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MILITARY SPECIFICATION

DIGITAL CITIES DATA BASE (DCDB)

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification defines requirements for the Defense Mapping Agency's (DMA) Digital Cities Data Base (DCDB).

1.2 Purpose. The purpose of this document is to specify the product requirements and product format for the production of the Digital Cities Data Base (DCDB) for Cruise Missile planning, Probabilistic Vertical Obstruction Data (PVOD) production and other applications.

1.3 Security. These Product Specifications and resultant products are UNCLASSIFIED.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks.

This section is not applicable to this specification.

2.1.2 Other Government documents, drawings, and publications.

This section is not applicable to this specification.

2.2 Non-Government publications.

This section is not applicable to this specification.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Director, Defense Mapping Agency, ATTN: PR, 8613 Lee Highway, Fairfax, VA 22031-2137 by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A **AREA MCGT**

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein (except for related associated detail specifications, specification sheets, or MS standards), the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Accuracy. The horizontal accuracy of the city outline will be equivalent to the accuracy of an ONC Category C chart, or 0.06 inch at 1:1,000,000 scale.

3.2 Product description.

3.2.1 Size. The DCDB consists of 1° x 1° cells (manuscripts) which are ordered by ONC. To be included in the data base, an ONC must have at least one 1° x 1° cell with city outlines represented.

3.2.2 City outlines. The DCDB will be a digital replication of features which depict populated places (city outlines) on the DMA Operational Navigation Chart (ONC) 1:1,000,000 series charts. City outlines appearing on ONC flat copy will be digitized and encoded in a format compatible to the DMA Digital Landmass System Digital Feature Analysis Data (DFAD).

3.2.3 Digitizing source.

a. The base for the digitizing source for each DCDB ONC production shall be the ONC map projection with graticule values.

b. The digitizing source for each DCDB ONC shall be a flat copy of each ONC suitable for use on digitizing equipment.

3.2.4 Feature digitizing.

a. Features shall be digitized sequentially by the Feature Analysis Code (FAC) number indicated on the manuscript (1° x 1° cell) for each feature.

b. FAC #1 shall always be defined by the four extreme corners of the cell.

c. All features shall be digitized in a counterclockwise direction. The feature being described shall always be left of the digitizing direction.

d. A feature completely enclosed within another feature shall be digitized with a higher FAC number than the enclosing feature. The higher numbered feature shall be digitized last.

e. Features having a common boundary shall be digitized as separate features and assigned different FAC numbers. The common boundary shall be included within each feature.

f. Any ONC void of city outlines shall not be included in the DCDB.

3.3 Product format. The product format describes the medium and the physical characteristics of the digitized city outline data records for the express purpose of exchange of DCDB information.

Note: There shall be no Data Set Identification (DSI) and Accuracy Description (ACC) Records as is typical in DLMS DFAD format.

3.4 Standard format.

3.4.1 Physical characteristics of magnetic tape.

a. Length - 2400 feet

b. Width - .5 inch

c. Nine tracks recording format

d. Odd parity

e. Density/recording method - 1600 BPI/Phase encoded

f. Inter-record gap - .6 inch

g. Physical end-of-tape markers at the beginning (beginning-of-tape marker) and end of tape (end-of-tape marker).

3.4.2 Type of I/O. The Defense Mapping Agency DLMS format data created by DMA uses UNISYS NTRAN I/O processing. The individual records contain no system generated control words.

3.5 File description.

a. The city outline file shall consist of digitally encoded descriptive data about populated areas appearing on DMA ONC Series Charts.

b. Each manuscript (1° x 1° cell) on the file shall consist of a descriptive header record, followed by one or more feature records. The header record contains index and reference information for each cell of the ONC chart. The header record also defines the latitude and longitude of an origin, which shall be South and West of all digitized coordinates on the cell. All other coordinates shall be stated relative to this origin. The feature records contain digitally encoded descriptive information and digitized coordinates delineating each feature.

(1) A 1° x 1° cell from the ONC as defined by feature number 1, will describe a geographic rectangle whose sides are arcs of latitude and longitude. Feature 1 (FAC #1) defines the 4 extreme corners of the cell.

(2) If there are any cells void of city outline data, those cells shall be included in the ONC area. Those cells shall contain the descriptive header record and Feature 1.

3.6 Logical characteristics. The DMA computer stores negative values in ones-complement form. For example, a negative integer one would be recorded as follows:

777777777776 (octal)

Users who either read or write the city outline file should use care that 36 bit quantities whose left-most bits (sign bit) is on (indicating a negative value to the SPERRY series computer) cause the desired effect. This is particularly important in either generating or checking the checksum word. For example, the DMA Computer System representation of -1 would represent and have the effect of adding -2 when used on some computers. Special care and programming may be required in order to duplicate the DMA Computer System arithmetic for checksum calculation.

3.7 Data record characteristics.

3.7.1 Record lengths. When the city outline file is generated, the following record lengths are produced:

Manuscript header record 5 - 36 bit words
Feature record 601 - 36 bit words
Terminating Record 5 - 36 bit words

a. The standard DMA computer tape duplicating procedure causes the tape records to be increased in length up to the next highest even number of words. Thus, the 5 word records become 6 and the 601 word records become 602. The 6th or 602nd word is added at the end of the record and is a word of zeros.

b. Because of the above, city areas may be generated in either the 5/601 or 6/602 record lengths depending on the particular hardware/software limitations.

3.7.2 Checksum word. The checksum word will appear as the 5th word in the 1° x 1° cell header, the terminating record, and as the 601st in the features record regardless of whether the 5/601 or 6/602 combination is used. The checksum is formed by using integer addition on each 36 bit value in the record. The DMA Computer System addition performs an end-around carry. That is, if during the addition a bit overflows past the high-order position, the bit is then added in the low-order position. The following is an example of the formation of a checksum for a five word cell header record:

001101462707	word 1	
000004525350	word 2	
777764571147	word 3	(octal)
023730045400	word 4	
025023047027	checksum	

3.7.3 Terminator record. The city outline file shall be terminated by the first four words of the header record being 1 in the first 6 bits. This terminator record shall be followed by two (2) tape marks. No ONC file will carry over to another magnetic tape reel.

3.7.4 Sort sequence.

3.7.4.1 Major sort. Each 1° x 1° cell for the ONC chart shall be sorted and placed on the magnetic tape as follows. Refer to figure 1.

a. Ascending latitude of 1° x 1° cell origin (south - negative, north - positive).

b. Ascending longitude of 1° x 1° cell origin (west - negative, east - positive).

```
(8,1)     (8,2)    ...    (8,N)
 .         .        .      .
 .         .        .      .
 .         .        .      .
                                        cell (1,1) First cell on tape
(2,1)     (2,2)    ...    (2,N)         cell (1,2)
                                             .
                                             .
(1,1)     (1,2)    ...    (1,N)                .
                                        cell (1,N)
                                        cell (2,1)
                                        cell (2,2)
                                        .
                                        .
                                        .
                                        cell (2,N)
                                        cell (8,1)
                                        cell (8,2)
                                        .
                                        .
                                        .
                                        cell (8,N) Last cell on tape
```

FIGURE 1. Sort sequence on the ONC tape.

3.7.5 Record sequence.

a. 1° x 1° Cell Header Record (Manuscript Header Record)

b. Feature record (one for each feature on this cell) - Areal feature

c. Termination Record*

d. Tape mark (twice)*

*See 3.6, File description, for further information.

3.8 Description of record contents.

3.8.1 Header record. Header record for each 1° x 1° cell

Note: The numbers enclosed within parentheses below under CONTENTS are the possible range of values.

Word	Bits	Type	Contents
1	1-6	I	All zero bits
1	7-9	I	Manuscript Type USE 0
1	10-12	I	Level Type USE 0
1	13-26	I	WAG (WAC) Number (1-9999)
1	27-31	I	WAG (WAC) Cell (1-25)
1	32-36	I	WAG Cell (1-16)
2	1-36	I	Latitude of 1° x 1° cell origin in integer tenths of seconds. Southern hemisphere values are recorded as ones-complement negative integers. Origin is 1 minute south of 1° x 1° cell.
3	1-36	I	Longitude of 1° x 1° cell origin in integer tenths of seconds. Western hemisphere values are recorded as ones-complement negative integers. Origin is 1 minute west of 1° x 1° cell.
4	1-18	I	Estimated maximum latitude of digitized coordinates in integer tenths of seconds, referenced to 1° x 1° cell origin. Use 37,200
4	19-36	I	Estimated maximum longitude of digitized coordinates in integer tenths of seconds, referenced to 1° x 1° cell origin. Use 37,200
5*	1-36	I	Checksum - sum of first four words
6*	1-36	I	All zero bits

*See 3.6, File description, for further explanation.

3.8.2 Features record.

Note: Point and Linear features are not required for city outlines.

3.8.2.1 Areal feature.

a. Feature 1

(1) Feature Header

Word	Bits	Type	Contents
1	1-14	I	Feature Analysis Code (FAC) Number USE 1
1	15-16	I	Feature Type USE 2
1	17-26	I	Predominant Height USE 0
1	27-36	I	Feature Identification Code Number USE 902
2	1-5	I	Surface Material Category Code Number USE 10
2	6-9	I	Number of structures per square kilometer/nautical mile. Code number of areal features USE 0
2	10-13	I	Percent of tree coverage USE 0
2	14-17	I	Percent of roof coverage USE 0
2	18-23	-	Not used for areal features USE 0

(2) Feature 1 Coordinates Delineating 1° x 1° cell Boundary

3	1-18	I	Latitude of a digitized coordinate of a feature in integer tenths of seconds referenced to this 1° x 1° cell origin. (For features that exit a cell, a negative value will indicate the last point digitized on the line. This point is not necessarily the last point of feature, rather it identifies the point at which the feature exits the manuscript. The negative latitude representation is signed magnitude.)
3	19-36	I	Longitude of a digitized coordinate of a feature in integer tenths of seconds referenced to this 1° x 1° cell origin.
•	•	•	•
•	•	•	•
•	•	•	•
N+21-36	-	Same as above	

b. Feature 2 through 16383

(1) Feature Header

Word	Bits	Type	Contents
1	1-14	I	Feature Analysis Code (FAC) Number (2-16383)
1	15-16	I	Feature Type USE 2
1	17-26	I	Predominant height USE 2
1	27-36	I	Feature Identification Code Number USE 401
2	1-5	I	Surface Material Category Code Number USE 4
2	6-9	I	Number of structures per square kilometer/nautical mile. Code number for areal features. USE 0
2	10-13	I	Percent of tree coverage USE 0
2	14-17	I	Percent of roof coverage USE 10
2	18-23	-	Not used for areal features USE 0
2	24-36	I	Number of digitized coordinates of feature (3-8191)

(2) Coordinates Delineating Each Feature

Word	Bits	Type	Contents
3	1-18	I	Latitude of a digitized coordinate of a feature in integer tenths of seconds referenced to this 1° x 1° cell origin. (A negative value will indicate the last point digitized on the line, not necessarily the last point of feature. This identifies the point at which the feature exits the cell. The negative latitude representation is signed magnitude.)
3	19-36	I	Longitude of a digitized coordinate of a feature in integer tenths of seconds referenced to this 1° x 1° cell origin.

Word	Bits	Type	Contents
•	•	•	•
•	•	•	•
•	•	•	•
N+2	1-36	-	Same as above

Note: N is the number of digitized coordinates of a feature.

(3) If the N coordinates for the areal feature exceed the remaining space in a record, the feature is continued into the next record(s) with no intervening control words (except for checksum). When the last feature on a 1 x 1 cell is completed, any remaining space in the last record is filled with a pad value such that the feature type (word 1, bits 15-16) us equal to 3. A minimum of one pad value is required.

(4) *601 Data Word

Hash total - the sum of all the 600 data words

(5) *602 Word

*See 3.6, File description, for further explanation.

c. Terminating Record (in place of Header Record)

Word	Bits	Type	Contents
1	1-6	I	77 octal (63 decimal)
2	1-6	I	77 octal (63 decimal)
3	1-6	I	77 octal (63 decimal)
4	1-6	I	77 octal (63 decimal)
5*	Checksum	—	Sum of four words
6*			

*See 3.6, File description, for further explanation.

3.9 WAG cell determination. The WAG (WAC) CELL system divides the WG (WAC) area into 25 equivalent arc areas and subdivides each one of the 25 parts into sixteen (16) equivalent parts (21' x 12'). The 25 sheet subdivision is the standard Series 200 sheet indexing system and the 16 sheet subdivision is the standard Series 50 indexing system within the Series 200. This is a total of 400 WAG CELL numbers in all WAG (WAC) areas. The WAG CELL number identifies the lower left corner of the 1° x 1° cell.

3.10 Explanation of cell origin. Explanation of 1° x 1° Cell Origin and Maximum Change for Digitized Coordinates of 1° x 1° Cell.

a. Latitude of 1° x 1° Cell Origin - The origin of a 1° x ° cell will always be a whole minute value even though the field allows values to be expressed to tenths of a second. The origin will always be to the lower left and outside of the 1° x 1° cell.

b. Longitude of 1° x 1° Cell Origin - Comments for the latitude of 1° x ° cell origin apply.

c. Estimated Maximum Change in Latitude of Digitized Coordinates will be the maximum value to the highest bounding minute even though the field would allow values to be expressed to tenths of a second. Because the value is greater than or equal to the maximum latitude value of any feature, it may be outside the 1° x 1° cell.

d. Estimated Maximum Change in Longitude - The comments for estimated maximum change in latitude apply.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use their own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in this specification where such inspections are deemed necessary to ensure products and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of a contract. Sampling inspection, as part of operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

5. PACKAGING

This section is not applicable to this specification.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory).

6.1 Intended use. The Digital Cities Data Base (DCDB) provide Cruise Missile mission planners with a capability to display city outlines on Cruise Missile Mission Planning Systems. This data will also be used in the production of Probabilistic Vertical Obstruction Data (PVOD).

6.2 Supersession. This specification supersedes the Defense Mapping Agency Product Specifications for Digital Cities Data Base (DCDB), PS/4GJ/200, First Edition, December 1987.

6.3 Definitions.

6.3.1 Feature Analysis Code (FAC) - A number assigned for each areal feature or item portrayed on the manuscript. A 1° x 1° cell boundary is always FAC #1.

6.3.2 Areal feature - An area completely enclosed by a delimiting line on the manuscript. Feature Type 2.

6.3.3 Manuscript - A 1° x 1° cell on an Operational Navigation Chart (ONC).

6.3.4 Feature Identification Code (FID) - The predominant nature of all features selected for portrayal. Code 902 is soil. Code 401 is multi-family dwelling (general).

6.3.5 Surface Material Category (SMC) - A division of the various surface materials based upon the predominant exposed surfaces. Category 4 is a composition. Category 10 is soil.

6.3.6 Digital Feature Analysis Data (DFAD) - A generalized description and portrayal of culture and planimetric features in DMA standard digitized format.

6.4 International standardization agreements.

"Certain provisions of this specification are subject of international standardization agreement. When amendment, revision, or cancellation of this specification is proposed that will modify the international agreement concerned, the preparing activity will take appropriate action through international standardization channels, including departmental standardization offices, to change the agreement or make other appropriate accommodations."

6.4.1 International Standardization Agreements (STANAGs).

This section is not applicable to this specification.

6.4.2 Quadripartite Standardization Agreements (QSTAGs).

This section is not applicable to this specification.

6.4.3 Air Standardization Coordinating Committee Agreements (ASCC AIR STDs/ STDs/ ADV PUB).

This section is not applicable to this specification.

6.4.4 International MC&G agreements.

This section is not applicable to this specification.

6.4.5 Executive orders.

This section is not applicable to this specification.

6.4.6 Inter-Agency agreements.

This section is not applicable to this specification.

6.4.7 Other documentation.

This section is not applicable to this specification.

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CONCLUDING MATERIAL

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(Project MCGT-0014)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
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I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER	2. DOCUMENT DATE (YYMMDD)
	MIL-D-89011	2 July 1990

3. DOCUMENT TITLE
Digital Cities Data Base (DCDB)

4. NATURE OF CHANGE (*Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.*)

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME (Last, First, Middle Initial)	b. ORGANIZATION	
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