



## Siege Engines Handbook

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## Revision History

Summary of changes from previous version (2016)

Page	Paragraph	Summary of Change	Date approved by BOD
6	III.E.3	Added a type of material ('4710') for the creation of ballista bolts. Material has been tested by the Siege Deputy and found suitable. This will help mitigate difficulty in finding 3408 and 3608.	10/21/2023

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# Introduction

This document is designed to provide a basic structure for the safe and effective administration of siege engine activities within the SCA. These regulations are designed to provide a common structure for siege activities while giving the individual Kingdoms as much freedom as possible to develop their own structure for the support of these activities.

/s/ Arabella da Siena

Society Marshal

# Siege Rules

## I. Marshalling and Authorization

### A. Reporting

1. Each Kingdom shall report its activities involving siege to the Society Earl Marshal's Deputy for Siege on a quarterly basis. Any injury resulting from siege activities and requiring professional medical attention will be reported to the Society Earl Marshal immediately after the event where it occurred. It is recommended that each Kingdom Earl Marshal appoint a deputy to fulfill these duties and to oversee the Kingdom Siege Program.

### B. Siege Engineer Authorization

1. Each Kingdom will have a separate authorization procedure for any person wishing to operate or crew a siege engine. This authorization at a minimum shall include:
  - a. Demonstration of knowledge of the rules for melee combat
  - b. Demonstration of understanding the rules for siege
  - c. Demonstration of ability to safely operate an engine
  - d. Demonstration of ability to inspect engine for safety
  - e. Demonstration of ability to render engine safe, should the need arise
  - f. Understanding of how engines/engineers are killed by opponents
  - g. It is **RECOMMENDED** that engineers be observed for at least 1 battle before authorizations are made final.

### C. Marshalling Siege Combat

1. Marshals trained in siege activities will oversee the inspection of engines and operators and will be present on any field where siege engines are in use. During combat there will be a minimum of 1 Siege Marshal for each end of the field that has a siege engine. It is recommended that there be 1 Siege Marshal for every 3 engines in use.
2. All Siege Marshals shall:
  - a. Be members of the Society for Creative Anachronism
  - b. Be authorized in siege combat, or have gone through a siege marshal training program within their Kingdom
  - c. Have a basic understanding of all major engine types (Ballista/Arbalest, Catapult/Onager, Trebuchet [both counterweight and man-powered])
  - d. Know how to inspect engines and ammunition
  - e. Know the current siege engine regulation
3. In addition to these requirements, Siege Marshals on the field shall:
  - a. Have at least 1 year or 4 events of experience as an engineer, or have completed an appropriate training program within their Kingdom

- b. Know the basics of armored combat marshaling (see Marshal's Handbook) and conduct themselves safely on the field. (Being a warranted armored combat marshal is recommended but not required.)
4. Marshals on the field within the range of siege combat are required to wear eye protection which is sufficient to protect against the missiles in use, such as industrial or sports safety glasses or goggles. Note that SCA legal helms are considered sufficient protection.

## **II. SCA Siege Engines and Structures**

### **A. Types of Siege Devices**

1. There are two types of siege devices: active siege engines and passive siege structures. For the purposes of this document, and to avoid confusion, siege engines shall be defined as those designed to deliver ammunition larger than the already established small arms ammunition.
  - a. Siege engines are broken down into two categories. Type A engines shall be designed to deliver large ammunition to a range between 40 and 80 yards (36.6 and 73.2 meters). Type A engines can use all approved ammunition classes. Type B engines shall be designed to deliver small siege ammunition to a range between 40 and 80 yards (36.6 and 73.2 meters). Type B engines may not use anything larger than small siege ammunition. For the purposes of administration, any device not designed to deliver these types of ammunition will not be considered a siege engine and unless acceptable for use as combat archery, shall not be usable.
  - b. Man-powered trebuchets shall be considered Type B engines and must meet the requirements stated, with the exception that they shall not be required to have a mechanical release or cocking device. These engines may fire up to 2 small siege projectiles, or 2–8 small arms projectiles, per shot.
2. Siege structures will be defined as devices, such as towers or ramps, used to support personnel but not fitted with active weaponry.

### **B. General Siege Engine Regulations**

1. All engines shall have a maximum range of 80 yards (73.2 meters). This is especially important in direct-fire weapons, where range greater than this often results in safety concerns involving extreme minimum-range impact.
2. Engines and their projectiles shall be inspected by a warranted Siege Marshal before being used at that event and after any modifications are made to the engine during the course of an event.
3. Direct-fire engines shall not be discharged against personnel within a range of 30 feet (9.2 meters).
4. No engine will be discharged while any non-crew person is within 5 feet (1.52 meters) of the travel path of moving parts (e.g., a trebuchet will not be discharged while a fighter is standing anywhere in the path of the arm, front or back).

5. Engines must be equipped with a safety device sufficient to prevent accidental firing if they are to be relocated while cocked. Any engine without such a device shall only be relocated while un-cocked.
6. Except for man-powered trebuchets, all siege engines will be fitted with an appropriate mechanical trigger mechanism that shall be used for every shot.
7. Cannons or any replica of cannons are not allowed in SCA combat. Engines may not use compressed or ignited gasses or liquids or combusting materials of any kind to power projectiles.
8. Builders should attempt to visually and functionally recreate period siege engines. Engines shall be powered in a manner functionally consistent with their period counterparts. When period power methods are unsafe or not feasible, alternative sources of power may be used.
9. Any material approved for use in devices on the battlefield may be used in the construction of engines, provided that the materials are sufficient to ensure the safety of the engine. For safety, the following materials have special requirements:
  - a. **Turnbuckles and eye bolts.** When used in or attached to the source of power for an engine, these items shall be rated to withstand 150% of the forces produced (e.g., if the cable attached to a turnbuckle will support 100 pounds [45 kilograms] of tension, the turnbuckle will be rated at 150 pounds [67.5 kilograms] static load). Hardware store and home center hardware is often of low quality and rating, while aircraft or marine hardware is generally more appropriate.
  - b. **Steel cable.** While steel cable is useful for such functions as safe-tying a throwing arm, it will not be used as a bowstring for any type of siege engine.
  - c. **All softwoods and non-laminated hardwoods.**
    - a. When used as the throwing arm for a catapult, trebuchet, or the bow arms of a torsion ballista, they shall be secured against breakage with a minimum of glue-soaked sisal or jute cord wrapping (2-inch wraps every 6 inches [5.2 centimeter wraps every 15.2 centimeters]) over a section of rope glued along the full length of the arm. This will keep the arm from leaving the engine should it break. It is strongly recommended that all arms be wrapped in this manner, regardless of material used.
    - b. When used as the support for the main pivot axle(s) of a catapult, trebuchet, or torsion ballista, a minimum of two layers of wood, glued together with alternating grain directions, shall be used in order to avoid operating stresses causing a separation of the support wood along the grain. Using a structural metal plate through-bolted onto a single layer wooden timber is also an acceptable construction method if the axle passes through the metal plate.
10. Engines shall be durable enough to survive the rigors of combat and, while they should not be struck with hand weapons, should withstand either being struck with a full-force blow or being run into by a combatant.
11. All engines must be free-standing and may not use an operator as part of their support structure. Operators will not be included in measuring the footprint of an engine.
12. Siege Engines shall not have any bolts, or other projections (which may reasonable be expected to contact persons should they fall on the engine) extend more than ½" (1.3cm) into a legal face grill. Any items such as this must be covered with sufficient



rigid material, a Tennis Ball, or a suitable rubber stopper, to prevent them from entering a legal face grill more than ½" (1.3cm). Triggers, release hooks, or other firing mechanism components, that would not normally be in a position that could cause injury should someone accidentally fall on the engine, are exempt from this.

13. All Siege engines and structures will be labeled with the name of owner, group, and kingdom, for the purpose of identification.
- C. Type A engines shall:
1. Have a minimum footprint of 18 square feet (1.67 square meters).
  2. Be able to deliver a large siege missile at least 40 yards (36.6 meters).
  3. Have a mechanical cocking device, such as a winch or windlass and trigger and may not be cocked by hand.
  4. Have a minimum crew of 3 people. Should crew size fall below minimum, the engine will not be operated.
  5. Be able to fire 1 large siege projectile, or up to 5 small siege projectiles, or 2-20 small arms projectiles, per shot.
- D. Type B engines shall:
1. Have a minimum footprint of 12 square feet (1.11 square meters).
  2. Be able to deliver a small siege missile at least 40 yards (36.6 meters).
  3. Have a mechanical cocking device, such as a winch or windlass and trigger and may not be cocked by hand. Man powered trebuchets are exempt from this requirement.
  4. Have a minimum crew of 2 people. Should crew size fall below minimum, the engine will not be operated.
  5. Be able to fire 1 small siege projectile, or 2-4 small arms projectiles, per shot.
- E. Siege structures shall:
1. Be able to support 300 pounds for every 4 square feet (135 kilograms for every 0.37 square meters) of platform area.
  2. Be equipped with railings or walls at least 36 inches (0.91 meters) tall and able to support 100 pounds per foot (45 kilograms per 30.4 centimeters) of railing length if the platform is more than 3 feet (0.91 meters) from the ground.
  3. Be structurally stable (e.g., a wheeled siege tower should have a base big enough and wheels large enough to safely carry crew over the terrain of the field).
  4. Battering rams and battering structures are permitted for use against authorized buildings and siege structures. Using a battering ram against a human target is expressly forbidden. Battering rams must be durable enough to withstand repeated impacts and light enough to be safe when carried or if dropped.
  5. Siege structures that have a platform must have a base with a width and depth equal to or greater than 80% of the platform height. The platform may not be larger than the base, and may not extend past the base footprint in any direction. Structures that have a platform height of over 9 feet (2.74 meters) from standing surface to ground, may not have a platform that exceeds 75% of the base dimensions. For example, a tower that has a platform height of 10 feet (3.05 meters) must have a base that is no less than 8 feet (2.43 meters) in either direction. Additionally the platform dimensions may not exceed 75% of the base dimensions (e.g. an 8' x 8' base (2.43m x 2.43m) could only have a 6' x 6' (1.83m x 1.83m) platform).

6. Siege structures may not be made from industrial scaffolding, as it is not designed for the applications in which SCA combat operates.

### III. Siege Ammunition

- A. No siege engine ammunition may exceed 1 pound (0.45 kilograms) in weight.
- B. Siege Class Ammunition must be colored with yellow tape as described below, in order to denote it as Siege Class Ammunition.
- C. Siege ammunition may not be fired from small arms or thrown by hand.
- D. All Siege ammunition will be labeled with the name of owner, group, and kingdom, for the purpose of identification.
- E. Siege Ammunition may only be constructed of the following materials:
  1. Open-cell or closed-cell foam.
  2. Tennis balls. Tennis balls shall be punctured with a hole which may not exceed 1/16th of an inch (2 millimeters) in diameter, or a slit which may not exceed 1.5 inches (3.75 centimeters), in order to relieve internal pressure.
  3. Siloflex used in Siege ammunition must meet one the following three sets of standards:

COLOR	SIZE	ASTM	PE	SIDR/SDR or SODR
Black	1 inch ID (2.5 centimeters)	D2239	3408, 3608 or 4710	SIDR $\leq$ 15 or SODR $\leq$ 17
Black	1.25 inch OD (3.2 centimeters)	D2737	3408, 3608 or 4710	SIDR $\leq$ 15 or SODR $\leq$ 17
Yellow	1 inch IPS (2.5 centimeters)	D2513	2046 or 2708	SDR = 11

4. Cord.
5. Duct and filament tape.
6. Film canisters.
7. PVC reinforcement rings. Rings may not exceed 2 inches (5.1 centimeters) in length. Missile shafts may not be made from PVC.
8. Leather.
9. Lightweight fabric such as broadcloth, trigger, or similar material.
- F. Large siege ammunition is intended to simulate large, heavy projectiles normally used as anti-structure missiles (e.g., 250-pound [112.5 kilogram] sandstone rocks used in the largest of engines). These missiles are simulated with 1-pound (0.45 kilogram) "rocks." Large siege ammunition shall:
  1. Be constructed of fabric spheres filled with light-density foam and taped with filament and duct tape for protection.
  2. Be a minimum of 6½ inches (16.5 centimeters) in diameter.
  3. Have at least 50% of their surfaces covered with yellow tape.

- G. Small siege ammunition is intended to simulate smaller, lighter projectiles used as light anti-structure and antipersonnel missiles (e.g., ballista javelins and 10-pound [4.5 kilogram] stones as used in Perriers). Permissible small siege projectiles include:

1. 4-tennis-ball clusters – the tennis balls must be punctured and either (1) secured with filament tape and duct tape or (2) tied together with a cord passing through each ball and wrapped with duct tape. At least 50% of their surfaces must be covered with yellow tape.
2. Ballista Bolts - must have a shaft made from Siloflex or similar equivalent material (as per III.C.3). They must have a tip made with at least 3" (7.6cm) of resilient material between the end of the shaft and the striking surface, must be at least 2.5" (6.4cm) in diameter, and must have at least 1" (2.5 cm) of progressive give without bottoming out on the shaft. Additionally, the end of the shaft that the tip is secured to must be capped with a minimum of 1/8" (4mm) thick heavy leather, or a 35mm film container (or similar item), securely fastened with filament tape. The tip shall be secured to the shaft with filament tape that completely covers the foam, then covered with yellow tape. The back end of the bolt may have a short (less than 2" (5.1cm) in length) piece of PVC pipe (or other similar non-brittle, non-metallic, lightweight material), that is securely attached to reinforce this area. Bolts must be stable in flight or have fletching made from flexible material to make them stable in flight.

They must be at least 48" (122 cm) in length. Bolts made with Siloflex that is not yellow in color must have their shafts and striking surfaces covered completely with yellow tape, except for an area that is just large enough to show a full set of the specifications imprinted on the pipe's surface. Shafts made from yellow Siloflex may not be covered with tape, and the markings must be visible. Note: 1/2 tennis balls may be attached to the foam tip to cover the striking surface as long as they are an integral part of the tip and there remains at least 1" (2.5cm) of progressive give after the 1/2 tennis ball is attached.

- H. Specialty siege ammunition is intended to simulate specialty ammunition (e.g., flaming oil pots or flaming javelins) or effect weapons (e.g., diseased animal corpses or the heads of decapitated messengers). Specialty missiles will have damage determined in the scenario rules. Most effect weapons will have little or no damage potential, and therefore should be used sparingly. Specialty siege ammunition may be used as long as it does not exceed the weight or construction limitations of the approved ammunitions.

## **IV. Engine and Structure Inspection**

- A. Siege engines shall be inspected before combat use. Engine inspection procedures shall include at least the following:
1. Any event allowing siege engines must have an equipment inspection station. This inspection station shall, at minimum, consist of a field with a firing line and range markers at 40 and 80 yards (36.6 and 73.2 meters) from the firing position.
  2. Preliminary inspection of the engine shall be made before any shots are fired. The marshal will check for structural integrity of the components of the engine. Siege Engines shall not have any bolts, or other projections (which may reasonably be expected to contact persons should they fall on the engine) extend more than 1/2"

- (1.3cm) into a legal face grill. Any items such as this must be covered with sufficient rigid material, a tennis ball, or a suitable rubber stopper, to prevent them from entering a legal face grill more than 1/2" (1.3cm). Triggers, release hooks, or other firing mechanism components, that would not normally be in a position that could cause injury should someone accidentally fall on the engine, are exempt from this.
3. The operational demonstration phase of the inspection shall, at minimum, consist of 4 shots from the engine configured for the maximum power it will use on the field at that event. These 4 shots shall deliver the ammunition between 40 and 80 yards (36.6 and 73.2 meters) at a firing angle of between 40 and 45 degrees elevation without mechanical failure and shall consistently deliver the ammunition in a reasonably straight and stable path downrange (curving due to cross wind is acceptable).
  4. Static inspection for stability of the engine and mechanical observation of the framework and the mechanism shall be made after the firing.
  5. The crews of direct fire engines should be willing to receive a shot from their engine at minimum range, while in armor, should it be requested.
- B. Siege structures shall be inspected before being allowed to participate in an event. Inspection should include, at minimum, structural integrity, stability, condition of hardware, and condition of any safety devices (barriers, walls, etc.). Ideally, a maximum load of armored combatants should be on board the siege structure during inspection. Inspection will include a demonstration of mobility if the structure is designed to be mobile.

## V. Siege Engine Operation

- A. Anyone operating a siege engine in combat will be armored to the SCA minimum Heavy Weapons Armor requirements. **(Archers' gauntlets may be used instead of full gauntlets for hand protection.)**
- B. Siege engine crews shall be made up of members who are authorized in siege and are familiar with the engine that they are operating.
- C. Siege engine crews shall inspect their engine for wear, stress, and fatigue before each battle and, if possible, during holds.
- D. During holds, siege engine crews may not cock, load, move, or in any other way make their engine ready.
- E. Siege engine crews shall immediately secure their engine should it become unsafe. They will remove the engine from the field at their earliest opportunity.
- F. Siege engine crews are responsible for the safe operation of their engine during combat. They are to make sure that crew members are clear of moving parts and that non-crew personnel are not directly in front of the engine and not within 5 feet (1.52 meters) of the travel path of moving parts before discharging their weapon.
- G. Siege engine crews are responsible for the safety and condition of their ammunition, and shall visually inspect each round for damage before it is fired. (Ammunition that has been inspected prior to the battle does not need to be re-inspected before it is fired, but any

ammunition that has been retrieved from the field must be re-inspected. Engines will not fire ammunition that is not designed for their weapon.

- H. It is recommended that siege engine crews give verbal commands for each phase of engine operation.

## **VI. Siege Ammunition Damage**

- A. Blows from siege-class ammunition (1-pound [0.45 kilogram] rocks, 4-tennis-ball clusters, and 48- inch [1.22 meter] ballista javelins, all colored yellow as outlined in item 2 of Siege Ammunition Standards) will be judged fatal or completely disabling upon striking any legal target area and will be capable of killing through shields, provided that the scenario rules permit this. Hand weapons hit by siege-class ammunition will be judged destroyed; anyone intentionally blocking or deflecting siege-class ammunition will be considered as having been struck and killed by the ammunition.
- B. Siege Ammunition is considered spent upon striking a target, the ground, or a battlefield structure. Siege class ammunition which strikes a tree will not be considered spent until striking a target, the ground, or a battlefield structure.
- C. Small Arms Ammunition (single tennis balls and tube-shafted combat archery arrows and bolts) fired from a siege engine will be treated as combat archery projectiles.
- D. Small Siege Ammunition, in addition to the above, will also be capable of damaging or destroying light structures such as other siege engines, pavices, siege towers, etc., provided that scenario rules permit this.
- E. Large Siege Ammunition, in addition to all of the above, will also be capable of damaging or destroying any type of structure such as castle walls, towers, redoubts, etc., provided that scenario rules permit this.
- F. Recommendations for Damage to Structures from Siege Engines
  - 1. Since some structures are not easily modifiable during the course of combat, these recommendations should only be applied in situations where they would be practicable. It is also recommended that any of the numbers given below be modified based on the number of engines participating in any given scenario.
  - 2. Breaching walls, destroying towers, and other permanent structures: It is recommended that this be accomplished by hitting the structure 5 times with large siege ammunition, and that these structures are immune from damage by small siege projectiles.
  - 3. Gates: It is recommended that these be destroyed upon 3 hits from large siege ammunition, and that they are immune to small siege ammunition.
  - 4. Temporary siege structures and siege engines should be considered destroyed by 1 hit from large siege ammunition or by 3 hits from small siege ammunition.
  - 5. If a manned tower or siege structure is destroyed, it is recommended that all occupants of the structure be considered killed as well. If a siege structure is destroyed, it is recommended that any crew in physical contact with the engine be considered killed as well.

6. Maximum rates of fire: While it would be preferable to not have to impose any arbitrary maximum rate of fire, if there are a large number of siege engines at an event, it may be necessary for reasons of fair game play. If so, the following is recommended: Type A engines should be allowed to fire no more than 1 time per minute, and Type B engines should be allowed to fire no more than 2–3 times per minute.

## **VII. Destroying Siege Engines and Structures**

- A. As siege engines can pose many risks to attacking fighters, it is strongly recommended that great caution be exercised when approaching them. Be sure to stay clear of moving parts and try to approach them from the side. When engaging engines or structures, **DO NOT STRIKE THEM WITH A HANDHELD WEAPON**. While these items should be constructed to withstand blows, it is dangerous to do so, as an accidental discharge of the weapon may result. Anyone found intentionally striking a siege engine or structure should be removed from the field and possibly face further action, such as a marshal's court.
- B. The proper way to destroy these weapons is to safely approach the engine or structure, lay your weapon on it, and declare "this weapon is destroyed" (as with a declared kill from behind). This shall be done in a safe and deliberate manner, not in a rush while engaged with another opponent. Siege engine crews are required to wear SCA minimum armor and should be treated as any other fighter on the field. If they are authorized for armored combat and have a secondary weapon, they may use it. If not, they may be killed as an unarmed or helpless opponent; if they yield, do not strike them. Active combat should not take place within 5 feet (1.52 meters) of an active siege engine. If this situation arises, a hold should be called and the engine declared destroyed. Siege engines and structures may also be destroyed by siege class ammunition fired from a siege engine.

## **VIII. Capturing Siege Engines and Structures**

- A. In the event that a Siege engine crew has been killed or captured, but the engine or structure itself has not been destroyed, the engine or structure may continue to be used by the capturing army, provided that:
  - 1. It is only operated by authorized Siege Engineers who are familiar enough with the engine to operate it safely.
  - 2. The owner or their authorized representative has signaled their consent to its after-capture use by placing a green ribbon or tape near the cocking and firing mechanisms, or at the entry of the structure. Please remember that Siege engines and structures represent a significant investment and their owners may not be willing to allow use by crews not familiar with that specific engine's operation.
- B. It is recommended that a member of the original crew remain with the captured engine or structure in order to advise the new operators on any relevant safety and operational considerations. The original crew member shall not participate in the operation of the captured engine.
- C. Engines and structures may be re-captured and the same provisions shall apply. If an original crew member is still with the engine and it is re-captured by their original army, they may resume their role in the operation of the engine.

## **IX. Miscellaneous**

- A. New and experimental weapons types and ammunition shall be required to undergo the same approval process as any other battlefield object. Current information on new weapons approval procedures is delineated in the Marshal's Handbook.
- B. The metric conversions in the Siege Engines Handbook are mathematically derived and do not necessarily reflect the dimensions of materials available in countries where the metric system is prevalent. The Earls Marshal of SCA Kingdoms with chapters in such countries are authorized to round these converted dimensions for use in their Kingdom's combat rules, and to minimally revise the dimensions based on the materials available, provided that any such rounding or revision may not diminish the safety of any combat participant or spectator. The measurement system used for Siege activities at an event shall be that which is native to the host group's Kingdom, unless otherwise published in advance.

# Appendix A

## Glossary

**Arbalest:** A tension-powered ballista (giant crossbow)

**Ballista:** A two-armed, torsion-or tension-powered, arrow-or rock-throwing, direct-fire siege engine

**Ballista bolt:** A spear-like projectile shot from a ballista

**Catapult:** A single-armed, torsion-or tension-powered, rock-throwing, indirect-fire siege engine.

**Closed-cell foam:** Stiff, resilient foam similar to sleeping pads

**Direct fire:** Delivery of a missile in a straight, flat trajectory directly into the target **Effect weapons:** Novelty missiles, such as simulated animal parts, usually with no real damaging ability

**Eyebolts:** Hardware resembling a bolt formed into a circle on the non-threaded end

**Footprint:** Ground area covered by an engine as viewed from directly above, measured as length times width for engines with a square base and length times half the width for engines with a triangular or diamond-shaped footprint

**Indirect fire:** Delivery of a missile in a high, arcing trajectory ending at the target **Light-density foam:** Foam weighing up to ½ pound per cubic foot (0.23 kilograms per 0.03 cubic meters)

**Mangonel:** A man-powered trebuchet

**Man Powered:** An engine in which the mechanical energy to launch the projectile or ammunition is supplied directly by people, pulling on ropes for example, rather than being stored mechanically (i.e. by a spring or raised counterweight) for later release.

**Mechanical trigger device:** A device used to hold the engine in a braced or cocked state and to activate (shoot) the weapon

**Medium-density foam:** Foam weighing between ½ and 4 pounds per cubic foot (0.23 to 1.8 kilograms per 0.03 cubic meters)

**Onager:** See catapult

**Open-cell foam:** Light, sponge-like foam, such as upholstery or pillow foam

**Perrier:** A man-powered trebuchet Siege engines

**Siege Engines:** Missile-launching devices designed to deliver missiles larger than already established small arms ammunition

**Siege structures:** Devices such as towers or ramps that are used to support personnel, but are not fitted with active weaponry

**Specialty ammunition:** Special-purpose ammunition, such as simulated flaming missiles

**Trebuchet:** A gravity-or man-powered, sling-type, rock-throwing, indirect-fire siege engine



**Turnbuckle:** Hardware consisting of 2 eyebolts fitted to a threaded barrel, used for adjusting the length of cables

**Winch:** A winding device, usually geared and equipped with a ratchet

**Windlass:** A winding device, usually consisting of a spool with double crank handles, a set of pulleys, and hooks, but not normally equipped with a ratcheting device.