Traffic Engineering and Highway Safety Bulletin

Gates Revisited
SMART Assessments

November 2009

Over the last eight to ten years, a lot of time and resources have been focused on securing access points to military bases all over the world. Throughout this genesis much advancement in design requirements, implementation of technology and improved operational procedures has been realized.

SDDCTEA has been focused on how this advancement will impact the security, safety and traffic efficiency of Entry Control Facilities/Access Control Points (ECFs/ACPs). The focus actually started with its original gate manual (Pamphlet 55-15), released in 1982, and has included several Traffic Engineering and Highway Safety Bulletins focused on the subject as well as recent updates of Pamphlet 55-15, *Traffic and Safety Engineering for Better Entry Control Facilities* in 2006 and 2009.

Part of SDDCTEA's focus has included evaluating the use of automated systems. In 2006 SDDCTEA began investigating how varying types of automation would affect traffic throughput at ECFs/ACPs to provide practitioners with as much unbiased information as possible as they weigh their options for improvement.

What came out of the investigation was the SMART Process. The SMART process helps plan ECF/ACP improvements now, and to the extent possible, for the future.

How SMART Are You?

Answer the questions to this short quiz below then read on to find out the answers.

1. The SMART process replaces the need for a traffic engineering assessment at an entry control facility? **True or False**
2. Using the SMART process can help define the magnitude and true impact of decisions made at entry control facilities? **True or False**
3. Guards can process traffic faster with automated equipment than by performing manual ID checks. **True or False**

"OPMG partnered with SDDCTEA to develop and refine the SMART Process and the SMART Decision Evaluator. During the process it became very clear that implementing "SMART" tools in the earliest phases of ACP assessments will ensure initial access control point design submittals inculcate solid traffic engineering analysis and address the many complex issues at play for these security features. We believe in the process and have incorporated it into our revised physical security policy on the design of ACPs."

- Department of the Army's Office of the Provost Marshal General

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Traffic Engineering and Safety Assessments

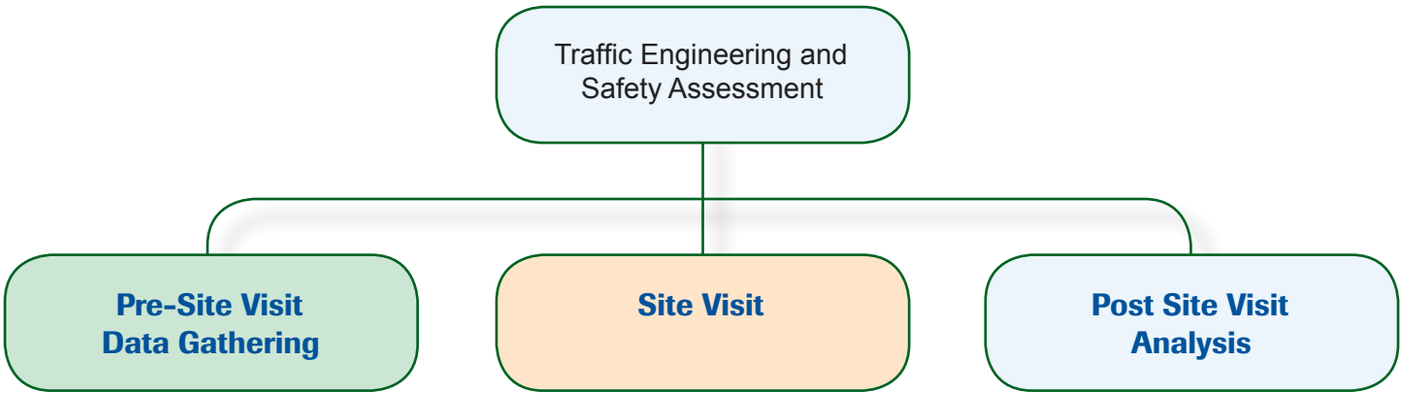
Project execution without planning can result in a failure to address design priorities (security, safety and traffic efficiency), wasted resources, additional costs and a poor public perception.

Conducting a SMART traffic engineering and safety assessment will lend itself to coordinated, right-sized recommendations. Exhibit 1 shows the elements of a SMART assessment.

Q: The SMART process replaces the need for a traffic engineering assessment at an entry control facility?

A: False - The SMART process is integrated within the traffic engineering assessment. The assessment itself is arguably the most important aspect of planning for an ECF, regardless of whether a retrofit option or new construction is anticipated.

Exhibit 1: SMART's Role in Determining Automation



Pre-Site Visit Data Gathering

There are three primary goals that need to be accomplished during the pre-site visit activities:

- ✔ Determination of Applicable Standards and Guidance
- ✔ Stakeholder Coordination
- ✔ Data Gathering

The success of the ECF evaluation will be dependent on the ability of the site visit team being able to "hit the ground running." Lost time on site collecting background information and coordinating with stakeholders limits the time that the team can spend observing ECF operations and determining the proper placement of components.

Detailed descriptions about Pre-Site Visit Data Gathering can be found in the SDDCTEA Pamphlet 55-15, Exhibit 2.1.

Pre-site visit data gathering includes the following data:

Previous studies
↓
Panning data
↓
Electronic mapping
↓
Force protection information
↓
Signalized intersection data
↓
Crash data
↓
Staffing levels
↓
Historical traffic volumes

Site Visit

The site visit should consist of a systematic compliance check of all applicable standards.

The site visit leader should compile a detailed checklist to be handed to all participants at the start of the evaluation. While conducting the site visit, the ECF evaluation team should focus on evaluating every aspect of the existing conditions and how those conditions contribute to unsecure, unsafe, congested, and aesthetically unpleasing situations. Some keys to remember to ensure that the site visit is a worthwhile time investment include:

- ✔ Remember that stakeholder coordination is important, but they don't all necessarily have to participate in the site visit. Assemble a core-team to represent the group that can get the task done efficiently
- ✔ Taking a step back and simply observing the uninterrupted operation of the ECF can be as valuable as counting traffic
- ✔ Look for visual cues such as dead grass or curbs with rubber markings from tires because these may provide insight into larger issues regarding mobility within the ECF.
- ✔ Spend time with the guards and learn "what life is like" at the ECF.

Collect traffic data
↓
Conduct a safety review
↓
Conduct an operational and manpower review
↓
Inventory existing conditions
↓
Identify short-term, low-cost enhancements

Post-Site Visit Analysis

The post-site visit analysis gives practitioners an opportunity to compile all that has been learned about the ECF/ACP in question and compare it with the stated goals of stakeholders and applicable standards. When conducted in a SMART way, the post-site visit analysis will yield the following outcomes:

Guidance on ECF/ACP operations:
- ✔ Number of ECFs/ACPs
- ✔ Hours of operation
- ✔ Manpower needs

↓
Identification of low-cost, short-term enhancements
↓
Determination of automation strategies
↓
Right-sizing of future lane requirements
↓
Assessment of future land use needs and master plan impacts
↓
Development of a long-term vision and associated concepts
↓
Consideration of near-term and long-term AVB placement
↓
Evaluation of contextual AVB traffic control options
↓
Awareness of ramifications of short-term and long-term decisions
↓
Reduction of "wasted" resources

The development of 1391 programmatic costs should also be included as part of the post site visit analysis.

Why be SMART?

The previous pages demonstrated what the SMART process is and how it should be implemented. But what are the benefits of using the process?

A couple of representative examples may provide the best explanation. See Exhibit 2 below.

Q: Using the SMART process can help define the magnitude and true impact of decisions made at entry control facilities?

A: True - Following a coordinated approach to assessing an ECF can save both time and money when seeking to address security, safety or traffic congestion.

Exhibit 2: ECF SMART Assessment Examples

	Example One	Example Two
Existing Conditions	✔ Three ID check lanes ✔ Peak demand of 3,500 vph ✔ One guard per lane conducting manual ID checks	✔ One ID check lane ✔ Peak demand of 401 vph ✔ One guard per lane conducting manual ID checks
Stakeholder Direction	✔ Construct nearly $2.5 million worth of improvements including, AVBs, a new visitor center, visitor parking area, a new canopy over inbound and outbound and guard ID check islands	✔ Conduct a site preparation study to determine the feasibility of implementing handheld automation equipment
Blind Decisions	✔ The project moved forward and was within one month of the start of construction. ✔ The plans did not consider AVB safety, true traffic demands under BRAVO+ conditions, or true visitor center parking demand.	✔ The study was completed and noted that two lanes would be required where there is one now. ✔ The conclusion of the report still recommended the installation of the equipment in the existing condition ✔ The report failed to analyze what overall site impacts would be felt by implementation and did not correlate the equipment to increased traffic backups.
Corrective Actions	✔ An ECF SMART Assessment was conducted and identified that the AVBs were in the wrong location and recommended moving them to be collocated with an intersection. ✔ The assessment also identified the need for 5 inbound lanes and at the same time recommended not providing a canopy over outbound lanes. This allowed for the design of the additional lanes needed without increasing the cost of the canopy. ✔ Lastly, the assessment was able to provide immediate safety improvements for guards by identifying short-term enhancements and several design changes for the proposed work.	✔ A comprehensive traffic engineering study was completed that included a review of ECFs/ACPs where the SMART process was incorporated. ✔ The analysis concluded that if the equipment was installed, it would result in an extra traffic queue of 43 vehicles during the peak hour. ✔ As a result of the SMART assessment, the decision was made to suspend the implementation of handheld automation equipment until the appropriate infrastructure improvements could be programmed

The ACP/ECF SMART Decision Evaluator

SDDCTEA, The Army's Office of Provost Marshal General, Army Corps of Engineers Protective Design Center, and Army Corps of Engineers Electronic Security Center realized that automation of ECFs either by a handheld device or structurally mounted equipment will affect almost every aspect of an ECF and that proper planning is a "must have." So to provide practitioners with a way of analyzing this complicated situation, the agencies partnered to create the ACP/ECF SMART Decision Evaluator.

The purpose of the ACP/ECF SMART Decision Evaluator is to provide perspective on the issues associated with each approach to ECF processing (manual as well as handheld and structural mounted automation) so that, when combined with practical knowledge, decisions are made with full awareness of the ramifications. The ACP/ECF SMART Decision Evaluator has been designed to require a minimal amount of data entry. Results from the ACP/ECF SMART Decision Evaluator can be exported to an MS Excel template for inclusion in other documents or for additional analyses as shown in Exhibit 3.

Calculations completed by the software are based on common engineering, security and economic principles and although a full traffic engineering assessment is needed to correctly plan for any changes at the ECF, including the implementation of automation, the ACP/ECF SMART Decision evaluator will help practitioners reduce the planning view from 10,000 to 1,000 feet.

Contact SDDCTEA for information on how to obtain a copy of the ACP/ECF SMART Decision Evaluator. **The use of the ACP/ECF SMART Decision Evaluator should be under direct supervision and/or in close coordination with SDDCTEA.**

Exhibit 3: ACP/ECF SMART Decision Evaluator

SAMPLE
SAMPLE CITY, USA
SAMPLE AFB

	Existing	Handheld	AIE Processing		User Defined	Manual Processing		Handheld Processing		AIE Processing	
			Without Arms	With Arms		Single	Tandem	Single	Tandem	Without Arms	With Arms
Lanes Provided or Needed	3	3	3	3	2	4	3	4	3	3	4
Additional Lanes Needed					-1	1	0	1	0	0	1
Expand or Construct New					No Change	Expand	No Change	Expand	No Change	No Change	Expand
Cost of Needed Lanes					$0	$1,600,000	$0	$1,600,000	$0	$0	$1,600,000
Lanes					$0	$97,851	$0	$97,851	$0	$0	$97,851
Annualized Infrastructure Maintenance Cost					$14,678	$19,571	$14,678	$19,571	$14,678	$14,678	$19,571
Traffic Queues (vehicles)	150	360	32	285	661	3	3	18	32	32	6
Annualized Congestion Cost	$523,152	$1,255,565	$111,606	$993,989	$2,305,356	$10,463	$10,463	$62,778	$111,606	$111,606	$20,926
Additional Manpower Needed	0	$0	0	0	-1	1	3	1	3	0	1
Annualized Manpower Cost	$195,000	$195,000	$111,606	$195,000	$130,000	$260,000	$390,000	$260,000	$390,000	$195,000	$260,000
Technology Cost	$0	$45,000	$480,000	$480,000	$175,000	$0	$0	$60,000	$45,000	$480,000	$640,000
Annualized Technology Cost	$0	$5,010	$53,437	$53,437	$19,482	$0	$0	$6,680	$5,010	$53,437	$71,249
Annualized Technology Maintenance Cost	$0	$150	$1,603	$1,603	$584	$0	$0	$200	$150	$1,603	$2,137
Total Annual Costs	$732,830	$1,470,403	$376,324	$1,258,707	$2,470,101	$387,885	$415,141	$447,080	$521,444	$376,324	$471,734
Risk Score	0.49	0.32	0.08	0.08	0.2	0.49	0.49	0.32	0.32	0.08	0.08

Note: The SMART Evaluator is designed to provide a comparison for up to 10 needed lanes at a single ACP/ECF. A large sample of historical infrastructure costs are not available for this data set. Contact SDDCTEA or the ACE-PDC for assistance with calculations in these cases.

Gannett Fleming

How to be SMART About Automation

Since 2006, SDDCTEA has evaluated the interaction between more than 6,300 drivers and automation equipment at 13 installations, 27 ECFs and 62 lanes in CONUS, USFK and USAREUR. These evaluations have included both government owned and vendor implemented systems and throughout these evaluations traffic throughput as been recorded versus manual credential validations. This analysis led to the revised processing chart from the 2009 SDDCTEA Pamphlet 55-15 shown in Exhibit 4.

While the security aspects of automated equipment can be quantified and have been noted, current handheld devices in use offer no benefit for throughput versus manual ID checks and structural mounted automation only provides a benefit when traffic arms are not used to release vehicles from the ID check position. These evaluations and the findings associated with them helped debunk several myths regarding automation equipment that is currently in use.

Q: Guards can process traffic faster with automated equipment than by performing manual ID checks?

A: False - As Exhibit 4 shows, processing rates for all types of automation provide less throughput than manual checks except for one processing technique shown in the automated lanes column below.

Implementation of automation without the evaluation of the short-term and long-term effects that the installed system will have on a particular ECF and/or neighboring ECFs can lead to operational impacts, or at the very least, a quick loss of confidence in the installed system. ECFs are highly scrutinized features at military installations and often garner a lot of attention from many different subject matter experts. For an installation, this attention can lead to many recommendations without coordination. This situation can create not only missed opportunities but also uncoordinated recommendations.

Exhibit 4: ECF Processing Rates

Processing Technique	Assumed FPCON	Manual Checks		Checks Using Handheld Devices		Structrual Mounted Devices	
		Single Lane Checks	Tandem Lane Checks	Single Lane Checks	Tandem Lane Checks	Without Traffic Arms	With Traffic Arms (Up/Down For Each Vehicle)
		vphpl	vphpl	vphpl	vphpl	vphpl	vphpl
Vehicle identification only	Alpha	800 to 1,400	NA	NA	NA	800 to 1,400	550 to 800
Vehicle and occupant identification	Bravo, Bravo+ and Charlie	300 to 450	400 to 600	275 to 375	350 to 475	400 to 450	325 to 350
Inspection of mission essential vehicles only	Delta	20 to 120	NA	20 to 120	NA	NA	NA

**Notes: See Pamphlet 55-15 page 2-16 for additional information regarding this chart*

SMART Projects

Many installations may not have the available resources to conduct SMART assessments in a timely manner. This means that contractor services must be retained to accomplish the task.

Scoping a SMART Traffic Engineering Assessment

Whether internal or external resources are utilized, one of the most important things that an ECF practitioner may do is properly set the scope of services to be provided and create an action-outcome based agenda.

To that end, SDDCTEA recommends the core objectives shown in the list below to be included as a minimum to what will hopefully become a successful Traffic Engineering Assessment.

- ✔ Assess ECF user concerns and evaluate origins and destinations.
- ✔ Perform an assessment of compliance of existing/proposed facilities with the UFC, the SDDCTEA Pamphlet 55-15 and all applicable service standards and guidance.
- ✔ Conduct a safety review.
- ✔ Perform an inventory of existing infrastructure and operational procedures.
- ✔ Conduct traffic data collection activities, to include 24-hour automated traffic recordings, as well as peak-period visual observations.
- ✔ Conduct a comprehensive review of overall ECF needs (number of ECFs, locations, total lanes) at each installation.
- ✔ Calculate lane requirements with consideration of growth (BRAC, etc), as well as single or tandem lane processing and automation (Structural mounted automation, etc).
- ✔ Identify short-term recommendations to enhance safety and/or traffic operations.
- ✔ Review current designs for standards compliance issues.
- ✔ Identify long-term recommendations.
- ✔ Calculate manpower requirements for all short-term and long-term concepts.
- ✔ Calculate threat requirements including AVB strategy.

Preparing SMART Construction RFPs

ECF construction contracts may be awarded in several ways; however there are steps that can be taken to promote successful projects regardless of the contracting mechanism.

The list below shows what should be provided to the contractor as part of the RFP and what should be required as a minimum from the contractor.

Provide to the Contractor

- ✔ Qualifications requirements
- ✔ Utility information
- ✔ Geotechnical information - borings
- ✔ SMART Traffic engineering assessment
- ✔ Design charrette document
- ✔ Manpower approach and anticipated staffing requirements
- ✔ Site plan and topography – site survey
- ✔ Pavement requirements
- ✔ Preliminary threat calculations and preferred AVB strategy
- ✔ Lighting, power and communication requirements
- ✔ Gatehouse security monitoring system performance specifications
- ✔ Future requirements to be supported

Require from the Contractor

- ✔ Utilize design standards and requirements
- ✔ Provide certification of qualification
- ✔ Schedule
- ✔ Final site plan/ roadway plan
- ✔ Drainage and stormwater plan
- ✔ Signing and pavement marking plan
- ✔ Lighting plan
- ✔ CCTV plan
- ✔ Passive barrier performance plan
- ✔ AVB system plan and test plan
- ✔ Power and communications plan
- ✔ Refined threat calculations

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Reference List

✔ Surface Deployment and Distribution Command Transportation Engineering Agency, SDDCTEA. Pamphlet 55-15, *Traffic and Safety Engineering for Better Entry Control Facilities*. Scott AFB, Illinois, 2009.

✔ Surface Deployment and Distribution Command Transportation Engineering Agency, SDDCTEA. Pamphlet 55-17, *Better Military Traffic Engineering.* Scott AFB, Illinois, 2008.

✔ www.tea.army.mil

Training

Continuing Education	Phone	Web Site
Pennsylvania State University;		
The Pennsylvania Transportation Institute	(814) 865-4700	www.pti.psu.edu
University of Maryland;		
Md. Transportation Technology Transfer Center	(301) 403-4623	www.ence.umd.edu/tttc
Georgia Institute of Technology	(404) 385-3501	www.gatech.edu
Northwestern University Center for Public Safety	(800) 323-4011	www.northwestern.edu/nucps/index.htm
Texas A&M University	(979) 845-3211	www.tamu.edu
University of Washington; College of Engineering	(206) 543-2100	www.engr.washington.edu/epp

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