

COMBINED ARMS COLLECTIVE TRAINING FACILITY  
(CACTF)  
NARRATIVE DESCRIPTION



**Definition:** (from TC 90-1) The terms "urban operations" and "UO" replaces all instances of "military operations on urbanized terrain" and "MOUT."

**MILITARY OPERATIONS ON URBANIZED TERRAIN:** In the past, Army doctrine characterized urban areas as a type of specialized terrain, like jungles and mountains, and called operations in this type of terrain *military operations on urbanized terrain* (MOUT). Doctrine emphasized tactical warfighting tasks on this terrain, which was characterized by densely situated buildings and streets, and assumed the enemy consisted of conventional (Soviet-type) forces. Defeating or destroying those forces overrode all other considerations.

**URBAN OPERATIONS :** The concept of UO assumes that the urbanized terrain is populated, and that the populace must be a foremost consideration. UO recognizes that the populace can help either side, and that it requires a working infrastructure. Urban operations, whether against an insurgent or unconventional enemy, thus vastly differ from MOUT ([Table 1](#)).

**Table 1. Comparison of MOUT and UO.**

	<i>MOUT</i>	<i>UO</i>
Enemy force	Conventional, Soviet type	Insurgent or unconventional
Mission	Defeat or destroy enemy above all other considerations	Defeat the enemy Gain and retain the good will of the populace
Populace	Not considered	Important consideration

Although certain techniques and tactics are common to both types of operations, UO goes beyond MOUT, focusing not only on defeating the enemy, but also on gaining and retaining the good will of the population. UO consider the complex and dynamic interactions and relationships between the urban area’s key components--the terrain (natural and manmade), the population, and the supporting infrastructure--as an overlapping and interdependent system of systems.

A single urban operation may include the full range of Army operations--offensive, defensive, stability and support --that may be executed, either sequentially or simultaneously (FM 3-06, Chapter 1). Furthermore, to accomplish an objective, UO demand working with sister services, US government agencies, nongovernmental organizations, and regional and international organizations.

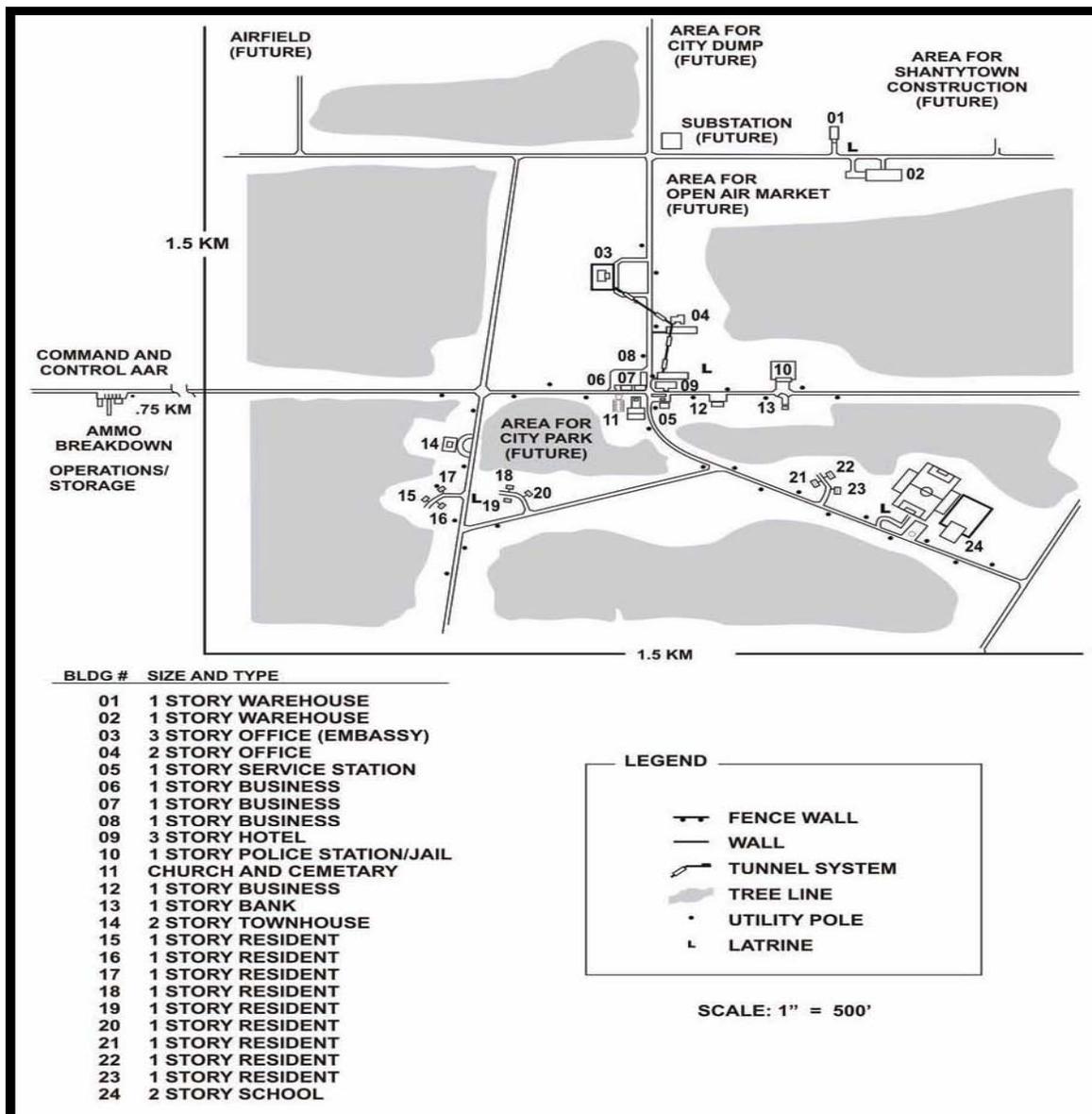
Purpose: The information in this document is based on TC 25-8 Training Ranges dated 5 April 2004 and TC 90-1 dated May 2008, FCC 17901. The Combined Arms Collective Training Facility (CACTF) is a training facility designed to conduct multi-echelon, full-spectrum operations training up to battalion task force (TF) level. Situational Training Exercise (STX) and support and stability operations tasks are provided to assist the company and platoon units in developing training plans. The leader or commander is provided with a CACTF to evaluate unit urban operations proficiency. The CACTF is intended to support blank fire, Multi-Integrated Laser Engagement System/Tactical Engagement System (MILES/TES), Special Effects Small-Arms Marking System (SESAMS), STX, and Field Training Exercise (FTX) scenarios on a semiannual basis. The CACTF supports branch-specific lane training and combined arms training up to battalion level across the full spectrum of the following operations: offense, defense, stability, and support.

Description: The CACTF replicates an urban environment. The facility consists of 2.25 square kilometers of urban sprawl with 20 to 26 buildings, roads, alleys, parking areas, underground sewers, parks, athletic fields, and a command and control building. (See the ROCA Details file in the Appendix of this document). The actual size and configuration of the CACTF depends on the local installation site requirements. The CACTF is designed to support heavy and light infantry, armor, artillery, and aviation

positioning and maneuver. Table 2 (from TC 90-1) below displays the recommended building types and features in the CACTF and Figure 1 shows a sample layout.

20 TO 26 BUILDINGS (1.5 km by 1.5 km)	
➤ Tunnel/sewer system.	➤ Props/furniture.
➤ Shanty town.	➤ Targetry.
➤ 1 three-story building.	➤ Audio/image capture with an EDIT/REPLAY.
➤ 3 two-story buildings.	➤ Control Building with AAR facility.
➤ Industrial area.	➤ Breachable walls.
➤ Electricity and potable water.	
➤ City dump.	

Table 2. CACTF Characteristics



## Figure 1. Sample CACTF Layout

The CACTF is a non live-fire training facility designed to accommodate the MILES training system. The CACTF consists of buildings and vehicular and pedestrian circulation systems. Supporting features, such as overhead and underground utility systems, walls and fences, and streetscape elements arranged to depict urbanized terrain, may be added as options.

Land Requirements: CACTF land requirements encompass two areas--the control/staging area and the urban complex.

Maneuver and Staging Area. The CACTF must include sufficient training lands to support a peripheral maneuver and staging area surrounding a built-up urban complex. The maneuver and staging area training lands must:

- a. Provide a generally unobstructed maneuver area surrounding the urban complex.
- b. Provide site characteristics that reinforce the realism of the training exercise.
- c. Accommodate peripheral tank maneuver trails concealed from the urban complex for undetected maneuvering in the staging areas.
- d. Provide cover and concealment for staging and maneuver operations.

Urban Complex. The complete built-up urban complex, as shown in the Layout Details in the Appendix of this document, requires about 1.5 kilometers by 1.5 kilometers (556 acres).

Siting. The designer must site-adapt the arrangement of the CACTF components (roads, buildings, and supporting features), ensuring that the layout complies with the training objectives in TC 90-1, TRAINING FOR URBAN OPERATIONS. These objectives must be incorporated into the design. A proposed site for the CACTF should satisfy the following criteria:

- a. The site should accommodate lay-of-the-land development and require minimal site work with respect to topography or vegetation; the site should contribute to and enhance training realism.

CACTF Built-Up Urban Area. This area must be arranged as follows:

- a. The urban complex must consist of residential, retail/commercial, public institutional, high-density residential, and light industrial land-use categories that are arranged in distinct sectors within the overall urban layout.

- b. Land-use sectors must be arranged to provide an increasing level of urbanization from the periphery to the center of the urban complex.
- c. The built-up urban area must approximate a radial pattern, concentrating the highest level of urbanization near the center of the urban complex.

CACTF Building Siting. The buildings that compose the CACTF are the most dominant elements within the urban complex. The position of buildings within the urban complex implicitly defines the exterior space; it is essential, therefore, that the siting of each building be based on the relationship of the building to the comprehensive urban layout. The arrangement of buildings in the CACTF built-up urban complex must accomplish the following:

- a. Limit unobstructed line-of-sight to approximately 90 meters (300 feet) on the ground plane.
- b. Channel vehicular and nonvehicular flow to control the degree of accessibility throughout the urban area.
- c. Site buildings to delineate exterior space, providing a diversity of urban open space in terms of volume, configuration, and enclosure.
- d. Exploit the inherent structural characteristics of each building, such as height, window arrangement, and mass, in order to maximize tactical opportunities.

CACTF Enclosed Space. The arrangement of buildings influences the degree to which open space is enclosed in the urban area. The following guidelines should help create enclosure:

- a. For residential and light industrial land use, the horizontal distance to the farthest vertical enclosing element should be approximately four times the vertical height of the enclosing element.
- b. For public/institutional, high-density residential, and retail/commercial (central business district) land use, the horizontal distance should be, at most, three times the vertical height of the enclosing element.

CACTF Urban Open Space. Open space in the urban complex consists of dedicated and vacant areas dominated by a relatively unobstructed horizontal ground plane, such as a plaza, park, or parking area. Open space in residential and light industrial areas is defined by ground plane delineation, such as roads, drainage, corridors, and low-level (single- and two-story) structures. In urban land-use areas (such as high-density residential, public/institutional, and retail/commercial areas),

open space is characterized by a predominantly hard-surfaced ground plane and rigidly defined by two- and three-story structures providing a high degree of spatial enclosure. Urban open-space layout considerations must include the following:

- a. Provision for the diversity of spatial configuration and visual openness.
- b. Provision for a variety of categorical open spaces, such as the highly structured, hard-surfaced plaza located in the central business district, vacant service areas located to the rear of major building complexes, and residential open space providing natural ground covers.

**Topography.** Where possible, the CACTF built-up urban complex should occupy gently rolling terrain. The maximum recommended slope gradient for lay-of-the-land roads within the built-up urban complex is approximately 15 percent.

**Soils.** The soil characteristics within the built-up urban complex should provide a stable subsurface that shall support the building foundations for the representative structures shown in the Layout Details in the Appendix of this document and the roads accommodating the largest vehicles used in the complex.

**Drainage.** The CACTF area should be well drained. Existing natural drainage should be incorporated into the overall facility drainage design when possible.

**Vegetation.** Existing vegetation throughout the CACTF area should be retained and incorporated into the overall facility plan when possible.

CACTF Structures: The CACTF is composed of buildings representing a generic architectural style that incorporates specific training features. The conceptual drawings give the basis for the preparation of detailed design documents. The detailed design of CACTF buildings must incorporate the specific special features listed below in Table 3.

Buildings	Drawing Numbers	Specific Features				
		Roof Hatches	Mouse Holes	Loop Holes	Reinforced Window Ledges	Rappel Anchors
Warehouse	CTF-03	X				
Municipal	CTF-04, CTF05			X	X	X
Office	CTF-6		X	X	X	X
Service Station	CTF-7					
Hotel	CTF-8	X	X	X	X	X
Police Station/Jail	CTF-9					
Church	CTF-10			X	X	
Business	CTF-11	X	X	X	X	X
Bank	CTF-12		X	X	X	
Townhouse	CTF-13		X	X	X	X
Residential	CTF-14	X	X	X	X	
School	CTF-15		X	X		

Table 3 - Special Features

#### Architectural Considerations:

**Durability and Performance Characteristics.** The CACTF structures must be designed and constructed of durable, cost-effective materials that have a projected 25-year life span. All structural designs should be based on site-specific conditions and must meet or exceed the normal floor live load of 2.5 kPa (50 psf) for buildings and 5 kPa (100 psf) for stairs.

The designer may substitute locally available materials that equal or exceed the durability and performance characteristics of the materials recommended herein. Building foundation and roof load requirements must be designed to accommodate site-specific conditions.

The buildings referred to in this document have not been designed as waterproof structures. Therefore, all masonry walls exposed to the weather must receive a waterproofing treatment.

Features. The following features are unique to the CACTF buildings:

Mouse Holes. These are 600- by 600-millimeter (2- by 2-foot) holes randomly located in walls and floors. Floor mouse holes must have a hinged cover flush with the floor and must be designed to withstand floor live load.

Loop Holes. These are randomly spaced 200- by 400-millimeter (8- by 16-inch) openings in exterior walls and roofs. Loopholes on gabled roofs must be flashed in order to protect wooden structures from rain runoff. Loopholes in exterior walls must be a minimum of one course above the finish floor. Loopholes must not be located directly below second- and third- story window openings.

Roof Hatches and Openings. All two- and three-story CACTF structures must provide 600- by 600-millimeter (2- by 2-foot minimum size) access through the roof.

Reinforced Window Ledges. All structures must be equipped with reinforced window ledges. The reinforced window ledges on the second and third story must be protected from grappling hook impact.

Rappel Anchors. These anchors should be composed of steel rings with a minimum 50-millimeter (2-inch) diameter. They must be securely mounted in the upper-level floors and roofs of two- and three-story flat-roofed buildings and must be capable of supporting a 1,555-newton (350-pound) live load. Rappel anchors should be located in each quadrant of two- and three-story flat-roofed buildings and randomly located throughout the upper floors of other types of two- and three-story buildings. Two rappel anchors--300 millimeters (12 inches) apart--must be located at each anchor point.

Plumbing Vent Pipes and Chimney Stacks. All structures with gabled roofs must be supplied with randomly located plumbing vent pipes and chimney stacks capable of supporting a 1,555-newton (350-pound) live load. All plumbing vent pipes must be flashed.

Structural Design Criteria. All CACTF structures must be designed in accordance with the following requirements, unless otherwise indicated herein:

- a. Ground floors of all buildings, except those over basement areas, must be constructed of a concrete slab.
- b. All interior floors must be sloped a minimum of 10-millimeters per meter (1/8-inch per foot) to Loop Holes or Weep Holes in order to drain.

- c. All windows must be provided with reinforced window ledges. The use of Shutters are optional.
- d. All exterior masonry surfaces should undergo a sand-finished, earth-tone masonry treatment.
- e. Flat roofs must be surfaced with a 50-millimeter-minimum (2-inch-minimum) concrete topping mixture and sloped a minimum of 20-millimeters per meter (1/4-inch per foot) in order to drain roof outlets.
- f. The top course of a parapet must be reinforced.

Basements. All basement locations in the CACTF should be determined by site-specific conditions. All basements floors should be sloped and provide sufficient drainage to decrease the possibility of standing water. When applicable, design for the track vehicle surcharge on basement walls is the responsibility of the designer.

CACTF Vehicular Circulation System in the CACTF Maneuver and Staging Area: The vehicular circulation system in the CACTF maneuver and staging area should consist of designated tank trails designed in accordance with Army standards.

CACTF Built-Up Urban Complex. The vehicular circulation system in the CACTF built-up urban complex must include primary, secondary, local, and service category roads. The arrangement of roads in the built-up urban complex should be designed to accomplish the following:

- a. Channel the primary traffic flow--vehicles in excess of 8,165 kg (18,000 lb).
- b. Minimize site work through a lay-of-the-land road layout.
- c. Furnish diverse traffic and maneuver situations, incorporating various intersection configurations and maneuver obstacles, such as minimal turning radii and structurally constricted travel ways.
- d. Construction Materials. CACTF roads may be constructed with crushed aggregate material or concrete. The design of concrete roads is addressed in TM 5-822-6. Where crushed aggregate is used, concrete turning pads designed for 54,430 kilogram (120,000 pounds)(category VII) tracked vehicles should be provided at each intersection.

Bridge / Overpass. The primary vehicular route through the urban built-up area should contain a bridge element if the terrain dictates. An arch-type culvert with a minimum span of 7.6 m (25 ft) may be used as an acceptable alternative to conventional bridge construction.

Underground Sewer Network. The CACTF should incorporate a closed conduit storm drainage system. The underground system must include manholes and 107 linear meters (350 linear feet) of 1,050-mm-diameter (42-in-diameter minimum) reinforced concrete or corrugated metal pipe. Layout consideration for the underground system must include the following:

- a. A functionally designed system.
- b. Concentration of the branching portion of the system near the center of the urban complex.
- c. Connection of the underground system for discharge to a peripheral open channel or a natural drainage system.

#### Drainage Provisions.

Interior Drainage. All subsurface features (such as basements and the storm sewer system) within the built-up urban complex must incorporate adequate provisions to ensure positive drainage. The interior floor surfaces of all CACTF buildings should be sloped to discharge storm drainage to drain outlets or discharge points. Basement drains must provide positive drainage.

Slope Requirements. Finished grades adjacent to all buildings should be sloped a minimum of 2 percent away from the buildings in unpaved areas and 1 percent in paved areas. Roads should be sloped a minimum of 2 percent for a cross slope and 1 percent for a longitudinal slope.

Additional Drainage. To ensure positive drainage, site-specific conditions may require additional drainage provisions for the overall CACTF complex.

Scale Model: A scale model of the CACTF must be available for support briefings before operations and for after-action reviews. The model may be located in the CACTF warehouse, which may be used as a briefing/training area. This model may be financed through design funds to facilitate customer understanding of design or through construction funds as a part of the deliverables.