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## Standard Guide for Use of Universal Transverse Mercator (UTM) Grids When Preparing and Using a Field Map for Land Search<sup>1</sup>

This standard is issued under the fixed designation F2099; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This guide describes one method of setting up a Universal Transverse Mercator (UTM) grid system on a base map for transfer to a field map.

1.2 This guide provides a uniform way of communicating UTM coordinates.

1.3 This guide is intended to be used with United States Geological Survey (USGS) 7.5-min quadrangle topographical maps with a scale of 1:24 000, with or without UTM grid lines.

1.4 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory requirements prior to use.*

### 2. Referenced Documents

2.1 *ASTM Standards*:<sup>2</sup>

F1846 Practice for Symbols and Markings for Use With Land Search Maps

### 3. Terminology

3.1 *Definitions of Terms Specific to This Standard*:

3.1.1 *field map*, *n*—a copy of a base map or portion thereof provided to search and rescue field teams or crews.

3.1.2 *grid overlay*, *n*—a transparent piece of material used for interpolating UTM coordinates on a USGS topographical map. For a 1:24 000 scale map, the overlay contains, as a

minimum, lines representing at least two adjacent sides of a 1000-m square, with the lines subdivided into tenths.

3.1.3 *Universal Transverse Mercator (UTM)*, *n*—a rectangular grid system that covers the earth between latitude 80° South and latitude 84° North.

3.1.4 *UTM grid lines*, *n*—a series of straight lines that connect the UTM tick marks having identical numbers on the top and bottom of the map, as well as a series of lines that similarly connect the left and right side UTM tick marks.

3.1.5 *UTM tick marks*, *n*—small vertical or horizontal lines on 1:24 000 USGS maps, light blue in color, approximately 0.3 cm (1/8 in.) in length spaced 1000 m (1 km) (scale) apart.

### 4. Significance and Use

4.1 The base map, field maps, and the UTM grid lines are used during search operations to ensure that field personnel and the command post can accurately communicate specific position information in the search area.

4.2 Section 5 verifies if the UTM grid lines are on the base map or not. If the UTM grid lines are not on the base map, Section 5 describes how to draw them on the map.

4.3 Section 6 establishes how to set up and prepare field maps for personnel to use in the field.

4.4 Section 7 describes the uniform way of determining and communicating UTM coordinates.

### 5. Verifying and Drawing UTM Grid Lines

5.1 Obtain the USGS quadrangle map (7.5 min or 1:24 000) with the area that is to be copied. Review the map to see if UTM grid lines are marked on the map. If so, proceed to Section 6, otherwise continue with 5.2.

5.2 Obtain a straightedge long enough to connect opposite UTM tick marks and which can be used to draw full-length straight lines in a single stroke, and a pen or pencil. Continue with 5.3.

5.3 *Drawing Horizontal and Vertical UTM Grid Lines*:

5.3.1 Starting at the top or bottom of the map, align the straightedge on the UTM tick marks at the left and right sides of the map, ensuring the numbers are the same. In a single stroke, draw a line connecting the tick marks. Move the

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

straightedge to the next set of UTM tick marks and again draw a single line connecting them. Continue this process until all horizontal lines are drawn.

5.3.2 Starting at either side of the map, align the straightedge on the UTM tick marks at the top and bottom of the map, ensuring the numbers are the same. In a single stroke, draw a line connecting the tick marks. Move the straightedge to the next set of UTM tick marks and again draw a single line connecting them. Continue this process until all vertical lines are drawn.

5.4 When possible, maps should be reviewed and grid lines drawn on the maps before being used on a search so that the procedure in 5.3 does not have to be performed during the search.

## 6. Preparing UTM Coordinates on a Base Map for Copying to a Field Map

6.1 Position a sheet of paper, the same size as the paper onto which the map will be copied, over the area of the base map which is to be copied.

6.1.1 When placing the paper, consider that succeeding steps of this procedure will shift the copy area down and to the left and that the copy machine may not be able to copy to the edges of the desired area.

6.2 Place a piece of removable, nondestructive tape, such as white copy or correction tape or transparent tape, on the base map along the entire bottom edge of the paper.

6.3 Place a piece of removable, nondestructive tape, such as white copy or correction tape or transparent tape, on the base map along the entire left edge of the paper.

6.4 Remove the sheet of paper from the base map.

6.5 Wherever the tape along the bottom edge of the copy area crosses a vertical line connecting UTM tick marks,

transfer the last two (large) digits of the corresponding UTM coordinates from the top or bottom of the map to the tape.

6.6 Wherever the tape along the left edge of the copy area crosses a horizontal line connecting UTM tick marks, transfer the last two (large) digits of the corresponding UTM coordinates from the left or right side of the map to the tape.

6.7 Place the marked area of the map on the copy machine, with the lower left corner of the tape being the reference corner. Ensure that the information transferred to the tape appears within the copy area, considering that the copy machine may not copy completely to the edges of the original.

6.8 Make copies as needed for the anticipated size of the incident.

## 7. Reading the UTM Coordinates for Search and Rescue Operations

7.1 Reading the UTM coordinates using eight digits provides a 10-m (32.8-ft) accuracy. All numbers are read right, then up. Reading four digits to the right and four digits up provides the eight digits.

7.2 The four digits read to the right and the four digits read up are the ten-thousands, thousands, hundreds, and tens of metres.

7.3 The ten-thousands and thousands of metres digits are read directly from the map and are the digits transferred to the tape in 6.3. The hundreds of metres digit is the first interpolation from the grid overlay and the tens of metres is the second interpolation.

## 8. Keywords

8.1 management; map; search; topographical; universal transverse; USGS; UTM

## APPENDIX

### (Nonmandatory Information)

#### X1. METHOD FOR FINDING THE UTM COORDINATES OF A POINT ON A 1:24 000 SCALE USGS TOPOGRAPHIC MAP

X1.1 On a 1:24 000 scale USGS topographic map (7½ min), the UTM values are shown at tick marks along the edges of the map. At each tick mark there is a three- or four- digit number. The first one or two numbers will be printed smaller than the third and fourth. One of the numbers along each edge may have small trailing zeroes and the letter “m” with a larger “E” or “N.” See Fig. X1.1. Position is reported using these numbers.

X1.2 The intersections of the UTM tick marks form squares 1000 m to a side.

X1.3 To find the UTM coordinates of a point, the 1000-m square containing the point is divided into ten equal parts in each direction and the position is reported in tenths reading right, then up. Dividing the grid into tenths can be done by

estimating or with a transparent overlay. Each UTM grid for a given map scale is the same size and is a true square (height equals width; sides are at right angles), which is why an overlay can be used.

X1.4 As an example of determining UTM coordinates, the position of “X” in Fig. X1.2 will be found.

X1.4.1 First, the “X” is to the right of the large digits “92” (ignore the letters and small numbers). Then, counting to the right, the “X” is between Lines 6 and 7. Since it is closer to Line 6, its position is noted as 926.

X1.4.2 Next, find the large digits that the “X” is above or up from, in this case, “96.” Then counting up, the “X” is between Lines 5 and 6. Since it is closer to Line 5, its position is noted as 965.