

**VB-7 SWINGING GATE**  
SCALE: NONE

TYPE: NO STOPPING CAPABILITY  
OPERATION: GATES SWING HORIZONTALLY, PLUNGER BAR AND HARDWARE CONTRIBUTE TO THE EFFECTIVENESS.  
COST: \$2,600/PAIR  
COMMENT: USEFUL FOR DEFINING A BOUNDARY AT LITTLE USED ENTRY POINTS.

**VB-8 SLIDING GATE**  
SCALE: NONE

TYPE: HIGH VEHICLE THREAT RANGE  
OPERATION: GATE SLIDES HORIZONTALLY  
COST: \$13,500/26 FT. BARRICADE  
COMMENT: GREATER MASS OF LOWER SECTION AND RESTRAINT OF GATE SECTION IMPROVES EFFECTIVENESS

**VB-9 CABLE BARRIER**  
SCALE: NONE

TYPE: LOW VEHICLE THREAT RANGE  
OPERATION: SLACK CABLE LIES ON GROUND, CABLE DRAWN OPEN THROUGH PIPES TO CLOSE BARRIER.  
COST: \$1,800  
COMMENT: DESIGNED AND TESTED BY SANDIA DESIGN GOAL=0.06 MILL. FT-LBS SOIL TYPE AFFECTS PERFORMANCE

**VB-10 CRASH BEAM**  
SCALE: NONE

TYPE: LOW VEHICLE THREAT RANGE  
OPERATION: BEAM MOVES Laterally, BOTH ENDS OF BEAM RESTRAINED.  
COST: \$23,600/14 FT. BARRICADE  
COMMENT: NONE

**VB-11 SWING BARRIER**  
SCALE: NONE

TYPE: NO STOPPING CAPABILITY  
OPERATION: BEAM SWINGS HORIZONTALLY, FREE END UNRESTRAINED  
COST: \$6,200/10 FT. BARRICADE  
COMMENT: USEFUL FOR TRAFFIC CONTROL ONLY, USEFUL UNDER A CANOPY OR OTHER AREA WHERE VERTICAL HEIGHT IS LIMITED.

**VB-12 ENHANCED GATE**  
SCALE: NONE

TYPE: NOT TESTED  
OPERATION: STANDARD SWING GATE REINFORCED WITH CABLES ANCHORED WITH DEADMAN ANCHORS, CENTER LOCKING BAR AND LOCKING CHAIN DETERMINE EFFECTIVENESS.  
COST: \$7,000/PAIR  
COMMENT: CENTER LOCKING BAR MAY BE A PISTON OPERATED DEVICE.

**VB-13 TELESCOPING GATE**  
SCALE: NONE

TYPE: NOT TESTED  
OPERATION: MULTIPLE SECTIONS MOVE HORIZONTALLY.  
COST: \$11,100/26 FT. BARRICADE  
COMMENT: OPERATES FASTER THAN NORMAL SLIDING GATE, HEAVY LOWER SECTION AND LATERAL RESTRAINT OF GATE IMPROVES EFFECTIVENESS.

**VB-14 CHAIN BARRIER**  
SCALE: NONE

TYPE: NOT TESTED  
OPERATION: CHAIN RAISED AND LOWERED BY CARRIER HOUSED WITHIN BOLLARD.  
COST: \$8,300/10 FT. BARRICADE  
COMMENT: NONE

**VB-15 CRASH BEAM**  
SCALE: NONE

TYPE: NOT TESTED  
OPERATION: BEAM OPENS VERTICALLY, BOTH ENDS OF BEAM RESTRAINED WHEN CLOSED.  
COST: \$26,600/10 FT. BARRICADE  
COMMENT: NONE

**VB-16 TRAFFIC BARRIER**  
SCALE: NONE

TYPE: NOT TESTED  
OPERATION: BEAM RAISED TO ALLOW TRAFFIC TO PASS, FREE END NOT RESTRAINED.  
COST: \$3,700/10 FT. BARRICADE  
COMMENT: USEFUL FOR TRAFFIC CONTROL ONLY.

**VB-17 SLIDING GATE**  
SCALE: NONE

TYPE: NO STOPPING CAPABILITY  
OPERATION: GATE SLIDES HORIZONTALLY ON OVERHEAD TRACK.  
COST: \$5,200/10 FT. BARRICADE  
COMMENT: SLIDING GATES ALSO TELESCOPE OUT FROM THE SIDE, USING IDLER WHEELS ABOVE AND BELOW THE GATE.

**VB-18 VERTICAL LIFT BARRIER**  
SCALE: NONE

TYPE: NOT TESTED  
OPERATION: ARM AND GATE OPEN VERTICALLY.  
COST: \$7,700/10 FT. BARRICADE  
COMMENT: QUICK OPENING

**VB-19 CRASH BEAM**  
SCALE: NONE

TYPE: LOW VEHICLE THREAT RANGE  
OPERATION: MANUAL RAISING AND LOWERING (OPTION FOR HYDRAULIC OPERATION)  
COST: \$4,000/10'-6"  
COMMENT: DESIGN GOAL=4,000 LBS. AT 40 M.P.H.

**VB-20 TRAFFIC CONTROLLER**  
SCALE: NONE

TYPE: SEE COMMENT  
OPERATION: ELECTRIC DRIVEN SHAFT RAISES TEETH TO SLASH THE TIRES OF A VEHICLE AS IT PASSES THROUGH THE GATE.  
COST: \$9,400/10 FT. BARRICADE  
COMMENT: SPRING LOADED MODELS MAY BE USED TO CONTROL ENTRY ON EXIT LANES, USEFUL FOR TRAFFIC CONTROL ONLY, EASILY DEFEATED.

**VB-21 LIFT GATE**  
SCALE: NONE

TYPE: NO STOPPING CAPABILITY  
OPERATION: GATE IS RAISED ABOVE THE ROADWAY.  
COST: \$11,500/15 FT. BARRICADE  
COMMENT: NONE

**VB-22 FOLDING GATE**  
SCALE: NONE

TYPE: NO STOPPING CAPABILITY  
OPERATION: GATE SECTIONS FOLD BACK UPON THEMSELVES AS THEY OPEN.  
COST: \$24,700/23 FT. BARRICADE  
COMMENT: USEFUL WHEN SPACE AVAILABLE TO THE SIDE OF THE GATE IS INADEQUATE.

**VB-23 CRASH BEAM**  
SCALE: NONE

TYPE: HIGH VEHICLE THREAT RANGE  
OPERATION: HONEYCOMB MATERIAL CUSHIONS BLOW TO RESTRAINTS & ABSORBS SOME OF THE ENERGY OF THE BLOW  
COST: \$32,800  
COMMENT: DESIGN GOAL=1.5 MILL. FT-LBS.

**DISPENSABLE AGENTS**

ACTIVELY DISPENSED MATERIALS MAY BE USED TO IMPEDE THE MOVEMENT OF VEHICLES OR CAUSE THE DRIVER TO LOSE CONTROL OF HIS VEHICLE. THESE AGENTS CAN ELIMINATE OR MINIMIZE TRACTION FOR A VEHICLE, BLOCK THE PASSAGE OF A VEHICLE, OR INCAPACITATE THE OCCUPANTS OF A VEHICLE.

1. SLIPPERY MATERIALS  
FOAMS, POWDERS, AND SOLUTIONS WHICH MAY BE SPREAD OVER PAVEMENT TO MINIMIZE TRACTION ARE COMMERCIALY AVAILABLE. USED IN SHARP TURNS OR BEFORE BARRICADES, THEY WILL CAUSE A DRIVER TO LOSE CONTROL OF HIS VEHICLE.
2. RUBLE PILES  
LARGE VOLUMES OF RUBLE STORED ABOVE OR TO THE SIDE OF THE ROADWAY MAY BE RELEASED TO BLOCK THE ROADWAY.
3. OBSCURANTS  
SMOKE MAY BE USED TO LIMIT THE VISIBILITY OF A DRIVER, ESPECIALLY IN A TUNNEL OR OTHER CONFINED SPACE. SPRAYS MAY BE USED ON A WINDSHIELD, STROBE LIGHTS MAY BE USED AT NIGHT.
4. IRRITATING AGENTS  
VARIOUS IRRITANTS MAY BE USED TO INCAPACITATE THE OCCUPANTS OF A VEHICLE. THESE AGENTS WILL BE MOST EFFECTIVE IN A CONFINED SPACE SUCH AS A TUNNEL.

THESE AGENTS SHALL BE DISPENSED ONLY AT THE COMMAND OF A GUARD SELF-ACTUATING DISPENSERS SHALL NOT BE USED.

**VB-21 LIFT GATE**  
SCALE: NONE

**VB-22 FOLDING GATE**  
SCALE: NONE

**VB-23 CRASH BEAM**  
SCALE: NONE

**VB-24 DISPENSABLE ITEMS**  
SCALE: NONE

**MANUFACTURERS**

THE BARRIERS SHOWN ON THESE DRAWINGS ARE COMMERCIALY AVAILABLE. SOME HAVE BEEN TESTED, AND TEST DATA IS AVAILABLE FROM THE MANUFACTURERS.

THE FOLLOWING MANUFACTURERS OF VEHICLE BARRIERS HAVE BEEN IDENTIFIED. UNDOUBTEDLY THERE ARE MANY OTHERS. THE FOLLOWING ARE NOT TO BE TAKEN AS APPROVED MANUFACTURERS BUT ARE LISTED ONLY TO PROVIDE POTENTIAL USERS WITH SOURCES OF INFORMATION.

SYMBOL	MANUFACTURER	SYMBOL	MANUFACTURER
BC	BARRIER CONCEPTS INC. OAK RIDGE, TN (615) 462-3192	N	NASATKA BARRIER INC. CLINTON, MD. C00 868-0300
D	DELTA SCIENTIFIC CORP. 2450 AVENUE STANFORD WEST VALENCIA, CA. 90355 (800) 846-2787	R	ROBOT INDUSTRIES INC. DEARBORN, MI C03 846-2623
EN	ENTWISTLE CO. HUDSON, MA. (617) 481-0000	T	TTERRO INTERNATIONAL INC. ALEXANDRIA, VA. 22206 (703) 671-2242
FO	FOLGER ADAMS CO. ELMWOOD, IL. C02 739-3900	W	WESTERN INDUSTRIES INC. BOTTICHAL, MD. (703) 228-3157
M	MERIDIAN ENGINEERING NEWPORT BEACH, CA. (714) 863-3068		

**DESIGN PARAMETERS**

A VEHICLE MOVING TOWARD A BARRIER HAS KINETIC ENERGY DETERMINED BY THE VEHICLE'S WEIGHT AND SPEED. ON IMPACT WITH THE BARRIER, SOME OF THIS ENERGY IS CONVERTED TO HEAT, SOUND, AND PERMANENT DEFORMATION OF THE VEHICLE. THE REMAINDER OF THE KINETIC ENERGY MUST BE ABSORBED BY THE BARRIER IF THE VEHICLE IS TO BE STOPPED. THE KINETIC ENERGY OF A VEHICLE VARIES LINEARLY WITH THE VEHICLE'S WEIGHT AND BY THE SQUARE OF ITS SPEED. THIS SPEED IS MORE OF A DETERMINATE OF THE KINETIC ENERGY OF A VEHICLE THAN ITS WEIGHT. THE STANDARD ILLUSTRATION IS THE VEHICLE TRAVELING AT 60 MPH HAVING MORE HITTING POWER THAN AN ARMORED CAR WEIGHING 30 TIMES THE VEHICLE BUT ONLY TRAVELING AT 10 MPH.

IF THE VEHICLE'S WEIGHT AND SPEED EXCEED THE DESIGN PARAMETERS OF A BARRIER, ONE OF TWO EVENTS WILL OCCUR. THE BARRICADE MAY BREAK LOOSE FROM ITS RESTRAINTS ALLOWING THE VEHICLE TO CONTINUE WITH MINIMAL DAMAGE. HOWEVER, IF THE BARRIER CAUSES SUFFICIENT DAMAGE TO THE VEHICLE OR THE OCCUPANTS BEFORE IT FAILS, THE VEHICLE WILL BE UNABLE TO CONTINUE. BARRIERS LIKE CHAIN LINK GATES WILL FAIL IN THE FORMER MANNER. HOWEVER, BARRIERS DESIGNED FOR A DEFINED VEHICLE THREAT WILL FAIL IN THE SECOND MANNER. IF A BARRIER IS DAMAGED TO THE POINT WHERE IT MUST BE REPLACED OR ITS CONCRETE HOUSING REPAIRED, THE LOSS WILL BE SLIGHT IF IT SUCCEEDS IN STOPPING THE THREAT.

**BARRIER SELECTION**

THE CONCEPTS SHOWN ENVISION ACTIVE BARRIERS OR PASSIVE BARRIERS. HOWEVER, THE SELECTION OF THE BARRIER IS LEFT TO THE LOCAL SECURITY PLANNERS. SELECTION SHOULD BE MADE ON THE BASIS OF THE THREAT DEFINED, THE TERRAIN ENCOUNTERED, THE SPEED OF DEPLOYMENT, AND THE COST OF THE BARRIERS. OTHER FACTORS TO CONSIDER ARE THE MAINTENANCE COSTS, THE REPLACEMENT OR REPAIR COSTS SHOULD THE BARRIER EVER BE USED, AND THE SAFETY OF INNOCENT PERSONS CAUGHT BY THE BARRIER WHEN IT IS DEPLOYED. IT SHOULD BE NOTED THAT ALL THESE BARRIERS, WITH THE POSSIBLE EXCEPTION OF THE ARRESTING NET, REPRESENT A LETHAL FORCE TO ANY ONCOMING VEHICLE. IF ONE OF THESE BARRIERS IS DEPLOYED TO HALT THE THREAT, ANY OTHER TRAFFIC WILL ENCOUNTER THE SAME LETHAL BARRIER QUITE UNEXPECTEDLY. THE WIDTHS OF SOME BARRIERS MAY BE VARIED. OTHERS MAY BE PROVIDED IN GREATER OR LESSER MULTIPLES. THESE CHANGES WILL VARY THE COSTS OF THE BARRIERS AND THEIR EFFECTIVENESS AGAINST SOME THREATS.

**IMPACT ENERGY (KINETIC ENERGY)**

IMPACT ENERGY IN FT-LBS =  $\frac{W \times V^2}{2 \times 32.2}$

W = VEHICLE WEIGHT IN POUNDS  
V = VEHICLE SPEED IN FT. PER SEC.  
V = MPH x 1.467  
V = 3600 SEC/HR

OR  
IMPACT ENERGY IN FT/LBS =  $33.44 \times 10^{-6} W \times V^2$  W= LBS V= MPH

**NOTE:**  
THE DESIGN CAPACITY OF EACH BARRIER WAS CURRENT WITH THE PREPARATION OF THESE DRAWINGS. VARIOUS GOVERNMENT AGENCIES ARE DEVELOPING DESIGN STANDARDS TO APPLY TO THESE BARRIERS. THE MANUFACTURERS MAY MODIFY THEIR BARRIERS TO COMPLY WITH THESE STANDARDS AND IN DOING SO, INCREASE THE DESIGN CAPACITY OF THEIR BARRIERS.

U.S. ARMY ENGINEER DIVISION, HUNTSVILLE CORPS OF ENGINEERS HUNTSVILLE, ALABAMA	
Site adapt A/E :	ENTRY POINTS FOR U.S. ARMY INSTALLATIONS
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