SECTION 13
HOW TO ATTACK OPERATIONAL TARGETS

1301. Before deciding on the method of attack, be sure that the tactical aim to be achieved is clear, eg, is the target to be totally destroyed, or is it only to be damaged , and if so to what extent, or is it just to be denied to the enemy without actual damage to the target itself.

1302. When satisfied as to the tactical aim, decide on the minimum amount of damage to be done to achieve that aim, when times is short the engineer plan must be directed to doing at least that amount of damage. When there is ample time the technical aim will be to do the maximum amount of effective damage; to do more is merely to waste resources.

1303. Table 29 lists some methods of attacking a variety of operational targets.

1304. (Table 30 provides some data for the hasty estimation of men, time, and explosives required for the demolition of various types of bridge). They are average figures based on experience in the 1939-45 war, and it is unlikely that they would prove correct for any one bridge;) a detailed reconnaissance of every bridge is always necessary. The use of RDD is not considered in this table.

Table 29 -Some Methods of Attacking Operational Targets

Ser	Target	Hasty methods	Deliberate methods
(a)	(b)	(c)	(d)
1.	Roads …	(i) Craters at bridge approaches, defiles, fords, etc (ii) Rooting. If macadam surface, augment with craters (iii) Flooding Block culverts (iv) Tree felling if road passes through dense forest (v) Mines and booby traps superimposed everywhere	(i) As in column (c) (ii) Mined charge on escarpments or hillsides to blow out outer side of road, and in cuttings to blow in the sides of the cutting
2.	Airfields ..	Attack runways first and then any other areas suitable for landing and take-off (i) Rooting. If macadam surface, augment with craters (ii) Craters. lines across whole runway. Craters must be as deep as possible. (iii) Surface obstacles, eg, loaded trucks, unserviceable plant, etc, all immobilized by breaking axles (v) Mines and booby traps superimposed everywhere	(i) As in column (c) (ii) Destroy or block drainage (iii) Block approach roads (see serial No.1) (iv) Destroy refuelling plant (see serial No.14) and dis-pose of fuel (see serial No.13) (v) Demolish workshops, control tower, hangars, etc (see serial No.7)
3.	Bridges …	Aim should be to create a gap of greater span than the enemy's mobile bridging equipment. Therefore, if bridge is short, crater approaches as well. To hinder replacement destroy all (or as many as time, labour, and explosives permit) of the following : Span, abutments, piers, and nearby bridging sites. Many continental bridges are built with demolition chambers in haunches or abutments.	As in column (c)

Ser	Target	Hasty methods	Deliberate methods
(a)	(b)	(c)	(d)
(i)	RC spans …	(i) RDD (concrete) (ii) Pressure charge	Two-stage demolition
(ii)	Masonry arch rings	(i) Cut at haunch, including spandrel and parapet walls. (ii) Cut at crown, only if time is insufficient for cut at haunch	(i) Cut at both haunches. In multi-span bridges if one arch is cut, all may collapse, but ensure this by attacking all
(iii)	Steel girder spans	(i) Charge, demolition, necklace (ii) Cut all members on selected plane (see Figure 25)	(i) Cut all members on selected plane
(iv)	Suspension bridges	(i) Cut cables (ii) Cut roadway	(i) As in column (c) (ii) Mined charges against tower foundations and anchorages if practicable
(v)	Masonry and unreinforced concrete butments	Mined charges placed by camouflet or borehole methods	Mined charges in chambers from driven galleries
(vi)	Masonry and unreinforced plain concrete piers	(i) Borehole charges (ii) Footing charges where conditions allow	(i) As in column (c) (ii) With piers in water, after first cut by boreholes as near water level as practicable, it may be possible to sink mined charges by drilling vertically so as to cut pier below water level
(vii)	Timber trestles and pile piers	(i) Cut all members on one (sloping) plane (ii) Burn pier, climatic conditions permitting ie, no wind and timber dry. Ignite at bottom	As in column (c)
4 (i)	Railways- Short term, ie, when our own forces expect to	(i) Remove locos and important rolling stock, eg, tank transporting flats, refrigerated cars, etc (ii) Immobilize locos by removing vital and hard-to-	(i) As in column (c) (ii) Deny loco facilities, eg, fuel stock (by fire), water supplies, storage tanks,

Ser	Target	Hasty methods	Deliberate methods
(a)	(b)	(c)	(d)
	advance over the same system later	come-by parts including stocks of spares, eg, valves, injectors, water pumps (iii) Destroy locos by small charges in boiler and fire box, and attached to cylinders, driving wheels, etc. Remove or damage (by sledge hammer) injectors, safety valve, and cap fittings. Treat diesel and electric locos in similar fashion	pumps and wells (iii) Deny workshop facilities by removal of vital parts, destruction of power supply etc. (iv) Track demolition (applicable mainly to single track systems) with mechanical rail rooter
4 (i)	Railways Contd.	(iv) Destroy rolling stock by breaking wheels axle boxes. If high embankment or demolished bridges exit, drive complete trains over (v) Destroy points and crossing at junctions, marshaling yards, etc (vi) Disrupt communications, eg, signals, telephones, telegraph and block instruments and signal cabins. Most of this can be done by fire, sledge hammers, or removal of essential parts (vii) Remove key personnel and records	
(ii)	Long term……	(i) Remove all locos and rolling stock (ii) Destroy all bridges over 20‘ span (see Serial No. 3 above)	(i) As in column (c) (ii) Block tunnels by destroying lining for 20 yds where tunnel passes through loose ground, by small mined or borehole charges; or, if tunnel passes through firm ground or solid rock, by large mined charges placed as in Figure 13-13

Ser	Target	Hasty methods	Deliberate methods
(a)	(b)	(c)	(d)
5	ports-	Duel responsibility of Navy (for work in navigable channels and anchorages) and Army (for work on land). The following methods relate to the Army's work :	As in column (c)
(i)	Short term	(i) Mines and booby traps everywhere (ii) Dislocate power and water supplies (iii) Damage road and rail facilities as in Serials No. 1 and 4 (i) (iv) Remove key personnel and records	(i) As in column (c) (ii) Immobilize cargo handling facilities, power houses, workshops, etc, by removing vital parts. Keep careful records to facilitate eventual rehabilitation
(ii)	Long term	(i) Destroy quays and jetties by craters and mined charges (ii) Damage lock gates with underwater breaching charges and mechanism with cutting charges (iii) Damage cranes by cutting legs nearest water and so tipping the crane into dock (iv) Burn building, eg, power stations, transit sheds, fuel storage tanks, etc (v) Damage road and rail facilities as in Serial No, 1 and 4 (ii) (vi) Remove key personnel and records (vii) Mines and booby traps everywhere	
6 (i)	Inland water ways Short term	 (i) Obstruct waterway by sinking tugs, barges, etc (ii) Remove vital parts of lock gate, sluice gate, etc, machinery (expert advice should be obtained)	

Ser	Target	Hasty methods	Deliberate methods
(a)	(b)	(c)	(d)
		*If authorized by the formation commander.	
(ii)	Long term	(i) Obstruct waterway by sinking craft filled with concrete (ii) Destroy locks, dams, weirs, and sluices with underwater breaching charges and machinery with cutting charges (iii) Destroy aqueducts by pressure charge on inside	(i) As in column (c) (ii) Cut banks with mined charges at places where flooding of surrounding country would result
7 (i)	Buildings Wooden	Burn	Burn
(ii)	Masonry (small rooms)	Destroy with concussion charges	Concussion charges or mined charges under foundations
(iii)	Masonry (all large rooms) and framed structures (not RC)	Cut main supporting walls and pillars	Cut main supporting walls and pillars, Alternatively place mined charge under foundations.
(iv)	RC framed structures	Cut all columns on three sides simultaneously with charges, demolition, necklace	Cut all column on three sides simultaneously with borehole charges (two in each column, 6'' apart vertically)
(v)	Heavy RC shelters, etc	Destroy with concussion charges	Destroy with water concussion charges
(vi)	Damaged brick or masonry buildings	Attack strong points, eg, corners, junctions of party walls, with tamped cutting charges from inside building	Cut all vital walls with borehole charges spaced the thickness of the wall apart. For walls over 18" thick use two rows
8 (i)	Water supplies Short term ……	(i) Remove or disable pumping machinery (ii) Tube wells can have removable plug inserted about	As in column (c) , but if time is available much can be done to conceal

Ser	Target	Hasty methods	Deliberate methods
(a)	(b)	(c)	(d)
		15 ft down, after which well head is blown in with small charge to simulate complete destruction (iii) Water tanks be riddled with small arms fire or burst open with concussion charge fired in filled tank (C= 1 lb for every 100 cu ft of capacity)	the position of the well by removing pipe lines and other indicators and even re-laying them elsewhere as a deception plan
(ii)	Long term ..	(i) Contaminate wells with bone oil (ii) Destroy wells. Destroy deep boreholes by disconnecting rising main airline, pump rods, etc, and dropping them to bottom and then exploding one or two pounds of PE deep down, but above water level. Dug wells can be destroyed by throwing in bulky articles (eg, logs, agricultural machinery, and then blowing in about eight feet of lining with crater charges placed by camouflet equipment	(i) As in column (c), but use any available time and labour to conceal position of wells, eg, blow in well by mined charge (sufficient to make crater 15 to 30 ft below ground surface and about 10 ft from edge of well (ii) Reservoirs can be destroyed or badly cracked with mined charges.
8 (ii)	Water supplies-contd.	(iii) Pumps should be removed or destroyed (see Serial No.14) (iv) Water tanks can be dealt with as for Serial No. 8(i)	(iii) Dams, Although the demolition of even large multiple arch dams (see Figure 27) is a comparatively simple problem, the weight of explosive required for the demolition of a gravity dam of any appreciable size demands special planning
9	Telephone and telegraph communication	The work should be planned in close co-operation with Sigs whose technicians should undertake specialist tasks such as recognition of vulnerable points, imposing faults in circuits etc. Generally speaking, demolitions of	As in column (c)

Ser	Target	Hasty methods	Deliberate methods
(a)	(b)	(c)	(d)
		exchanges and central offices pay the highest dividend, while the time spent in destroying aerial lines (felling poles, cutting wires, etc) is rarely worthwhile Subterranean lines can be located by the test box indicators. Random lengths can be dug up and destroyed and then traces of work and the indicator marks removed	
10	Guns	If no explosive is available either:- (i) Block the end 2 ft of the bore and then fire an HE shell, or (ii) Attack breech end with sledge hammer, burring the threads of the block and denting the recoil cylinder. If explosive is available, block end 2 ft of bore, load shell into breech, pack in charge (C=d^2 Ib for slabs or $\frac{d^2}{2}$ Ib for plastic in close contact, where d=diameter of bore in ins), close breech as far as possible and fire charge	As in column (c), except that if the PE charge and tamping are carefully placed to obtain good contact and no voids, the charge C can be reduced by 25 per cent
11	AFVs	Detonate a charge of 20 Ib inside the hull after closing all hatches. If access to hull is not possible, place charge under gun mantlet or corner of the turret	The aim is render the vehicle useless, even as a source of spares :- (i) 10 Ib of PE laid on a triple bogie assembly will break suspension (ii) 5-Ib charge against base of turret and another under gun mantlet will destroy turret race ring and gun mounting (iii) Destroy gun as in Serial No.10

Ser	Target	Hasty methods	Deliberate methods
(a)	(b)	(c)	(d)
			(iv) Engine transmission can be wrecked by a series of 1-Ib Charges
11	Afvs-contd.		(v) If AFV carries a stock of ammunition, lay shells in stack with fuzes to the centre and detonate by means of 1-Ib charge as near the fuzes as possible. Flood the interior with fuel before firing
12 (i)	Ammunition, etc- HE shells and bombs	Place all in close contact. Prepare 5 percent for initiation by explosive (for bombs see Figure 6, shells remove fuze and gaine or plug by means of special spanner and substitute primer in plastic) and fire. If time permits, doze up a bank of earth all round to limit flying splinters	As in column (c)
(ii)	SAA …	Stack boxes in close contact, soak with gasoline or kerosene and fire	As in column (c)
(iii)	Explosives …	Remove all detonators, unpack boxes and spread contents out in a thin line, lgnite at down-wind end (to avoid too rapid and spread of fire), using, if necessary, a little gasoline or kerosene to assist. Do not throw waste explosive into water supplies-it may poison them	As in column (c)
13	POL stocks …	Work to ASC instructions, If these are not available, break containers to allow contents to escape, then ignite with Very pistol from up-wind. Heavier distillates and greases will need lavish priming with gasoline before	As in column (c)

Ser	Target	Hasty methods	Deliberate methods
(a)	(b)	(c)	(d)
		they will ignite	
14	Miscellaneous machines, eg, gasoline engines, pumps	Attack cylinder blocks, crank case, main castings, main bearings if exposed, etc with 2-Ib charges. Alternatively, batter with sledge hammers	Drain cooling systems, oil sumps empty grease boxes, etc, and run machine until it seizes up. With centrifugal pumps, remove filters at intake and contaminate flow with small gravel, nuts and bolts, etc, to wreck vanes. Complete demolition of casing, base-plate, etc, with explosive See also Table 30
15	Sheet lce …	4-Ib charges laid on the surface at 2-yds intervals on lines 1 yd apart will break up ice 16 ins thick. Fire charges simultaneously	2-Ib charges in boreholes at 2-yd intervals in lines 2 yds apart will break up ice 2 ft thick. Fire charges simultaneously
16 (i)	Assault targets Wire entanglements	Note.- The AVE gun can under suitable conditions deal with items (ii) to (vi) Bangalore torpedo	

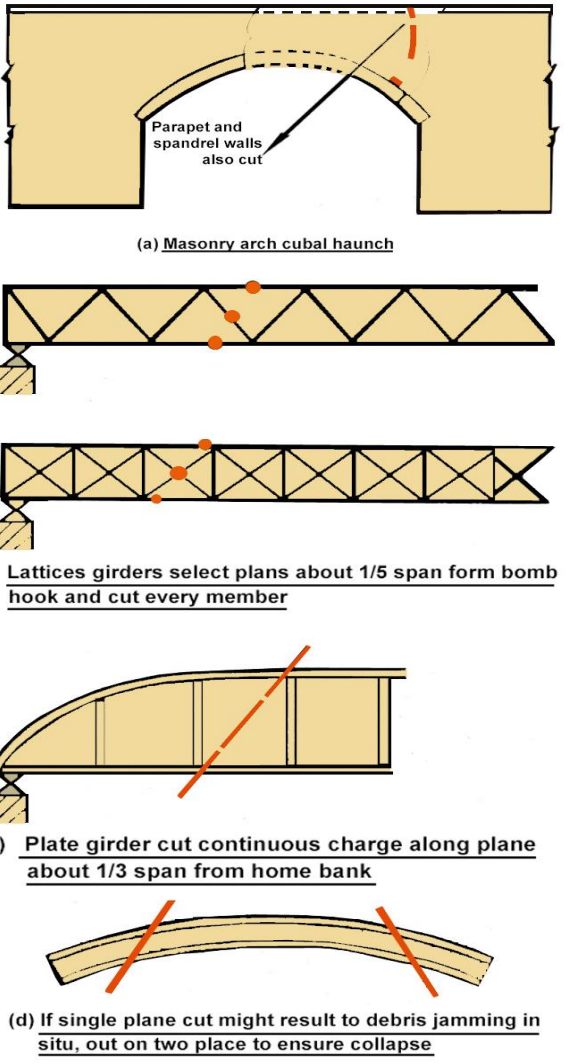


Figure 13-1: Placing charges to cut bridge spans

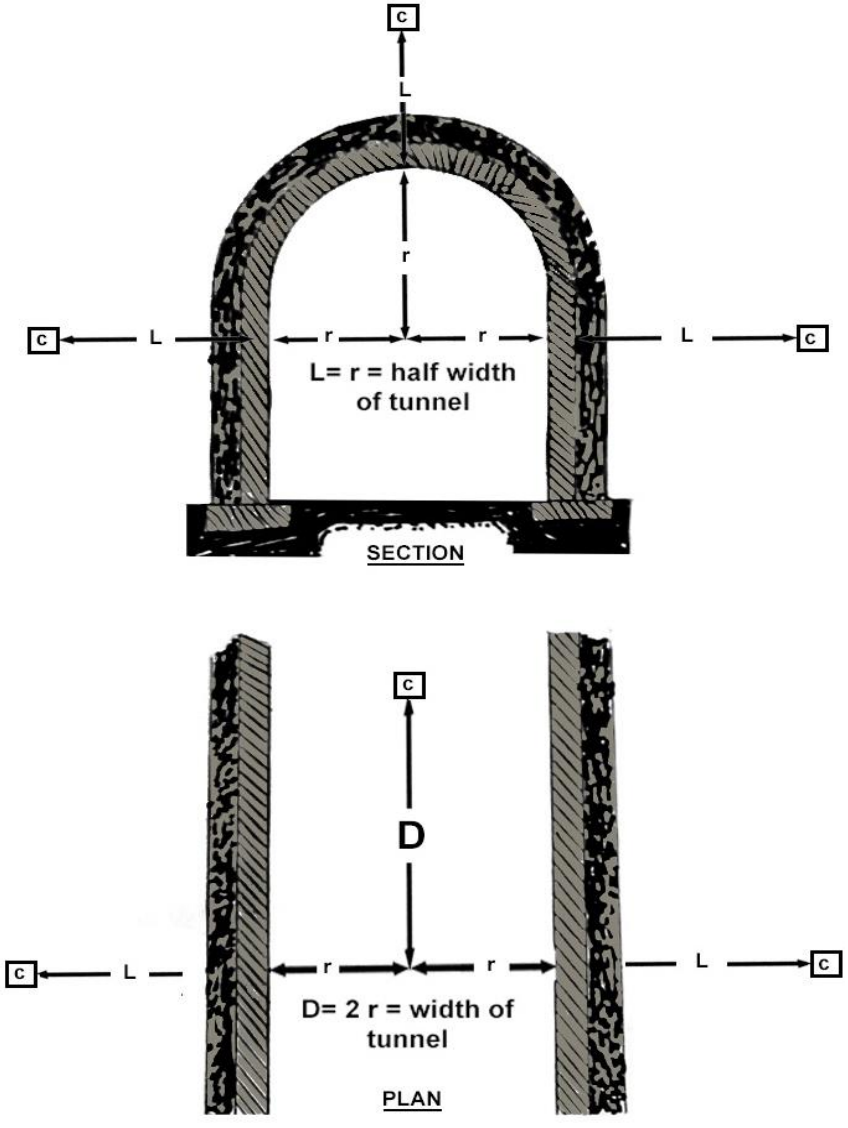
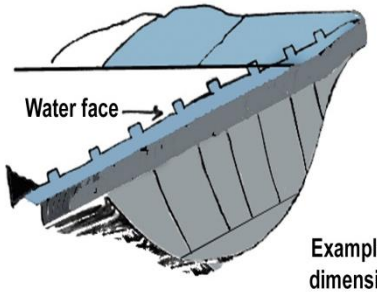


Figure 13-3: Demolition of tunnel in firm ground or rock

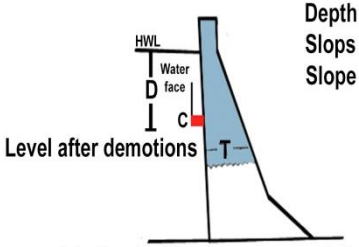


Example of dimensions

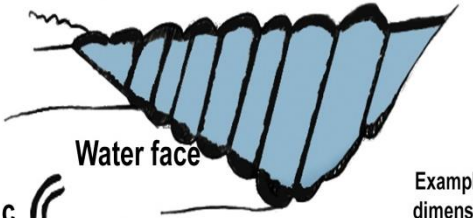
Depth of water - 200 ft
Slops of water face - 2in1
Slope of air face – 1in1

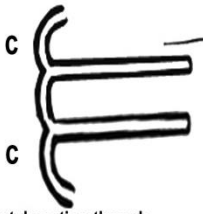
$c = \frac{T3}{3.5}$ lb

$d = \frac{2D}{3}$



(a) Gravity dam (mass concrete)





Horizontal section though one arch and supporting buttresses

(b) Multiple arch dam (RC snob ringe)

Example of dimensions

Depth of water - 200 ft
Thickness of RC Anch Ring | top 1'.6" bottom 3'.6"
Space between Buttresses - 50ft

C= charge to cut crown or hunch of arch = 2 T3 lb where T=thickness of arch ring (in feet) at point of attack

Figure 13-3: Demolition of dams

Table 30 -Data for Hasty Estimation of Men, Time and Explosives (PE3A or CE/TNT) Required for the Preparation of Bridges For Demolition

Ser	Name of bridge	Width	Span	Single cut across one span			Destruction of one pier						Destruction of one abutment					
							Using borehole charges			Using footing charges			Using mined charges placed by camouflet method			Using deliberate mined charges formula $\frac{D3}{50}$		
				No, of section	Time (hrs)	Explosive (Ib)	No, of section	Time (hrs)	Explosive (Ib)	No, of section	Time (hrs)	Explosive (Ib)	No, of section	Time (hrs)	Explosive (Ib)	No, of section	Time (hrs)	Explosive (Ib)
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(j)	(k)	(l)	(m)	(n)	(o)	(p)	(q)	(r)	(s)	(t)
1	Brick, masonry, or mass concrete arches, piers, and abutments	Up to 20	10-40	1	4*	80	1	6**	75	1	2	450	1	2	140	2	48	600
2	ditto …	Up to 20	40-80	1	5*	140	1	8**	125	1	2	450	1	2	140	2	48	600
3	ditto …	20-40	10-40	1	6*	160	1	10**	150	1	3	800	1	2	210	2	72	2,000
4	ditto …	20-40	40-80	2	6*	280	1	12**	225	1	3	800	1	2	210	2	72	2,000
5	Steel girder span, piers and abutments as in Serials No.1-4	Up to 20	10-40	1	4	60	1	5**	60	1	5*	75	1	2	140	2	48	600
6	ditto …	Up to 20	40-80	1	5	150	1	6**	125	1	2	450	1	2	140	2	48	600
7	ditto …	Up to 20	80-130	1	6	290	1	7**	150	1	2	450	1	2	140	2	48	600
8	ditto …	20-40	10-40	1	4	120	1	6**	150	1	3	800	1	2	210	2	72	2,000
9	ditto …	20-40	40-80	1	6	300	1	7**	225	1	3	800	1	2	210	2	72	2,000
10	ditto …	20-40	80-130	2	6	440	1	7**	225	1	3	900	1	3	210	2	72	2,000
11	RC Slabs, beams and girders; RC piers and abutments	Up to 20	10-40	1	4	160#	1	6**	100	Probably unsuitable			1	2	140	2	48	600
12	ditto …	Up to 20	40-80	1	5	350#	1	8**	150				1	2	140	2	48	600
13	ditto …	Up to 20	80-130	1	6	500#	1	10**	250				1	2	140	2	48	600
14	ditto …	20-40	10-40	2	4	320#	2	8**	200				1	2	210	2	72	2,000
15	ditto …	20-40	40-80	2	5	700#	2	10**	300				1	2	210	2	72	2,000
16	ditto …	20-40	80-130	2	6	1000#	2	12**	500				1	2	210	2	72	2,000
17	RC arches, piers and abutments	Up to 20	10-40	2	8*	500$	Piers probably too thick to attack						Abutments probably too heavy for use of camouflet charges			2	48	600
18	ditto …	Up to 20	40-80	2	12*	800$										2	48	600
19	ditto …	Up to 20	80-130	2	16*	1,000$										2	48	600
20	ditto …	Over 40	10-40	3	12*	1,000$										2	72	2,000
21	ditto …	Over 40	40-80	3	16*	1,600$										2	72	2,000
22	ditto …	Over 40	80-130	3	20*	2,400$										2	72	2,000

* May need compressor to break road surface.

** Compressor required for three quarters of this time. If beehives are used, for half this time.

Use pressure charges. Alternatively attack with charges, demolition, necklace from underneath.

$ Dig down and place pressure charges at crown and both $\frac{1}{4}$spans If available, use charges, demolition, necklace at crown and both $\frac{1}{4}$ spans.