DEMOLITION CARD GTA 5-10-9

SUPERSEDES GTA 5-14, 1 NOV 1959 MAY 1965

SEE AR 385-63 SAFETY REGULATION

☆ GPO : 1965 O—775-846

	RELATIVE EFFECTIVENESS OF MILITARY EXPLOSIVES USED AS EXTERNAL CHARGES		SIZE ISSUED
1.00	TNT	(BLOCK)	1/2 LB 1 LB
1.34	COMPOSITION C-4	(M-5A1 DEMO BLOCK)	2 1/2 LB
	SHEET EXPLOSIVE	(M118)	½LB
1.20	TETRYTOL	(M-1 AND M-2 DEMO BLOCK)	2 1/2 LB
0.42	AMMONIUM NITRATE	(CRATERING CHARGE)	40 LB
0.92	MILITARY DYNAMITE	(M-1)	1/2 LB

Quantities of explosives in these formulas and tables are for TNT,for other explosives,divide the quantity for TNT by the effectiveness ratio

MINIMUM SAFE DISTANCE FOR PERSONS IN THE OPEN WITH BARE CHARGES

POUNDS OF EXPLOSIVE	SAFE DISTANCE IN FEET	POUNDS OF EXPLOSIVE	SAFE DISTANCE IN FEET
1 TO 27 INCL	900	150	1593
32	951	200	1752
40	1020	300	2007
50	1104	400	2208
80	1290	500	2382
100	1392	OVER 500	2400

MINIMUM SAFE DISTANCE FOR PERSONS IN MISSILE PROOF SHELTER IS 300 FT

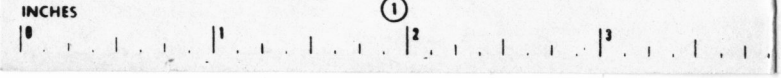
SAFETY REMINDERS . DO'S & DONT'S

1. DO NOT HANDLE EXPLOSIVES CARELESSLY.
2. DO NOT DIVIDE RESPONSIBILITY FOR EXPLOSIVE WORK.
3. DO NOT MIX EXPLOSIVES AND DETONATORS.
4. DO NOT CARRY EXPLOSIVES OR CAPS IN POCKETS.
5. DO KEEP BLASTING MACHINE UNDER CONTROL OF NCOIC.
6. DO WEAR HELMETS AT ALL TIMES WHILE FIRING EXPLOSIVES.
7. DO HANDLE MISFIRES WITH EXTREME CARE.
8. DO NOT TAKE CHANCES.

CONVERSION FACTORS FOR ALL TABLES

1 METER = 3.28 FT 1 FT = .3048 METER
1 KILOGRAM = 2.20 LB 1 LB = .4536 KILOGRAM

INCHES

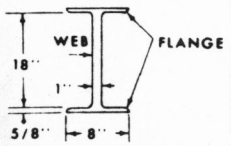


STEEL CUTTING CHARGES

POUNDS TNT = 3/8 x AREA OF CROSS-SECTION IN SQ IN.

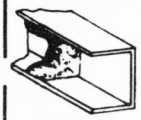
(CALCULATE RECTANGULAR AREAS,THEN ADD TO OBTAIN TOTAL AREA)

EXAMPLE PROBLEM

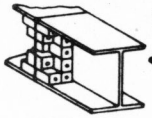


FLANGES: WIDTH = 8"
THICKNESS = 5/8"
CHARGE: FROM TABLE = 1.9
WEB: WIDTH = 18"
THICKNESS = 1"
CHARGE: FROM TABLE = 6.8
CHARGE TOTAL:
2 FLANGES = 2x1.9 = 3.8
WEB = 6.8
TOTAL = 10.6
USE 11 POUNDS TNT

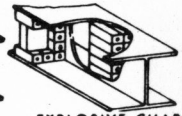
PLACEMENT OF CHARGES ON STEEL MEMBERS



PLASTIC EXPLOSIVE MOLDED ON CHANNEL



TNT PLACED ON ONE SIDE OF I BEAM



EXPLOSIVE CHARGE DIVIDED IN HALF, OFFSET MINIMUM THICKNESS OF WEB

CABLES RODS BARS

FOR CUTTING HIGH -CARBON STEEL PARTS, ALLOY STEEL ARTICLES,OR SLENDER STEEL MEMBERS

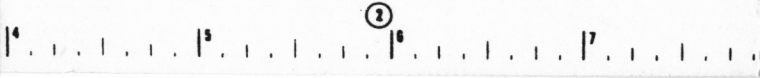
POUNDS TNT = D^2

"D" = DIAMETER OR LARGEST DIMENSION IN INCHES AND MUST BE 2" OR LESS; IF "D" IS MORE THAN 2", USE STEEL CUTTING FORMULA P=3/8A

THICKNESS OF SECTION IN INCHES	POUNDS OF TNT FOR RECTANGULAR STEEL SECTIONS OF GIVEN DIMENSIONS — WIDTH OF SECTION IN INCHES												
	2	3	4	5	6	8	10	12	14	16	18	20	24
1/4	.2	.3	.4	.5	.6	.8	1.0	1.2	1.3	1.5	1.7	1.9	2.3
3/8	.3	.5	.6	.7	.9	1.2	1.4	1.7	2.0	2.3	2.6	2.8	3.4
1/2	.4	.6	.8	1.0	1.2	1.5	1.9	2.3	2.7	3.0	3.4	3.8	4.5
5/8	.5	.7	1.0	1.2	1.4	1.9	2.4	2.9	3.3	3.8	4.3	4.7	5.7
3/4	.6	.9	1.2	1.4	1.7	2.3	2.8	3.4	4.0	4.5	5.1	5.7	6.8
7/8	.7	1.0	1.4	1.7	2.0	2.7	3.3	4.0	4.6	5.3	6.0	6.6	7.9
1	.8	1.2	1.5	1.9	2.3	3.0	3.8	4.5	5.3	6.0	6.8	7.5	9.0

TO USE TABLE:

1. MEASURE RECTANGULAR SECTIONS OF MEMBER SEPARATELY.
2. USING TABLE, FIND CHARGE FOR EACH SECTION.
3. ADD CHARGES FOR SECTIONS TO FIND TOTAL CHARGE.
4. NEVER USE LESS THAN CALCULATED CHARGE.
5. IF DIMENSION IS NOT ON TABLE, USE NEXT LARGER DIMENSION.

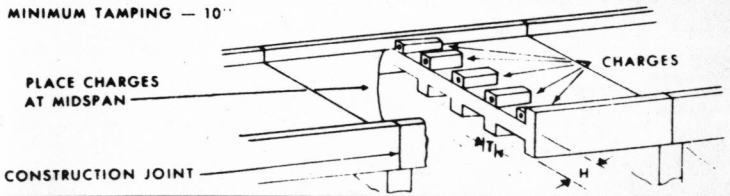


PRESSURE CHARGES

$P = 3H^2T$ (ADD 1/3 IF CHARGE IS UNTAMPED)

MINIMUM TAMPING — 10"

USED ON SIMPLE SPANS, CONCRETE T-BEAM BRIDGES



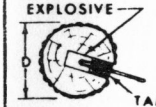
POUNDS OF TNT FOR EACH BEAM TAMPED CHARGES

HEIGHT OF BEAM IN FEET	THICKNESS OF BEAM IN FEET								
	1 12 IN	1¼ 15 IN	1½ 18 IN	1¾ 21 IN	2 24 IN	2¼ 27 IN	2½ 30 IN	2¾ 33 IN	3 36 IN
1 (12 IN)	3								
1¼ (15 IN)	5	6							
1½ (18 IN)	7	9	11						
1¾ (21 IN)	10	12	14	16					
2 (24 IN)	12	15	18	21	24				
2¼ (27 IN)	16	19	23	27	31	35			
2½ (30 IN)	19	24	29	33	38	43	47		
2¾ (33 IN)	23	29	34	40	46	51	57	63	
3 (36 IN)	27	34	41	48	54	61	68	75	81
3¼ (39 IN)	32	40	48	56	64	72	80	88	95
3½ (42 IN)	37	46	56	65	74	83	92	101	111
3¾ (45 IN)	43	53	64	74	85	95	106	116	127
4 (48 IN)	48	60	72	84	96	108	120	132	144
4¼ (51 IN)	55	68	82	95	109	122	136	149	163
4½ (57 IN)	61	76	92	107	122	137	152	167	183
4¾ (54 IN)	68	85	102	119	136	153	170	187	203
5 (60 IN)	75	94	113	132	150	169	188	207	225

TIMBER CUTTING CHARGES

INTERNAL CHARGES

EXPLOSIVE



$P = \frac{D^2}{250}$

TEST SHOT ABATIS $P = \frac{D^2}{50}$

EXTERNAL CHARGES $P = \frac{D^2}{40}$

WHERE "D" IS THE LEAST DIMENSION IN INCHES

TYPE OF CHARGE	EXPLOSIVE	LEAST DIMENSION OF TIMBER IN INCHES											
		6	8	10	12	15	18	21	24	27	30	33	36
		POUNDS OF EXPLOSIVE											
INTERNAL	ANY	½	½	½	1	1	1½	2	2½	3	4	4½	5½
EXTERNAL	TNT	1	2	2½	4	6	8½	11½	14½	18½	22½	27½	32½

CRATERING CHARGES

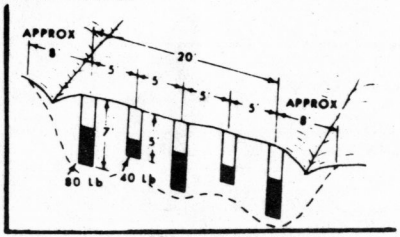
DELIBERATE ROAD CRATER

ALTERNATE 5 FT AND 7 FT HOLES SPACED ON 5 FT CENTERS

NO TWO 5 FT HOLES ARE TO BE PLACED NEXT TO EACH OTHER (END HOLES ALWAYS 7 FT)

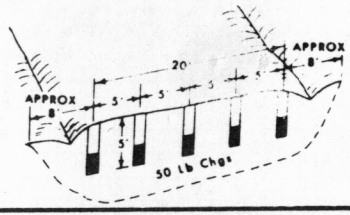
USE 40 LB CHARGES IN 5 FT HOLES AND 80 LB CHARGES IN 7 FT HOLES

RESULTING CRATER APPROX 8 FT DEEP AND 25 FT WIDE



HASTY ROAD CRATER

FORMULA FOR NUMBER OF HOLES $N = \frac{L-16}{5} + 1$



HOLES OF EQUAL DEPTH (2½ FT TO 5 FT)

USE 10 POUNDS OF EXPLOSIVE PER FT OF DEPTH

RESULTING CRATER DEPTH APPROX 1½ TIMES DEPTH OF BORE-HOLES

WIDTH APPROX 5 TIMES DEPTH OF BORE-HOLES

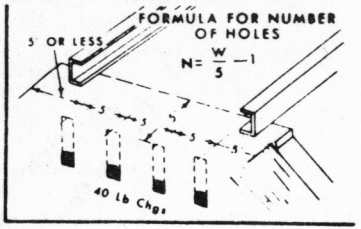
NOTE: ALL CRATERING CHARGES TO BE DUAL PRIMED WITH AT LEAST ONE LB OF EXPLOSIVE

BRIDGE ABUTMENT DESTRUCTION

ABUTMENTS 5 FT OR LESS IN THICKNESS

BEGINNING 5 FT IN FROM ONE SIDE OF ROAD, PLACE 40—LB CRATERING CHARGE IN HOLES 5 FT DEEP, 5 FT ON CENTERS AND 5 FT BEHIND RIVER FACE OF ABUTMENT

IF ABUTMENTS ARE OVER 20 FT HIGH, ADD A ROW OF BREACHING CHARGES ON THE RIVER FACE OF THE ABUTMENT



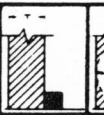
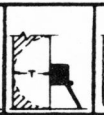
ABUTMENTS MORE THAN 5 FT THICK

CALCULATE CHARGES BY BREACHING FORMULA AND PLACE AGAINST REAR FACE AT A DEPTH EQUAL TO THICKNESS OF ABUTMENT AND SPACE THE SAME AS OTHER BREACHING CHARGES

WHEN ABUTMENTS ARE MORE THAN 20 FT HIGH, ADD A ROW OF BREACHING CHARGES ON THE RIVER FACE AT THE BASE OF THE ABUTMENT AND FIRE ALL CHARGES SIMULTANEOUSLY

REINFORCED CONCRETE ONLY

(FOR OTHER TYPES OF CONSTRUCTION SEE PG.6)

THICKNESS OF CONCRETE IN FEET	METHODS OF PLACEMENT: TNT						ANY	DISTANCE BETWEEN CHARGES IN FEET: INTERNAL	DISTANCE BETWEEN CHARGES IN FEET: EXTERNAL
									
COLUMN	1	2	3	4	5	6	7	8	9
2	16	28	15	8	8	16	1	2	4
2½	31	55	28	16	16	31	2	2½	5
3	41	67	38	21	21	41	4	3	6
3½	59	107	55	33	33	59	6	3½	7
4	88	159	81	49	49	88	8	4	8
4½	126	226	116	63	63	126	11	4½	9
5	157	282	144	79	79	157	16	5	10
5½	208	375	192	104	104	208	20	5½	11
6	270	486	249	135	135	270	21	6	12
6½	344	618	316	172	172	344	26	6½	13
7	369	664	340	185	185	369	33	7	14
7½	454	817	418	227	227	454	40	7½	15
8	551	991	507	276	276	551	49	8	16

NOTES:

1. 10% HAS BEEN ADDED TO THE TABLE FOR CHARGES LESS THAN 50 LBS.
2. FOR BEST RESULTS PLACE CHARGE IN SHAPE OF A SQUARE
3. FOR THICKNESS OF CONCRETE OF 4' OR LESS USE CHARGE THICKNESS OF 2" (ONE BLOCK THICK), OVER 4' THICK USE CHARGE THICKNESS OF 4" (ONE HAVERSACK OF TETRYTOL OR PLASTIC).

TO USE TABLE:

1. MEASURE THICKNESS OF CONCRETE.
2. DECIDE HOW YOU WILL PLACE THE CHARGE AGAINST THE CONCRETE. COMPARE YOUR METHOD OF PLACEMENT WITH THE DIAGRAMS AT THE TOP OF THE PAGE. IF THERE IS ANY QUESTION AS TO WHICH COLUMN TO USE, ALWAYS USE THE COLUMN THAT WILL GIVE YOU THE GREATER AMOUNT OF TNT.

CENTIMETERS

BREACHING CHARGES

FOR TYPES CONST. OTHER THAN REINFORCED CONCRETE

TABLE ON PAGE 5 IS FOR REINFORCED CONCRETE ONLY. FOR OTHER TYPES OF MATERIAL USE THE FOLLOWING CONVERSION FACTORS.

CONVERSION FACTORS FOR MATERIAL OTHER THAN REINFORCED CONCRETE		
EARTH	ORDINARY MASONRY, HARDPAN, SHALE, ORDINARY CONCRETE, ROCK, GOOD TIMBER AND EARTH CONSTRUCTION	DENSE CONCRETE, FIRST CLASS MASONRY
0.1	0.5	0.7

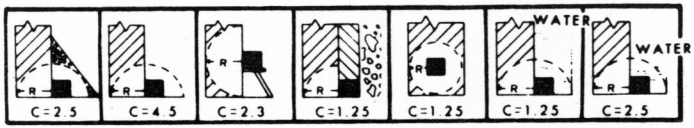
TO USE TABLE:

1. DETERMINE THE TYPE OF MATERIAL IN THE OBJECT YOU PLAN TO DESTROY. IF IN DOUBT, ASSUME THE MATERIAL TO BE OF THE STRONGER TYPE . e.g. UNLESS YOU KNOW DIFFERENTLY, ASSUME CONCRETE TO BE REINFORCED.
2. USING THE ABOVE TABLE, DETERMINE THE APPROPRIATE CONVERSION FACTOR.
3. USING THE TABLE ON PAGE 5, DETERMINE THE AMOUNT OF EXPLOSIVE THAT WOULD BE REQUIRED IF THE OBJECT WERE MADE OF REINFORCED CONCRETE.
4. MULTIPLY THE NUMBER OF POUNDS OF EXPLOSIVES (FROM TABLE ON PG.5) BY THE CONVERSION FACTOR FROM THE TABLE ABOVE.

EXAMPLE:

A TIMBER AND EARTH WALL 6½ FT. THICK AND AN EXPLOSIVE CHARGE PLACED AT THE BASE OF THE WALL WITHOUT TAMPING. THE CONVERSION FACTOR IS 0.5 (SEE TABLE ABOVE). IF THIS WALL WERE MADE OF REINFORCED CONCRETE, 618 LBS. OF TNT WOULD BE REQUIRED TO BREACH IT (SEE TABLE ON PAGE 5). MULTIPLY 618 LBS OF TNT BY 0.5 AND THE RESULT IS 309 LBS OF TNT REQUIRED TO BREACH IT.

VALUES OF C



EXAMPLE PROBLEM

BREACH A 4 FT REINFORCED CONCRETE WALL WITH AN UNTAMPED ELEVATED CHARGE.

$P = R^3 KC$ (+10% IF LESS THAN 50#)

$K = .55$ $C = 2.3$ $R = 4$ FT.

$P = 4^3 \times .55 \times 2.3$

P= 80.96 LBS TNT USE 81#

NUMBER OF CHARGES = $N = \frac{W(\text{width})}{2R(\text{breaching radius})}$

BREACHING CHARGES

FORMULA $P_{(TNT)} = R^3KC$ (+ 10% IF CHARGE IS LESS THAN 50 LB)

VALUES OF K		
MATERIAL	**R**	**K**
EARTH	ALL VALUES	0.05
POOR MASONRY, SHALE, HARDPAN, GOOD TIMBER AND EARTH CONSTRUCTION	ALL VALUES	0.23
GOOD MASONRY	LESS THAN 3 FT	0.35
CONCRETE BLOCK	3 FT TO LESS THAN 5 FT	0.28
ROCK	5 FT TO LESS THAN 7 FT	0.25
	7 FT OR MORE	0.23
DENSE CONCRETE, FIRST CLASS MASONRY	LESS THAN 3 FT	0.45
	3 FT TO LESS THAN 5 FT	0.38
	5 FT TO LESS THAN 7 FT	0.33
	7 FT OR MORE	0.28
REINFORCED CONCRETE (CONCRETE ONLY; WILL NOT CUT REINFORCING STEEL)	LESS THAN 3 FT	0.70
	3 FT TO LESS THAN 5 FT	0.55
	5 FT TO LESS THAN 7 FT	0.50
	7 FT OR MORE	0.43

SHAPED CHARGES

MATERIAL	M3			M2A3		
	PENETRATION	DIA OF HOLE	STANDOFF	PENETRATION	DIA OF HOLE	STANDOFF
REINFORCED CONCRETE	60"	3½"	STANDARD	30"	2¾"	STANDARD
ARMOR PLATE	20"	2½"	STANDARD	12"	1½"	STANDARD
PERMAFROST	72"	8" TO 5"	50"	72"	6" TO 1½"	30"
ICE	12'	6"	42"	7'	3½"	42"
SOIL	7'	14.5"	48"	7'	7"	30"

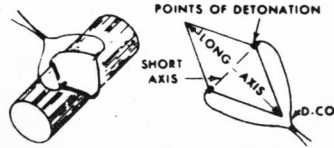
RULES OF THUMB

RAILROAD RAILS OVER 80 LB PER YD (MORE THAN 5" HIGH)		1 LB TNT
RAILROAD RAILS 80 LB OR LESS PER YD (5" OR LESS HIGH)		1/2 LB TNT
CONCRETE OBSTACLES 100 CU FT OR LESS (TETRYTOL OR HIGHER)		1 LB/CU FT
DITCH, PER CU YD OF EARTH		1 LB
BREACHING HARD SURFACE PAVEMENT (TAMPING 2×THICKNESS)		1 LB/2"
DEAD STUMPS, PER FT OF DIAMETER	(ADD 50% FOR STANDING TIMBER)	1 LB
GREEN STUMPS, PER FT OF DIAMETER		2 LB

ADVANCED DEMOLITION TECHNIQUES

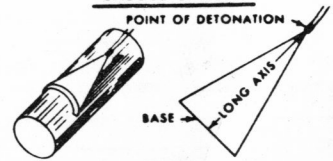
THESE TECHNIQUES ARE NOT INTENDED TO REPLACE CONVENTIONAL FORMULAS

DIAMOND CHARGE



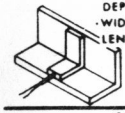
LONG AXIS = CIRCUMFERENCE OF TARGET
SHORT AXIS = ½ CIRCUMFERENCE OF TARGET
THICKNESS OF CHARGE: 1/3 BLOCK C4. BLOCK SHOULD BE CUT NOT MOLDED.
DETONATION: SIMULTANEOUS AT EACH END OF SHORT AXIS

SADDLE CHARGE



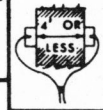
BASE = ½ CIRCUMFERENCE
LONG AXIS = 2 TIMES BASE
THICKNESS OF CHARGE: 1/3 BLOCK C4 UP TO 6", 1/2 BLOCK C4 FROM 6" TO 8"
DETONATION: FROM APEX OF TRIANGLE. USE ONLY FOR MILD STEEL UP TO 8"

RIBBON CHARGE



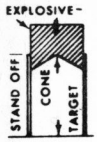
DEPTH: 3/4 THICKNESS OF TARGET
WIDTH: 3 TIMES THICKNESS OF CHARGE
LENGTH: SAME AS LENGTH OF CUT DESIRED
DETONATION: FROM ONE END ONLY

COUNTER-FORCE CHARGE



SIZE: 1 TO 1½ LB PER FT OF CONCRETE. PLACE HALF OF CHARGE ON EACH SIDE OF TARGET, DIRECTLY OPPOSITE EACH OTHER. BOTH CHARGES MUST BE DETONATED SIMULTANEOUSLY. USE ON CUBES & COLUMNS, NOT WALLS OR PIERS.

SHAPED CHARGE



STAND OFF: 1½ TIMES DIAMETER OF CONE.
HEIGHT OF CHARGE: 2 TIMES HEIGHT OF CONE.
ANGLE: 45 TO 60 DEGREES.
DETONATION: EXACT REAR CENTER OF CHARGE.

PLATTER CHARGE

EXPLOSIVE WT SHOULD BE APPROX EQUAL TO PLATTER WT. 2 TO 6 LB RECOMMENDED.
DETONATION: FROM EXACT REAR CENTER. PLATTER NEED NOT BE ROUND OR CONCAVE. RANGE: 25 — 50 YDS

RELIEVED-FACE CRATERING

LAYOUT FRIENDLY ROW FIRST AS SHOWN. LAYOUT ENEMY ROW WITH HOLES CENTERED BETWEEN FRIENDLY HOLES. DETONATE ENEMY ROW FIRST DETONATE FRIENDLY ROW ½ TO 1½ SEC DELAY AFTER ENEMY ROW.