Traffic Engineering and Highway Safety Bulletin 19-03
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Entry Control Facility (ECF) Development Process

In This Issue…

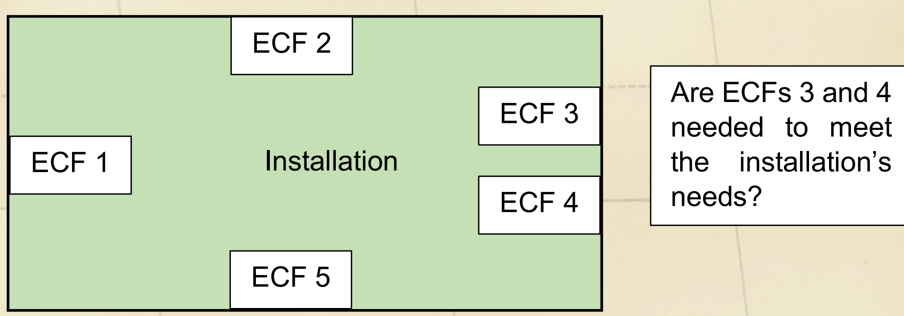
Overview

The term “entry control facility” encompasses the overall layout, organization, infrastructure, and facilities of an entry or access point. Throughout this bulletin, the term ECF will be used. It should be noted that ECF is synonymous with access control point (ACP) used in some service publications. Others commonly refer to an ECF as a gate. The objective of an ECF is to secure the installation from unauthorized access and intercept contraband (weapons, explosives, drugs, classified material, etc.) while also maximizing vehicular traffic flow. An ECF is crucial to ensuring the proper level of access control and maintaining safety for all DOD personnel, visitors, and commercial traffic to an installation.

This bulletin serves as a guide to the pre-planning, conceptual design, and final design processes for ECFs. Note that the information provided is not all-encompassing and readers are encouraged to refer to UFC 4-022-01 *Entry Control Facilities/Access Control Points*, the *Army Standard for Access Control Points,* and the *Army Access Control Points Standard Design*. For guidance on improving traffic operations and safety at ECFs, refer to SDDCTEA’s Pamphlet 55-15.

Pre-Planning

A thorough pre-planning process will help ensure that ECFs meet an installation’s needs, satisfy ECF priorities and functions, and accommodate future development plans. A systematic assessment of individual ECFs can help identify short- and long-term needs that are required to address security, safety, and traffic flow. A comprehensive review may identify opportunities for consolidation of other approaches and/or gates that may reduce operational resource needs. Early in the development process, stakeholder coordination is important to identify priorities and/or expectations for the ECF. It may also be helpful to coordinate with the state department of transportation or other local government agencies to assess impacts that outside projects may have on the installation. This can be accomplished by holding a kickoff meeting where all of the issues can be discussed.



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Note that the timing of planning and traffic studies can vary depending upon the situation. If it is simply reconstructing an existing ECF, then the traffic study can occur before or after the planning charrette. If it is a major relocation, then it may be necessary to hold a planning charrette before the traffic study to ensure all issues are identified before a traffic study is conducted.

Traffic Engineering and Safety Study

Once a comprehensive review of the ECFs is completed by installation stakeholders to identify short-term and long-term needs, a traffic engineering and safety study must either be conducted by SDDCTEA or conducted by a contractor and then validated by SDDCTEA prior to initiating ECF/ACP planning and programming documentation (UFC 4-022-01, Page 18). Although an ECF study does not have to be conducted by SDDCTEA, it is recommended that the installation coordinate with SDDCTEA prior to contracting a study in order to increase the likelihood of the study being validated by SDDCTEA. This engineering and safety study is recommended prior to the modification of an existing ECF/ACP and prior to the implementation of active vehicle barriers (AVBs) and automated equipment. However, a study is required prior to the major modification of an existing ECF/ACP and prior to the design of a new ECF/ACP. To conduct a traffic engineering and safety study, or to gain an understanding of what to expect from a study conducted by SDDCTEA, refer to SDDCTEA Pamphlets 55-15 and 55-8. An installation can request a traffic engineering and safety study from SDDCTEA by using the online form provided on SDDCTEA's website: https://www.sddc.army.mil/sites/TEA/Functions/SpecialAssistant/TrafficEngineeringBranch/Documents/SDDCTEA_Traffic_Engineering_Service_Request.pdf

The form requires contact information, a description of current issues, a scope statement, and installation stakeholder points of contact. From the description of current issues and the scope statement, SDDCTEA can develop a scope that meets the needs of the installation. Common issues associated with an ECF include traffic queuing and congestion, inadequate security measures to meet UFC (or Army) requirements, as well as traffic and guard safety concerns. Issues also could include future growth due to population reassignments, thereby adding traffic to an already congested ECF. The scope statement should describe the study extents in detail. For example, if during the pre-planning process it was decided by stakeholders that specific ECFs should be consolidated and/or relocated, then all operational ECFs should be included in the assessment since they would all most likely be impacted. Another example would be if an ECF is used for special purposes or for truck processing. Additionally, key items such as weekend drill duty, graduation days, or other special events that generate a high level of traffic should also be addressed. If any of these were to apply, the installation should provide dates and any operational changes made to accommodate the traffic patterns.

Once the ECF study request is submitted, SDDCTEA will determine the timeline of the study based on available funding and the current backlog of requests. There is no set process that a traffic study must follow but SDDCTEA has developed a schedule that delivers consistent results. The schedule followed by SDDCTEA for an ECF study is shown in figure 1:

Figure 1 Typical ECF Study Deliverables and Schedule*

Deliverable	Description	Schedule
In-brief Presentation and Site Visit	In conjunction with the designated installation POC, a face-to-face in-brief presentation/meeting is scheduled. Typically, the meeting is conducted at the start of the site visit. The site visit focuses on data collection which commonly includes traffic counts and assessments of the ECF(s) and adjacent (internal and external) intersections.	3-4 days for inbrief and data collection activities
Draft Report and Out-brief Presentation	The draft report includes adequate text, illustrations, and data to thoroughly document existing conditions and deficiencies; as well as to support the recommended improvements. Recommendations for all necessary improvements are described in text and illustrated. Conceptual drawings for the ECFs and any long-term intersection improvements are also provided. The draft report is provided to installation personnel prior to or at the out-brief presentation. The out-brief presentation provides an overview of the findings and recommendations detailed in the report. Input from installation stakeholders is taken into consideration for the next deliverable.	Due 120 days after completion of initial site visit
Draft Final Report	The draft final report includes an executive summary of the findings, cost estimates for all recommendations, and revisions due to draft report comments received from installation stakeholders.	Due 30 days after the outbrief
Final Report	The final report is a revised version of the previous deliverable based on comments received from installation stakeholders, and also includes electronic appendices. The installation is provided with bound paper copies of the final report and a disk containing the electronic appendices. The disk also includes CAD and/or GIS files that can be utilized by the installation as a starting point for final design of the recommended improvements.	Due 30 days after review period

** Note: The study may be conducted by SDDCTEA personnel or a contractor representing SDDCTEA. In this case, each deliverable is reviewed by SDDCTEA prior to submittal to the installation.*

Pre-Site Visit

Prior to a site visit by SDDCTEA or a contractor representing the agency, having existing information enables the team to properly determine what actions are required when on site. Gathering data and documentation prior to conducting the onsite ECF evaluation is an important part of the evaluation process that cannot be overlooked. The success of the ECF evaluation depends 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. The checklist shown below in figure 2 is information that should be gathered by the designated installation POC and provided to SDDCTEA (or representing contractor) as part of pre-site visit activities.

Figure 2 Pre-Site Visit Data and Documentation Gathering

Data	Considerations
Previous Studies	• SDDCTEA studies (can be found on SDDCTEA portal page or by request) • Major command studies • Security studies
Planning Data	• Master planning • Base Realignment and Closure (BRAC) • Deployment • Local growth
Electronic Mapping	• Aerial mapping at ½ meter resolution, geo-referenced
Force Protection Information	• AT measures at different FPCONs
Signalized Intersection Data	• Signal phasing • Timing plans
Crash Data	• Number of crashes • Location of crash • Type of crash (angle, head-on, sideswipe, property damage, rear-end) • Injury level • Time of day
Staffing Levels	• Total number of staff at ECF during peak times • Total number of staff at ECF during non-peak times • Vehicle processing techniques (single, tandem, other) • Pedestrian and bicycle processing procedure • Personnel dedicated to inspections • Visitor’s center staffing during peak times
Historical Traffic Volumes	• Automated traffic recordings of inbound and outbound traffic volumes • Peak hour ECF volumes • Maximum ECF queuing during peak times • Peak hour turning movement counts at adjacent intersections • 24-hour and peak hour truck volumes • 24-hour and peak hour pedestrian and bicycle volumes • Visitor’s center demands and processing • Inspection procedures and processing (POVs and Trucks)
Visitor Passes and Photo Passes	• Visitor passes must be obtained for the study team when comprised of contractors without a Common Access Card • Some installations require that the security forces be notified of photo taking while others require a photo pass • Information needed to obtain either pass should be requested and provided in advance of the site visit, being mindful to the installation’s processing time and protocols

Concept Development

After the site visit, the collected data is analyzed, and a draft report is developed that details existing conditions, deficiencies, recommendations, and conceptual designs for the ECF(s). The data collected, and calculated, throughout the study process dictates the design of the ECF. Critical information includes the following:

- Current peak hour demand volume for both POVs and commercial vehicles.
- Current peak hour vehicle search demand volume for both POVs and commercial vehicles.
- Current peak hour pedestrian and bicycle demand volume.
- Reasonable development of proposed design demand (*hourly*) volume).
- Capacity impacts caused by intersections or other roadway features prior to the approach zone and immediately after the response zone. *(Intersections and other roadway features that are located within the approach and response zones must also be analyzed for traffic volume impacts.)*
- Required number of ID check lanes.
- Visitor control center (VCC) processing and parking requirements.
- Design vehicle turnaround/rejection and pathway requirements.
- Threat containment requirements.

During the course of the study, the installation is provided two opportunities to review and comment on the contents of the report: after the draft report submission and after the draft-final report submission. For a study conducted by SDDCTEA directly (i.e., not by a contractor), the installation only reviews the draft submission. The installation should review the report and drawings in their entirety. Given that SDDCTEA focuses their efforts on ensuring sound engineering practices are utilized, as well as compliance with military, federal, and state guidelines/standards; the installation should pay special attention to the study's interpretation and use of the material provided by the installation. Listed below are key items that the installation stakeholders should consider when reviewing a study:

- Cost Feasibility of Improvement Recommendations
- Standoff Distances
- Compatible Land Use
- Environmental Constraints
- Master Plans and Future Development Plans
- Multi-Modal Accommodations

These key items are further discussed below.

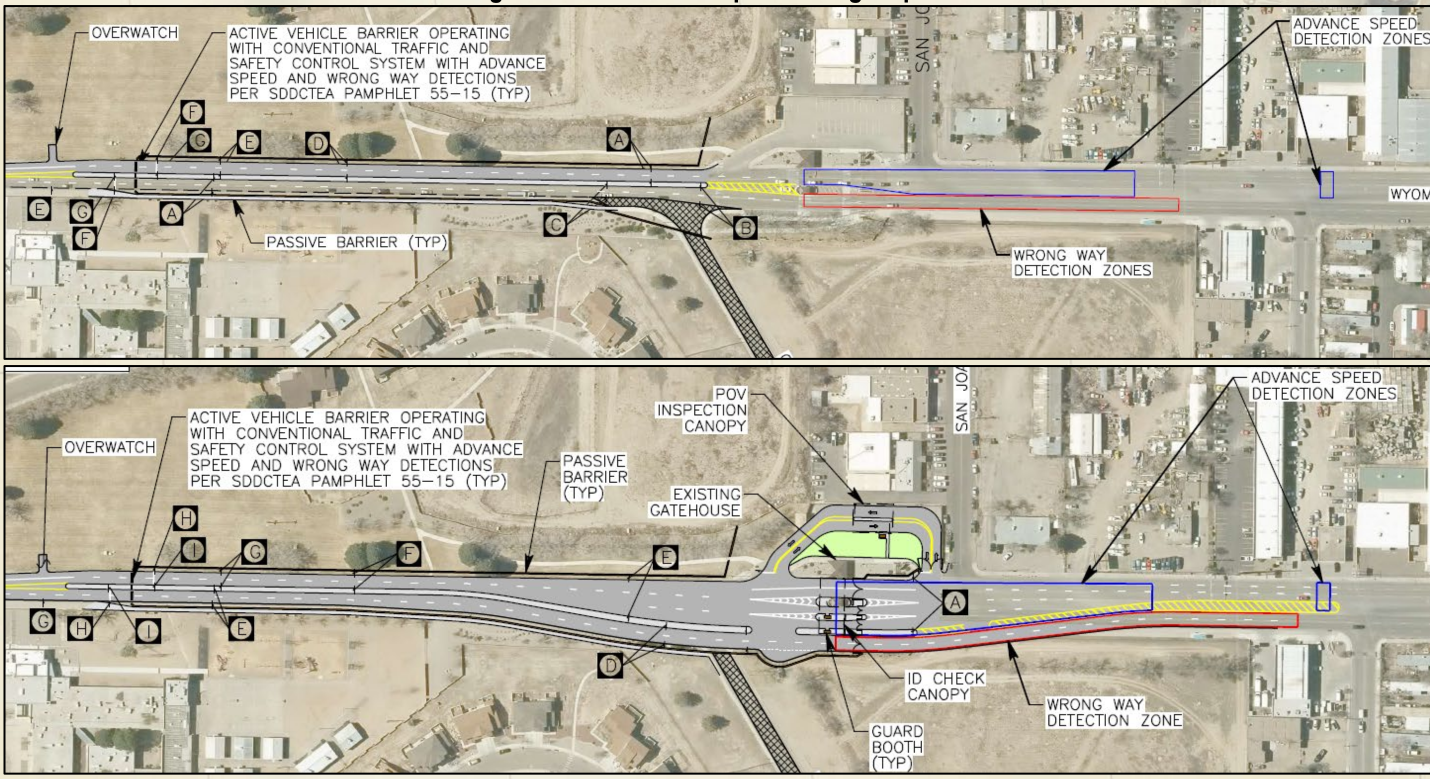
Cost Feasibility of Improvement Recommendations

Costs for upgrading an existing ECF or constructing a new ECF can range from several million dollars to tens of millions of dollars depending on the size, location, type of upgrades, etc. A military installation can only allocate a set amount of money or obtain limited funding for such construction. Therefore, it is up to the installation to determine if the conceptual designs provided by the study team meet their needs or exceed their needs. SDDCTEA recommendations are not limited by programming limitations, i.e. MILCON limits, as we focus on providing the best traffic engineering solution. It is the responsibility/risk of the installation to "break apart" recommendations in order to implement in stages. SDDCTEA can offer opinions on an installation's plan to implement, if requested.

In many cases, installations seek low-cost options such as replacing the passive and active barrier systems to meet threat containment requirements, constructing additional ID check lanes to meet increased demand, or constructing a POV or truck inspection area to meet inspection requirements. Interim-options that include these incremental improvements and also long-term options that present a fully compliant ECF can be provided.

Figure 3 below illustrates two conceptual designs for an ECF. The first design provides threat containment (in accordance with the UFC or Army Standard) by creating a secure perimeter with passive and active barriers, and also utilizes a SDDCTEA-approved AVB Safety Scheme for safety of the innocent drivers. It does not, however, bring the ECF into UFC/Army-compliance as it relates to facilities. Nor does it address future traffic volumes. The second design builds upon the previous design and includes a new ID check area to accommodate an increase in demand volume.

Figure 3 Conceptual Design Options



Background images source: Google Earth

Standoff Distances

The ECF is designed to dampen possible threats from outside sources. For this reason, the probability of a terroristic explosion in an ECF is higher than at other areas within an installation. When planning for an ECF location, it is important for planners to understand the design strategies used in determining standoff distances from protected facilities. Standoff distance refers to the shortest straight-line distance between a structure and a potential explosion location. For an ECF, the closest potential explosion location is the point on passive and active barriers closest to the structure.

Conceptual designs developed by SDDCTEA (or representing contractor) use the minimum standoff distances in UFC 4-010-01 *DoD Minimum Antiterrorism Standards for Buildings*. The publication also lists conventional standoff distances based on level of protection (i.e., low, medium, and high), explosive weights, and materials used for construction. The installation must determine the standoff distance required for final design and allow for building hardening if the conventional construction distances cannot be met. If the installation concludes that the ECF is better suited for another location or can be configured differently based on the infeasibility of hardening the buildings, then input can be provided during the review process of the study. The base planner can also facilitate coordination with Antiterrorism/Force Protection (AT/FP) experts to assist understanding of spatial separation requirements.

Compatible Land Use

If possible, ECFs should not be located near mission-critical areas, restricted areas or residential areas unless the ECF's purpose is to serve that area. The installation should make the study team aware of these areas and/or provide master and future development plans for the installation and the surrounding community that detail the information.

Environmental Constraints

It is important to consider the impact to existing environmental systems as well as constraints that may prohibit development in certain areas, including wetlands, protected habitats and resources, and restoration sites. The installation should provide either an aerial map, GIS files, or CAD files showing the approximated areas, so they can be avoided. SDDCTEA will not conduct an environmental survey. If the installation does not provide constraints, SDDCTEA recommendations will be based upon those constraints or the lack thereof.

Master Plans and Future Development Plans

ECFs are key nodes within installation circulation plans. Base circulation/transportation plans address the critical relationship between circulation and land use. The installation's future development, mission changes, population, facilities, and infrastructure must be synchronized with its circulation system. The installation planner should provide SDDCTEA or the contractor with information regarding development scenarios, future facility projects, land use patterns, strategic vision, base capacity profile and other planning considerations impacting access to the base cantonment area, military family housing, training and operating areas, and critical linkages with regional transportation systems.

The calculated future traffic demand for ECFs, intersections, and roadways utilize ITE trip generation analysis. Typically, traffic is distributed and assigned to the affected study intersections and roadway locations. The independent forecasting for the future traffic is to be based on known building construction and/or relocation, the Master Plan, BRAC, Grow the Army, and/or other known re-stationing. This information is to be provided by the installation to SDDCTEA (or representing contractor). If this information cannot be provided, a growth factor can be applied to the volumes based on estimates provided by installation personnel.

Multi-Modal Accommodations

Emphasis on alternative transportation modes encourages future demand for pedestrian, bicycle, and van/car pool or bus lanes to expedite safe access to the installation. Although pedestrian and bicycle data is captured as part of the data collection, the installation should still provide any additional information such as typical pedestrian or bicycle routes or any directives to increase multi-modal accommodations at a specific ECF to encourage more pedestrian or bicycle traffic. Accommodations such as bike lanes, pedestrian turnstiles, or even a dedicated pedestrian ECF can be provided in the conceptual design to meet the needs of the installation.

Conceptual Design

Following the conceptual design(s) presented in the traffic study report, the final design plans are developed for use during construction of the ECF. While the conceptual ECF design is intended to be geometrically accurate and to account for the constraints provided by the installation, the final design can differ significantly when translating the design to a 3-dimensional model. Note that SDDCTEA (or representing contractor) does not develop final design plans for ECFs. The final design plans should be developed by the installation or through a design firm contracted with the installation. Key items that are accounted for in the final design are shown below:

- Cross-sections
  - Travel Way and Lane Width*
  - Curb and gutter*
  - Shoulders*
  - Clear zone*
  - Medians and traffic islands*
- Turning movements and turning radii
  - Turn around/denial/exit points*
  - Large truck accommodations*
- Horizontal alignment
  - Horizontal curves*
  - Lane widening*
  - Horizontal Tangents and Transitions*
  - Horizontal Sight Distance
- Vertical alignments
  - Vertical clearance
  - Vertical curvature
- Environmental assessment and mitigation
- Stormwater management
- ABA-ADA accessibility
  - Sidewalks, bike facilities, curb ramps, etc.*
- Other geometric elements
  - Transition tapers*
  - Drainage
- Pavement design
- Passive and active barrier design
  - Threat calculations*
  - Barrier placement*
  - Selecting building materials, determining building hardening, and incorporating appropriate conventional standoff distances based on UFC force protection standards
- Signing, traffic signals, and pavement markings
  - Requirements*
  - Types*
  - Sizes and Legibility*
  - Retroreflectivity requirements*
  - Station and offsets
- Utility sources and design
- Lighting design
- Landscaping, aesthetics, and architecture
- Construction impacts and mitigation
- Work zone phasing – especially if gate remains open during construction

* Indicates that the item is provided in the conceptual design provided by SDDCTEA (or representing contractor) but should be verified during final design.

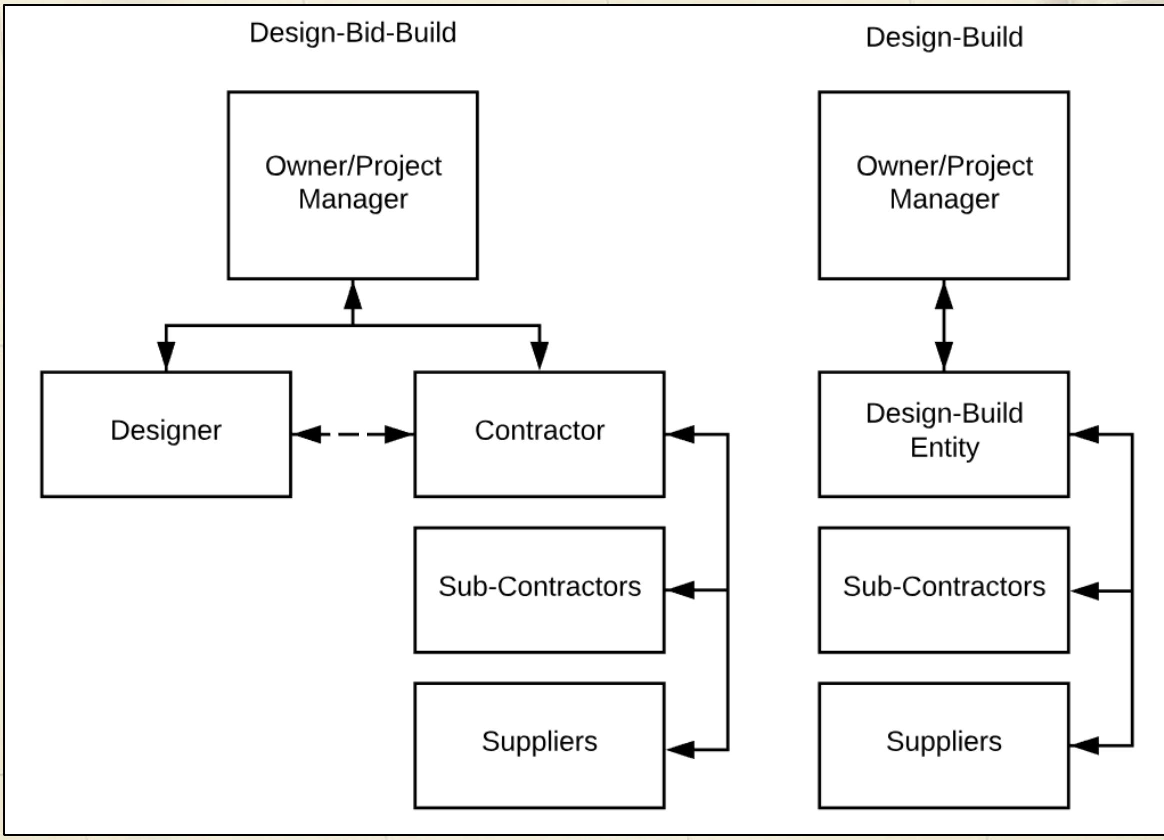
Contracting Mechanisms

Improvement projects such as ECF projects can be completed under numerous contractual formats between the owner and design and construction service providers. The most common are design-bid-build (DBB) and design/build (DB). The structure of each contracting mechanism is shown in figure 4.

Design-bid-build: This is the most traditional process in the U.S. construction industry, where the owner contracts separately with a designer and a construction contractor. The design firm is hired to deliver 100 percent complete design documents. The owner or agent then solicits fixed price bids from construction contractors to perform the work. Designers and contractors bear no contractual obligation to one another. While the owner bears all risk associated with the completeness of the design documents, the owner has a designer representing them without conflict to provide technical oversight during construction.

Design/build: Under this method, an owner typically hires a single entity, the designer/builder, to perform both design and construction under a single contract. Portions or all of the design and construction may be performed by the entity or subcontracted to other companies. DB is characterized by high levels of collaboration between the design and construction disciplines, input from multiple trades into the design, and a single entity bearing project risk. Typically, the general contractor is responsible contractually for this delivery method, but the owner must provide sufficient technical oversight for the entire process, from preparation of the request for proposal (RFP) through design and construction.

Figure 4 DBB and DB Structures



Installations that want to control the design and construction process and have sufficient personnel or a firm to closely watch the process may be more suited to the DBB process; especially if they are willing to bear the risk that the design will be complete and include sufficient constructability analysis and contingencies to absorb potential costly change orders. The results from a DBB approach generally are better for very simple and predictable projects. However, DB projects typically outperform DBB projects in terms of cost and schedule performance, quality outcomes, reduced owner risk, change orders and the ability to respond to evolving facility needs.

ECF Study Checklist

The checklist in figure 5 on the following page summarizes information that should be obtained before the site visit or provided during the review process, items the installation should consider when reviewing ECF conceptual drawings, and the items provided by SDDCTEA (or representing contractor) in the final report. Note that the final report items listed may be excluded from a study at the discretion of SDDCTEA and some additional items may be included in the study as needed, such as a speed study, origin-destination study, additional intersection counts, sign assessment, pedestrian/bike assessment, etc. The installation should review the study to ensure that information provided by the installation for the study is interpreted properly and also ensure that recommendations are feasible.

Figure 5 ECF Study Checklist

	Pre-Site Visit / Installation Review		Concept Review		Final Report Review Items
	Previous SDDCTEA studies		Addresses both motorist and personnel safety concerns		24-hour and peak hour ECF volumes
	Major command studies		Addresses security concerns		ECF queueing information
	Security studies		Addresses capacity and congestion issues		Peak hour intersection volumes
	Master planning documents		Meets standoff requirements		24-hour and peak hour truck volumes
	BRAC information		Accommodates design vehicles		24-hour and peak hour ped/bike volumes
	Deployment information		Meets functional use classification (i.e., primary, secondary, limited use, pedestrian access)		24-hour and peak hour roadway volumes
	Local growth information		Has feasible and cost-effective design		Roadway speed data summary
	Aerial mapping (high-resolution, georeferenced)		Has reasonable operational costs and manpower requirements		Existing ECF compliance assessment
	AT measures at different FPCONs		Complies with master plans and/or future development plans		Intersection and ECF traffic safety assessment
	Signal timing plans		Meets compatible land use requirements		Calculation of future demand
	Crash data (location, type, injury level, time of day, etc.)		Complies with environmental constraints		Trip generation and trip distribution
	Staffing Levels (peak and off-peak)		Accommodates all modes of transportation such as pedestrians and bikes (when applicable)		Intersection and ECF capacity analysis
	Vehicle processing procedures		Avoids costly utility adjustments		Required number of ECF processing lanes
	Ped and bike processing procedures		Meets installation property boundary requirements		Assessment of ECF manpower needs
	Inspection personnel		Accommodates both random and select vehicle inspections		Visitor center processing and parking requirements
	Visitor center staffing		Accommodates truck inspection needs (i.e., holding area, search office, inspection equipment, etc.)		Design vehicle turnaround and pathway requirements
	Historical 24-hour and peak hour ECF volumes		Accommodates visitor processing and parking demands		Threat containment requirements
	Historical ECF queueing information				Photographs of all deficiencies within study area
	Historical peak hour intersection volumes				Short-term recommendations and cost of improvements
	Historical 24-hour and peak hour truck volumes				Long-term recommendations and cost of improvements
	Historical 24-hour and peak hour ped/bike volumes				Conceptual ECF, intersection, and/or roadway drawings
	Historical visitor center demand				
	Visitor passes (if applicable)				
	Photo passes (if applicable)				
	Cost feasibility of improvements				
	Standoff distances				
	Compatible land use				
	Environmental constraints				
	Multi-modal accommodation needs				

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Reference List

- ☑ TEA Home: http://www.sddc.army.mil/sites/tea
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