



Artifacts Specification Tunnel Circuit Event

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1. Introduction

This document provides specifications for the artifacts expected to be used in the DARPA Subterranean (SubT) Challenge. An “artifact” is an object or feature of interest that could reasonably be found in subterranean environments. The main scoring objective of the competition is the need to search for, detect, and provide spatially referenced locations of artifacts relevant to each of the three subdomains (Tunnel, Urban Underground, and Cave Networks).

The intent of this document is to provide the finalized set of five artifacts that will be used in the Tunnel Circuit being held in August 2019. This document supersedes the *SubT Challenge Artifacts Specification (STIX Event)* document dated February 11, 2019. Major revisions in this document are indicated by blue text.

This document is subject to change and may be superseded by later versions. The latest official versions of all documents will be posted to the [SubT Challenge Website](#) and the [SubT Community Forum](#).

DARPA anticipates a total of nine artifact types as illustrated in Figure 1. Three artifacts will be common to all three subdomains and are expected to appear in all three Circuit Events (a.k.a. the Tunnel Circuit, Urban Circuit, and Cave Circuit). Two additional artifacts will be specified for each Circuit Event that are event-specific and will not appear in the other Circuit Events. Thus, each Circuit Event will have a total of five artifact types; the three common artifacts and two event-specific artifacts. The Final Events are expected to include all nine artifact types.

The sections below provide specifications and descriptions for each of the five artifacts that are being announced at this time. The specifications include artifact names, vendors, model numbers, purchase hyperlinks, and other relevant information. Teams are not required to purchase or use these exact items, but sufficient detail is provided for teams that want to use the specific artifacts in their development and testing.

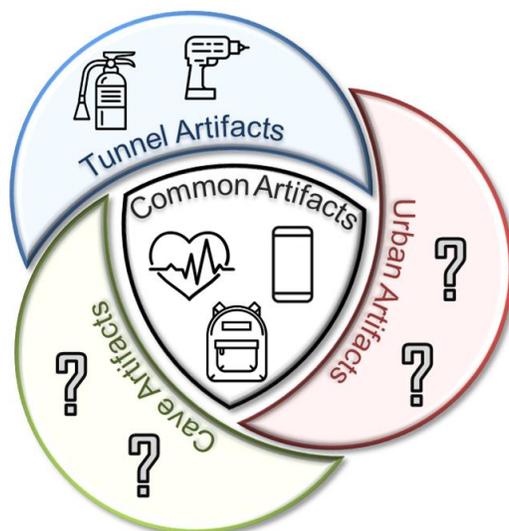


Figure 1: Common and event-specific artifacts for each of the SubT Circuit Events

2. Common Artifacts

The following three artifact types are expected to appear in all three Circuit Events as well as the Final Events.

2.1. Artifact 1 - Survivor

Overview:

The survivor manikin will emulate a human survivor using an anatomical, thermal manikin to represent both human shape and body temperature. The manikin will be wearing traditional subterranean worker apparel, which includes a yellow high-visibility jacket, grey work pants, and standard yellow steel-toed work boots. The manikin has heating elements located in its hands and face, which emulate human body temperature.

Specifications:

The manikin itself is a Thermal Image (TI) Rescue Randy manikin produced by Simulaids. This artifact uses the 145lb model of the Rescue Randy manikin. The manikin will be wearing a black and yellow Fleece Bomber Safety Jacket by Pyramex, with Dickies Slate Work Pants and yellow Construction Boots by Everboots. The manikin will not have any headwear or gloves, as to better promote thermal visibility of the heating elements in the head and hands. The manikin is not expected to have auditory cues and is not expected to be actuated to generate movement. It is anticipated that the manikins will be placed in a static sitting position against walls inside of the competition course.

Localization Point: The intersection of the primary front zipper and the boundary between the yellow and gray portions of the jacket.



Figure 2: Survivor Manikin Artifact

Purchase Links:

- The EMS Store: [Simulaids Thermal Image TI Rescue Randy, 145lbs](#)
 - NOTE: Less expensive variants are available that do not have the thermal feature. Teams may also consider other manikins from other suppliers.
- Amazon: [Pyramex Safety Jacket, Lime, X Large](#)
- Amazon: [Dickies Carpenter Jean, Slate, 34Wx34L](#)
- Amazon: [Everboots Work Boots, Tan, 12M](#)

2.2. Artifact 2 - Cell Phone

Overview:

The cell phone artifact represents any typical hand-held electronic device that would be carried by humans in subterranean environments. It acts as a surrogate for objects such as hand-held radios and surveying equipment, which when discovered are indicators of human presence and activity. The cell phone will be a standard smartphone.

Specifications:

The cell phone artifact will be a Samsung Galaxy J8 J819M/DS. It is approximately 160 mm x 76 mm x 8 mm in size and has a 154 mm diagonal screen. The phone is made of black plastic, with bezels on the top and bottom portions of the screen. During a scored run, the screen will be on and playing a video with audio. It is intended that the phone will be positioned with the screen facing outward and it may be located on the ground, walls, or work tables. The phone's internal radios (i.e., cellular, WiFi, Bluetooth) will be enabled, with Bluetooth set in "Discoverable" mode.

Localization Point: The centroid of the phone's bounding box.

Purchase Link: [Samsung Galaxy J8, Black](#)



Figure 3: Cell Phone Artifact

2.3. Artifact 3 - Backpack

Overview:

The backpack artifact represents a typical, adult sized backpack used for transporting personal items and equipment.

Specifications:

The backpack artifact will be a JanSport Big Student Backpack, in the Red Tape color. The front portion of the bag is all red, while the back portion and straps are black. It will contain a sandbag to weigh it down in place, and all of the zippers will be closed. The backpack will be red in color, and may be found on the ground, hanging on a wall, or resting on a work surface in the competition courses. At the start of a run, the front of the backpack will be facing outward or upward. The backpack will be weighted to aid in holding the backpack in place.

Localization Point: The top left corner of the "P" in the JANSPORT logo.

Purchase Link: [JanSport Backpack, Red Tape](#)



Figure 4: Backpack Artifact

3. Tunnel Circuit Artifacts

There will be two event-specific artifacts that are only expected to appear in the Tunnel Circuit and the Final Event competition courses.

3.1. Artifact 4 - Drill

Overview:

The electronic hand drill artifact is a typical cordless power tool. It represents a multitude of hand tools (manual or powered) that can be found in a tunnel environment. This artifact will be a standard electronic hand drill, with the battery attached.

Specifications:

The electric hand drill artifact will be a Black & Decker GC960 cordless drill. It has an orange body, with a black battery and black chuck collar. A Phillips head driver will be located in the drill's chuck. It will not be in operation during the competition run and may be found on the ground or on work tables. The resting orientation of the drill is not specified.

Localization Point: The lower tip of the black trigger.

Purchase Link: [Black+Decker GC960](#)



Figure 5: Electric Hand Drill Artifact

3.2. Artifact 5 - Fire Extinguisher

Overview:

The fire extinguisher artifact is a typical hand-held, metal cylinder fire extinguisher commonly found in a variety of environments. Finding this artifact represents identifying the locations of general emergency equipment in the tunnel, which would aid responders that subsequently enter the environment to mitigate an emergency.

Specifications:

The fire extinguisher artifact will be a First Alert FE2A10GR Red Fire Extinguisher. It has a red cylinder, with a black hose and black operating handle. The fire extinguisher may be found on the ground, on a work table, or hanging from a wall. It will not be in operation, and its hose will be attached in the stored configuration.

Localization Point: The center of the pressure dial located near the handle.

Purchase Link: [First Alert FE2A10GR](#)



Figure 6: Fire Extinguisher Artifact

4. Urban Circuit Artifacts

There are two event-specific artifacts that are only expected to appear in the Urban Circuit and the Final Event competition courses. These artifacts are expected to be announced no later than three months before the Urban Circuit Event.

4.1. Artifact 6 – [To Be Announced]

4.2. Artifact 7 – [To Be Announced]

5. Cave Circuit Artifacts

There are two event-specific artifacts that are only expected to appear in the Cave Circuit and the Final Event competition courses. These artifacts are expected to be announced no later than three months before the Cave Circuit Event.

5.1. Artifact 8 – [To Be Announced]

5.2. Artifact 9 – [To Be Announced]