

CONCEPT F

PREMISE: INCREASE THE NUMBER OF INCOMING LANES AND ENTRY CONTROL POINT SO THAT EACH VEHICLE CAN BE STOPPED AND INSPECTED.

OPERATION: THE VEHICLE BARRIER IN EACH ENTRANCE AND EXIT LANE MUST BE DEPLOYED AT ALL TIMES BECAUSE THERE WOULD NOT BE SUFFICIENT TIME FOR DEPLOYMENT AFTER IDENTIFICATION OF A THREAT. THE TOLL GATE IN EACH ENTRANCE LANE IS A SAFETY FEATURE THAT DEFINES THE STOPPING POINT FOR INSPECTION AND STOPS A VEHICLE BEFORE IT COLLIDES WITH THE BARRIER. THE VEHICLE BARRIERS MAY BE OPENED TO PERMIT GREATER TRAFFIC FLOWS IF SECURITY CONDITIONS PERMIT IT.

THE OPTIONAL SEPARATE LANE FOR INCOMING VISITORS AND TRUCKS IMPROVES THE EFFICIENT FLOW OF TRAFFIC THROUGH THE OTHER LANES.

APPLICATION: THIS CONCEPT IS WELL SUITED TO INSTALLATIONS WITH MINIMAL DISTANCE BETWEEN THE PUBLIC ROAD AND THE CHECKPOINT.

LIMITATIONS: THIS CONCEPT REQUIRES A LARGE NUMBER OF EXPENSIVE VEHICULAR BARRIERS WHICH ARE SUBJECT TO FREQUENT OPERATION (HEAVY WEAR AND TEAR). MINIMAL BLAST PROTECTION IS OFFERED TO SECURITY PERSONNEL. THE APPLICATION OF THIS CONCEPT WILL HAVE A MAJOR EFFECT UPON NORMAL TRAFFIC FLOW ENTERING AND EXITING THE INSTALLATION. PRIOR TO IMPLEMENTING THIS CONCEPT, A THOROUGH TRAFFIC ENGINEERING STUDY WILL BE REQUIRED.

NOTE: WHEN AN INSTALLATION REQUIRES A HIGH LEVEL OF SECURITY, THE BARRIERS SHOULD BE USED IN PAIRS TO FORM AN ENTRAPMENT ZONE.

SEE SHEETS I-6 FOR ADDITIONAL NOTES

VEHICLE APPROACH

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THERE ARE SIGNIFICANT ADVANTAGES TO BE GAINED IN CONTROLLING THE SPEED OF THE APPROACHING VEHICLE. IF THE DESIGN VEHICLE IS NOT ALLOWED TO REACH THE BARRIER TRAVELING AT A HIGH RATE OF SPEED, A MORE ECONOMICAL BARRIER MAY BE USED AND THE PROBABILITY OF STOPPING THE VEHICLE ARE SIGNIFICANTLY INCREASED. IF A VEHICLE'S SPEED CAN BE REDUCED BY 50 PERCENT, THEN ITS KINETIC ENERGY IS REDUCED BY 75 PERCENT.

LAW-ABIDING DRIVERS WILL REDUCE THEIR SPEED WHEN APPROACHING THE CHECKPOINT IN RESPONSE TO WARNING STRIPS OR SPEED BUMPS IN THE ROAD; SPEED LIMIT, CAUTION OR STOP SIGNS ALONGSIDE THE ROAD; FLASHING LIGHTS ALONG THE ROAD; OR CHANGES IN THE WIDTH OF THE ROAD OR ROAD SURFACE. HOWEVER, THESE MEASURES ARE NOT SUFFICIENT TO FORCE THE DETERMINED AGGRESSOR TO SLOW DOWN. MORE FORCEFUL WAYS TO MAKE THE DRIVER OF ANY VEHICLE SLOW DOWN INCLUDE THE USE OF HORIZONTAL AND VERTICAL CURVES IN THE ROAD, STRINGENT REDUCTIONS IN THE ROAD WIDTHS, AND TRAFFIC CONGESTION IN THE ROAD AHEAD. TO USE THESE MEASURES SUCCESSFULLY, IT IS NECESSARY TO KEEP THE DRIVER ON THE ROAD AND PREVENT HIM FROM GOING AROUND THESE HAZARDS OR TAKING A SHORT CUT ACROSS ANY OPEN TERRAIN. THE CONCEPTS SHOWN ON THESE DRAWINGS ILLUSTRATE WAYS TO ACHIEVE THIS REDUCTION IN APPROACH SPEEDS. TRAFFIC FRICTION DEVICES ARE SHOWN ON SHEET 7. THE TABLE BELOW MAY BE USED TO SELECT HORIZONTAL CURVES IN THE ROAD BEFORE THE CHECKPOINTS AND THE VEHICLE BARRIERS. THE CRITICAL R CURVES ARE NOT CALCULATED USING A SUPER-ELEVATION. IN ADDITION, IF THESE CURVES WERE GIVEN A REVERSE SUPER-ELEVATION A SPEEDING VEHICLE WOULD MORE LIKELY SKID OUT OF CONTROL.

VERTICAL CURVES MAY BE EFFECTIVE IN CONTROLLING THE SPEED OF APPROACHING VEHICLES. WHEN THE CHECKPOINT IS LOCATED AT THE TOP OF A STEEP GRADE, APPROACHING VEHICLES, ESPECIALLY HEAVY TRUCKS, CAN ONLY APPROACH THE CHECKPOINT AT REDUCED SPEEDS. FOR SIMILAR REASONS, THE CHECKPOINT SHOULD NOT BE LOCATED AT THE BOTTOM OF A HILL. HEAVY TRUCKS AND OTHER VEHICLES WILL BE MORE DIFFICULT TO STOP IF THEY ARE ABLE TO BUILD UP SPEED COMING DOWN A HILL.

WHEN SHARP HORIZONTAL CURVES, STEEP VERTICAL CURVES, AND/OR TRAFFIC FRICTION DEVICES ARE USED, SIGNS MUST BE POSTED TO WARN APPROACHING DRIVERS OF THE UPCOMING TRAFFIC HAZARDS AND TO ESTABLISH THE SAFE VEHICLE SPEEDS. SIGNS SHALL ALSO CAUTION THAT SPEED LIMITS WILL BE STRICTLY ENFORCED.

WHERE POSSIBLE, INCOMING DRIVERS SHOULD CURVE TO THE LEFT AS THEY APPROACH THE CHECKPOINT. LEFT-HAND CURVES GIVE THE GUARDS AT THE CHECKPOINT A BETTER VIEW OF INCOMING VEHICLES AND THEIR DRIVERS AND MAKES IT EASIER FOR THEM TO IDENTIFY WHICH VEHICLES ARE AUTHORIZED ENTRY. LEFT-HAND CURVES ALSO EXPOSE THE DRIVER OF A THREAT VEHICLE TO THE GUARDS' LINE OF FIRE AND ANY PASSENGERS OF SUCH A VEHICLE ARE FORCED TO FIRE PAST THE DRIVER OUT THE LEFT SIDE WINDOWS.

APPROACH CURVES TURNING RADIUS (R)			USE OF TABLE
VEHICLE SPEED	MINIMUM (SAFE R)	CRITICAL R	
15 MPH	50 FT	25 FT	1. SELECT DESIRED VEHICLE SPEED. 2. SELECT R BETWEEN RECOMMENDED R AND SAFE R. 3. NOTE VEHICLE SPEED OF CRITICAL R CORRESPONDING TO R SELECTED IN STEP 2. 4. IS VEHICLE SPEED FOUND IN STEP 3 ACCEPTABLE? 5. IF NOT, SELECT A SHORTER R AND REPEAT STEPS 3 & 4.
20	90	45	
25	150	70	
30	230	100	
35	310	135	
40	430	175	
45	550	22	
50	690	275	
55	840	335	
60 MPH	1040 FT	400 FT	

CRITICAL R = V<sup>2</sup> + 8.98  
V = VEHICLE SPEED IN MPH

1984 AASHTO, A POLICY ON GEOMETRIC DESIGN OF HIGHWAYS & STREETS. CRITICAL R BASED ON A 0.6 COEFFICIENT OF SIDE FRICTION. APPROACH CURVES ASSUMED TO BE FLAT, I.E. NO SUPERELEVATION.

CONCEPT G

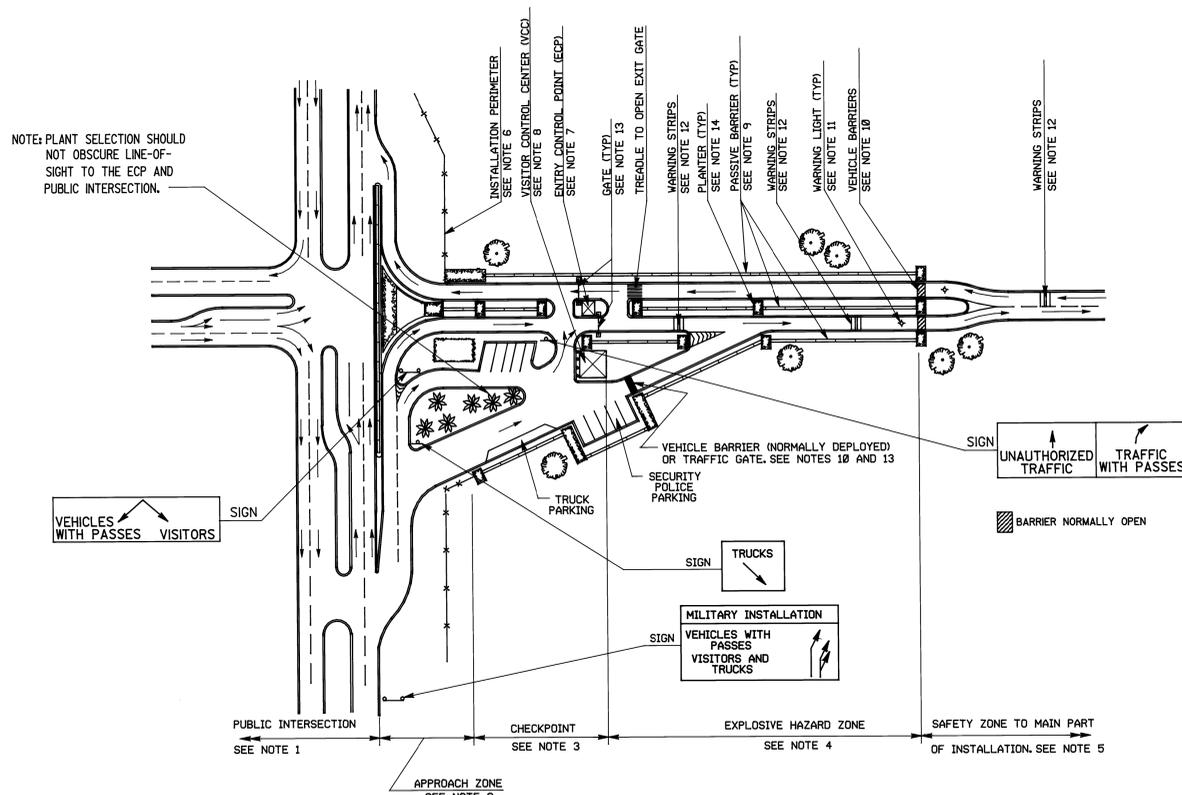
PREMISE: USE PASSIVE BARRIERS TO CREATE A SHARP TURN TO FORCE A VEHICLE TO SLOW DOWN BEFORE ENTERING THE CHECKPOINT.

OPERATION: VEHICLES WITH PASSES ARE SEPARATED FROM THOSE WITHOUT PASSES. GATES AT THE CHECKPOINT ARE OPTIONAL. VEHICLE BARRIERS ARE DEPLOYED BY GUARDS OR WHEN A TOLL GATE IS BROKEN BY A SPEEDING VEHICLE. THE EXIT LANE IS AUTOMATICALLY RAISED ON DEMAND FOR AN EXITING VEHICLE.

APPLICATION: THIS CONCEPT IS WELL SUITED TO A SITUATION WHERE THERE IS A SHORT DISTANCE BETWEEN THE PUBLIC ROAD AND THE CHECKPOINT. THE EXPLOSIVE HAZARD ZONE MAY BE REDUCED IN LENGTH IF ENTRAPMENT ZONES ARE FORMED IN EACH LANE BY ADDING ADDITIONAL BARRIERS AND THE GUARDS ARE PROTECTED FROM A BLAST.

LIMITATIONS: THE BARRIER AT THE PUBLIC ROAD LIMITS FLEXIBILITY FOR ENTERING AND EXITING THE INSTALLATION. THE APPLICATION OF THIS CONCEPT WILL HAVE A MAJOR EFFECT UPON NORMAL TRAFFIC FLOW ENTERING AND EXITING THE INSTALLATION. PRIOR TO IMPLEMENTING THIS CONCEPT, A THOROUGH TRAFFIC ENGINEERING STUDY WILL BE REQUIRED.

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Symbol	Description	Date	Approved
△	GENERAL REVISIONS - SHEET REDRAWN	27 FEB 89	ASJ

U.S. ARMY ENGINEER DIVISION, HUNTSVILLE, ALABAMA

ENTRY POINTS FOR U.S. ARMY INSTALLATIONS CONCEPTS F & G

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