70	.20	nil	nil
18	21	.50	.04	.125	nil
19	21	.70	.20	nil	nil
20	21	.40	.45	nil	nil
21	21	.70	.35	nil	nil
22	21	.70	.67	.025	nil
23	21	.22	2.33	.63	nil
24	21	1.10	.67	.63	nil
25	21	2.50	2.50	.15	.025
26	21	.70	1.00	.10	.025
27	21	.90	.63	nil	nil
28	21	1.20	.63	.125	.05
29	21	1.60	lost	.19	.15
30	21	2.00	2.75	.21	.125
31	21	1.40	2.00	.38	.15

### X - Line (Edges of frame)

1	21	nil	nil
2	21	nil	nil
3	21	nil	nil
4	21	nil	nil
5	21	nil	nil
6	21	.20	.63
7	21	lost	.025
8	21	.33	.37
9	21	.12	.125
10	21	.14	.125
11	21	nil	.15
12	21	.80	.28
13	21	.60	.33
14	21	.90	.16
15	21	.50	.29
16	21	.30	.10
17	21	.54	.075
18	21	.70	.23
19	21	.55	.20

-2-  
Appendix IV (cont)

X Line (continued)

<u>Position</u>	<u>Height above ground</u>	<u>During shoot</u>	<u>Zero to Z + 30 min.</u>
20	21 in.	.25	.05
21	21	.55	.05
22	21	.17	.025
23	21	.25	.23
24	21	.15	.025
25	21	.35	.20
26	21	.05	nil
27	21	.07	nil
28	21	.25	.017
29	21	.02	nil
30	21	.016	nil
31	21	nil	nil
32	21	nil	nil
33	21	nil	nil

APPENDIX V

Dosages (CT) obtained during firing and the subsequent  
30 minutes (a period of 102 minutes).

On the Target Area

<u>Position</u>	<u>In Trench</u> <u>mg.min/cu.m.</u>	<u>At 8 inches</u> <u>mg.min/cu.m.</u>	<u>At 21 inches</u> <u>mg.min/cu.m.</u>
1	150	130	220
2	190	120	150
3	100	160	110
4	230	150	60
5	220	160	190
6	-	630	270
7	400	580	90
8	140	220	160
9	50	95	75
10	-	60	-

Along the Sides of the Target Area

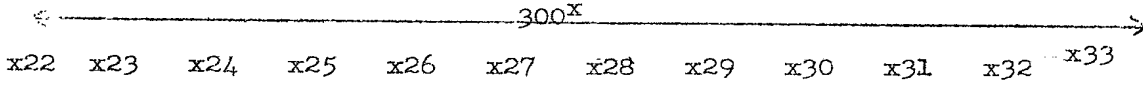
<u>Position</u>	<u>At 21 inches</u> <u>mg.min/cu.m.</u>	<u>Position</u>	<u>mg.min/cu.m.</u>	<u>Position</u>	<u>mg.min/cu.m.</u>
1	100	10.	93	20	42
2	215	* 11	68	* 21	60
3	221	12	76	22	70
4	197	13	138	23	84
5	194	14	198	24	99
6	147	15	29	25	255
7	162	16	48	26	80
8	78	17	56	27	85
9	-	18	37	28	106
		19	56	29	-
				30	226
				31	160

\* Position 11 - 21 were along downwind edge of area.

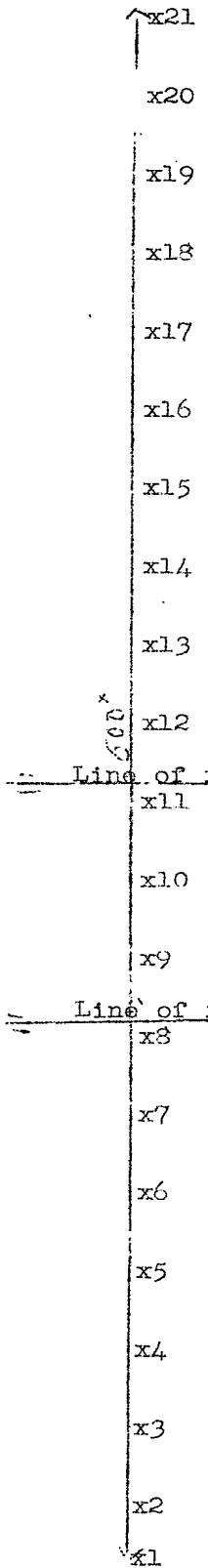
# Appendix VI.

Field Experiment No. 137

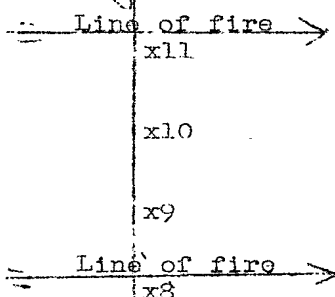
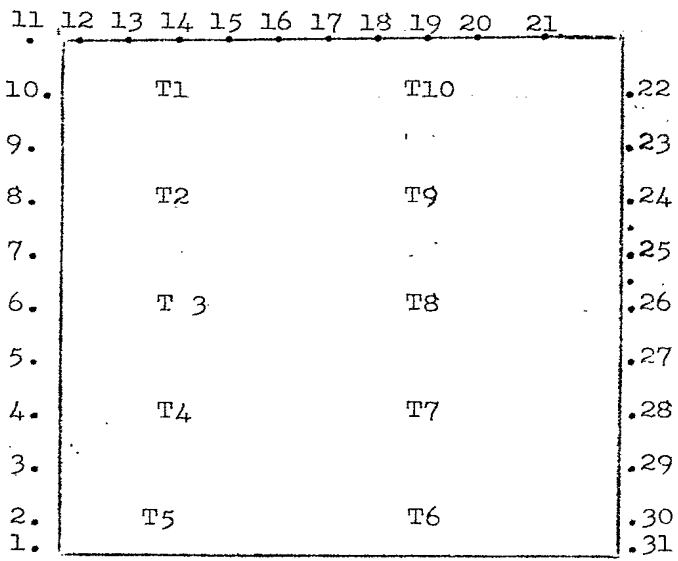
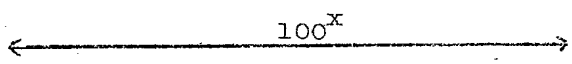
## Layout



x22 x23 x24 x25 x26 x27 x28 x29 x30 x31 x32 x33



- X Line: Edges of frame  
Spacing 25<sup>x</sup>.
- U Line: Edges of target area  
Spacing 10<sup>x</sup>.
- T Samples: Trenches on target area  
as numbered.
- G Samples: 8 inches height, beside trenches  
on target area.
- A Samples: 21 inches height, beside trenches  
on target area.



U Line



Approximate  
wind direction  
during shoot.

X Line



COPY

EXPERIMENTAL STATION, SUPPL.

SUPPLIED REPORT NO. 86.

SERIAL NUMBER 10

DATE: 11 August 1943.

AREA SHOOT WITH 5.5 INCH BR/GERM. SHELL CHARGED HTV PLUS 0.1

PER CENT PERSPEX

SUMMARY

1. A trial has been carried out in warm weather with 5.5 inch BR/Germ shell charged HTV plus 0.1 per cent Perspex to assess:-
  - (a) The vapour danger on an area bombarded with the recommended minimum number of rounds.
  - (b) The anti-personnel performance of the shell with this charging against men in the open and in slit trenches.
2. 150 rounds were fired from 2 guns in 72 minutes and it was estimated that the amount of charging on the target area (100 yds x 100 yds) was equivalent to the total contents of 26 shells.
3. For the conditions of this trial, the ammunition expenditure would have caused troops occupying the target area during firing and for half an hour afterwards (in all 102 minutes) to suffer a serious risk of exposure to a CT. of 200 mg. min/cu. ft. There is reason to suppose that such a dosage would produce casualties under tropical conditions, but would be of border line effectiveness under less severe conditions.
4. Under the conditions of this trial, the fall in vapour concentration on the target area was very rapid and some 30 minutes after firing had ceased, previously unexposed troops could have occupied the area for a prolonged period without incurring a serious proportion of casualties provided that their gas discipline was good and that frequent reliefs were made of men occupying the occasional more heavily contaminated areas if these could not be avoided.
5. The spray from 5.5 inch BR/Germ. shell charged HTV plus 0.1 per cent Perspex contains many large drops even in hot weather and will give much superior anti-personnel effect against troops in the open or in slit trenches than is obtainable from these shell charged HTV without the added Perspex.

(sgn) H. F. Barrett

(H. F. Barrett)  
Chief Superintendent,  
Experimental Station.

HRS/SB

X 1 Sept 1943

EXPERIMENTAL STATION  
SUFFIELD, ALBERTA

## ADDENDUM TO SUFFIELD REPORT NO. 84 (addendum)

## THE ASSESSMENT OF VAPOUR HAZARD FROM C. W. SHELL CHARGED LIQUID

1. It will be noted that in Suffield Report No. 84 the vapour hazard has been considered on the basis of the risk of casualties amongst troops occupying the Target Area, and not, as in P.M. No. 14, on the dosages obtained along the downwind edge of this area.
2. The recommended procedure for engaging a target with shell charged liquid, is to consider the target as surrounded by a frame and to engage this larger area in a manner which would theoretically, produce the required degree of contamination over the whole of it. Under these conditions the downwind edge of the target area would be well inside the contaminated zone.
3. In the trial under consideration the contents of 26 5.5 inch HE/Chem Shell were distributed over an area of 100 yards by 100 yards, the expenditure recommended in P.M. 14. Whilst the device of the frame was not used, it is reasonable to assume that the distribution of contaminated zones was typical of what would have been obtained over the area, including the frame, if the normal practice had been adopted.
4. An inspection of Suffield Report No. 84 Appendix V shows that the incidence of high dosage was adventitious and unrelated to wind direction. This was probably due to localised zones of convection since the trial was carried out on a clear sunny day.
5. It would be difficult to maintain on the basis of the dosages along the downwind edge of the Area (Posn. Nos. 11-20), that the recommended expenditure of ammunition would cause any serious vapour hazard. On the other hand, the results show that this expenditure will cause, on the area, an appreciable risk of casualties from vapour for troops occupying it during and shortly after the bombardment.
6. It is suggested that assessment of vapour hazard should be based on the risk of casualties on the target area and not on the average dosages obtained along the downwind edge.

This addendum was prepared by Mr. F. L. Wild,  
Experimental Station, Suffield.

*original report in 54357-29-4*

(and) H. E. Barrett  
(H. E. Barrett)  
for Chief Superintendent,  
Experimental Station

H.E.P./J



4 SEPT 1943

EXPERIMENTAL STATION  
SUFFIELD, ALBERTAADDENDUM TO SUFFIELD REPORT NO. 84THE ASSESSMENT OF VAPOUR HAZARD FROM C.W. SHELL CHARGED LIQUID

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This addendum was prepared by Mr. F.E. Wild, Experimental Station, Suffield.

HMB/JM

*H.M. Barrett*  
\_\_\_\_\_  
(H.M. Barrett)  
for Chief Superintendent,  
Experimental Station.

46/1677 #14

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AK

DIRECTORATE OF SCIENTIFIC INFORMATION SERVICES DEFENCE RESEARCH BOARD ROOM 4743, "A" BUILDING OTTAWA 4, ONT., CANADA	
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