

CONCEPT BA

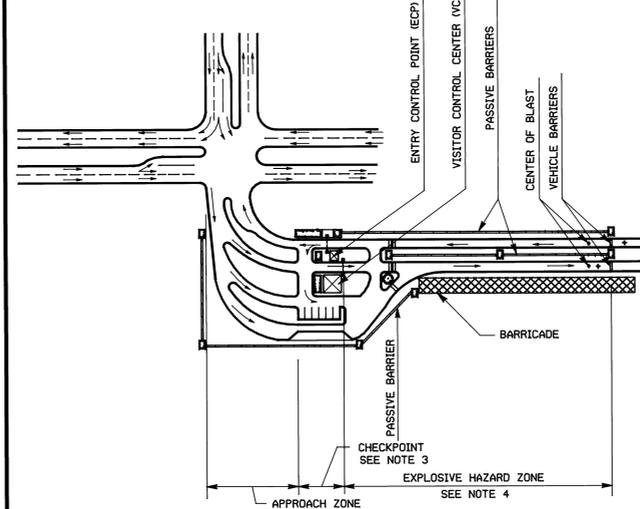
PREMISE: PROTECT INDIVIDUAL FACILITIES AGAINST THE EFFECTS OF A BLAST AT THE VEHICLE BARRIERS.

METHOD: THE FOLLOWING METHODS MAY BE USED TO PROTECT BUILDINGS WITHIN THE SAFETY ZONE:

1. REMOVE OR DEMOLISH THEM.
2. CONVERT THEM TO UNINHABITED BUILDINGS.
3. HARDEN THE BUILDINGS BY REMOVING THE WINDOWS AND STRENGTHENING THE STRUCTURE AND EXTERIOR WALLS.
4. BUILD A BARRICADE TO PROTECT THE BUILDING AGAINST FRAGMENTS FROM THE BLAST. THIS METHOD MAY NOT PROTECT THE BUILDING FROM OVERPRESSURE.

APPLICATION: THIS CONCEPT WILL WORK IF THE BUILDINGS ARE SCATTERED, FEW IN NUMBER, AND AT LONG DISTANCES FROM THE ACCESS POINTS.

LIMITATIONS: THIS CONCEPT WILL NOT BE EFFECTIVE ON A DENSELY DEVELOPED INSTALLATION.



CONCEPT BB

PREMISE: SEPARATE ENTRY POINT FROM THE INSTALLATION BY A SINGLE, LONG BARRICADE WALL PARALLEL TO THE BASE PERIMETER.

METHOD: PROVIDE THE ENTRY POINT ALONG THE PUBLIC ROAD AND PROVIDE A BLAST WALL BETWEEN THE ACCESS POINT AND THE MAIN BASE.

APPLICATION: MAY BE USED WHEN THERE IS ADEQUATE OPEN SPACE ALONG THE PERIMETER OF A MILITARY INSTALLATION.

LIMITATIONS: TALL BARRICADES WILL BE REQUIRED TO PROTECT MULTI-STORY BUILDINGS. THIS CONCEPT PROVIDES PROTECTION AGAINST FRAGMENTS BUT NOT NECESSARILY AGAINST THE OVERPRESSURE OF A BLAST.

EXPLOSIVE HAZARD AND SAFETY ZONES

REFERENCES

DOD 6055.9 STD DOD AMMUNITION AND EXPLOSIVE SAFETY STANDARDS
 TM 5-855-1 FUNDAMENTALS OF PROTECTIVE DESIGN FOR CONVENTIONAL WEAPONS STRUCTURES TO RESIST THE EFFECTS OF ACCIDENTAL EXPLOSIONS
 TM 5-1300

SAFETY ZONE (40W^{1/3} AND 24W^{1/3})

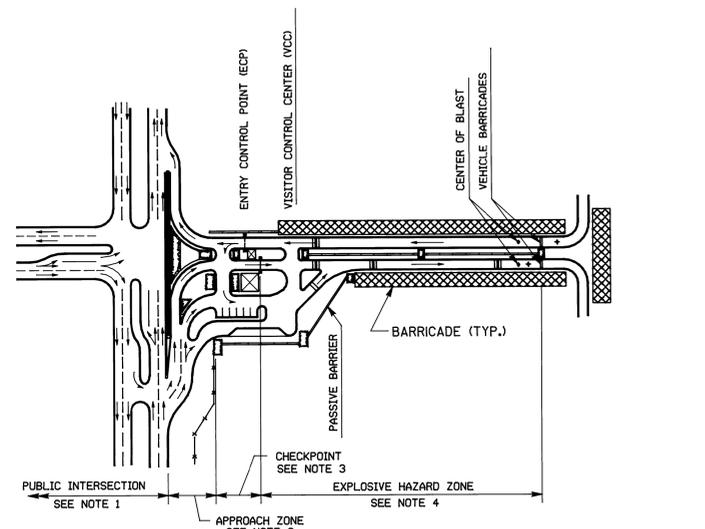
IF A THREAT VEHICLE STRIKES A VEHICLE BARRIER, THE EXPLOSIVE CARGO OF THAT VEHICLE MAY EXPLODE. THEREFORE, PERSONNEL AND FACILITIES ON THE MILITARY INSTALLATION MUST BE PROTECTED FROM THE EFFECTS OF SUCH AN EXPLOSION. THE MOST EFFECTIVE PROTECTION MAY BE PROVIDED BY SEPARATING THE ACCESS POINTS FROM THE MAIN AREAS OF THE INSTALLATION. THIS SEPARATION IS CALLED THE SAFETY ZONE. THE SAFETY ZONE IS MEASURED FROM THE VEHICLE BARRIER TO ANY UNINHABITED BUILDINGS (INHAB. BLDG.), PUBLIC ROADS (PUB. ROAD), AND RECREATION AREAS. THE SAFETY ZONE SHALL EXTEND IN ALL DIRECTIONS FROM THE VEHICLE BARRIER. THE DISTANCE IS DETERMINED BY THE WEIGHT OF THE EXPLOSIVE CHARGE AND THE FACILITY OR PERSONNEL TO BE PROTECTED. REFER TO TABLE BELOW FOR THESE SAFETY DISTANCES. IF THE DISTANCES BELOW CANNOT BE ATTAINED, IT MAY BE NECESSARY TO PROTECT UNINHABITED FACILITIES AND PERSONNEL BEFORE PROVIDING BLAST PROTECTION. CONDUCT AN ANALYSIS AS PER TM 5-1300. LIMITED BLAST PROTECTION MAY BE PROVIDED USING THE BARRICADES. REFER TO DEF 149-30-01 FOR BARRICADE CONCEPTS.

EXPLOSIVE HAZARD ZONE (08W^{1/3} AND 9W^{1/3})

SECURITY PERSONNEL AT THE ACCESS POINT SHALL ALSO BE PROVIDED BLAST PROTECTION IF AT ALL POSSIBLE. THIS PROTECTION MAY BE PROVIDED BY SEPARATING THE CHECKPOINT FROM VEHICLE BARRIERS BY AN EXPLOSIVE HAZARD ZONE. THE EXPLOSIVE HAZARD ZONE IS MEASURED FROM THE VEHICLE BARRIERS TO THE NEAREST ENTRY CONTROL POINT OR THE VISITOR CONTROL CENTER. REFER TO TABLE 1 (BELOW - COLUMN (UNBAR.)) FOR THE REQUIRED EXPLOSIVE HAZARD ZONE DISTANCES. IF THE REQUIRED DISTANCE CANNOT BE ATTAINED, THE NEXT COLUMN (BAR.) MAY BE USED IF A BARRICADE IS PLACED BETWEEN THE CHECKPOINT FACILITIES AND THE VEHICLE BARRICADES. REFER TO BLAST CONCEPT BD.

CONCEPT BA

CONCEPT BB



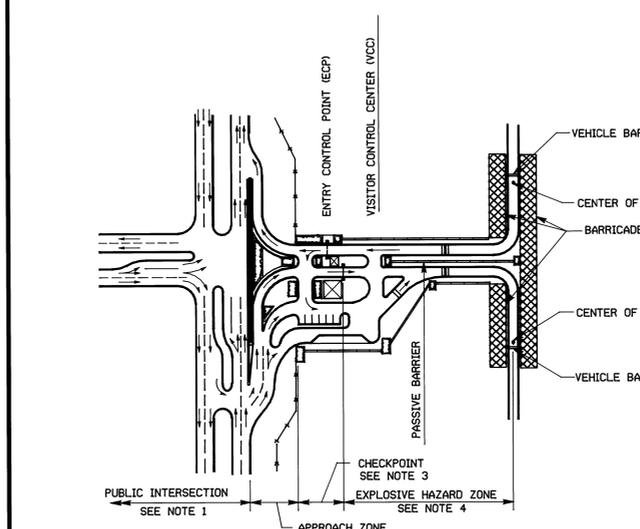
CONCEPT BC

PREMISE: SURROUND THE ENTRY POINT WITH BARRICADES

METHOD: PROVIDE BARRICADES ALONGSIDE THE ROADS AT THE VEHICLE BARRICADES.

APPLICATION: MAY BE USED WHEN THERE IS ADEQUATE OPEN SPACE WITHIN THE MAIN PART OF THE BASE TO INSERT THE ACCESS POINT AND THE BARRICADES.

LIMITATIONS: TALL BARRICADES WILL BE REQUIRED TO PROTECT MULTI-STORY BUILDINGS. THIS CONCEPT PROVIDES PROTECTION AGAINST FRAGMENTS BUT NOT NECESSARILY AGAINST THE OVERPRESSURE OF A BLAST.



CONCEPT BD

PREMISE: USE BARRICADES TO PROTECT BOTH THE CHECKPOINT AND THE MAIN PART OF THE BASE.

METHOD: PROVIDE BARRICADES BETWEEN THE VEHICLE BARRICADES AND THE CHECKPOINT AS WELL AS BETWEEN THE BARRICADES AND THE MAIN PART OF THE BASE.

APPLICATIONS: MAY BE USED WHEN THERE IS INADEQUATE SPACE FOR BOTH THE EXPLOSIVE HAZARD ZONE AND THE SAFETY ZONE.

LIMITATIONS: GUARDS AT THE CHECKPOINT ARE NOT ABLE TO OBSERVE ACTIVITY AT THE VEHICLE BARRICADES. TALL BARRICADES WILL BE REQUIRED TO PROTECT MULTI-STORY BUILDINGS. THIS CONCEPT PROVIDES PROTECTION AGAINST FRAGMENTS BUT NOT NECESSARILY AGAINST THE OVERPRESSURES OF A BLAST.

FRAGMENTS

THE ABOVE ZONES ARE BASED UPON QUANTITY-DISTANCE TABLES RELATED TO BLAST OVERPRESSURES. THE DANGER DUE TO FRAGMENTS AND FLYING DEBRIS WILL EXTEND BEYOND THE DISTANCES IN TABLE 1. FOR QUANTITIES OF TNT OF 100 LBS OR LESS, THE FRAGMENT ZONE EXTENDS 670 FEET. FOR QUANTITIES OVER 100 LBS, THE FRAGMENT ZONE EXTENDS 1250 FT. LOW ANGLE, HIGH VELOCITY FRAGMENTS MAY BE INTERCEPTED BY BARRICADES AS SHOWN ON DEFINITIVE DRAWING DEF 149-30-01, 'BARRICADES'.

BARRICADES

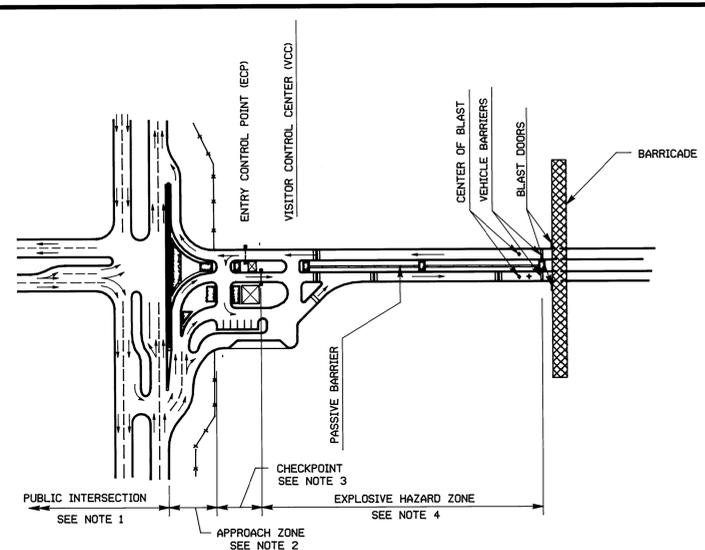
BARRICADES ACT AS SHIELDS BETWEEN THE EXPLOSION SOURCE AND THE PROTECTED FACILITY. BARRICADES CAN BE EITHER REVERTED OR UNREVERTED BARRICADES, SIMPLE CANTILEVER WALLS, ETC.. REFER TO DEF 149-30-01 FOR BARRICADE CONCEPTS.

PROPERLY CONSTRUCTED BARRICADES ARE EFFECTIVE AGAINST HIGH VELOCITY, LOW ANGLE FRAGMENTS. THEY ALSO PROVIDE LIMITED PROTECTION AGAINST BLAST OVERPRESSURES IN THEIR IMMEDIATE VICINITY. THEY DO NOT PROVIDE ANY PROTECTION AGAINST HIGH ANGLE FRAGMENTS AND ARE NOT EFFECTIVE IN REDUCING THE BLAST OVERPRESSURES IN THE FAR FIELD (DISTANCES GREATER THAN TWO TO TEN TIMES THE HEIGHT OF BARRICADE). FOR THIS REASON, EVEN WHEN BARRICADES ARE USED, AS IN SCHEMES BB THROUGH BF, INDIVIDUAL BUILDINGS MAY STILL REQUIRE PROTECTION TO PROTECT THEM AND THEIR OCCUPANTS FROM THE EFFECTS OF BLAST OVERPRESSURE.

WHEN BARRICADES ARE USED ALONGSIDE THE ACCESS POINTS, AS IN THE CONCEPTS SHOWN ON THIS DRAWING, THE OVERPRESSURES AT THE CHECKPOINTS MUST BE CHECKED AS PER TM 5-1300. DUE TO THE REFLECTED OVERPRESSURES SET UP BY THE BARRICADES, THE EXPLOSIVE HAZARD ZONE DISTANCES GIVEN IN THE TABLE BELOW MAY NOT APPLY.

CONCEPT BC

CONCEPT BD



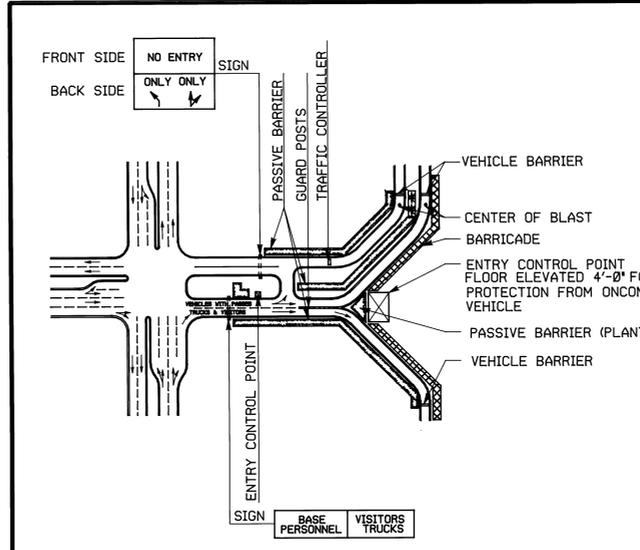
CONCEPT BE

PREMISE: USE BLAST DOORS IN A BARRICADE WALL TO PROVIDE PROTECTION FOR THE INSTALLATION.

METHOD: PLACE A BARRICADE BETWEEN THE VEHICLE BARRIERS AND THE MAIN PART OF THE BASE. USE BLAST DOORS IN THAT WALL TO PROVIDE BASE ACCESS. BLAST DOORS WILL BE CLOSED NORMALLY.

APPLICATION: THIS CONCEPT WILL WORK WELL IF THE VOLUME OF TRAFFIC THROUGH THE CHECKPOINT IS VERY LOW.

LIMITATIONS: TALL BARRICADES WILL BE REQUIRED TO PROTECT MULTI-STORY BUILDINGS. THIS CONCEPT PROVIDES PROTECTION AGAINST FRAGMENTS BUT NOT NECESSARILY AGAINST THE OVERPRESSURE OF A BLAST.



CONCEPT BF

PREMISE: USE A PROTECTED ENTRY CONTROL CENTER WITHIN THE BARRICADE.

METHOD: USE SHARP TURNS TO CONTROL VEHICLE APPROACH SPEEDS. ENTRY CONTROL CENTER IS PART OF THE PASSIVE BARRIERS AND THE BARRICADE. VEHICLE BARRIERS ARE BEHIND A SECOND CURVE, ENTRY CONTROL CENTER IS NOT IN LINE OF SIGHT OF THE EXPLOSION, BUT PARTIALLY PROTECTED BY THE BARRICADE.

APPLICATION: USEFUL WHEN BOTH EXPLOSIVE HAZARD AND SAFETY DISTANCES ARE LIMITED.

LIMITATIONS: GUARD CANNOT SEE VEHICLE BARRIERS.

CONCEPT BE

CONCEPT BF

TABLE 1 EXPLOSIVE HAZARD ZONE & SAFETY DISTANCES

AMOUNT OF MATERIAL IN POUNDS OF TNT (w)	SAFETY DISTANCES		EXPLOSIVE HAZARD DISTANCES	
	INHAB. BLDG.	PUB. ROADS	UNBAR.	BAR.
LESS THAN 50 LBS	150 FT	90 FT	60 FT	30 FT
50-100 LBS	190	115	80	40
100-300	276	160	120	60
1000-2000	505	305	230	90
2000-4000	635	380	290	115
4000-7000	770	460	340	145
7000-10000	865	520	390	170
10000-15000	990	595	450	225
15000-20000 LBS	1090 FT	655 FT	490 FT	245 FT
PEAK OVERPRESSURE DISTANCE FACTOR	1.2 PSI 40W ^{1/3}	2.3 PSI 24W ^{1/3}	3.5 PSI 18W ^{1/3}	12 PSI 9W ^{1/3}

ADAPTED FROM DOD 6055.9 STD W = NET WEIGHT OF HIGH EXPLOSIVE MATERIAL

GENERAL REVISIONS - SHEET REDRAWN

Symbol	Description	Date	Approved

U.S. ARMY ENGINEER DIVISION, HUNTSVILLE, ALABAMA

Site adapt A/E: **ENTRY POINTS FOR U.S. ARMY INSTALLATIONS BLAST SAFETY CONCEPTS**

Dwn. by: RDP Ckd. by: AF

Reviewed by: *Paul J. Williams* Date: 27 FEB 89 Sheet reference number: 12 Design file no.: Rev. Sheet 12 of 14

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