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MILITARY SPECIFICATION
OPERATIONAL NAVIGATION CHARTS (ONC)

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

1. SCOPE

1.1 Scope. This general specification defines requirements for the Defense Mapping Agency's (DMA) Operational Navigation Charts (ONC).

1.2 Purpose. The purpose of this specification is to assure uniformity of treatment among mapping and charting elements, primarily DMA and its contractors, engaged in a coordinated production and maintenance program for this product. Feature requirements are stated in terms of DMA's Feature/Attribute Coding Standard (FACS), to maintain consistency between various DMA production methods. The use of FACS in this specification is not intended to imply any external digital data coding standard. FACS is the internal coding standard used by DMA's Digital Production System (DPS), which is the primary intended, but not exclusive, method for production of this product at this time. The Digital Geographic Information Exchange Standard (DIGEST) Feature Attribute Coding Catalog (FACC), not FACS, is the approved coding standard for the exchange of digital geographic data, as well as the standard for DMA's Vector Product Format (VPF) product line. FACC may be included in, or replace FACS in a future edition of this specification.

1.3 Security.

1.3.1 Security classification of specification. This specification is UNCLASSIFIED.

1.3.2 Security classification of product. The security classification of the products generated by the use of these specifications will be the lowest category practicable. When it is necessary to assign a security classification to the product, it shall be in accordance with established national security procedures.

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, ST A-13, 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

DISTRIBUTION STATEMENT A.

Approved for public release: Distribution unlimited.

1.4 Introduction.

a. The Operational Navigation Chart (ONC) is designed to satisfy the enroute visual and radar requirements of pilots/navigators flying at medium (2000 feet to 25,000 feet above ground level) and low altitudes (500 feet to 2000 feet above ground level) or low altitude-high speed operations.

b. The successful execution of a low altitude mission depends entirely upon visual and radar identification of ground features and a rapid visual association with their chart counterpart. Under low altitude conditions, the apparent movement of the ground is rapid and causes blurring. The angular velocity of ground features as they sweep beneath the nose of the aircraft provides little time for recognition. Depth of vision is restricted because of the increased effect of perspective resulting from the closeness of the aircraft to the terrain. Ground fog, haze and other factors affecting the visibility can further combine to reduce depth of vision. In addition, the span of vision is restricted because of the necessity of "picking up" checkpoint features on or near the horizon directly ahead of the aircraft and making positive visual identification as the ground objects rapidly approach at increasing angular velocities. The pilot/navigator must have a preconceived mental image of each successive checkpoint feature to facilitate recognition at first glance. He must have an appreciation of the design and basic character of these checkpoints and know when (in seconds of time) and where (relative to the speed of the aircraft) they will be overflown. Therefore, the selection and portrayal of ground features should be based upon the requirement for rapid visual recognition of significant chart detail as seen from a low perspective angle.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the current Department of Defense Index of Specifications and Standards (DODISS) and the supplement thereto, cited in the solicitation. (See 6.2)

MILITARY STANDARDS:

MIL-STD-129	-	Marking for Shipment and Storage
MIL-STD-2402 (DMA)	-	MC&G Symbology
MIL-STD-2403 (DMA)	-	MC&G Product Rules
MIL-STD-2408 (DMA)	-	Glossary of MC&G Feature and Attribution Definitions
MIL-STD-2409	-	MC&G Accuracy
MIL-STD-2410 (DMA)	-	MC&G Reproduction and Printing
MIL-STD-2414 (DMA)	-	DMA Stock Number Bar Coding

NOTE: Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Bldg. 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094).

2.1.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part

of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

- a. DMA Standard Supporting Mark 90, Section 500 - Geographic Names

NOTE: Copies of the above publication are available from the Defense Mapping Agency, TIJ, Fairfax, VA 22031-2137).

- b. DMA Technical Manual 8358.1: Datums, Ellipsoids, Grids and Grid Reference Systems.

- c. DMA Technical Manual 8358.2: The Universal Grids: Universal Transverse Mercator (UTM) and Universal Polar Stereographic (UPS)

- d. DMA Instruction (DMAINST) 8570.1: DMA Product Maintenance System, January 1988.

NOTE: Copies of the above publications are available for DoD users from the Defense Mapping Agency Combat Support Center, 6001 MacArthur Boulevard, Bethesda, MD 20816-5001. Other users may obtain these publications from the National Ocean Service, and its authorized sales agents.

- e. International Standardization Agreements. (See 6.6.1)

2.2 Non-Government publications.

This section is not applicable to this specification.

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 First Article. When specified (See 6.2), a sample shall be subjected to first article inspection (See 6.3) in accordance with 4.3.

3.2 Accuracy. (See 2.1.2.d)

3.2.1 Absolute horizontal accuracy.

90% Circular Error (CE) World Geodetic System (WGS)
All Features \leq 2010 meters (\leq 6600 feet)

3.2.2 Absolute vertical accuracy.

90% Linear Error (LE) Mean Sea Level (MSL)
Contour (3A010) \pm 152.4 meters (\pm 500 feet) [1/2 the contour interval]
Spot Elevations (3A030) \pm 30 meters (\pm 100 feet)

3.2.3 Heighting accuracy.

90% LE Above Ground Level (AGL)
All Features \pm 9 meters (\pm 30 feet)

NOTE: Refer to MIL-STD-2409 for accuracy derivations.

3.2.4 Displaced feature symbols. Feature symbols which are displaced as identified in MIL-STD-2403 MC&G Product Rules (reference displacement rules) are excluded from the accuracy requirements as stated in sections 3.2.1 and 3.2.2.

3.2.5 Projection Accuracy. The basic projection layout must be accurate to within ± 0.5 mm (± 0.02 inch) diagonal measurement.

3.2.6 Registration Accuracy. Registration marks shall be accurately inscribed upon each separation and be within 0.25 mm (0.01 inch) between separations.

3.3 Datum.

3.3.1 Horizontal datum. Horizontal datum shall be the current WGS.

3.3.2 Vertical datum. Vertical datum shall be MSL.

3.4 Adjoining data set and chart match. All information shall be matched with adjoining data sets or charts. In achieving match, however, no errors of position shall be introduced into new production, nor shall any factual error be made in an attempt to tie adjoining areas.

3.5 Series.

This section is not applicable to this specification.

3.6 Scale. ONC series shall be produced at 1:1,000,000 scale.

3.7 Chart design.

3.7.1 Area of coverage.

a. Individual chart coverage limits shall be as defined by the DMA Area Requirements and Product Status (ARAPS) file.

3.7.2 Non-standard sheet limits.

a. Geographic limits of a chart shall not be shifted to avoid unnecessary production without written request and subsequent approval of HQ DMA/PR.

b. Detail or tints shall not extend beyond the south and west chart limits except upon written request and subsequent approval of HQ DMA/PR and when necessary to portray an entire airfield symbol or pattern.

3.7.3 Insets. Insets shall not be shown unless upon written request and subsequent approval of HQ-DMA/PR.

3.7.4 Overlap.

a. Detail and tints contained on the chart shall extend into the north and east overlaps and into the northeast corner of the chart.

b. Detail and tints shall extend 2.5 mm (0.1 in.) beyond the north and east trim lines to ensure a bleeding edge.

3.7.5 Detail Selection and Density.

a. Rigid guidelines to satisfy requirements in the selection and density of chart detail cannot be formulated in view of the multiple requirements. For this reason, the finished product may not necessarily represent optimum presentation of each chart feature. However, the selection criteria detailed in this section should serve as general guidance in achieving the best overall balance and relativity of the chart features portrayed. The cartographer should bear in mind that aeronautical and vertical data are the most important information on the Operational Navigation Chart.

b. **Basic Selection Criteria:** The following basic guidelines governing the selection of feature detail should be kept in mind.

(1) A firm requirement exists to provide maximum density of ground features significant in visual and radar low altitude-high speed navigation without impairing chart legibility.

(2) Features validly selected for portrayal in one area may well be inappropriate for portrayal in another area. In areas of sparse or moderate cultural development, the lesser chart features assume extreme importance because they pinpoint landmarks and should be shown. In congested areas with significant cultural development these same features would not be seen during a low altitude-high speed mission and would normally not be shown.

(3) Cultural features that are so unique and outstanding that they serve as a medium for instantaneous orientation of the chart to the ground are landmark features and should be shown.

(4) When maximum feasible feature density is exceeded, the order of elimination of features (including feature labels and geographic names) shall be as follows:

- (a) Canal; small town and other minor geographic names.
- (b) Tracks and trails.
- (c) Ditches and intermediate streams
- (d) Single line streams, wells, and other minor hydrographic features and their labels
- (e) Secondary roads
- (f) Cultural features lacking visual or radar significance

3.8 Size and dimensions. The trim size is 1057 mm x 1461 mm (41 5/8 inch x 57 1/2 inch).

3.9 Projection.

3.9.1 Projection and standard parallel determination.

a. Operational Navigation Charts located between 0° and 80° North and South shall be produced on the Lambert Conformal Conic (LCC) Projection, based on standard parallels 5°20' apart as follows:

<u>Established Limits</u>	<u>Standard Parallels</u>	<u>Convergence Factor</u>
0° to 8°	1°20' and 6°40'	0.06979
8° to 16°	9°20' and 14°40'	0.20799
16° to 24°	17°20' and 22°40'	0.34215
24° to 32°	25°20' and 30°40'	0.46965
32° to 40°	33°20' and 38°40'	0.58800
40° to 48°	41°20' and 46°40'	0.69491
48° to 56°	49°20' and 54°40'	0.78830
56° to 64°	57°20' and 62°40'	0.86634
64° to 72°	65°20' and 70°40'	0.92752
72° to 80°	73°20' and 78°40'	0.97065

b. Charts located between 80° and 90° North and South shall be produced on the Polar Stereographic (PS) Projection, based on the scale factor established by the Lambert Conformal Conic Projection at latitude 81°03'.

c. Charts with an area of coverage spanning two established limit areas shall be produced on standard parallels applicable to the greater area of the chart.

3.9.2 Projection lines.

a. Projection lines shall be shown as follows:

<u>Projection</u>	<u>Area</u>	<u>Selection</u>
LCC	0° to 80° N & S	all full degree latitude all full degree longitude
PS	80° to 84° N & S	all full degree latitude all full degree longitude
PS	84° to 90° N & S	all full degree latitude each full degree longitude divisible by 4

b. Projection lines shall extend beyond the trim lines on the north and east of each chart and 1.8 mm (0.07 inch) beyond the geographic limits on the south and west.

c. Quality Standard. The final projection shall be accurate to within ± 0.5 mm (± 0.02 in.) diagonal measurement.

3.9.3 Projection line ticks.

a. The following projection lines shall be ticked:

<u>Latitude Band</u>	<u>Latitude Lines</u>	<u>Longitude Lines</u>
0° to 56° N & S	all	all
56° to 72° N & S	all	every other line starting at the west chart limit

72° to 80° N & S	all	every 4th line starting at the west chart limit
80° to 84° N & S	all	every 4th line starting at the 0° longitude
84° to 90° N & S	all	every 3rd line starting at the 0° longitude

b. Projection lines shall be ticked at the following intervals:

<u>Latitude Band</u>	<u>Latitude Lines</u>	<u>Longitude Lines</u>
0° to 64° N & S	1'	1'
64° to 84° N & S	5'	1'
84° to 90° N & S	1'	1'

c. Tick marks shall extend away from Greenwich and the Equator. Short tick marks shall be on the west side of lines of west longitude and on the east side of lines of east longitude. Similarly, short ticks shall be on the north side of north latitude lines and on the south side of south latitude lines. At 0° and 180° longitude and on the equator, tick marks shall extend equidistantly on both sides of the graticule.

d. Selected ticks shall extend equally on both sides of projection lines as follows:

<u>Latitude Band</u>	<u>Latitude Lines</u>	<u>Longitude Lines</u>
0° to 64° N & S	each 10 minute	each 10 minute tick
64° to 84° N & S	each 30' tick	each 10 minute tick
84° to 90° N & S	none	each 10 minute tick

e. Refer to APPENDIX B (ONC Style Sheet) for tick dimensions (length and line weight).

3.9.4 Projection Values.

a. Projection line values shall be shown in the chart margin overlaps and throughout the chart interior.

b. Refer to APPENDIX B (ONC Style Sheet) for values type size and positioning.

3.10 Reference systems.

3.10.1 Military Grid Reference System (MGRS) and British Grid Reference Systems (BGRS).

a. This specification provides guidance for the application of the MGRS and BGRS to Operational Navigation Charts. MGRS includes the Universal Transverse Mercator (UTM) Grid and the Universal Polar Stereographic (UPS) Grid. The BGRS are independent systems required for specific areas of the world.

b. Grids are applied to military maps and charts to provide a uniform system for referencing and making measurements. There is a defined relationship between the grid and the graticule so that a corresponding geographic position can be determined for each grid position.

c. The application of MGRS or BGRS to maps and charts produced by DMA is directed by DMA Technical Manual 8358.1 (Datums, Ellipsoids, Grids And Grid Reference Systems), DMA Technical Manual 8358.2 (The Universal Grids: Universal Transverse Mercator (UTM) and Universal Polar Stereographic (UPS)) and current directives concerning the requirement for dual grid portrayal.

3.10.1.1 Limits of grid systems.

a. The UTM Grid shall be shown between 84°N and 80°S, except in areas where BGRS are required.

b. The UPS Grid shall be shown beyond 84°N and 80°S.

c. BGRS shall be shown in areas where prescribed by DMA TM 8358.1

3.10.1.2 Grid preparation. The grid shall be prepared in accordance with the following:

a. Each 100,000 meter (or yard) grid line shall be shown throughout the chart and extend beyond the trim line on the north and east. 100,000 meter (or yard) grid lines shall extend 4 mm (0.15 in.) beyond the south and west geographic limit lines.

b. 10,000 meters (or yard) grid ticks shall be shown on all 100,000 meters (or yard) grid lines and along the south and west geographic limits of the chart.

c. Ticks shall extend equally in both directions beyond the line they overlay.

d. Refer to APPENDIX B (ONC Style Sheet) for grid line and tick dimensions.

e. Ellipsoid, major grid, and grid zone junctions shall be shown by a solid line terminating at the limits of the charted area. The identifying names of the Ellipsoids, major grids or grid zones shall be shown on each side of, and parallel with, the junction line or respective projection line in a position that will not overprint base detail causing illegibility of either.
Examples:

BESSEL ELLIPSOID
INTERNATIONAL ELLIPSOID

UTM GRID ZONE DESIGNATION: 37R
MALAY GRID

UTM GRID ZONE DESIGNATION: 50P
UTM GRID ZONE DESIGNATION: 49P

NOTE: Exception is required when junction line(s) are coincident with chart projection line(s), then the junction line(s) shall be omitted and only identification label(s) shown.

f. The grid square identification (100,000 unit squares) shall be shown at each 100,000 unit grid line intersection. When the system is a British Grid that identifies larger grid squares or areas e.g. 500,000 unit squares, in addition to the 100,000 squares, then the extra identification shall be shown in smaller letters (or letters and figures) immediately preceding the 100,000 unit grid square identification. Refer to APPENDIX B (ONC Style Sheet) for type size, style and position.

g. Grid lines shall be labeled along the margins as follows:

(1) Full grid line values shall be shown at the first grid line (or tick) in each direction from each corner.

(2) Full grid line values shall include the abbreviated designation of the measuring unit "m" for meters (or "yds" for yards on some British grids) and the abbreviated geographic designation of the line (or tick), "N" for Northings and "E" for Eastings.

(3) Even numbered intermediate grid line values shall be shown in the south and west margins and shall include only the principal digits and digits prefixing the principal digits. Intermediate grid line values shall be omitted in the north and east margins. Do not overprint geographic values. Grid values shall be adjusted to clear geographic values in the south and east margins.

(4) Numbers shall be positioned to read from the bottom of the chart except for the Northing full grid values which shall be positioned to read from the right side.

(5) The principal digit of grid line values and the "N" and "E" shall be bolder type.

(6) Refer to APPENDIX B (ONC Style Sheet), for type size, style and position.

3.10.1.3 Grid reference box placement and labeling.

a. A grid reference box shall be shown for each grid system portrayed. In the case of BGRS, a grid reference box shall be shown for each unit of measure portrayed (meters/yards) and for each system of grid identification portrayed.

b. Each grid reference box shall include a step-by-step guide to determining the grid reference position of a point located within that chart.

c. Refer to APPENDIX B (ONC Style Sheet) for grid reference box design, type requirements and position.

3.10.2 World Geographic Reference System (GEOREF).

a. GEOREF shall be shown by a diagram in the margin of Operational Navigation Charts. Refer to APPENDIX B (ONC Style Sheet) for reference box design, type requirements and position. The sample reference point in the GEOREF diagram, to the nearest minute, shall be tailored to each individual chart.

b. The GEOREF is based on normal geographic longitude and latitude lines and values. (See APPENDIX B - FIGURE 1. 15° GEOREF Quadrangles)

Basically, this system defines the unit geographic area in which a specific point lies. It is read to the right and up in all cases except for those charts containing either the north or south pole. The point of origin is the 180th meridian and the South Pole. It extends to the right or eastward from the 180th meridian, 360 degrees, to the 180th meridian, and upward or northward from the South Pole, 180 degrees, to the North Pole. The GEOREF divides the earth's surface into quadrangles of longitude and latitude with a simple, brief systematic code that gives positive identification to each quadrangle. The system and identification code is as follows:

(1) There are 24 longitudinal zones of 15 degrees each. To the right or eastward from the 180th meridian, these zones are lettered A through Z, omitting the letters I and O. There are 12 bands of latitude of 15 degrees each. Upward or northward from the South Pole, these bands are lettered from A through M omitting the letter I. This combination divides the earth's surface into 288 basic 15 degree quadrangles, each identified by 2 letters, the first letter being that of the longitudinal zone and the second letter that of the latitude band.

(2) Each basic 15 degree quadrangle is divided into 15 lettered degree units eastward and 15 lettered degree units northward. These 1 degree quadrangles are lettered from A through Q, omitting the letters I and O. Thus, 4 letters will positively identify any single degree quadrangle in the world, the first two letters being the reference of the 15 degree quadrangle obtained as detailed above, the third letter being that of the 1 degree longitudinal zone, and the fourth letter that of the 1 degree latitude band.

(3) Each degree quadrangle is divided into 60 numbered GEOREF "minute" units eastward and 60 numbered GEOREF "minute" units northward. Thus 4 letters and 4 figures, read to the right and up in all cases, will positively identify a 1 minute quadrangle anywhere in the world, and will locate a point within approximately 1 nautical mile. In referencing on charts in the Western Hemisphere, the GEOREF "minute" units are equal to 60 minutes minus the number of minutes of west longitude, as the GEOREF numeration is eastward from the 180th meridian. In referencing on charts south of the equator, in both the Eastern and Western Hemispheres, the GEOREF "minute" units are equal to 60 minutes minus the number of minutes of South latitude, as the GEOREF numeration is northward from the South Pole. In referencing on charts in the Eastern Hemisphere, the GEOREF "minute" units are equal to the minutes of east longitude. Also, in referencing on charts north of the equator, in both Eastern and Western Hemispheres, the GEOREF "minute" units are equal to the minutes of north latitude.

c. GEOREF lines and labels.

(1) The divisions between 15 degree quadrangles shall be portrayed by overprinting the appropriate lines of latitude and longitude with a solid line.

(2) The appropriate letter designators (text labels) of each 15 degree and 1 degree quadrangle shall be portrayed.

d. Refer to APPENDIX B (ONC Style Sheet) for lineweights, type style, size and position.

3.10.3 World Area Code (WAC) Index. The World Area Code identifiers shall be portrayed and indexed in the body of the ONC and in the interchart relationship diagram (See 3.11.3.10) for each chart.

3.11 Margin data. Refer to APPENDIX B (ONC Style Sheet) for graphic illustration of the design, composition and location of all margin data.

a. Legends, notes and diagrams that require tailoring are indicated on the style sheet by a (12% black screen) gray tint overprint and accompanying number marking the respective paragraph in the product specification to be followed for guidance. Other notes shall be added as necessary for each individual chart.

b. All margin data contained on the chart shall be positioned within the trim limits.

c. The bottom and left margin space may vary in width depending upon the size of the geographic area encompassed.

d. All ONC margin notes and diagrams shown in this specification are portrayed in a convenient format. The correct fonts (type, size and style), colors, justification, dimensions and placement for all margin notes and diagrams are specified in APPENDIX B (ONC Style Sheet).

3.11.1 Standard margin information. Refer to the section indicated within parentheses for information concerning a specific topic.

- a. Aircraft Facility Legend (3.11.3.6)
- b. Aeronautical Caution Note (3.11.3.25)
- c. Bar Scale (3.11.3.12)
- d. Civil Purchasers Note (3.11.3.13)
- e. DMA Seal (3.11.3.27)
- f. Elevation Conversion Scale (3.11.3.20)
- g. Elevations in Feet Notes (3.11.3.33)
- h. Publishers Note (3.11.3.26)
- i. Radio Facilities Legend (3.11.3.6)
- j. Series Title/Code/Scale (3.11.3.1)
- k. Vertical Datum Note (3.11.3.11)
- l. Vertical Obstruction Disclaimer (3.11.3.17)

3.11.2 Variable margin information. Refer to the section indicated within parentheses for information concerning a specific topic.

- a. Aeronautical Currency Date (CAUTION NOTE) (3.11.3.7.d/3.11.3.25)
- b. Boundary and Names Disclaimer Notes (3.11.3.16)
- c. Buffer Zone (3.11.3.32)
- d. Chart Number (3.11.3.2)

- e. Classification, Releasability, and Handling Notes (3.11.3.28)
 - f. Compilation/Revision dates(3.11.3.7/ 3.11.3.26)
 - g. Contour Interval Notes (3.11.3.14)
 - h. Copyright Note (3.11.3.35)
 - i. Culture Feature Abbreviations (3.11.3.29)
 - j. Edition Number (3.11.3.5)
 - k. Facsimile Lithographic Note (3.11.3.34)
 - l. (GEOREF) World Geographic Reference System Diagram (3.11.3.22)
 - m. Glossary (3.11.3.30)
 - n. Grid Reference System Boxes (MGRS/BGRS) (3.11.3.24)
 - o. Interchart Relationship Diagram (3.11.3.10)
 - p. Locality Designation (Country name(s)) (3.11.3.3)
 - q. Lithographic Note (3.11.3.7.f)
 - r. Magnetic Variation Note (3.11.3.7.e)
 - s. Maximum Elevation Figures (MEF) Note (3.11.3.21)
 - t. Miscellaneous Notes (3.11.3.16)
 - u. Names Disclaimer Notes (3.11.3.16.b)
 - v. Projection and Convergence Factor Note (3.11.3.8/3.11.3.9)
 - w. Revision Currency Note (3.11.3.7.c)
 - x. Special Use Airspace Notes (3.11.3.6)
 - y. Spot Elevations/Accuracy Note (3.11.3.6/3.11.3.15)
 - z. Stock Number Bar Code (3.11.3.4)
 - aa. Symbol Legends (3.11.3.6)
 - bb. Terrain Characteristic Tint Diagram / Highest Terrain Elevation on chart. (3.11.3.19)
 - cc. Users Note (3.11.3.23)
 - dd. Vertical Obstruction (VO) Note (3.11.3.18)
 - ee. Vegetation (Legend and Notes). (3.11.3.16.c/3.11.3.31)
- 3.11.3 Margin data clarifications.
- 3.11.3.1 Series title, code, and scale.

- a. Title: OPERATIONAL NAVIGATION CHART
- b. Code: ONC
- c. Scale: SCALE 1:1,000,000

3.11.3.2 Chart number. Charts of this series shall be identified alpha-numerically. The code "ONC" shall precede the chart number in the upper left, lower left and right margin as shown in APPENDIX B (ONC Style Sheet).
Examples:

ONC E-3 ONC H-9 ONC M-25

3.11.3.3 Locality designation.

a. The locality designation shall appear below the chart number in the bottom left margin panel and consist of the country (or countries listed alphabetically), island group or ocean name(s). Island group names shall be used instead of the country name to which the island (or group) belongs.
Example:

ALBANIA, BULGARIA, CZECHOSLOVAKIA, GREECE, HUNGARY,
ROMANIA, TURKEY, USSR, YUGOSLAVIA

b. A country which falls in the north or east overlap shall be included in selecting the country names of the locality designation note.

c. Locality names shall be separated by commas.

3.11.3.4 Stock number bar code. The DMA Stock Number and Edition Number are in human readable form only. For chart requisitioning purposes within DMA, the DMA Stock Number will conform to the requirement of the DMA Automated Distribution Management System (DADMS). The DMA Stock Number will be maintained until which time the requirement to show both is phased out in favor of the National Stock Number (NSN). The HRI edition number will remain. Both stock numbers and bar coding are shown in accordance with MIL-STD-2414 for Bar Codes. The bar codes and stock numbers are shown in the bottom margin at the lower left work limit of the chart. See APPENDIX B - ONC Style Sheet.
Example:


NSN 4671001234567
DMA STOCK NO. ONCXXF03


ED. NO. 002

3.11.3.5 Edition number.

- a. The initial publication of each ONC shall be "ED. NO. 001"
- b. Subsequent editions of the ONC shall be consecutively numbered.
- c. Edition number advancement.

(1) The edition number shall be advanced to the next higher number upon recompilation or revision of any factual graphic data on the chart.

(2) The edition number shall not be advanced on reprinted charts even though minor changes to the margin information has been accomplished.

d. Edition number shall be shown accompanying the series and sheet information enclosed by a box outline in the upper left, lower left and lower right chart margin in accordance with APPENDIX B (ONC Style Sheet)

3.11.3.6 Symbol legend. (Culture, Built-up Area, Spot Elevation, Aeronautical, Aircraft/Radio Facilities and Special Use Airspace).

a. Symbols define and illustrate features represented on the chart.

b. A standard legend as illustrated in the APPENDIX B (ONC Style Sheet) shall be applied to individual charts even though all symbols in the legend may not occur on a respective chart. An exception is to delete the Military Operations Area (MOA) Symbol and type when feature is not shown in the body of the chart.

c. Cultural features that appear within the main body of a chart should also have symbology (example feature) and description in the culture legend. These features include roads, railroads, power transmission lines, built-up areas, etc. Specific features that do not occur within the body of the chart may be deleted from the legend. Features that appear within the body of the chart with a text description label do not have to have a counterpart example in the margin legend.

d. Legend symbols may be deleted and replaced with words "None Shown" if their inclusion necessitates an extra color separation(s) solely for margin data portrayal.

e. Glacial (blue) area pattern fill when applicable to a chart interior shall be included in the symbol legend.

3.11.3.7 Currency information.

a. Compilation date shall be added as part of the publishers note (3.11.3.26) to reflect the completion (month-year) of the compilation or recompilation (excluding aeronautical data). Example:

Compiled October -1985.

b. A revision date shall be added to the publishers note (3.11.3.26) for new editions reflecting revised base data as the last sentence in the note. Example:

Revised June-1986.

c. An explanatory phrase shall be added as part of the publishers note (3.11.3.26) to indicate pertinent information revised or added to chart. Example:

(Revision limited to aeronautical information, correction of all CHUM conditions and currency of planimetric data.)

d. Currency date of aeronautical information shall be added as part of the Aeronautical Caution note (3.11.3.25).

e. Magnetic Variation Information.

(1) Date of isogonic information (related to 5 year epochs) and annual rate of change value (increase or decrease) shall be added to the Magnetic Variation note positioned below the Aeronautical Caution Note. Example:

LINES OF EQUAL MAGNETIC VARIATION FOR 1985*
(Annual rate of change 1" increase**)

(2) When the magnetic variation is ≤ 15 minutes over the entire chart and no isogonic lines are shown the following note shall replace the standard note:

MAGNETIC VARIATION FOR 1985* IS APPROXIMATELY
15" OVER THE ENTIRE CHART.
(Annual rate of change 1" increase**)

* Use applicable value, ** (increase or decrease)

f. Current date (month-year) that chart assignment is printed/reprinted shall be added in numeric form to the lithographic note. Example:

Lithographed by DMAAC 6-86.

g. Currency date of vertical obstruction information shall be added as part of the vertical obstruction note. (3.11.3.18)

3.11.3.8 Projection note.

a. The note for Lambert Conformal Conic Projection charts between 80° North and 80° South latitude shall vary to conform to the standard parallels applicable to pertinent chart. See section 3.9.1 for listing of standard parallels. Example:

Lambert Conformal Conic Projection
Standard Parallels 25°20' and 30°40'

b. The note for Polar Stereographic Projection charts used in the polar latitudes (north of 80° north and south of 80° south latitudes) shall read:

Polar Stereographic Projection
Scale 1:1,000,000 at 81°03'

3.11.3.9 Convergence factor.

a. A convergence factor shall be applied on charts between 0° and 80°N and 80°S produced on the Lambert Conformal Conic Projection. The convergence factor associated with the standard parallels of the chart projection (See 3.9.1) shall be centrally positioned below the projection note. Example:

Convergence factor 0.46965

b. Convergence factor is not required on charts produced on the Polar Stereographic Projection.

3.11.3.10 Interchart relationship diagram. The Interchart relationship diagram shall be developed for each chart area in accordance with design indicated on the APPENDIX B (ONC Style Sheet). The required information consists of the following items tailored for each product:

- a. ONC sheetlines and numbers.
- b. World Aeronautical Chart sheetlines and numbers in areas where no ONC coverage exists.
- c. World Area Code (WAC) identifiers and limits within the frame of the basic ONC outline. Not shown in adjacent ONC areas in diagram.
- d. International boundaries and country names. Boundary disclaimer notes shall be displayed over the interchart relationship diagram whenever boundaries appear within the diagram and not within the chart body. When boundary(s) are present within body of a chart then the boundary disclaimer notes shall be shown in the margin section titled "NOTES". (See 3.11.3.16).
- e. Major bodies of water and names.
- f. Major rivers and city names shall be added as necessary for graphic location and interpretation purposes.
- g. The following note shall be positioned at the top of the Interchart Relationship diagram

This diagram is for index purposes only - Not necessarily an indication of published charts.

3.11.3.11 Vertical datum note. The following note relating to the datum (Mean Sea Level) on which all elevation values are based shall be shown:

ALL ELEVATION VALUES (AERONAUTICAL, RELIEF AND
HYDROGRAPHIC) ARE BASED ON MEAN SEA LEVEL

3.11.3.12 Bar scales (distance graphs). Graphic bar scales provide a means for making measurements on the chart. Scales shall be shown for nautical miles, statute miles and kilometers in a stacked order with the zero point of each scale vertically aligned. (See APPENDIX B - ONC Style Sheet)

3.11.3.13 Civil purchasers note. The following note shall be shown on all ONCs produced:

For sale by the National Ocean Service
and its authorized agents.

3.11.3.14 Contour interval notes. Contour interval notes shall address the basic contour, intermediate contour and supplementary contour as shown on the chart. The notes for each situation shall be formulated individually as follows:

- a. Basic contours: The contour interval is either same throughout chart or in multiple intervals. Notes shall be tailored to the individual chart. The word "maximum" shall not be used; the value of highest the contour shall be used instead. "BSL" shall be used when a below sea level contour is shown on chart.

- (1) Basic interval throughout:

CONTOURS
Basic interval 1000 feet

- (2) Multiple intervals. Example:

CONTOURS
1000 feet from 0 to 6000 feet
2000 feet from 6000 to 10000 feet

b. Intermediate and supplementary contours fall into several categories:

- (1) For those shown at one specific elevation and/or within certain elevation limits, notes shall read:

Intermediate contours shown only at ___ feet.
Supplementary contours shown at ___ feet intervals below ___ feet

- (2) For those shown throughout chart at certain elevations only, as opposed to certain interval, notes shall read:

Intermediate/Supplementary contours shown
only at ___ and ___ feet.

- (3) For those at certain elevations, shown only in select portions of the chart, add a phrase reflecting the condition to the note in 3.11.3.14.b.(2). The phrase shall be simple and reflect the true and complete condition. Examples:

in relatively level area.

in (COUNTRY) and(COUNTRY).

in relatively level areas of (COUNTRY) and(COUNTRY).*

*(Do not use if either of above notes will suffice by itself)

- (4) For those shown at a certain interval throughout the chart:

Intermediate/Supplementary contours shown at ___ foot intervals.

- (5) For those shown at certain interval in a selected portion of the chart only. Examples are presented in order of preference (if applicable):

below ___ feet.

below ___ feet in relatively level areas only.

from ___ feet to ___ feet.
below ___ feet in (COUNTRY) and (COUNTRY) only.

below ___ feet in relatively level areas of (COUNTRY) only.

in relatively level areas of (COUNTRY) and (COUNTRY)

in (COUNTRY) and (COUNTRY) only.

3.11.3.15 Spot elevation legend/accuracy notes. Spot elevations shall be represented as shown on the spot elevation legend including the highest elevation tailored for each chart. When accuracy values for approximate elevation (sawbuck symbol) vary over different areas of a chart, the accuracy note(s) shall be tailored to the individual chart. Examples:

Approximate Elevations.....x⁰⁰⁰⁰
 (Maximum possible vertical error is 250 feet in the USSR,
 1000 feet in China)

Approximate Elevations.....x⁰⁰⁰⁰
 (Maximum possible vertical error is 250 feet in Borneo,
 undetermined in Papua, within 500 feet in West New Guinea)

Approximate Elevations.....x⁰⁰⁰⁰
 (Maximum possible vertical error is 200 feet North of 48°, 600
 feet South of 48°)

Approximate Elevations.....x⁰⁰⁰⁰
 (Maximum possible vertical error is 500 feet in Burma, 250
 feet in remainder of chart)

Approximate Elevations.....x⁰⁰⁰⁰
 (Maximum possible vertical error is 500 feet East of 130°
 between 28° and 32°, 2000 feet in remainder of chart)

3.11.3.16 Miscellaneous notes. Notes regarding specific features, conveying proper understanding or addressing policy or information contained in the body of the chart shall be shown in the section titled "NOTES".

a. Boundary Disclaimer Notes:

(1) When international boundaries and/or lines separating areas of national sovereignty (e.g. armistice lines, cease-fire lines) are portrayed, the following note shall be shown:

Boundary representation is not necessarily authoritative.

(2) When the producing nation does not recognize a country's administrative control of an area (or areas) formerly having independent status the following note, in addition to the standard boundary disclaimer note shall be shown:

The (name of government) has not recognized the incorporation of (name of country or countries) into (name of controlling country).

(3) When the portrayal of international boundaries is revised, the following note shall be shown:

The depiction of international boundaries has been changed since the last edition.

b. Names Disclaimer Notes: When required by State Department policy and guidance, names disclaimers shall be shown. Disclaimer occurs in cases where the producing country does not recognize the political status of an entity but uses names having local sanction.

(1) For charts that completely cover an area requiring a disclaimer, the note shall read:

Geographic names or their spelling do not necessarily reflect recognition of the political status of the area by (name of government).

(2) For charts that partially cover an area requiring a disclaimer, the note shall read:

Geographic names or their spellings in (name of country or countries) do not necessarily reflect recognition of the political status of the area(s) by (name of government).

c. Vegetation Notes.

(1) When no vegetation (trees) data is shown or known to exist within a chart, the vegetation legend shall be omitted and the following note added:

No prominent vegetation is known to exist within the area of this chart.

(2) When information is not available to portray vegetation (tree) pattern known to exist within the area of a chart, the vegetation legend shall be omitted and the following note added:

No adequate source material was available to display vegetation patterns within the area of this chart.

(3) If a chart is predominately forest covered then clearings will be shown and labeled and the following note added to the notes legend:

Generally forest covered.

3.11.3.17 Vertical Obstruction disclaimer. The following note shall be shown positioned below the Vertical Obstructions Note:

CAUTION

Vertical Obstructions, including Power Transmission Lines have been extracted from the most reliable source available; however, there is no assurance that all are shown, or that their locations or heights are exact.

3.11.3.18 Vertical Obstructions (VO) note. The following note shall be shown under the section titled "VERTICAL OBSTRUCTIONS". (See APPENDIX B - ONC Style Sheet). The Month-Year shall be tailored for each chart.

Example:

VERTICAL OBSTRUCTIONS SHOWN HAVE BEEN
SELECTED FROM INFORMATION AVAILABLE AS OF
JULY - 1988

All reported vertical obstructions cannot be portrayed due to chart scale. Obstructions shown are the highest within each 3 minute by 3 minute matrix, originating at full degree intersections, and at least 200 feet AGL. In and around major populated places the pattern is further reduced to enhance clarity.

3.11.3.19 Terrain Characteristic Tint diagram. The Terrain characteristic tint diagram illustrates and defines the range of elevations appearing on a chart, in the form of tinted bands. The standard four (4) color tint diagram (with shaded relief) shall be shown on all ONCs and consist of one tint for level areas (at different elevations), and three tints for the

elevation ranges; low relief, moderate relief and high relief. (See APPENDIX B - ONC Style Sheet) See 3.14.2 for tint specifications.

a. The only variable information in the diagram are the text labels between the elevation tint bands. The standard breaks at "5000" and "9000" feet shall be adjusted based on the regional coverage of the ONC.

b. Shaded relief shall be shown in the diagram.

c. The following note shall shown below the diagram:

Green color indicates flat or relatively level terrain regardless of altitude above sea level.

d. When applicable the following note shall be added below the diagram title.

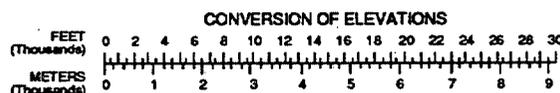
(areas of unreliable relief are devoid of tint.)

e. The highest terrain elevation and appropriate latitude and longitude values for the entire chart area including the North and East overlap portions of the chart shall be shown positioned above the diagram.

f. When multiple tint band systems are shown in the body of a chart, an explanatory note describing the system employed shall be formulated and added below the characteristic tint diagram. Example:

Note: Two terrain characteristic tint systems have been employed on this chart. Tints are shown from 0 to 5000 feet, 5000 to 9000 feet in Turkey and from 0 to 5000 feet, 5000 to 9000 feet, 9000 to 10,000 feet in the remainder of the chart.

3.11.3.20 Elevation conversion scale. The Feet-Meters Elevation Conversion Scale is designed to permit the conversion of intermediate values by comparison. The standard scale of 0-30,000 Feet/0-9000 Meters shall be shown on all charts. The lineweight and graphic specifications are provided in APPENDIX B - ONC Style Sheet.



3.11.3.21 Maximum Elevation Figures (MEF).

a. The following note (tailored for the highest MEF) shall be shown in the ONC margin:

ATTENTION

THIS CHART CONTAINS MAXIMUM ELEVATION FIGURES (MEF)

The Maximum Elevation Figures shown in quadrangles bounded by ticked lines of latitude and longitude are represented in THOUSANDS and HUNDREDS of feet above mean sea level. The MEF is based on information available concerning the highest known feature in each quadrangle, including terrain and obstructions (trees, towers, antennas, etc.). In areas of extensive unreliable relief, the MEF is shown by a note spread across the area.

12⁵

Example: 12,500 feet

(b) The MEF note sentence; "In areas of extensive unreliable relief the MEF is shown by a note spread across the area." shall be deleted from the MEF note text if no areas of unreliable relief exist on the chart.

(c) See 3.14.1 for MEF computation and APPENDIX B (ONC Style Sheet) for MEF note placement.

3.11.3.22 World Geographic Reference System (GEOREF) diagram. The World Geographic Reference System (GEOREF) shall be shown by a diagram referencing 15° and 1° quadrangles. Sample reference point to the nearest minute shall be tailored to chart area. (See 3.10).

3.11.3.23 User's note. Each chart shall contain a user's note.

a. The note on US/UK produced ONC's shall read as follows:

USERS SHOULD REFER CORRECTIONS, ADDITIONS
AND COMMENTS FOR IMPROVING THIS PRODUCT TO:
(US Users) DIRECTOR, DEFENSE MAPPING AGENCY
ATTN: PR
8613 Lee Highway
Fairfax, VA 22031-2137
(UK Users) Directorate of Military Survey
Ministry of Defense, London

b. The note on Australian produced ONC's shall read as follows:

USERS SHOULD REFER CORRECTIONS, ADDITIONS
AND COMMENTS FOR IMPROVING THIS PRODUCT TO:
(US Users) DIRECTOR, DEFENSE MAPPING AGENCY
ATTN: PR
8613 Lee Highway
Fairfax, VA 22031-2137
(Other Users) Department of Defense (Air Force Office)
Aeronautical Information Service
RAAF, "FROGNALL" via CANTERBURY
Victoria, 3126. Australia

3.11.3.24 Grid Reference System Boxes (MGRS/BGRS). Each chart with MGRS/BGRS overprint (UTM, British Grid, etc.) shall contain the appropriate grid reference box(es) describing grid(s) data with instructions for composing a grid reference by sample display of a reference point computation. See 3.10.1 for MGRS/BGRS description and APPENDIX B (ONC Style Sheet) for example grid reference boxes.

3.11.3.25 Aeronautical caution note.

a. US produced ONC's:

<p>CAUTION</p> <p>AIR INFORMATION CURRENT THROUGH * 30 APRIL 1987</p> <p>Before using this chart, consult the current DMA Aeronautical Chart Updating Manual (CHUM/CHUM Supplement, and the latest Flight Information Publications (FLIPS) and Notices to Airmen (NOTAMS) for vital updating information.</p>
--

b. UK produced ONCs:

CAUTION

AIR INFORMATION CURRENT THROUGH
* 30 APRIL 1987

Before using this chart, consult the current DMA Aeronautical Chart Updating Manual (CHUM)/CHUM Supplement or MOD (UK) Aeronautical Chart Amendment Document (CHAD), and the latest Flight Information Publications (FLIPS) and Notices to Airmen (NOTAMS) for vital updating information.

c. Australian produced ONCs:

CAUTION

AIR INFORMATION CURRENT THROUGH
* 30 APRIL 1987

Before using this chart, consult the current DMA Aeronautical Chart Updating Manual (CHUM)/CHUM Supplement or the RAAF Chart Amendment Document, and the latest Flight Information Publications (FLIP) and Notices to Airmen (NOTAMS) for vital updating information.

*Insert the appropriate date: Day Month Year (See 3.11.3.7.d)

3.11.3.26 Publishers note. The following note shall be shown together with the compilation and revision information. Example:

Prepared and published by the
DEFENSE MAPPING AGENCY
Compiled June-1985. Revised October-1987.

a. Add a simple explanatory phrase, as applicable, following publishers note to indicate pertinent information revised or added to chart. For example:

(Revision limited to aeronautical information,
correction of all CHUM conditions and currency
of planimetric data.)

b. When a chart contains airspace activated by Notices to Airmen (NOTAM) the following statement should be added to the legend:

All Special Use Airspace is portrayed in the body of this chart
with the following exception(s):
Those activated by NOTAM.

3.11.3.27 DMA seal. The standard Defense Mapping Agency seal shall be shown on all charts published by or for DMA:



3.11.3.28 Classification, releasability, and handling notes. All Operational Navigation Charts are UNCLASSIFIED and have no requirements for classification, releasability, or downgrading notes.

a. When required, the following note (6 pt. normal and 12 pt. bold SW-742) shall be applied to the upper left and lower right corners of the chart in lieu of the classification note: (See APPENDIX B - ONC Style Sheet)

LIMITED DISTRIBUTION

Distribution authorized to DoD, and to nonDoD Government Agencies under M.O.U., IAW 10 U.S.C. Sect. 130 & 2796. Release authorized to U.S. DoD contractors IAW 48 C.F.R. Sect. 252.245-7000. Refer other requests to Headquarters, DMA, ATTN: Release Officer, Stop A-10. Destroy as "For Official Use Only." Removal of this caveat is prohibited.

3.11.3.29 Culture feature abbreviations. Listing shall be portrayed containing only those cultural features pertinent to chart as developed from standard listing shown on the APPENDIX B (ONC Style Sheet). See section 6.9 for a complete listing of possible abbreviations.

3.11.3.30 Glossary. A glossary of pertinent generic terms and English translations shall be prepared on an individual chart basis. Generic term refers to a name or portion of a name which identifies the type of feature named on the chart. Examples of generic terms to be included are: bay, cape, cove, harbor, inlet, island, lake, mountain, point, river, etc.

3.11.3.31 Vegetation legend.

a. A Vegetation Symbol legend shall be depicted on charts containing vegetation (tree) data.

b. When no vegetation is shown or known to exist within charted area, the vegetation symbol legend shall be omitted and the appropriate note added to the notes per 3.11.3.16.c.

3.11.3.32 Buffer zone. An example of Buffer Zone symbology shall be added below aeronautical legend data when Buffer Zone information is depicted on the chart.

3.11.3.33 Elevations in feet notes. Elevations in Feet notes shall be shown on each chart as follows:

ELEVATIONS IN FEET

a. One note positioned in the upper left margin centered below the chart number (3.11.3.2) and above the vertical datum note (3.11.3.11).

b. Two notes positioned in the lower margin on each side of the bar scale (3.11.3.12).

3.11.3.34 Facsimile lithograph note.

a. Charts printed from reproduction material furnished by another country under facsimile printing agreement, a note containing the agency code and facsimile printing date shall replace the original lithograph (print) note. Example:

Reprinted by DMAAC 5-90.

b. Except for special notes (when required), only the following changes shall be made to margin data on the finished reproduction material, ensuring that:

(1) Correct users note is applied.

- (2) Correct aeronautical caution note is applied.
- (3) Civil purchasers note is applied.
- (4) Correct stock number bar code is applied.

3.11.3.35 Copyright Note. A copyright note shall be portrayed on all Operational Navigation charts; centered below the DMA seal (3.11.3.27). The copyright year shall be the same as the publication year. Example:

© COPYRIGHT (year) BY THE UNITED STATES GOVERNMENT
NO COPYRIGHT CLAIMED UNDER TITLE 17 U.S.C.

3.12 Culture. The selection and portrayal of cultural features are based upon the requirement for rapid visual recognition of features as seen from a low perspective angle. Refer to category 1 (Culture) code features in TABLE I of this specification for individual feature requirements.

a. Cultural feature text labels may be abbreviated in areas of congested cultural information for the purpose of enhancing chart clarity. See 3.11.3.29, 6.9, APPENDIX B - ONC Style Sheet, and MIL-STD-2403 Product Rules for feature labeling.

3.12.1 Vertical Obstructions (VO).

a. All cultural features extending 61 meters (200 ft) or more Above Ground Level (AGL) shall be depicted as "Vertical Obstructions."

b. Only the highest Vertical Obstruction within each 3 minute by 3 minute matrix, originating at full degree intersections, shall be shown in non built-up areas. The 3 minute by 3 minute matrix is defined by the projection and projection ticks shown on the chart.

c. An exception to the 3 minute by 3 minute requirement occurs for built-up areas (any area containing built-up area tint) plus the area within a 3 nautical mile limit line around each built-up area. In these cases, the built-up area and surrounding 3 NM area shall be divided into four quadrants and only the highest vertical obstruction within each quadrant shall be shown.

d. The four quadrants shall be formed by defining the center (by area) of the built-up area and projecting a meridian through that point from limit line to limit line. A second line, perpendicular to the first shall be passed through the center point from limit line to limit line.

3.13 Hydrography. The selection and portrayal of hydrographic features are based upon the requirement for rapid visual recognition of features as seen from a low perspective angle. Refer to category 2 (Hydrography) code features in TABLE I of this specification for individual feature requirements.

3.14 Hypsography/Physiography. The selection and portrayal of terrain features are based upon the requirement for rapid visual recognition of features as seen from a low perspective angle. Refer to category 3 (Hypsography) code and category 4 (Physiography) code features in TABLE I of this specification for individual feature requirements.

a. Each 1 degree by 1 degree area on the map as defined by the latitude and longitude grid, should contain approximately 6 to 8 normal spot elevations.

3.14.1 Maximum Elevation Figures (MEF).

a. MEF information is required over all land masses including areas of unreliable relief and open water areas containing man-made obstructions (such as oil/gas rigs/superstructures).

b. The MEF represents the highest elevation, natural or man-made, in a quadrangle bounded by ticked lines (latitude and longitude) of the graticule and shall be portrayed centered in each quadrangle.

c. MEF figures shall be composed of the thousand foot digit(s) and a smaller hundred foot digit. Zero thousands shall be shown with a larger thousand foot digit of zero followed by the smaller hundred foot digit. Zero hundreds shall be shown with a smaller hundred foot digit of zero. The last two digits of the number shall be omitted.

d. Where areas of unreliable relief exist contiguously on a chart, a note or notes expressing the general condition shall be spaced over the area, instead of individual MEF values in each quadrangle. Example:

**MAXIMUM ELEVATION FIGURES ARE
BELIEVED NOT TO EXCEED 7600 FEET.**

(1) The note will be positioned in such a manner as to imply a general condition.

(2) The use of more than one note may be necessary where terrain characteristics vary considerably, in order to describe various situations.

(3) If it is obvious that a portion of a quadrangle with unreliable relief (no contours) contains reliable relief (a major mountain peak) that represents the highest elevation then that value shall be applied as the MEF.

e. MEFs shall not be shown in overlaps of the chart unless the entire land area, in an area not bounded by ticked lines of latitude and longitude, is contained on the chart.

f. **Methods of Computation:** In determining the MEF, extreme care should be exercised to increase such figures only to the point where it is assured that they represent a safe flying altitude based on the existing elevation data shown on the source data/material.

(1) When within a quadrangle a man-made feature (i.e. vertical obstruction) is higher than the highest natural terrain feature, determine the elevation of the top of the feature (above MSL), add the vertical error figure (vertical accuracy factor of data/source). Round the resultant sum to the next higher hundred foot level for the final figure. (A resultant figure shall not be rounded up to the next higher hundred foot level when it is an even multiple of 100). Example:

Elevation of Vertical Obstruction(top)	=	6265 ft.
(above mean sea level)		
Possible vertical error	=	<u>+ 500 ft.</u>
		6765 ft.

Round to next higher 100 ft. level	=	6800 ft.
------------------------------------	---	----------

Maximum Elevation Figure (MEF) = 6⁸

(2) When within a quadrangle a natural terrain elevation is higher than the highest man-made feature, determine the highest natural terrain elevation, add an allowance of 61m (200 feet)* for non-represented natural or man-made features and then add the vertical error figure (vertical accuracy factor of data/source). Round the resultant sum to the next higher hundred foot level for the final figure. (A resultant figure shall not be rounded up to the next higher hundred foot level when the addition results in an even multiple of 100). Example:

Highest natural terrain elevation (above mean sea level)	=	9815 ft.
Allowance *	=	200 ft.
Possible vertical error	=	<u>+ 500 ft.</u>
		10515 ft.
Round to next higher 100 ft. level	=	10600 ft.

Maximum Elevation Figure (MEF) = 10⁶

(3) When the highest natural terrain in a quadrangle is below sea level (BSL), add the BSL value to the 61m (200 feet)* allowance for non-represented natural or man-made features and then add the vertical error figure (vertical accuracy factor of data/source). Round the resultant sum to the next higher hundred foot level for the final figure. (A resultant figure shall not be rounded up to the next higher hundred foot level when it is an even multiple of 100).

Example:

Highest terrain elevation (above mean sea level)	=	- 360 ft.
Allowance *	=	200 ft.
Possible vertical error	=	<u>+ 500 ft.</u>
		340 ft.
(Even hundred - Do Not Round)	=	300 ft.

Maximum Elevation Figure (MEF) = 0³

*(Note: For quadrangles which cover (totally or partially) areas of Canada, Denmark, France, Germany, Italy, Netherlands or Turkey use a 100m (328 foot) allowance for non-represented natural or man-made features instead of 61m (200 feet) in the computation.)

3.14.2 Terrain Characteristic tints.

a. Tints are required to be displayed in areas of accurate and approximate relief (contours).

b. Areas of unreliable relief (no contour information) and areas covered by permanent ice and snow shall be devoid of elevation tints.

c. Three tints are used to define the overall elevation level. A fourth tint is used to portray level area/valley accentuation.

(1) Low relief tint: Normally extends from sea level (includes BSL area) to a level which best encompasses or limits broad areas of rolling and relatively hilly terrain. "0" to "5000" is the standard range for this tint. Low relief tint shall be shown as 42% screen in SPC #55607 (green) or equivalent process printing color.

(2) Moderate relief tint: Represents the major mountain mass (including high plateaus and valleys) and extends from the upper limits of the Low Relief Tint to a level delineating the extreme peaks and ridges of a formation. "5000" to "9000" is the standard range for this tint. Moderate relief tint shall be shown as 54% screen in SPC #57437 (buff) or equivalent process printing color.

(3) High relief tint: Represents the extreme high areas of a mountain range and extends from the upper limits of the moderate relief tint to the maximum elevation. "9000" to "Maximum" is the standard range for this tint. High relief tint shall be shown as solid screen in SPC #57437 (buff) or equivalent process printing color.

(4) Level area and valley accentuation: Represents relative level areas to separate relatively flat from sloping areas and extends along the major drainage systems narrow valleys, depressions, and similar level areas occurring in the hilly and mountainous areas. A relatively level area is defined as a general area less than 5% (3°) in slope. Level area tint shall be shown as a 100% screen in SPC #55607 (green) or equivalent process printing color.

d. When highest terrain characteristic tint area within an area equivalent to $\leq 25 \times 25$ square mm (1 square inch) the higher tint area shall be included with the next lower tint band.

e. Terrain characteristic tints shall not be shown in built-up areas, water areas, or runway features and point aircraft facility features.

f. A diagram of terrain characteristic tints shall be shown in the margin of the chart (See section 3.11.3.19).

3.14.3 Unreliable Relief.

a. Form Lines: Form lines will not be shown nor used to develop elevation tints. However, sources with form lines may be used to develop generalized shaded relief for prominent features in unreliable relief areas (no adequate contour data).

b. Hachures: Hachures shall be utilized to emphasize isolated hills or rises that would not otherwise be depicted by the established contour interval (or shaded relief). Hachures shall always be supported with a spot elevation. Hachures will not be shown in areas where source material is available and adequate to portray contours and shaded relief. In delineating hachures, only the shape and alignment of ridge lines and peaks need be shown. The lineweights, gauges and design of hachures are not strictly prescribed since their rendition depends upon the technique of the compiler.

c. Relief Data Incomplete: Where source materials are insufficient to show complete illustration of relief by contouring, the land area (devoid of elevation tints) shall be appropriately labeled "RELIEF DATA INCOMPLETE". The note should be centered in the area. Large areas shall show an additional note along the edges of these areas reading: "Limits of Reliable Relief

Information". Every effort should be made to avoid portrayal of small areas of unreliable relief by tying the contours through the areas. Areas compiled from source materials that do not contain contours, but do permit the illustration of relief by hachures or shaded relief shall also be outlined and labeled as above.

3.14.4 Shaded relief. Shaded relief provides a means of graphically portraying important topographic features ranging from ridge lines, canyons and peaks in rugged terrain to isolated sharply rising hills in areas of flat terrain. In areas which are culturally underdeveloped the user relies more heavily on terrain features for navigation. Relief features selected for portrayal shall be limited to the specific landforms or portion thereof which have strategic importance or that will enhance the "picture" formed by contours.

3.14.3.1 Shaded relief criteria.

a. Terrain $\geq 5\%$ ($\geq 3^\circ$) of slope and rising more than 150m (500 feet) above surrounding terrain shall be considered for shading.

b. In areas 50 km square or larger, having a slope in excess of 5%, (3°), only the major ridges and peaks shall be shaded.

c. In level terrain, hills or unique landforms which do not meet slope criteria may be shaded if they are considered critical to the low altitude-high speed mission. At low altitude navigation mode (500 feet or less) the radar coverage displayed is no greater, and usually far less, than 30 nautical miles. This shall be the prime factor to be considered for establishing the criticality of features for portrayal.

d. Shaded relief shall be shown for areas of unreliable relief if there is sufficient detail to do so.

e. Shaded relief shall be shown in permanent snow and ice areas when sufficient contour information exists.

f. Shaded relief shall be omitted from spot elevation value text. Each shaded relief void area shall equal the space occupied by the text plus a 0.25 mm (.01 inch) zone surrounding the text.

g. The required density shaded relief halftone negative shall be produced with a total "dropout" in areas void of shaded relief. Tonal characteristics, when shaded relief is portrayed, shall have 0-5% for highlight tones, 40-50% for middle tones and 80-85% for deep shadow areas.

3.15 Vegetation. Refer to category 5 (Vegetation) code features in TABLE I of this specification for individual feature requirements.

3.16 Demarcation. Refer to category 6 (Demarcation) code features in TABLE I of this specification for individual feature requirements.

3.17 Aeronautical. Aeronautical information shall extend to the limits of the chart. Refer to category 1R and 1U code features in TABLE I of this specification for individual air facility requirements.

3.18 Names and labeling.

a. Refer to MIL-STD-2402, MIL-STD-2403, and DMA Standard Supporting Mark 90 - Section 500 for proper naming and labeling of applicable features.

b. The following is a list of features which may not appear in Table I of the product specification, but may be named on the final product. Definitions for the following features may be found in DMA Standard Supporting Mark 90-Section 500 Geographic Names:

<u>NAME</u>	<u>EXAMPLE</u>
Bay	Chesapeake Bay
Cape	Cape of Good Hope
Channel	English Channel
City	New York City
Desert	Sahara Desert
Falls	Niagara Falls
Forest	Black Forest
Gulf	Gulf of Mexico
Harbor	Boston Harbor
Inlet	Hamilton Inlet
Island Chain	Hawaiian Islands
Lake	Lake Michigan
Mountain Range	Rocky Mountains
Ocean	Atlantic Ocean
Park	Yellowstone National Park
Peak	Pikes Peak
Plain	Great Plains
Plateau	Colorado Plateau
Point	Point Lookout
River	Missouri River
Sea	Caribbean Sea
Sound	Puget Sound
Strait	Bering Strait
Valley	Death Valley

c. The application of proper place names shall be in accordance with the current State Department policy and guidance.

d. Spelling shall be in accordance with conventional English usage or that which is acknowledged as official by the United States board on Geographic Names (BGN).

e. Pertinent generic terms used in feature name or portion of a name in the absence of conventional names shall be listed in glossary form and shown on an individual chart basis as necessary. (See 3.11.3.30).

3.18.1 Names and labeling selection and application criteria. Selection and application shall be based upon feature importance and area density.

a. Names of aeronautical facilities and related aeronautical information are of major importance.

b. Vertical information (spot elevations, contours, obstructions, etc.) is also of major importance.

c. The selection and application criteria for the density of feature names (text labels) placement is specified in section 3.7.5.

d. Labels shall be positioned to assure immediate and unmistakable identification of the feature being named/labeled. See MIL-STD-2402 MC&G Symbology and MIL-STD-2403 MC&G Product Rules.

(1) Aeronautical data (symbols and type) shall not be obscured by other chart detail.

(2) Positioning of type over and in alignment with linear features producing an overprint shall be avoided, if possible, as such condition often completely destroys the continuity of a feature while at same time type becomes illegible.

(3) Label for area feature whose symbolized size is of a dimension capable of accommodating type size and/or length of label, shall be positioned within the feature outlines near the center.

(4) Areas too small to accommodate interior labels shall be labeled outside and adjacent to the feature.

3.19 Radar.

This section is not applicable to this specification.

3.20 Intelligence information.

This section is not applicable to this specification.

3.21 Special areas.

This section is not applicable to this specification.

3.22 Symbology.

a. Feature symbols shall be shown in accordance with the MIL-STD-2402 MC&G Symbology.

b. The center and orientation of a symbol shall correspond with the center and orientation of the feature presented unless addressed otherwise through a specific product rule. (See MIL-STD-2403 MC&G Product Rules).

3.23 Reproduction.

a. Reproduction of charts shall be by lithography.

b. Charts shall be printed on JCP E-30 white lithographic map stock.

c. Printing colors and screens shall conform to information and items illustrated in MIL-STD-2410 MC&G Reproduction and Printing.

3.24 Magnetic variation.

a. Isogonic lines connecting points of equal magnetic variation shall be shown at intervals of 1 degree in a generalized smooth curve.

b. When the total isogonic difference on a chart is $\geq 5^\circ$ the interval between the lines shall be increased proportionately. Line spacing closer than 127 mm (5 inches) shall be avoided.

c. A minimum of two (2) isogonic lines shall be shown on each chart except when the value of the magnetic variation is the same over the entire chart, in which event the isogonic lines shall be omitted.

d. A pertinent magnetic variation note shall be placed in the chart margin as specified in 3.11.3.7.e.

e. The use of intermediate lines is permissible to provide satisfactory portrayal of unusual variation patterns.

f. Magnetic unreliability notes and local magnetic notes shall be shown when required.

g. Text labels shall be placed on feature line:

(1) Two dash lengths from geographic limit or trim line on product and at 100 mm (4 inch) to 150 mm (6 inch) intervals along feature length.

(2) Centered on and 90° to feature line so that label can be read from left to right.

(3) The isogonic line shall be deleted for the isogonic text label plus an additional space of 0.25 mm (0.01 inch) space between both sides of the text and the line.

3.25 Feature/Attribute.

3.25.1 General. This section contains feature, feature attributes category, feature attribute category value, inclusion condition and specific rules corresponding to Operational Navigation Chart production.

3.25.2 Feature/Attribute category, inclusion conditions and product rules. The following is an explanation of the heading and sub-heading format for TABLE I:

TABLE I Feature/Attribute category, inclusion conditions and product rules.

PRODUCT:	OPERATIONAL NAVIGATION CHART	(product type)
CATEGORY:	Culture (1)	(feature category)
SUBCATEGORY:	Extraction (1A)	(feature subcategory)

FCode (1)	Feature (2)	
FT (3)	<u>Attributes</u>	<u>Rules (7)</u>
	XXX (4) Attribute (5)	
	<u>Inclusion Conditions:</u> (6)	

////////////////////////////////////

(1) F(Feature)Code - 5 digit alpha numeric, Feature Attribute Coding Standard (FACS) Code assigned to each feature (e.g. 1U030-Aircraft Facility). The first two digits identify the category and subcategory to which each feature belongs (e.g. 1 = Culture Category, U = Airports subcategory).

(2) Feature - Name of feature as specified in the FACS. A feature is a physical (e.g. Vertical Obstruction) or conceptual (e.g. Airspace) entity of the real world which has one or more set of coordinates to be included on a product.

(3) Feature Type - designation of a feature type.

Area(A) - More than two sets of coordinates defining a closed area; areas may span more than one map sheet or geographic area requirement.

Line(L) - Two or more coordinate sets defining a series of line segments.

Point(P) - One set of coordinates.

NOTE: If there is more than one Feature Type for the feature, then the ACode and Inclusion conditions are stated separately for each type.

(4) A(Attribute) Code - Three digit alpha or alpha numeric character (acronym) FACS code assigned to each attribute category which identifies the attribute category (e.g., EXS - Existence Category). Attribute categories are defined by mutually exclusive sets of attribute values which are feature dependent. Attribute values relative to product are normally contained in MIL-STD-2402 under column headed "AValue", a few exceptions are contained in the inclusion conditions.

(5) Attribute - Name of attribute category required by the feature as specified in the FACS. Attribute categories are characteristics in menu form relative to a specified feature or features.

(6) Inclusion conditions - Conditions under which the feature/attribute(s) are required by the product (e.g., Power Transmission Pylon, (1T040), is included on a particular product only if Height (HGT) \geq 60m). Conditions should be stated in Boolean logic.

(7) Rule - 5 digit alpha-numeric code indicating rules (listed in MIL-STD-2403) which specify requirements for a feature to satisfy final product format/requirements. APPENDIX A (Product Rules) of this specification provides the rule numbers and rule text for each feature and feature type shown on the Operational Navigation Chart.

4. QUALITY ASSURANCE

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 his 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 supplies 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 the contract. Sampling inspection, as part of manufacturing 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.

4.2 Classification of Inspection. The inspection requirements specified herein are classified as follows.

- a. Visual examination (See 4.4).
- b. Review of construction records (See 4.5).

4.3 First article inspection. When a first article inspection is required (See 3.1 and 6.2), it shall be visually examined for defects as specified in 4.4, and the construction record reviewed for compliance as specified in 4.5

4.4 Visual examination. The map/chart shall be examined for defects and errors as specified by the contract or government. Required corrections shall be made to manuscripts, drafting positives, and reproducible material before the map/chart is sent to the next production stage. Defects detected during the inspection of the printed "catch copy" shall be evaluated by DMA for criticality, and suitable corrective action.

4.5 Review of construction records. Records about the construction of the map/chart shall be maintained. The records shall document sources, decisions regarding reconciliation of conflicting data, etc. Chart records/construction histories shall be reviewed concurrently with visual examinations (See 4.4) to ensure that proper cartographic procedures have been followed.

4.6 Government furnished material. The contractor shall not duplicate, copy or otherwise reproduce the MC&G property for purposes other than those necessary for performance of the contract.

4.7 Government property surplus. At the completion of performance of the contract, the contractor, as directed by the contracting officer, shall either destroy or return to the government all government furnished MC&G property not consumed in the performance of the contract.

5. PACKAGING

5.1 Packaging. Packaging shall be level C (See 6.2) unless otherwise specified. This packaging provides minimum protection, and it is needed to protect material under known favorable conditions. The following criteria determine the requirements for this degree of protection:

- a. Use or consumption of the item at the first destination.
- b. Shock, vibration, and static loading during the limited transportation cycle.
- c. Favorable warehouse environment for a maximum of 18 months.

d. Effects of environmental exposure during shipment and in-transit delays.

e. Stacking and supporting superimposed loads during shipment and temporary storage.

5.2 Marking. In addition to any special markings required by the contract or order, markings shall be in accordance with requirements of MIL-STD-129 for military levels of protection.

6. NOTES

6.1 Intended use. Operational Navigation Charts (ONCs) provide an intermediate scale translation of cultural and terrain features for pilots/navigators flying at very low altitudes (below 500 feet AGL), low altitude-high speed operations (500 feet to 2000 feet AGL) and through medium (2000 feet to 25,000 feet AGL) altitudes.

6.2 Acquisition requirement. Acquisition documents must specify the following:

a. Title, number and date of this specification.

b. Issue of the DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced. (See 2.1.1).

c. When a first article is required. (See 3.1, 4.3, and 6.3).

d. Levels of packaging. (See 5.1).

6.3 First article. When a first article is required, it shall be inspected and approved under appropriate provisions of FAR 52.209. The contracting officer shall specify the appropriate type of first article and the number of units to be furnished in the solicitation/contract. The contracting officer shall also include specific instructions in acquisition documents regarding arrangement for selection, inspection, and approval of the first article.

6.4 Supersession. These specifications supersede the Defense Mapping Agency Product Specification for Operational Navigation Charts, PS/1AB/120, January 1981 and changes thereto.

6.5 Definitions.

6.5.1 Accuracy. The degree of conformity with which horizontal position and vertical values are represented on a map, chart, or related product in relation to an established standard. (See 3.2).

6.5.1.1 Horizontal accuracy, absolute. The uncertainty in the horizontal position of a point with respect to the WGS. The value is expressed as a circular error at the 90% confidence level. (See 3.2.1).

6.5.1.2 Vertical accuracy, absolute. The uncertainty in the height of a point with respect to MSL. The value is expressed as a linear error at the 90% confidence level. (See 3.2.2).

6.5.2 Attribute. Name of the attribute category required by the feature. Attribute categories are characteristics in menu form relative to a specified feature or features. (See TABLE I).

6.5.3 Attribute code (Acode). Three digit alpha or alpha-numeric character (acronym) code assigned to each attribute category which identifies the attribute category (e.g. EXS - Existence Category). Attribute categories are defined by mutually exclusive sets of attribute values which are feature dependent. (See TABLE I).

6.5.4 Circular error (CE). An accuracy figure representing the stated percentage of probability that any point expressed as a function of two linear components (for example, latitude and longitude or northing and easting) will be within the given figure. (See 3.2.1).

6.5.5 Feature. Name of feature. A feature is a physical (e.g. Bridge) or conceptual (e.g. Route-Nautical) entity of the real world which has one or more set of coordinates to be included on a product. (See TABLE I).

6.5.6 Feature code (Fcode). Five digit alpha-numeric code assigned to each feature (e.g. 1A010 - Mine). The first two digits identify the category and subcategory to which each feature belongs (e.g. 1-Culture, A-Extraction). (See TABLE I).

6.5.7 Feature type. Designation of feature type. (See TABLE I).

a. Area - More than two sets of coordinates defining a closed area; areas may span more than one map sheet or geographic area requirement.

b. Line - Two or more coordinate sets defining a series of line segments.

c. Point - One set of coordinates.

NOTE: If there is more than one feature type for the feature, then the Acode and inclusion conditions are stated separately for each type.

6.5.8 Horizontal datum. The geodetic reference system on which product features are positioned. (See 3.3.1).

6.5.9 Inclusion condition. Conditions under which the feature/attribute(s) are required by the product. (See TABLE I).

6.5.10 Linear error (LE). Linear error is the difference between the true or known value and the measured or derived value, and is normally expressed in terms of a percentage probability level. For example, L E 90% is the term used to express the linear error at 90% probability which is the Map Accuracy Standard. This refers to the vertical accuracy of terrain elevations in the digital data base. (See 3.2.3).

6.5.11 Maximum Elevation Figure (MEF). The highest elevation, natural or man-made, in specific individual quadrangles. (See 3.11.3.21).

6.5.12 Rule. A five digit alpha-numeric code indicating rules (See MIL-STD-2403, MC&G Product Rules) which specify requirements per feature to satisfy final product format/requirements. (See TABLE I).

6.5.13 Vertical datum. The vertical reference system to which product heights are referenced. (See 3.3.2).

6.5.14 World Geodetic System (WGS). A consistent set of parameters describing the size and shape of the Earth, the positions of a network of points with respect to the center of mass of the Earth, transformations from major geodetic datums, and the potential of the Earth (usually in terms of harmonic coefficients). (See 3.3.1).

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

6.6.1 International Standardization Agreements (STANAGs).

- a. 2201 Standard Unit of Vertical Measure To Be Shown on Land Maps
- b. 2211 Geodetic Datums, Ellipsoids, Grids, and Grid References
- c. 2215 Evaluation of Land Maps, Aeronautical Charts, and Digital Topographic Data
- d. 3408 Position Reference System for Aeronautical Charts
- e. 3409 Projections for Aeronautical Charts
- f. 3412 The Color and The Minimum Aeronautical overprint for Topographic Aeronautical Charts
- g. 3591 Criteria for Maximum Elevation Figures for Topographic Aeronautical Charts
- h. 3666 Maximum Printing Sizes for Maps, Aeronautical Charts and Geographic Products
- i. 3671 Edition Designation System for Land Maps, Aeronautical Charts and Military Geographic Documentation
- j. 3675 Symbols on Land Maps, Aeronautical Charts and Special Naval Charts
- k. 3676 Marginal Information on Land Maps, Aeronautical Charts and Photo maps
- l. 3677 Standard Scales for Land Maps and Aeronautical Charts
- m. 3689 Place Name Spelling on Maps and Charts
- n. 3690 Standard Printing Sizes for Maps of Various Scales
- o. 3716 Map Series Numbering

6.6.2 Quadripartite Standardization Agreements (OSTAGs).

This section is not applicable to this specification.

6.6.3 Air Standardization Coordinating Committee Agreements (ASCCs)

This section is not applicable to this specification.

6.6.4 International MC&G agreements.

This section is not applicable to this specification.

6.6.5 Executive orders.

This section is not applicable to this specification.

6.6.6 Inter-Agency Agreements.

This section is not applicable to this specification.

6.6.7 Other documentation.

This section is not applicable to this specification.

6.7 Subject term (key word) listing.

Aeronautical
 Defense Mapping Agency
 MC&G (Mapping, Charting and Geodesy)
 Operational Navigation Chart

6.8 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

6.9 (U) Abbreviations.

Abbreviation		Feature (Symbol)
ANT	-	Antenna
BT	-	Bridge Tower
BG	-	Building
CA	-	Castle
CSY	-	Causeway
CPP	-	Chemical Processing Plant
CH	-	Church
CT	-	Control Tower
CON	-	Conveyer
CLT	-	Cooling Tower
CR	-	Crane
DIT	-	Drive-in Theater
EW	-	Early Warning Radar
F	-	Factory
FS	-	Flare stack
GH	-	Gas holder
G	-	Glasshouse
GE	-	Grain Elevator
HPP	-	Hydro Power Plant
IND STU	-	Industrial Structure
LTH	-	Lighthouse
LT	-	Lookout Tower
MST	-	Mast

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MWT	-	Microwave Tower
MN	-	Mine
MON	-	Monument
RIG	-	Offshore Oil Rig
P	-	Pipeline
PP	-	Power Plant
PS	-	Pumping Station
PY	-	Pylon
RTR	-	Racetrack
RA	-	Radio Antenna
RT	-	Radio Tower
RVP	-	Recreational Vehicle Parking Area
RHS	-	Roundhouse
SDP	-	Sewage Disposal Plant
SS	-	Smokestack
ST	-	Stadium
STP	-	Steeple
SSTN	-	Substation
TK	-	Tank
TT	-	Tension Tower
TPP	-	Thermal Power Plant
TWR	-	Tower
TY	-	Transformer Yard
TP	-	Trailer Park
WTK	-	Water Tank
WT	-	Water Tower
WY	-	Wrecking Yard

TABLE I Feature/Attribute category, inclusion conditions, and product generation rules.

PRODUCT: OPERATIONAL NAVIGATION CHARTS
CATEGORY: Culture (1)
SUBCATEGORY: Extraction (1A)

1A030 QUARRY (Cont.)
POINT

Inclusion Conditions:

WID(WIDTH) >= 100 m and < 2,000 m
 and DEP(DEPTH BELOW SURFACE LEVEL) >= 10 m

*ONC

1A040 RIG /SUPERSTRUCTURE
POINT

<u>Attributes</u>	<u>PG Rules</u>	<u>PG Rules</u>
AOO ANGLE OF ORIENTATION	D-6001	R-7111
COE CERTAINTY OF EXISTENCE	L-0001	R-7112
HGT HEIGHT ABOVE SURFACE LEVEL	L-0002	R-7219
LOC LOCATION /ORIGIN CATEGORY	L-0014	R-7407
PRO PRODUCT CATEGORY	L-5040	R-7814
ZVL Z VALUE	R-0046	

Inclusion Conditions:

HGT(HEIGHT ABOVE SURFACE LEVEL) >= 61 m
 and LOC(LOCATION/ORIGIN CATEGORY) 9(OTHER)
 OR HGT(HEIGHT ABOVE SURFACE LEVEL) >= 15 m
 and LOC(LOCATION/ORIGIN CATEGORY) 2(OFF-SHORE)

*ONC

1A050 WELL
POINT

<u>Attributes</u>	<u>PG Rules</u>
EXS EXISTENCE CATEGORY	D-6001
HYC HYDROGRAPHIC CATEGORY	D-7000
PRO PRODUCT CATEGORY	L-0014
WID WIDTH	R-7020
	R-7142
	R-7145
	R-7241

Inclusion Conditions:

WID(WIDTH) >= 5 m

*ONC

1B000 DISPOSAL SITE /WASTE PILE
AREA

<u>Attributes</u>	<u>PG Rules</u>
HGT HEIGHT ABOVE SURFACE LEVEL	D-6001
PRO PRODUCT CATEGORY	D-7000
WID WIDTH	L-0014
	R-7020
	R-7142
	R-7145
	R-7241

TABLE I Feature/Attribute category, inclusion conditions, and product generation rules.

PRODUCT: OPERATIONAL NAVIGATION CHARTS
CATEGORY: Culture (1)
SUBCATEGORY: Disposal (1B)

**1B000 DISPOSAL SITE /WASTE PILE (Cont.)
 AREA**

Inclusion Conditions:

WID(WIDTH) >= 610 m
 and HGT(HEIGHT ABOVE SURFACE LEVEL) >= 10 m

POINT

<u>Attributes</u>	<u>PG Rules</u>
AOO ANGLE OF ORIENTATION	D-6001
HGT HEIGHT ABOVE SURFACE LEVEL	D-7000
PRO PRODUCT CATEGORY	L-0014
WID WIDTH	R-7020
	R-7142
	R-7241
	R-7356
	T-7002

Inclusion Conditions:

WID(WIDTH) >= 100 m and < 610 m
 and HGT(HEIGHT ABOVE SURFACE LEVEL) >= 10 m

~~*ONC~~

**1C000 PROCESSING PLANT /TREATMENT PLANT
 AREA**

<u>Attributes</u>	<u>PG Rules</u>
PRO PRODUCT CATEGORY	D-6001
WID WIDTH	D-7000
	L-0014
	L-0024
	R-7020
	R-7241
	R-7252
	R-7354

Inclusion Conditions:

WID(WIDTH) >= 305 m

POINT

<u>Attributes</u>	<u>PG Rules</u>
AOO ANGLE OF ORIENTATION	D-6001
PRO PRODUCT CATEGORY	D-7000
WID WIDTH	L-0014
	R-7020
	R-7241
	R-7252
	R-7356

TABLE I Feature/Attribute category, inclusion conditions, and product generation rules.

PRODUCT: OPERATIONAL NAVIGATION CHARTS
CATEGORY: Culture (1)
SUBCATEGORY: Associated Industrial Structures (1F)

**1F070 FLARE PIPE (Cont.)
 POINT**

Inclusion Conditions:

HGT(HEIGHT/ABOVE SURFACE LEVEL) >= 10 m
 and LOC(LOCATION/ORIGIN CATEGORY) 3(ON GROUND SURFACE)
 OR HGT(HEIGHT/ABOVE SURFACE LEVEL) >= 61 m

*ONC

**1E050 FORT
 AREA**

<u>Attributes</u>	<u>PG Rules</u>
WID WIDTH	D-6001
	D-7000
	L-0014
	L-0024
	R-7020

Inclusion Conditions:

WID(WIDTH) >= 610 m

POINT

<u>Attributes</u>	<u>PG Rules</u>
AOO ANGLE OF ORIENTATION	D-6001
WID WIDTH	D-7000
	L-0014
	R-7020
	R-7356

Inclusion Conditions:

WID(WIDTH) >= 100 m and < 610 m

*ONC

**1J050 WINDMILL /WINDMOTOR
 POINT**

<u>Attributes</u>	<u>PG Rules</u>	<u>PG Rules</u>
AOO ANGLE OF ORIENTATION	D-6001	R-0046
COE CERTAINTY OF EXISTENCE	D-7000	R-7111
HGT HEIGHT ABOVE SURFACE LEVEL	L-0001	R-7112
LEN LENGTH /DIAMETER	L-0002	R-7148
ZVL Z VALUE	L-0014	R-7298
	L-5036	R-7407
	L-5040	T-7013

Inclusion Conditions:

LEN(LENGTH/DIAMETER) >= 15 m
 and HGT(HEIGHT ABOVE SURFACE LEVEL) >= 15 m
 OR HGT(HEIGHT ABOVE SURFACE LEVEL) >= 61 m

*ONC

TABLE I Feature/Attribute category, inclusion conditions, and product generation rules.

PRODUCT: OPERATIONAL NAVIGATION CHARTS
CATEGORY: Culture (1)
SUBCATEGORY: Recreational (1K)

1K070 DRIVE-IN THEATER (Cont.)
AREA

Inclusion Conditions:

WID(WIDTH) >= 305 m

POINT

Attributes
 AOO ANGLE OF ORIENTATION
 WID WIDTH

PG Rules
 D-6001
 D-7000
 L-0014
 R-7020
 R-7356

Inclusion Conditions:

WID(WIDTH) >= 50 m and < 305 m

*ONC

1K115 OUTDOOR THEATER /AMPHITHEATER
AREA

Attributes
 WID WIDTH

PG Rules
 D-6001
 D-7000
 L-0014
 L-0024
 R-7020

Inclusion Conditions:

WID(WIDTH) >= 305 m

POINT

Attributes
 AOO ANGLE OF ORIENTATION
 WID WIDTH

PG Rules
 D-6001
 D-7000
 L-0014
 R-7111
 R-7112

Inclusion Conditions:

WID(WIDTH) >= 50 m and < 305 m

*ONC

1K130 RACE TRACK
LINE

Attributes
 LEN LENGTH /DIAMETER
 WID WIDTH

PG Rules
 D-6001
 D-7000
 L-0014
 R-7020

TABLE I Feature/Attribute category, inclusion conditions, and product generation rules.

PRODUCT: OPERATIONAL NAVIGATION CHARTS
 CATEGORY: Culture (1)
 SUBCATEGORY: Recreational (1K)

1K130 RACE TRACK (Cont.)
 LINE

Inclusion Conditions:

LEN(LENGTH/DIAMETER) >= 610 m
 and WID(WIDTH) >= 4 m

POINT

Attributes

AOO ANGLE OF ORIENTATION
 LEN LENGTH /DIAMETER
 WID WIDTH

PG Rules

D-6001
 D-7000
 L-0014
 R-7020
 R-7356

Inclusion Conditions:

LEN(LENGTH/DIAMETER) >= 50 m and < 610 m
 and WID(WIDTH) >= 4 m

ONC

1K150 SKI JUMP
 LINE

Attributes

HGT HEIGHT ABOVE SURFACE LEVEL
 WID WIDTH

PG Rules

D-6001
 D-7000
 L-0013
 R-7020

Inclusion Conditions:

WID(WIDTH) >= 15 m
 and HGT(HEIGHT ABOVE SURFACE LEVEL) < 61 m

POINT

Attributes

AOO ANGLE OF ORIENTATION
 COE CERTAINTY OF EXISTENCE
 HGT HEIGHT ABOVE SURFACE LEVEL
 WID WIDTH
 ZVL Z VALUE

PG Rules

D-6001
 D-7000
 L-0001
 L-0002
 L-0014
 L-5040

PG Rules

R-0046
 R-7111
 R-7112
 R-7407
 T-7013

Inclusion Conditions:

WID(WIDTH) >= 5 m and < 15 m
 OR HGT(HEIGHT ABOVE SURFACE LEVEL) >= 61 m

ONC

1K160 STADIUM
 AREA

Attributes

HGT HEIGHT ABOVE SURFACE LEVEL
 WID WIDTH

PG Rules

D-6001
 D-7000
 L-0014
 L-0024
 R-7020

TABLE I Feature/Attribute category, inclusion conditions, and product generation rules.

PRODUCT: OPERATIONAL NAVIGATION CHARTS
CATEGORY: Culture (1)
SUBCATEGORY: Recreational (1K)

1K160 STADIUM (Cont.)
AREA

Inclusion Conditions:

WID(WIDTH) >= 305 m
 and HGT(HEIGHT ABOVE SURFACE LEVEL) < 61 m

POINT

<u>Attributes</u>	<u>PG Rules</u>
AOO ANGLE OF ORIENTATION	D-6001
COE CERTAINTY OF EXISTENCE	D-7000
HGT HEIGHT ABOVE SURFACE LEVEL	L-0014
WID WIDTH	L-5040
ZVL Z VALUE	R-0046
	R-7020
	R-7111
	R-7112
	R-7407

Inclusion Conditions:

WID(WIDTH) >= 50 m and < 305 m
 OR HGT(HEIGHT ABOVE SURFACE LEVEL) >= 61 m

*ONC

1L015 BUILDING
AREA

<u>Attributes</u>	<u>PG Rules</u>
BFC BUILDING FUNCTION CATEGORY	D-6001
HGT HEIGHT ABOVE SURFACE LEVEL	D-7000
WID WIDTH	L-0014
	R-7020
	R-7147
	R-7228
	R-7243
	R-7332

Inclusion Conditions:

WID(WIDTH) >= 305 m
 and HGT(HEIGHT ABOVE SURFACE LEVEL) < 61 m

POINT

<u>Attributes</u>	<u>PG Rules</u>	<u>PG Rules</u>
AOO ANGLE OF ORIENTATION	D-6001	R-0046
BFC BUILDING FUNCTION CATEGORY	D-7000	R-7111
COE CERTAINTY OF EXISTENCE	L-0001	R-7112
HGT HEIGHT ABOVE SURFACE LEVEL	L-0002	R-7148
WID WIDTH	L-0014	R-7228
ZVL Z VALUE	L-4018	R-7407
	L-5040	T-7013

TABLE I Feature/Attribute category, inclusion conditions, and product generation rules.

PRODUCT: OPERATIONAL NAVIGATION CHARTS
CATEGORY: Culture (1)
SUBCATEGORY: Miscellaneous Features (1L)

**1L015 BUILDING (Cont.)
 POINT**

Inclusion Conditions:

WID(WIDTH) >= 50 m and < 305 m
 OR HGT(HEIGHT ABOVE SURFACE LEVEL) >= 61 m

*ONC

**1L020 BUILT-UP AREA
 AREA**

<u>Attributes</u>		<u>PG Rules</u>
COD	CERTAINTY OF DELINEATION	D-6001
DMR	DENSITY MEASURE (% OF ROOF COVER)	D-7000
EXS	EXISTENCE CATEGORY	R-7227
WID	WIDTH	R-7256
		R-7279
		R-7282
		R-7358
		R-7395
		R-7402

Inclusion Conditions:

WID(WIDTH) >= 3,000 m
 and DMR(DENSITY MEASURE (% OF ROOF COVER)) >= 6%

POINT

<u>Attributes</u>		<u>PG Rules</u>
AOO	ANGLE OF ORIENTATION	D-6001
DMR	DENSITY MEASURE (% OF ROOF COVER)	D-7000
EXS	EXISTENCE CATEGORY	R-7228
WID	WIDTH	R-7280
		R-7356
		R-7358

Inclusion Conditions:

WID(WIDTH) >= 610 m and < 3,000 m
 and DMR(DENSITY MEASURE (% OF ROOF COVER)) >= 6%

*ONC

**1L050 DISPLAY SIGN
 POINT**

<u>Attributes</u>		<u>PG Rules</u>
COE	CERTAINTY OF EXISTENCE	D-6001
HGT	HEIGHT ABOVE SURFACE LEVEL	D-7000
ZVL	Z VALUE	L-5040
		R-0046
		R-7112
		R-7407

TABLE I Feature/Attribute category, inclusion conditions, and product generation rules.

PRODUCT: OPERATIONAL NAVIGATION CHARTS
CATEGORY: Culture (1)
SUBCATEGORY: Storage (1M)

1M030 GRAIN ELEVATOR (Cont.)
POINT

Inclusion Conditions:

WID(WIDTH) >= 50 m and < 200 m
 OR HGT(HEIGHT ABOVE SURFACE LEVEL) >= 61 m

*ONC

1M050 SILO
POINT

<u>Attributes</u>	<u>PG Rules</u>	<u>PG Rules</u>
COE CERTAINTY OF EXISTENCE	D-6001	L-5040
HGT HEIGHT ABOVE SURFACE LEVEL	D-7000	R-0046
WID WIDTH	L-0001	R-7112
ZVL Z VALUE	L-0002	R-7407
	L-0014	T-7013
	L-5036	

Inclusion Conditions:

HGT(HEIGHT ABOVE SURFACE LEVEL) >= 61 m

*ONC

1M070 TANK
AREA

<u>Attributes</u>	<u>PG Rules</u>
HGT HEIGHT ABOVE SURFACE LEVEL	D-6001
PRO PRODUCT CATEGORY	D-7000
WID WIDTH	L-0014
	L-0024
	R-7020
	R-7147
	R-7258

Inclusion Conditions:

WID(WIDTH) >= 200 m
 and HGT(HEIGHT ABOVE SURFACE LEVEL) < 61 m

POINT

<u>Attributes</u>	<u>PG Rules</u>	<u>PG Rules</u>
COE CERTAINTY OF EXISTENCE	D-6001	R-0046
HGT HEIGHT ABOVE SURFACE LEVEL	D-7000	R-7112
PRO PRODUCT CATEGORY	L-0001	R-7148
WID WIDTH	L-0002	R-7258
ZVL Z VALUE	L-0014	R-7386
	L-5036	R-7407
	L-5040	T-7013

TABLE I Feature/Attribute category, inclusion conditions, and product generation rules.

PRODUCT: OPERATIONAL NAVIGATION CHARTS
CATEGORY: Culture (1)
SUBCATEGORY: Storage (1M)

1M070 TANK (Cont.)
POINT

Inclusion Conditions:

WID(WIDTH) >= 50 m and < 200 m
 OR HGT(HEIGHT ABOVE SURFACE LEVEL) >= 61 m

*ONC

1M080 WATER TOWER
POINT

<u>Attributes</u>	<u>PG Rules</u>	<u>PG Rules</u>
AOO ANGLE OF ORIENTATION	D-6001	L-5040
COE CERTAINTY OF EXISTENCE	D-7000	R-0046
HGT HEIGHT ABOVE SURFACE LEVEL	L-0001	R-7111
WID WIDTH	L-0002	R-7112
ZVL Z VALUE	L-0014	R-7407
	L-5036	T-7013

Inclusion Conditions:

HGT(HEIGHT ABOVE SURFACE LEVEL) >= 61 m

*ONC

1M010 RAILROAD TRACK
LINE

<u>Attributes</u>	<u>PG Rules</u>	<u>PG Rules</u>
ACC ACCURACY CATEGORY	D-6001	R-7176
EKS EXISTENCE CATEGORY	D-7000	R-7259
LEN LENGTH /DIAMETER	L-0013	R-7261
LTN LANE/TRACK NUMBER	L-5015	R-7281
RPS RAILROAD POWER SOURCE	L-5016	R-7285
RRC RAILROAD /ROAD CATEGORIES	R-7010	R-7811
	R-7161	T-7009

Inclusion Conditions:

LEN(LENGTH/DIAMETER) >= 3,000 m

*ONC

1M050 RR SIDING /RR SPUR
LINE

<u>Attributes</u>	<u>PG Rules</u>
LEN LENGTH /DIAMETER	D-6001
LTN LANE/TRACK NUMBER	D-7000
RPS RAILROAD POWER SOURCE	D-7001
RSA RAIL SIDING /SPUR ATTRIBUTE	L-0013
	R-7020
	R-7263
	R-7409
	R-7803

TABLE I Feature/Attribute category, inclusion conditions, and product generation rules.

PRODUCT: OPERATIONAL NAVIGATION CHARTS
CATEGORY: Culture (1)
SUBCATEGORY: Transportation R/R (1N)

1N050 RR SIDING /RR SPUR (Cont.)
LINE

Inclusion Conditions:

LEN(LENGTH/DIAMETEWR) >= 1250 m
 and RSA(RAIL SIDING/SPUR ATTRIBUTE) 1(SPUR) or 2(SIDING)

*ONC

1N080 RR YARD
LINE

Attributes

LEN LENGTH /DIAMETER
 LTN LANE/TRACK NUMBER

PG Rules

D-6001
 D-7000
 D-7001
 L-0013
 R-7020
 R-7264
 R-7803

Inclusion Conditions:

LEN(LENGTH/DIAMETER) >= 635 m

POINT

Attributes

AOO ANGLE OF ORIENTATION
 LEN LENGTH /DIAMETER
 LTN LANE/TRACK NUMBER
 WID WIDTH

PG Rules

D-6001
 D-7000
 L-0014
 R-7020
 R-7356
 R-7410
 R-7803

Inclusion Conditions:

LEN(LENGTH/DIAMETER) >= 450 m and < 635 m

*ONC

1N090 TRAMWAY /INCLINE RAILWAY
LINE

Attributes

LEN LENGTH /DIAMETER

PG Rules

D-6001
 D-7000
 R-7020
 R-7141
 R-7339

Inclusion Conditions:

LEN(LENGTH/DIAMETER) >= 3,000 m

*ONC

TABLE I Feature/Attribute category, inclusion conditions, and product generation rules.

PRODUCT: OPERATIONAL NAVIGATION CHARTS
 CATEGORY: Culture (1)
 SUBCATEGORY: Associated Transportation (1Q)

1Q040 BRIDGE /OVERPASS /VIADUCT (Cont.)
 LINE

Inclusion Conditions:

LEN(LENGTH/DIAMETER) >= 800 m

POINT

<u>Attributes</u>		<u>PG Rules</u>	<u>PG Rules</u>
AOO	ANGLE OF ORIENTATION	D-6001	R-7178
BDC	BRIDGE DESIGN CATEGORY	D-7000	R-7179
COE	CERTAINTY OF EXISTENCE	L-0002	R-7180
EXS	EXISTENCE CATEGORY	L-0014	R-7286
LEN	LENGTH /DIAMETER	L-0031	R-7287
OHB	OVERALL HEIGHT OF BRIDGE	L-5036	R-7302
TUC	TRANSPORTATION USE CATEGORY	L-5040	R-7385
ZVL	Z VALUE	R-0046	R-7407

Inclusion Conditions:

LEN(LENGTH/DIAMETER) >= 10 m and < 800 m
 OR OHB(OVERALL HEIGHT OF BRIDGE) >= 61 m

~~*ONC~~

1Q070 FERRY CROSSING
 LINE

<u>Attributes</u>		<u>PG Rules</u>
LEN	LENGTH /DIAMETER	D-6001
NAM	NAME CATEGORY	D-7000
		L-0013
		L-5010
		R-7193

Inclusion Conditions:

LEN(LENGTH/DIAMETER) >= 3,000 m

POINT

<u>Attributes</u>		<u>PG Rules</u>
LEN	LENGTH /DIAMETER	D-6001
NAM	NAME CATEGORY	D-7000
		L-0014
		L-5010
		R-7193

Inclusion Conditions:

LEN(LENGTH/DIAMETER) < 3,000 m

~~*ONC~~

1Q131 TUNNEL
 LINE

<u>Attributes</u>		<u>PG Rules</u>
LEN	LENGTH /DIAMETER	D-6001
		D-7000
		R-7020
		R-7155
		R-7182

TABLE I Feature/Attribute category, inclusion conditions, and product generation rules.

PRODUCT: OPERATIONAL NAVIGATION CHARTS
CATEGORY: Culture (1)
SUBCATEGORY: Communication /Transmission (1T)

**1T010 DISH (Cont.)
POINT**

Inclusion Conditions:

HGT(HEIGHT ABOVE SURFACE LEVEL) >= 61 m

*ONC

**1T030 POWER TRANSMISSION LINE
LINE**

Attributes

LEN LENGTH /DIAMETER
PHT PREDOMINANT HEIGHT

PG Rules

D-6001
D-7000
L-0015
R-7020
R-7289
R-7317
R-7318
R-7377

Inclusion Conditions:

LEN(LENGTH/DIAMETER) >= 1600 m
and PHT(PREDOMINANT HEIGHT) >= 10 m

*ONC

**1T040 POWER TRANSMISSION Pylon
POINT**

Attributes

COE CERTAINTY OF EXISTENCE
HGT HEIGHT ABOVE SURFACE LEVEL
ZVL Z VALUE

PG Rules

D-6001
D-7000
L-0001
L-0002
L-0014
L-5036
L-5040
R-0046
R-7112
R-7407

Inclusion Conditions:

HGT(HEIGHT ABOVE SURFACE LEVEL) >= 61 m

*ONC

**1T050 COMMUNICATIONS FACILITY
AREA**

Attributes

HGT HEIGHT ABOVE SURFACE LEVEL
NST RADIO NAVIGATION /COMMUNICATION
WID WIDTH

PG Rules

D-6001
D-7000
L-0014
L-0024
R-7020
R-7147
R-7246

TABLE I Feature/Attribute category, inclusion conditions, and product generation rules.

PRODUCT: OPERATIONAL NAVIGATION CHARTS
CATEGORY: Culture (1)
SUBCATEGORY: Communication /Transmission (1T)

**1T050 COMMUNICATIONS FACILITY (Cont.)
 AREA**

Inclusion Conditions:

WID(WIDTH) >= 250 m
 and HGT(HEIGHT ABOVE SURFACE LEVEL) < 61 m
 and NST(RADIO NAVIGATION/COMMUNICATION) 12(RADIO) or 15(TV)

POINT

<u>Attributes</u>	<u>PG Rules</u>	<u>PG Rules</u>
AOO ANGLE OF ORIENTATION	D-6001	R-7111
COE CERTAINTY OF EXISTENCE	D-7000	R-7112
HGT HEIGHT ABOVE SURFACE LEVEL	L-0001	R-7148
NST RADIO NAVIGATION /COMMUNICATION	L-0002	R-7246
WID WIDTH	L-0014	R-7407
ZVL Z VALUE	L-5040	T-7013
	R-0046	

Inclusion Conditions:

WID(WIDTH) >= 15 m and < 250 m
 and NST(RADIO NAVIGATION/COMMUNICATION) 12(RADIO) or 15(TV)
 OR HGT(HEIGHT ABOVE SURFACE LEVEL) >= 61 m

*ONC

**1T060 TELEPHONE LINE /TELEGRAPH LINE
 LINE**

<u>Attributes</u>	<u>PG Rules</u>
LEN LENGTH /DIAMETER	D-6001
PHT PREDOMINANT HEIGHT	D-7000
	L-0013
	R-7020
	R-7144
	R-7377

Inclusion Conditions:

LEN(LENGTH/DIAMETER) >= 35,000 m
 and PHT(PREDOMINANT HEIGHT) >= 10 m

*ONC

**1T080 TOWER (COMMUNICATION)
 POINT**

<u>Attributes</u>	<u>PG Rules</u>	<u>PG Rules</u>
AOO ANGLE OF ORIENTATION	D-6001	L-5040
COE CERTAINTY OF EXISTENCE	D-7000	R-0046
HGT HEIGHT ABOVE SURFACE LEVEL	L-0001	R-7111
ZVL Z VALUE	L-0002	R-7112
	L-0014	R-7407
	L-5036	T-7013

TABLE I Feature/Attribute category, inclusion conditions, and product generation rules.

PRODUCT: OPERATIONAL NAVIGATION CHARTS
CATEGORY: Hydrography (2)
SUBCATEGORY: Inland Water (2H)

2H180 WATERFALL (Cont.)
LINE

Inclusion Conditions:

LEN(LENGTH/DIAMETER) >= 400 m

POINT

<u>Attributes</u>	<u>PG Rules</u>
HGT HEIGHT ABOVE SURFACE LEVEL	D-6001
LEN LENGTH /DIAMETER	D-7000
NAM NAME CATEGORY	L-0014
	L-5010
	R-2232
	R-7020
	R-7375

Inclusion Conditions:

LEN(LENGTH/DIAMETER) < 400 m
and HGT(HEIGHT ABOVE SURFACE LEVEL) >= 10 m

ONC

2I020 DAM
LINE

<u>Attributes</u>	<u>PG Rules</u>
EXS EXISTENCE CATEGORY	D-6001
HGS HEIGHT OF SPILLWAY	D-7000
LEN LENGTH /DIAMETER	D-7004
NAM NAME CATEGORY	L-0014
	L-5010
	R-2232
	R-7209
	R-7305
	R-7306
	R-7349

Inclusion Conditions:

LEN(LENGTH/DIAMETER) >= 250 m

ONC

2I030 LOCK
LINE

<u>Attributes</u>	<u>PG Rules</u>
LEN LENGTH /DIAMETER	D-6001
	D-7000
	L-0014
	R-2232
	R-7806

TABLE I Feature/Attribute category, inclusion conditions, and product generation rules.

PRODUCT: OPERATIONAL NAVIGATION CHARTS
CATEGORY: Physiography (4)
SUBCATEGORY: Landforms (4B)

4B090 EMBANKMENT (Cont.)
LINE

Inclusion Conditions:

LEN(LENGTH/DIAMETER) >= 1,000 m
 and PHT(PREDOMINANT HEIGHT) >= 3 m

*ONC

4B100 ESKER
LINE

<u>Attributes</u>		<u>PG Rules</u>
HGT	HEIGHT ABOVE SURFACE LEVEL	D-6001
LEN	LENGTH /DIAMETER	D-7000
		L-0013
		R-7211

Inclusion Conditions:

LEN(LENGTH/DIAMETER) >= 1,000 m
 and HGT(HEIGHT ABOVE SURFACE LEVEL) >= 3 m

*ONC

4B110 FAULT
LINE

<u>Attributes</u>		<u>PG Rules</u>
LEN	LENGTH /DIAMETER	D-6001
		D-7000
		L-0013
		R-7211

Inclusion Conditions:

LEN(LENGTH/DIAMETER) >= 10,000 m

*ONC

4B135 ISLAND
AREA

<u>Attributes</u>		<u>PG Rules</u>
NAM	NAME CATEGORY	D-6001
		D-7000
		D-7005
		L-0014
		L-0024
		L-5010
		R-7378
		R-7388
		R-7399

Inclusion Conditions:

All required

*ONC

APPENDIX A

OPERATIONAL NAVIGATION CHART (ONC) PRODUCT RULES

10. SCOPE

10.1 Scope. This APPENDIX provides information about the product rules necessary for the production of Operational Navigation Charts. This APPENDIX is a mandatory part of the specification and the information contained herein is intended for compliance.

20. APPLICABLE DOCUMENTS

20.1 Government documents.

20.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the current Department of Defense Index of Specifications and Standards (DODISS) and the supplement thereto, cited in the solicitation (See 6.2).

MILITARY STANDARDS:

MIL-STD-2402 (DMA)	-	MC&G Symbology
MIL-STD-2403 (DMA)	-	MC&G Product Rules
MIL-STD-2408 (DMA)	-	Glossary of MC&G Feature and Attribution Definitions
MIL-STD-2410 (DMA)	-	MC&G Reproduction and Printing

20.1.2 Other government documents, drawings, and publications.

- a. DMA Standard Supporting Mark 90, Section 500 - Geographic Names.

20.1.3 Non-government publications.

This section is not applicable to this APPENDIX.

20.2 Order of precedence. In the event of a conflict between the text of this APPENDIX and either TABLE I of this specification, or MIL-STD-2403 cited above, the TABLE I, MIL-STD-2403 take precedence.

30. PRODUCT RULES

30.1 Classification of rules Rules are classified into the following types:

- a. Displacement
- b. Labeling
- c. Override
- d. Representation
- e. Suppression
- f. Thinning

30.2 APPENDIX organization This APPENDIX lists in alphanumeric order the rule numbers and rule text for each feature type (area, line and point) of each FACS feature listed in TABLE I of this specification.

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APPENDIX A
OPERATIONAL NAVIGATION CHARTS PRODUCT RULES

RULE TYPE:

Rules

-

FIX Rules

A-0005 Include if feature height \geq 1/2 Contour Interval (3A010).

DISPLACEMENT Rules

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APPENDIX A
OPERATIONAL NAVIGATION CHARTS PRODUCT RULES

RULE TYPE: DISPLACEMENT

D-6001 HIERARCHY ORDER FOR DISPLACEMENT:

The following feature listing represents FACS features which could conceivably be displaced. The order in which these features are displaced, if applicable, is e.g., A Canal (#5) has a higher number than River (#2) so the Canal shall be displaced and the River shall retain its true position.

1. River / Stream (2H140)
2. River or Stream Vanishing Point (2H145)
3. Lake / Pond (2H080)
4. Reservoir (2H130)
5. Canal (2H020)
6. Ditch (2H030)
7. Aqueduct (2H010)
8. Tunnel (1Q131) (Containing Aqueduct (2H010))
9. Tunnel Entrance - Exit (1Q132) (Containing Aqueduct (2H010))
10. Flume (2H060)
11. Penstock (2H110)
12. Filtration / Aeration Beds (2H040)
13. Spring (2H170)
14. Well (1A050)
15. Cistern (2I010)
16. Salt Evaporator (2H150)
17. Salt Pan (4A020)
18. Land Subject to Inundation (2H090)
19. Marsh (5D040)
20. Swamp (5D030)
21. Bog (5D010)
22. Hummock (5D020)
23. Glacier (2J030)
24. Glacial Moraine (2J020)
25. Esker (4B100)
26. Snow Field / Ice Field (2J100)
27. Ice Cliff (2J040)
28. Ice Shelf (2J065)
29. Ice Peak, Nunatak (2J060)
30. Pack Ice (2J070)
31. Polar Ice (2J080)
32. Seawall (2B230)
33. Pier Wharf (2B190)
34. Jetty (2B140)
35. Dam (2I020)
36. Breakwater (2B040)
37. Lock (2I030)
38. Sluice Gate (2I040)
39. Ramp (2B220)
40. Slipway (2B240)
41. Drydock (2B090)
42. Ford (2H070)
43. Rapids (2H120)
44. Waterfall (2H180)
45. Oasis (5C020)
46. Fish Trap / Fish Weir (2B110)
47. Fish Hatchery (2H050)
48. Foreshore (2A020)
49. Railroad Track (1N010)
50. Bridge / Overpass / Viaduct (1Q040) (Carrying Railroad Track (1N010))
51. Tunnel (1Q131) (Containing Railroad Track (1N010))
52. Tunnel Entrance - Exit (1Q132) (Containing Railroad Track (1N010))
53. Ferry Crossing (1Q070) (Carrying Railroad Track (1N010))
54. Ferry Site / Ferry Slip (1Q080) (Carrying Railroad Track (1N010))
55. Embankment (4B090) (Supporting Railroad Track (1N010))
56. Cut Line (4B071) (Supporting Railroad Track (1N010))
57. Snow Shed / Rock Shed (1L210) (Containing Railroad Track (1N010))
58. RR Siding / RR Spur (1N050)
59. RR Yard (1N080)
60. Tramway / Incline Railway (1N090)
61. Aerial Cableway Line / Ski Lift Line (1Q010) (Carrying Tramway / Incline Railway (1N090))

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APPENDIX A
OPERATIONAL NAVIGATION CHARTS PRODUCT RULES

RULE TYPE: DISPLACEMENT

62. Aerial Cableway Pylon /Ski Lift Pylon (1Q020) (Supporting Tramway/
Incline Railway (1N090))
63. Road (1P030)
64. Interchange (1P020)
65. Bridge / Overpass / Viaduct (1Q040) (Carrying Road (1P030
66. Bridge Superstructure (1Q050) (Containing Road (1P030))
67. Tunnel (1Q131) (Containing Road (1P030))
68. Tunnel Entrance - Exit (1Q132) (Containing Road (1P030))
69. Ferry Crossing (1Q070) (Carrying Road (1P030))
70. Ferry Site / Ferry Slip (1Q080) (Carrying Road (1P030))
71. Embankment (4B090) (Supporting Road (1P030))
72. Cut (4B070) (Supporting Road (1P030))
73. Trail (1P050)
74. Cart Track (1P010)
75. Contour (Land) (3A010)
76. Ridge Line (3A020)
77. Island (4B135)
78. Volcano (4B180)
79. Bluff / Cliff, Escarpment (4B010)
80. Fault (4B110)
81. Crevice / Crevasse (4B060)
82. Embankment (4B090) (when disassociated with Railroad Track (1N010)
or Road (1P030))
83. Rock Formation (4B160)
84. Sand Dunes / Sand Hills (4B170)
85. Mountain Pass (4B150)
86. Cave (4B030)
87. Missile Site (1L120)
88. Homogeneous Radar Significant Area (HRSA) (1L095)
89. Built-up Area (1L020)
90. Shantytown (1L208)
91. Native Settlement (1L135)
92. Mobile Home Park (1I020)
93. Early Warning Radar Site (1T020)
94. Building (1L015)
95. Station (Communication) (1T050)
96. Control Tower (1Q060)
97. Hut (1L100)
98. Cemetery (1L030)
99. Monument (1L130)
100. Pumping Station (1L180)
101. Ruins (1L200)
102. Depot (Storage) (1M010)
103. Grain Elevator (1M030)
104. Grain Bin (1M020)
105. Silo (1M050)
106. Tank (1M070)
107. Mooring Mast (1Q110)
108. Chimney/Smokestack (1F010)
109. Crane (1F040)
110. Display Sign (1L050)
111. Dish (1T010)
112. Steeple (1L220)
113. Water Tower (1M080)
114. Tower (Communication) (1T080)
115. Tower (Non-Communication) (1L240)
116. Telephone Line /Telegraph Line (1T060)
117. Substation /Transformer Yard (1Q030)
118. Wrecking Yard /Scrap Yard (1B010)
119. Drive-In Theater (1K070)
120. Recreational Vehicle Area (1K140)
121. Fort (1H050)
122. Power Plant (1D010)
123. Power Transmission Line (1T030)
124. Power Transmission Pylon (1T040)
125. Race Track (1K130)
126. Stadium /Outdoor Theater /Amphitheater (1K115)
127. Athletic Field (1K040)
128. Mine (1A010)

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APPENDIX A
OPERATIONAL NAVIGATION CHARTS PRODUCT RULES

RULE TYPE: DISPLACEMENT

- 129. Rig /Superstructure (1A040)
- 130. Quarry (1A030)
- 131. Pipeline /Pipe (1L160)
- 132. Tunnel (1Q131) (Containing Pipeline /Pipe (1L160))
- 133. Tunnel Entrance - Exit (1Q132) (Containing Pipeline /Pipe(1L160))
- 134. Settling Basin /Sludge Pond (1C030)
- 135. Storage Bunker /Storage Mound (1M060)
- 136. Mineral Pile (1M040)
- 137. Disposal Site /Waste Pile (1B000)
- 138. Processing Plant /Treatment Plant (1C000)
- 139. Catalytic Cracker (1C020)
- 140. Cooling Tower (1F030)
- 141. Flare Pipe (1F070)
- 142. Windmill /Windmotor (1J050)
- 143. Amusement Park Attraction (1K020)
- 144. Amusement Park (1K030)
- 145. Wall (1L260)
- 146. Fence (1L070)
- 147. Dragon (Tiger) Teeth (1L060)
- 148. Ski Jump (1K150)
- 149. Conveyor (1F020)
- 150. Trees (5C030)
- 151. Orchard /Plantation (5A040)
- 152. Cropland (Cultivated) (5A010)
- 153. Vineyard /Hops (5A050)
- 154. Grassland (5B010)
- 155. Sabkha (2H160)
- 156. Tundra (2J110)
- 157. Ground Surface (4A010)

- D-7000 All features shall retain a distance of 0.25 mm between symbolized features. In instances where sandwich effects occur, e.g., Building (1L015) requiring portrayal on a product which is adjacent to a required River/Stream (2H140) RR Track (1N010) is adjacent to the required Building, then deviations from the hierarchical scheme are necessary. Deviations shall be resolved by retaining the same relative locational relationships of all features involved, while maintaining the 0.25 mm distance between them.
- D-7001 Feature < 150 m distance from parallel mainline Railroad Track (1N010) shall be symbolized to retain a minimum distance of 0.75 mm (0.01 inch) at scale between features.
- D-7002 A 0.5 mm clear zone shall be provided between end of Cut Line (4B071) symbol ticks and any other feature symbol contained within Cut Line (4B071) area.
- D-7003 A 0.5 mm clear zone shall be provided between base perimeter line of Embankment (4B090) symbol and the symbol of supported feature, if any.
- D-7004 Feature utilized for Road (1P030) crossing shall be displaced on the upstream side of Road symbol to allow a 0.5 mm clearance between respective features.
- D-7005 All 1R (Air Traffic Services) and 1U (Airports) features shall remain in their true position.
- D-7006 Displacement shall not be applied to 2A010 (Coastal Shoreline) or 2H075 (Inland Shoreline).

GENERALIZATION Rules

- G-0009 Contiguous linear features having matching code attribution will be blended to form a single feature.
- G-0012 Area and line features will be generalized to detail compatible with scale.

LABELING Rules

- L-0001 HGT is converted to whole feet.
- L-0002 ZVL is converted to whole feet.

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- L-0004** Normal elevation feature occurring outside Glacier (2J030) or Snow Field/Ice Field (2J100) shall be labeled in Swiss 742, 8 point type in color #58600 Black-Solid.
- L-0005** Highest elevation feature in sheet occurring outside Glacier (2J030) or Snow Field/Ice Field (2J100) shall be labeled in Swiss 742, 12 point type in color #58600 Black-Solid.
- L-0006** Normal elevation feature occurring inside Glacier (2J030) or Snow Field/Ice Field (2J100) shall be labeled in Swiss 742, 8 point type in color #48253 Blue-Solid.
- L-0007** Highest elevation feature in sheet occurring inside Glacier (2J030) or Snow Field /Ice Field (2J100) shall be labeled in Swiss 742, 12 point type in color #48253 Blue-Solid.
- L-0013** Feature label shall be positioned so that wording may be read from left to right except for perpendicular wording which shall be readable from bottom to top (east side) of feature. Label for linear feature shall be positioned on the upper side at a distance of 0.5 mm from feature. Straight alignment is preferred, however, label shall follow the general direction and curvature of the feature as applicable.
- L-0014** Feature name/label shall be positioned parallel to lines of latitude and so that wording may be read from left to right. Label shall be positioned starting or ending 0.5 mm distance from feature and in the following hierarchial placement order respective to feature:
- (a) Lower right with top of label aligned with bottom of feature.
 - (b) Lower left with top of label aligned with bottom of feature.
 - (c) Upper right with bottom of label aligned with top of feature.
 - (d) Upper left with bottom of label aligned with top of feature.
 - (e) Below starting at center of feature.
 - (f) Below with end of label aligned to center of feature.
 - (g) Above starting at center of feature.
 - (h) Above with end of label aligned to center of feature.
 - (i) Above centered over feature.
 - (j) Below centered under feature.
- L-0015** Feature label shall be applied by breaking feature symbol and centering wording within space to read from left to right except for perpendicular label which shall be readable from bottom to top (east side) of feature. Space shall provide for sufficient length and width of type characters plus an additional 0.25 mm zone surrounding respective word.
- L-0016** Feature label shall be positioned in the approximate center of respective feature so that wording may be read left to right. Placement of label shall be made in the following hierarchial order:
- (a) parallel to lines of latitude
 - (b) curved respective to feature.
 - (c) diagonal respective to feature
- L-0018** Feature label shall be positioned a distance of 0.5 mm inside the peripheral limits line so that wording may be read from left to right except for perpendicular wording which shall be read bottom to top (east side) of feature.
- L-0019** Label shall be positioned in the approximate center a distance of 0.5 mm from respective side of feature line so that wording may be read from left to right except for perpendicular wording which shall be read from bottom to top (east side) of feature.
- L-0021** Feature label shall be positioned in the center of the facility box so that wording may be read from left to right and provide a 0.25 mm space surrounding respective label.
- L-0024** Feature label shall be positioned in center of feature area when area size is sufficient so that wording may be read from left to right and provide 0.25 mm space surrounding respective labeling.

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- L-0025 Feature label shall be positioned in the approximate center of feature area so that wording may be read left to right except for perpendicular wording which shall be readable from bottom to top (east side) of feature.
- L-0026 Feature NAM shall be positioned in the center of outlined facility box so that wording can be read from left to right and provide a 0.25 mm space surrounding label.
- L-0027 Facility equipment code shall be positioned centered on top line of facility box above facility name so wording can be read left to right and provide 0.25 mm space between ends of facility box line (deleted for label).and type.
- L-0028 If NST=12 (Radio), then NAM will be positioned centered vertically and horizontally on top line of facility box.
- L-0029 Radio station broadcast frequency numbers shall be positioned in the center of outlined facility box so that values can be read left to right and provide 0.25 mm space surrounding type.
- L-0030 Elevation figure for River/Stream (2H140) feature shall be shown in Swiss 742, 7 point type in color #48253 Blue-Solid.
- L-0031 OHB is converted to whole feet.
- L-0032 PHT or HGT is converted to whole feet.
- L-0041 If RST is 0 (unknown), then label with lower case "u" to the total runway label.
- L-0042 If RST is 5 (Natural), or 7 (Temporary), then label with lower case "s" added to the total runway label.
- L-3505 Label feature as per hierarchy for topo type placement parallel to south neatline corners reading left to right:
1. Positional hierarchy:
 - a. northeast (preferred position).
 - b. southeast (1st alternate).
 - c. northwest (2nd alternate)
 - d. southwest (3rd alternate)
 - e. top-centered (4th alternate)
 - f. bottom-centered (5th alternate)(Hierarchy is based on type positioning so as to avoid overprinting other type or obscuring detail.)
 2. Minimum space between type placement and feature symbol is 0.5 mm.
 3. This method of type placement shall be used for areal features when space does not permit labeling within that feature. When SCC = 0 Drop Window.
- L-3506 Names placement shall be oriented to the longest axis of the feature reading left to right and placed within the area outline and centered. If longest axis is perpendicular to the south neatline, the type shall be placed outside of the area outline, preferred position is northeast of the feature (Rule L-3505), but may be placed at any position around the feature so as not to overprint any other feature type and reading left to right.
- L-3803 Position type 3 mm away from line on each side, reading left to right, or bottom to top if line is vertical. Position country names adjacent to each other, and TXT label to the right of NM3 label.
- L-4008 If NAM = unknown, omit NAM window.
- L-4018 If BFC=000 (Unknown), or BFC=039 (Other), omit BFC window.
- L-4260 Label shall be positioned above feature, reading left to right (or to the left of vertical feature, reading bottom to top), at a 0.5 mm distance and parallel to respective feature. Label shall preferably be positioned at the midpoint of the line segment or symbol; however, it may be displaced laterally along respective feature to avoid overprinting other symbols or labels. If space will not permit placing label parallel to feature, offset the label in accordance with Rule L-4261 below and use a leader line to identify its location along the feature.

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- L-4707** If the attribute value is ACC 001 (Accurate) or EXS 001 (Definite), delete the window and condense remaining windows.
- L-4746** Possession of islands and island groups shall be shown by placing the country name in parentheses below the island name or island group name. If all of the islands in an Island group belong to one country, the country name shall be placed under the island group name only. If islands within the same island group belong to different countries, the country name shall be placed under each island name, and not under the island group name. Islands administered jointly by two countries shall show both country names, separated by a dash, e.g., (UK-US). Country names shall be abbreviated in the manner approved by the Board of Geographic Names. Type size for country names shall be 2/3 the size of the island name or island group name, but shall not be less than 5 point.
- L-4879** If BST=001 (Definite), delete the BST label.
- L-5002** ZVL value shall be inserted into feature lines by breaking of line and centering value within space:
- (a) In a steplike pattern to read from bottom or right side of chart.
 - (b) To read uphill (top of label facing top of relief form).
 - (c) To number each line once in a 50,000 m x 50,000 m area having < 5% (3 degrees) slope.
 - (d) To number each line once in a 35,000 m x 35,000 m area having \geq 5% (3 degrees) slope and < 9.5% (6 degrees) slope.
 - (e) To number each line once in a 25,000 m x 25,000 m area having \geq 9.5% (6 degrees) slope.
- L-5003** When 8 or more feature line labels are present in a 13,000 m x 13,000 m area only label every other line starting with top line of relief form.
- L-5005** If SSC = 012, 076, or 077, then label symbol as "Monument" (1L130).
- L-5006** Feature area size < 25 mm square shall be labeled according to Rule L-0014.
- L-5007** Feature label shall be positioned to read from left to right in the approximate center of feature area when area size \geq 25 mm square to < 76 mm square.
- L-5008** Feature label placement for areas \geq 76 mm square shall be made to read from left to right.
- L-5010** If NAM is not available, then label shall be omitted.
- L-5011** If NAM of Aircraft Facility (1U030) is identical to that of a named Built-up Area (1L020) feature or Navaid (1R030) facility within 25 mm radius of feature, then omit Aircraft Facility name.
- L-5013** If feature is coincident with the datum plane, then line shall be labeled "SEA LEVEL".
- L-5014** If feature is located below the datum plane, then respective line label value shall be preceded by a minus sign "-".
- L-5015** If ACC attribute value is 002 (approximate), then feature symbol shall be accompanied with descriptive label "approximate alignment" or abbreviation "A.P.A" if limited space prevails, in Swiss lower case type in print color #58600 Black-Solid.
- L-5016** If feature extends over distance \geq 76 mm at scale and requires descriptive labeling, then label shall be repeated at 100 mm intervals.
- L-5022** If feature = PPL 001 (1st Class), then name shall be shown as Swiss 742 10 point caps in color #58600 Black-Solid.
- L-5023** If feature = PPL 002 (2nd class), then NAM shall be shown as Swiss 742 8 point caps in color #58600 Black-Solid.
- L-5025** If feature in culturally non-developed region contains < 5,000 population or = PPL 003 (3rd class), then NAM shall be shown as Swiss 742 7 point caps and lower case in color #58600 Black-Solid.

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- L-5034 The label "Limits of Ice Shelf" shall be repeated at 130 mm intervals.
- L-5036 When multiple units of the same feature overlap when symbolized within a window size of 10 kilometers x 10 kilometers, only the tallest centermost or center point of two objects in that hierarchical order shall be symbolized and the total numeric count of features represented shall be placed in parentheses below respective symbols.
- L-5040 If COE (Certainty of Existence)=001 (Definite), do not show COE label on symbol. If COE=002, label "Doubtful" If COE=003, label "Reported"
- L-5045 If a 3A010 Contour has Hypsography Portrayal Category HQC=005 (Depression Index), or HQC=006 (Depression Intermediate) then a 3A030 Spot Elevation should be included within the lowest portrayed depression contour indicating the lowest elevation.
- L-7002 If LEN \geq 300 feet then include LEN of longest Runway (1U160) at respective Aircraft Facility (1U030) to the nearest 100 feet in the Aircraft Facility symbology following feature NAM (when NAM not omitted).
- L-7004 If FPT003 (minor(soft)), then a lower case "s" shall be included in the symbolization following the LEN (L-0002) (or NAM if 1U160 (Runway) LEN is not available).
- L-7005 If ACC001 (accurate), then omit ACC label.
- L-7006 If EXS003 (Reported), then EXS label shall read "Existence reported".
- L-7007 If rule(s) L-7002 and/or L-7004 do not apply, then omit separating slash(es) in the symbology.
- L-7050 All text associated with airfields should be center justified. Example:

ABANDONED
SOGGY DRY LAKE/50/s
2881

- L-7051 If a NAVAID (1R030) and an aircraft facility (1U030) occupy the same location and have exactly the same name, do not show the name twice. Show the text of the NAVAID with the elevation of the air facility below the NAVAID text box.

OVERRIDE Rules

- O-0021 If NAVAID (1R030) symbol will be overprinted by Aircraft Facility (1U030) symbol then break facility box and place NST Value (Radio Navigation/Communication) above NAM (Name Category) (graphic representation identical to symbol 1R030P003/P004.)
- O-0022 Cart Track (1P010) and Trail (1P050) will be symbolized as secondary roads.
- O-0023 If a bridge feature satisfies vertical obstruction criteria, then symbolize the bridge, and overprint with obstruction symbol (Posicut #3) and label.
- O-5009 If a water tower (1M080) has a height (HGT) \geq 10 meters, and is a component of an aircraft facility (1U030), retain and symbolize feature.

REPRESENTATION Rules

- R-0046 When obstructions coalesce at map scale, use Posicut #217 at obstruction point and label with highest obstruction information.
- R-0054 Each one degree by one degree area on the map, as defined by the latitude and longitude grid, should contain approximately 6 to 8 normal spot elevations.
- R-0061 The limit of Pack Ice (2J070) shall represent the average extent of pack ice 1/8 (12.5%) concentration or greater, for the month of greatest extent. The month of greatest extent shall be shown by the HSA attribute.
- R-2232 Omit if not shown in conjunction with a drainage feature.

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- R-2276** If a boundary is not recognized by the U.S. Department of State as an official international boundary, but falls under the category of "Other Line of Separation", and the type of boundary is not portrayed by another Subcategory 6A FACS feature, the TXT attribute is used to label the line in accordance with Geonames/Boundary guidance; e.g. "Administrative Line", "Provisional Administrative Line."
- R-2277** International boundaries and other lines of separation, and their associated labels, are shown in margin diagrams as well as in the body of the map or chart.
- R-2395** Sand Dune (4B170) patterns shall be positioned according to SDO to indicate their true orientation to the prevailing winds.
- R-2497** In areas where there is no defined boundary between two countries (BST=004), center NM3 and NM4 in the approximate area on their respective sides of the label "NO DEFINED BOUNDARY" Pairs of labels may be repeated if necessary for large areas, but pairs should be positioned far enough apart so that they DO NOT imply a specific division line between the two countries.
- R-2756** When the US-Russia International Maritime Boundary is shown on the map/chart, a legend "See note" shall be shown next to the boundary, and the following note shown in the margin of the map/chart, or if necessary, in any open water area:
- NOTE
Maritime boundary provisionally applied
pending formal exchange of instruments
of ratification.
- R-7001** A surface level elevation (ZVL) for the feature shall be applied at 4,500 m LEN to the longest Stream segment in a 100 nautical mile (nm) by 100 nm area, starting at the south west corner of the chart having a slope gradient category (SGC) of $\leq 5\%$.
- R-7010** Portion of feature symbol coincident with a symbolized 1Q040 (Bridge /Overpass /Viaduct), 1Q131 (Tunnel), 1Q132 (Tunnel Entrance-Exit) or 2I020 (Dam) shall be omitted.
- R-7020** If feature is located within Built-up Area (1L020) then feature shall not be symbolized.
- R-7108** Feature valid only when coincident with a portrayed River/Stream (2H140).
- R-7110** Feature limits shall extend inland to form butt-join with River/Stream (2H140) areal symbol at point where mouth of River /Stream = 2.5 mm WID, at product scale.
- R-7111** Feature < 61 m HGT shall be positioned in respect to AOO which reflects actual orientation relative to true north.
- R-7112** Feature ≥ 61 m HGT shall be positioned so that :
- (a) The top of symbol is oriented to follow true north.
 - (b) The dot at base of symbol represents the X-Y position of the feature.
- R-7115** NOTE: Foot of "x" symbol shall be aligned parallel to respective area lines of latitude.
- R-7118** Feature < 61 m HGT shall be positioned so that:
- (a) Apex of pylon symbol is coincident with respective Aerial Cableway Line (1Q010) symbol.
 - (b) Pylon oriented 90 degrees to respective line symbol.
- R-7119** Entrance-Exit abutment symbol shall be centered evenly to intersect and overlap respective Tunnel point locations and be oriented 90 degrees to connecting feature(s).
- R-7120** The waterline portion of symbol shall be portrayed parallel to respective area lines of latitude.
- R-7121** When Road (1P030) feature exists on top of Aqueduct (2H010) feature the Road symbol shall be shown and the label "underground Aqueduct" applied to respective location.

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- R-7123 If distance between adjacent features is < 46 m include as one feature outline and symbolize division space(s) by a 0.2 mm solid line shown in color #58600 Black.
- R-7126 Feature permanently drained for land reclamation shall be symbolized as relief feature (3A010-Contour).
- R-7127 River/Stream (2H140) shall be symbolized through feature Swamp (5D030) and Marsh (5D040).
- R-7128 If distance between adjacent features is ≤ 46 m include as one feature outline and symbolize division space(s) by a 0.2 mm solid line shown in color #48253 Blue.
- R-7132 Feature delimiting line shall be deleted in area lying coincident with Snow Field/Ice Field (2J100) limit line.
- R-7133 Feature shall be deleted when it overlaps with Glacier (2J030).
- R-7141 Include feature in area void of other cultural (1A010 through 1M080) features within 10,000 m x 10,000 m area.
- R-7142 Include feature in area void of other cultural (1A010 through 1M080) features within 25,000 m x 25,000 m area.
- R-7143 Include feature in area void of other cultural (1A010 through 1M080) features within 50,000 m x 50,000 m area.
- R-7144 Include feature in area void of other cultural (1A010 through 1M080) features within 75,000 m x 75,000 m area.
- R-7145 When 2 or more like features exist within a window size of 5,000 m x 5,000 m, merge features and symbolize as one.
- R-7147 When 2 or more like features exist within a window size of 2,000 m x 2,000 m, merge features and symbolize as one.
- R-7148 Feature having < 61 m HGT shall be omitted within Built-up (1L020) feature Areal outline.
- R-7152 If LOC attribute value is 4 (elevated), then wing tick portion of linear symbol shall be positioned to indicate support structure at each end of feature and /or each side of the feature being overpassed.
- R-7153 If elevated feature (LOC 4) occurs extensively across terrain or ≥ 15 m HGT across a valley or Canyon then label "Elevated pipeline" or "Suspended pipeline" shall accompany symbolization.
- R-7155 Omit coincident Railroad Track(1N010) or Road(1P030) within feature symbol.
- R-7156 Feature within distance $\leq 1,000$ m surrounding a Homogeneous Radar Significant Area (HRSA) (1L095) shall be omitted and label "walled" added adjacent to HRSA feature.
- R-7158 Symbol shall be deleted in areas lying coincident with Ice Cliff(2J040) feature.
- R-7161 If Railroad in a Road (1N010, RRC 14), then omit Railroad Track (1N010) symbol and portray Road (1P030) with cross tick from Railroad (1N010) symbol overlain on the Road (1P030) symbol.
- R-7163 When LTN > 1 , open area between lanes is < 100 m WID, feature shall be symbolized as LTN = 2.
- R-7168 Include feature in area void of other Road (1P030) features within a 20,000 m x 20,000 m area.
- R-7171 Feature having vertical accuracy ≤ 30 m shall be termed accurate and symbolized with dot locator symbol.
- R-7175 Include feature in areas void of Road (1P030) features within a 25,000 m x 25,000 m area.

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- R-7176** Railroad Track (1N010) symbol tick shall be omitted within 6.4 mm (0.25 inch) of abutment ends of Bridge /Overpass /Viaduct (1Q040) symbol
- R-7178** Feature shall be shown as a minimum symbol 1.3 mm (0.05 inch) LEN between abutment ticks.
- R-7179** Feature valid only when coincident with a portrayed Road (1P030) or Railroad (1N010).
- R-7180** If Bridge /Overpass /Viaduct (1Q040) overlap is $\geq 50\%$ outside Built-up Area (1L020), then the feature shall be portrayed; if $< 50\%$ do not portray Bridge /Overpass /Viaduct (1Q040) but portray the associated Road (1P030) or RR Track (1N010) and extend to the Built-up Area (1L020).
- R-7182** Tunnel (1Q131) shall be shown as a minimum length symbol 1.3 mm (0.05 inch) at scale and shall be centered evenly to intersect and overlap the Tunnel Entrance and Exit points (1Q132).
- R-7183** A Tunnel (1Q131) which provides passage for an Aqueduct (2H010) or Pipeline (1L160) shall be shown as a Tunnel symbol and labeled accordingly as Aqueduct or Pipeline.
- R-7184** Tunnel (1Q131) shall be shown as a minimum length symbol 2.5 mm (0.10 inch). Symbol position shall be centered evenly to intersect and overlap the Tunnel Entrance and Exit points.
- R-7187** Feature (1U025) only valid when shown in conjunction with portrayed offshore Rig /Superstructure (1A040). The Aircraft Landing Pad symbol shall be centrally positioned on apex of the (1A040) Rig /Superstructure symbol.
- R-7193** Feature valid only when coincident with portrayed Road (1P030), or portrayed Railroad (1N010)
- R-7194** Where the Airspace (1R010) feature delimiting line coincides with a projection line or other linear symbolized feature the identification zones line symbol for AUA 002, 007 and 044 features shall be omitted and the screen band placed along the inside edge of the projection line or linear symbol.
- R-7196** Where the Airspace (1R010) feature delimiting line for Buffer Zone (AUA 006) coincides with a projection line the delimiting line shall be omitted and the screen band placed along the inside edge of the projection line.
- R-7197** When a second Airspace (1R010-Prohibited, Danger, Restricted, Warning, Alert) area overlaps with an initial Airspace feature, the perimeter linewidth of the second shall be reduced in width to 0.15 mm. When a third Airspace (1R010-Prohibited, Danger, Restricted, Warning, Alert) overlaps its perimeter line within the overlap region shall be shown as a dash linewidth 0.25 mm, dash length 2.5 mm and dash spacing 0.5mm. If a fourth Airspace (1R010-Prohibited, Danger, Restricted, Warning, Alert) area should overlap it shall be bounded only by the area screen band (2.5 mm wide, 31% screen).
- R-7198** When Airspace features (1R010) (Prohibited, Danger, Restricted, Warning, Alert) coincide with (1R010) (ADIZ) or (1R010) (Buffer Zone), reduce the width of the (Prohibited, Danger, Restricted, Warning, Alert, or Caution) area screen to 1.5 mm.
- R-7202** If EFI attribute value is 003 (causeway) and feature is coincident with a Railroad (1N010) then show the Railroad symbol and label causeway.
- R-7203** A feature located within the area defined by the airfield symbol shall be centered above the north limits of respective Aircraft Facility (1U030) symbol with a 0.5 mm space provided between the two symbols.
- R-7209** If a Dam (2I020) is EXS 5 and HGS is ≥ 1 , then symbolize backup area as Land Subject to Inundation (2H090).
- R-7211** Contour (3A010) approaching (4B) landform feature shall be connected into feature symbol at the point where Contour becomes part of the slope of such feature (i.e., Embankment, Cut, Fault, etc.).

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- R-7214 Spot Elevation (3A030) shall be shown accompanying Mountain Pass (4B150) symbol.
- R-7215 When NAM label is void of proper name, label "Volcano".
- R-7216 Feature shall only be included in terrain areas measuring $\leq 5\%$ (3 degrees) of slope (SGC), as determined from Contour (3A010) feature base.
- R-7218 Linear (shelter belt) feature shall only be included if located $< 1,000$ m from a portrayed Road (1P030) or Railroad (1N010) feature.
- R-7219 Feature equipped with an Aircraft Landing Pad (1U025) shall have landing pad symbol centered in position on apex of Rig /Superstructure (1A040) symbol.
- R-7220 Top point of Light symbol shall be oriented 90 degrees to respective area lines of latitude.
- R-7226 Symbology shall be deleted within areal Built-up Area (1L020), Hydrography (category 2) and Runway (1U160) features and point Aircraft Facility (1U030) features.
- R-7227 Portion of feature symbol coincident with portrayed Railroad (1N010) Track, Coastal Shoreline (2A010) or extending into a River /Stream (2H140) areal feature or Lake /Pond (2H080) shall be deleted.
- R-7228 The portion of feature symbol which extends into Open Water (2A040), River/Stream (2H140) areal feature or Lake /Pond (2H080) shall be omitted.
- R-7229 If feature $\geq 5,000$ m WID at chart scale, then surface elevation (ZVL) shall be shown.
- R-7232 Feature shall be omitted:
(a) in Open Water, except for the international feature around Hong Kong.
(b) across inland water areas (Lakes and seas) $\geq 5,000$ m x 5,000 m.
- R-7233 Feature symbol coincident with River /Stream shall:
(a) show points of entry and departure with River /Stream.
(b) show every fifth (5th) unit of symbol.
(c) include symbol units at River/Stream junctions.
- R-7235 Include feature in area void of other cultural features (1A010 through 1M080) within 25,000 m x 25,000 m with the exception of the Great Wall of China which shall be shown in its entirety.
- R-7237 Symbology coincident with symbolized ports and harbor (2B) features shall be omitted.
- R-7240 If MIN attribute value is 000 (unknown), then label shall be omitted from symbology.
- R-7241 If PRO attribute value is 000 (unknown), then label shall be omitted from symbology.
- R-7242 If APS attribute value is 000 (unknown), then label shall be omitted from symbology.
- R-7243 If BFC attribute value is 000 (unknown), then label shall be omitted from symbology.
- R-7246 If NST attribute value is 000 (unknown) or 009 (other), then label shall be omitted from symbology.
- R-7250 If HSA attribute value is 003 (permanent), then label shall be omitted from symbology.
- R-7252 If PRO attribute value is 019 (other), then label shall be omitted from symbology.
- R-7253 If feature has assigned Vertical Accuracy (VA) > 30 m then feature shall be shown as ACC 002 (Approximate).

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- R-7254** If SSC attribute value is 000 (unknown) and HGT \geq 46m, label the feature as "Monument". If HGT $<$ 46m and SSC = 000 (Unknown) then label shall be omitted from symbology.
- R-7255** If SSC attribute value is 079 (other), and HGT \geq 46m, label the feature as "Monument". If HGT $<$ 46m and SSC = 079 (other) then label shall be omitted from symbology.
- R-7256** If two or more area outlines merge at symbolization, include as one feature omitting dividing line between features.
- R-7258** If feature is surrounded by Embankment /Fill (4B090), then Embankment/Fill feature shall take symbolization precedence and be shown with the label Tank (1M070) accompanied by pertinent PRO attribute category.
- R-7259** If EXS attribute value is 008 (dismantled) and feature having LEN \geq 1,000 m is being used as a Road, then proper Road (1P030) feature symbol shall be applied.
- R-7261** If a change in LTN $>$ 2 occurs in a multiple Track Line, then a Point of Change shall be indicated by positioning a hyphen between the LTN Track labels at the Point of Change.
- R-7263** If RR Siding /RR Spur (1N050) $<$ 4.0 mm length overall at chart scale, then omit symbol tick. If feature \geq 4.0 mm and $<$ 8.0 mm length, then apply one tick on center of linear symbol. Features \geq 8.0 mm shall be shown with normal symbolization.
- R-7264** Normally only the perimeter Tracks of feature shall be shown. Size and chart scale permitting, the centermost Track shall be included with symbolization.
- R-7276** If area \geq 5,000 m x 5,000 m is composed of multiple feature areas (attribute VEG-4) smaller than specified minimum inclusion condition then the label "Numerous rice fields" shall be applied to area.
- R-7277** If APS attribute value is 005 (other), then label shall be omitted from symbology.
- R-7279** Openings \geq 2.5 mm width within Built-up Area (1L020) shall be shown as land areas with appropriate land tint color.
- R-7280** If portrayal of an area \geq 1,000 m x 1,000 m as being Built-up Area (1L020) is inappropriate due to poorly defined limits, (when dense rural population is living in small villages or individual farms in close proximity ($<$ 250 m between features at scale) i.e., portions of India, Africa), then merge area into a generalized outline and apply label to indicate condition as "Continuous habitation", "Numerous villages", or "Scattered buildings".
- R-7281** If feature extends through "Continuous habitation" form of Built-up Area (1L020), then feature shall be shown.
- R-7282** If Built-up Area (1L020) is destroyed, then feature shall be depicted as previously existed and augmented by explanatory labeling enclosed in parentheses, i.e., (Destroyed) or (Partially destroyed).
- R-7283** If feature $<$ 61 m HGT serves as a lookout Tower (TTC 2), then Spot Elevation (3A030) of the center base of the tower shall be shown and positioned below label "Tower" in symbology.
- R-7284** If feature is portrayed then it shall terminate at a populated place, Interchange (1P020), Bridge/Overpass/Viaduct (1Q040), Lake/Pond (2H080), Coastal Shoreline (2A010) or symbolized cultural feature, unless in desert area, then Road (1P030) (or portions) which are stable shall be shown to extent possible (i.e., portion of feature covered by shifting sand, etc., shall not be shown).
- R-7285** If feature underpasses a portrayed Bridge /Overpass /Viaduct (1Q040), then feature symbol shall be omitted within 0.5 mm (0.02 inch) distance of portrayed overpassing feature.

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- R-7286 If parallel features jointly merge when portrayed at scale, then show as single feature centered in area and indicate the total numeric count of features represented in parentheses alongside symbol.
- R-7287 If BDC 005 (Floating Bridge), then feature shall not be shown with Bridge symbol. The Road (1P030) and or Railroad Track (1N010) served by the Bridge shall be symbolized across respective drain and label "Floating bridge" added.
- R-7288 Feature valid only when coincident with portrayed linear Tunnel (1Q131) symbol.
- R-7289 If at chart scale a powerline portrayal stops within 4.0 mm distance from a portrayed Built-up Area (1L020), Building (1L015) or Power Plant (1D010) feature then Powerline (1T030) shall be continued to connect with respective feature.
- R-7293 If feature falls partially within the chart area and partially beyond the south or west geographic limit of chart, then feature shall be shown in its entirety.
- R-7294 If window size is $\geq 5,000$ m x 5,000 m and contains multiple features smaller than specified inclusion condition, then a label "Numerous ditches" shall be applied in center of respective area.
- R-7295 Feature valid only when associated with a portrayed Road (1P030).
- R-7296 If area surrounding Reservoir (2H130) is flooded, then area shall be shown as Land Subject to Inundation (2H090).
- R-7298 If feature is < 61 m and ≥ 15 m HGT and is located in an area void of other cultural (1A through 1U) features within a 25,000 m x 25,000 m area, then feature shall be shown.
- R-7299 If Contour is present in Snow Field /Ice Field (2J100), then Contours shall be shown as HQC 012 (intermediate approximate) or HQC 013 (supplementary approximate) and adjusted to conform to the Contours adjacent to perimeter of Snow Field /Ice Field.
- R-7300 If feature is used to carry both 1P030 (Road) and 1N010 (Railroad Track) whether on the same or different level then feature symbol shall be shown with 1P030 (Road) continuing through the symbol and 1N010 (Railroad Track) drawn up to the ends of feature symbol.
- R-7302 If feature is pedestrian only (TUC 17), then only include when area is void of other cultural (1A through 1U) features within 25,000 m x 25,000 m area.
- R-7303 Feature valid only when coincident with a portrayed Road (1P030), Railroad Track (1N010), Aqueduct (2H010), or Pipeline (1L160).
- R-7304 If EFI attribute value 003 (causeway) and feature supports a Road (1P030) then show the Road symbol and label "Causeway"
- R-7305 If exaggeration is necessary to portray feature then symbol shall be shown as a minimum length of 1.3 mm (0.05 inch).
- R-7306 Feature valid only when coincident with a portrayed River/Stream (2H140) or Lake/Pond (2H080).
- R-7307 If Inland Shoreline (2H075) is coincident with the feature Dam (2I020), then perimeter symbol line shall be omitted.
- R-7308 Position point of symbol so as to be coincident with feature location and show direction of River /Stream (2H140) flow.
- R-7309 If area $\geq 5,000$ m x 5,000 m is composed of multiple features too numerous to delineate then symbol shall be omitted and label "Numerous canals" shall be applied in center of respective area.
- R-7317 If feature length ≤ 76 mm at chart scale, then "TL" label portion of symbol shall be at 25 mm (1.0 inch) intervals.
- R-7318 If feature length > 76 mm at chart scale, then label "TL" portion of symbol shall be shown at 50 mm intervals.

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- R-7332** If BFC attribute value is 039 (other), then label shall be omitted from symbology.
- R-7336** Portion of symbolized feature perimeter line contiguous to Coastal Shoreline (2A010) symbol shall be omitted.
- R-7337** Feature symbol shall have ticks positioned to indicate downhill slope/side of feature.
- R-7338** If HQC attribute value is 006 (Depression Intermediate), or 009 (Mound Intermediate), then feature symbol shall have ticks positioned to indicate downhill slope of feature.
- R-7339** If feature coincides with a portrayed Road (1P030), then base line of the Tramway/Incline Railway (1N090) symbol shall be omitted and cross ticks of feature symbol overlain on the Road symbol.
- R-7349** The symbolization of 2H090 (Land Subject to Inundation) for the area behind 2I020 (Dam) shall be delineated along the Contour level coincident with the HGS of the spillway of 2I020 (Dam).
- R-7352** Symbol shall be symmetrical across its total length and shall be centered at the middle of a subtended dash.
- R-7353** There shall be a minimum distance of 1.3 mm between a functional pair of Tunnel Entrance - Exit symbols.
- R-7354** If within the delineated outline of the feature there exists an area \geq 305 m WID that does not contain any Culture (1A-1U) feature, then that area shall be excluded from the delineated outline and treated as Ground Surface (4A010).
- R-7356** The symbol shall be positioned according to AOO.
- R-7357** For purposes of symbolization, LEN shall be portrayed at a 1:500,000 scale for the Runway length.
- R-7358** If distance between Built-up Area (1L020) perimeter and surrounding features perimeter is $<$ 2,500 m, include features as part of Built-up Area.
- R-7359** If distance between Built-Up Area (1L020) perimeter and surrounding features perimeter is $<$ 1,250 m, include features as part of Built-up Area.
- R-7364** If NAM is unknown, then NAM label is omitted
- R-7365** If ZVL is unknown, then the ZVL label is a "-" (dash).
- R-7366** If EXS = 28 (operational), then omit EXS label.
- R-7372** If Rules L-7002, R-7291 and R-7292 are not used, then assure unnecessary slashes are deleted from symbology.
- R-7373** Feature symbol shall be placed perpendicular to and extended from Shoreline to Shoreline of associated River/Stream (2H140).
- R-7374** Symbol shall be repeated along LEN of feature at a 2.0 mm interval.
- R-7375** Point symbol shall be placed perpendicular to associated River/Stream (2H140).
- R-7377** For parallel feature where:
- A. 2 lines are present the highest from PHT or the centerline between features which are equal or near equal in Predominant Height (PHT) shall be symbolized.
 - B. More than 2 lines are present, the centerline between the outermost lines shall be symbolized.
- R-7378** If feature Island (4B135), as determined by Island Shoreline (2H075), is located within Lake/Pond (2H080), and the HYC of Lake/Pond is 6 (Non-perennial), then omit Island fill for symbology.
- R-7385** Feature having $<$ 61 m OHB shall be omitted within Built-Up Area (1L020) feature outline per Rule R-7180.

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- R-7386 If the distance between individual adjacent units of this feature type is \leq the WID of the largest unit involved and is < 61 m HGT, then delineate all units as one areal outline if the resultant outline is ≥ 150 m WID.
- R-7387 Feature having < 61 m PHT shall be omitted within Built-Up Area (1L020) feature areal outline.
- R-7388 Whenever two or more Islands (4B135) exist within a window size of 625 m x 625 m, only the larger size or the centermost (if all features involved are of equal size) will be symbolized.
- R-7390 If portrayal of an area $\geq 1,000$ m x $1,000$ m as being Native Settlement (1L135) is inappropriate due to poorly defined limits, when dense rural population is living in small villages in close proximity (< 250 m between features at scale), then merge area into a generalized outline and apply label to indicate conditions as "Continuous habitation" or "Numerous villages".
- R-7391 Incorporate feature with Built-up Area (1L020) to determine the size/limits of the Built-up Area (1L020) for portrayal.
- R-7395 If distance between perimeter of Built-up Area (1L020) and any linear feature is ≤ 150 m then extend perimeter of (1L020) feature to be coincident with linear feature.
- R-7399 When features appear on Island (4B135) and their symbols coalesce, delete the symbol if the feature does not meet vertical obstruction criteria of ≥ 61 m HGT or PHT, whichever is applicable.
- R-7402 If straight line segments are < 0.8 mm in length at chart scale, then alter the configuration by combining the smaller line segments and smoothing the character of the line segments until collectively continuous straight line segments ≥ 0.8 mm in length at chart scale are achieved.
- R-7405 The LEN of 1U130 (Overrun /Stopway) shall be included in the LEN of 1U160 (Runway).
- R-7406 For symbolization 1U130 (Overrun /Stopway) shall be portrayed as 1U160 (Runway).
- R-7407 If feature is identified as a vertical obstruction by supplemental source, but is not verified by the photo source (i.e., COE 3), then label "Existence reported".
- R-7409 If LTN ≥ 5 , symbolize by portraying a representative pattern.
- R-7410 If ≥ 1 mm width at product scale, show a representative pattern.
- R-7411 If feature is $< 3,000$ m LEN and connects two or more portrayed hydrographic features (Canal 2H020, Lake/Pond 2H080, River/Stream 2H140, Swamp 5D030, Marsh 5D040), then the feature is required.
- R-7420 Sand dunes shall be positioned to indicate their true orientation (to the nearest degree), with respect to the prevailing winds.
- R-7803 This feature must touch a railroad (L1N010).
- R-7804 A coastal shoreline (2A010) that is contained by open water (2A040) must touch an island (4B135).
- R-7805 An inland shoreline (2H075) must touch either an island (A4B135) or a lake/pond (2H080).
- R-7806 This feature must touch either a river/stream (2H140), a canal (2H020) or a dam (2I020).
- R-7811 Railroads running through built-up areas will be shown with a reduced lineweight (reduce lineweight by 0.1 mm) and without the ticks.

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- R-7814** If two or more features exist within a window size of 5000 m x 5000 m:
- A. The highest (from HGT or PHT, whichever is applicable) feature shall be symbolized if HGT or PHT, whichever is applicable, is \geq 61 m.
 - B. When all features are equal HGT or PHT, whichever is applicable, then the center most feature shall be symbolized.
 - C. If features are $<$ 61 m HGT or PHT, whichever is applicable, then the center most feature shall be symbolized.
 - D. A numeric tally accounting for all identical features in window area shall be placed in parenthesis below respective symbol.
- R-7817** If the area delineation of this feature is smaller than 4.9 square mm at map scale, generalize the area feature into the corresponding point feature.
- R-9045** Marine Lights (Strobe and Identification Beacon) shall be shown in isolated areas if the range of the light is \geq 15 nautical miles.

SUPPRESSION Rules

- S-1500** Symbolize the casement portions (Left Bank / Right Bank) of the feature using the ACC and SLT attributes of the individual river or canal banks in conjunction with the inland shoreline (2H075) symbology. The AHC attribution of the inland shoreline (2H075) shall correspond to the HYC attribution of the associated water body as follows: HYC 008 = AHC 001, HYC 006 = AHC 002, and HYC 003 = AHC 003.
- S-1510** If a Runway (1U160) is a component of an aircraft facility (1U030) that has FPT (FACILITY PRIORITY TYPE) = 2 (MINOR HARD) or 3 (MINOR SOFT) then suppress the runway (1U160) symbol.

THINNING Rules

- T-0819** If name (NAM) is unknown, do not show feature.
- T-6010** Hierarchical order for ranking of feature for product portrayal are as follows:
- (a) All areal features are required to be symbolized on product.
 - (b) Line features \geq 20,000 m LEN are required to be symbolized on product.
 - (c) Line feature \geq 12,000 m and $<$ 20,000 m LEN where (b) above is void within an area $<$ 20,000 m x 20,000 m are required to be symbolized on product.
 - (d) Line feature \geq 5,000 m and $<$ 12,000 m LEN where (b) and (c) above are void within an area $<$ 20,000 m x 20,000 m are required to be symbolized on product.
- T-6025** Hierarchical order for ranking of features \leq 10,000 m wide for product portrayal areas are as follows:
- (a) All areal features $>$ 7,000 m and \leq 10,000 m WID in an area 25,000 m x 25,000 m are required to be symbolized on product.
 - (b) In areas 25,000 m x 25,000 m void of (a) above all features \geq 4,000 m and \leq 7,000 m WID are required to be symbolized on product.
 - (c) In areas 25,000 m x 25,000 m void of (a) and (b) above all features \geq 1,000 m and $<$ 4,000 m WID are required to be symbolized on product.
 - (d) In areas 25,000 m x 25,000 m void of (a), (b) and (c) above all features \geq 500 m and $<$ 1,000 m WID are required to be symbolized on product.
 - (e) In areas 25,000 m x 25,000 m void of (a), (b), (c) and (d) above all features having center to center distance \geq .02 inch at scale are required to be symbolized on product.
 - (f) In areas 25,000 m x 25,000 m void of (a) then (b) may be used in combination with (c) or (d) for symbolization on product.
 - (g) In areas 25,000 m x 25,000 m void of (a) and/or (b) then (c) may be used in combination with (d) for symbolization on product.

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- T-7002** If 2 or more like features exist within a window size of 2,000 m x 2,000 m, only the centermost feature shall be symbolized.
- T-7005** If 2 or more like features exist within a window size of 1,000 m x 1,000 m, only the centermost feature shall be symbolized.
- T-7008** Hierarchical order for ranking of features for product portrayal are as follows:
- (a) All multiple (LTN > 2) lane highways shall be symbolized.
 - (b) Double lane (LTN=2) shall be shown where (a) above is void within an area 14,200m radius.
 - (c) Single lane (LTN=1) shall be shown where (a) and (b) above are void within an area of 14,200m radius.
- T-7009** Hierarchical order for ranking of features for product portrayal are as follows:
- (a) All multiple (LTN >= 2) Track Railroads shall be symbolized.
 - (b) Single Track (LTN = 1) Railroads shall be shown to complete transportation connecting operational requirements.
 - (c) Non-operating, abandoned, under construction and /or destroyed Railroads shall not be shown in area < 20,000 m x 20,000 m containing (a) and/or (b) above.
- T-7010** Select order for omission of special use Airspace feature (attributed AUA) due to area congestion shall be made in the following order:
- (a) All features that are activated for one day or less per week.
 - (b) All features that are active for one month or less per year
 - (c) All danger areas.
- T-7011** If two or more features exist within a window size of 1,000 m x 1,000 m:
- (a) The highest (from HGT or PHT, whichever is applicable) feature shall be symbolized if HGT or PHT, whichever is applicable, is >= 61 m.
 - (b) When all features are equal HGT or PHT, whichever is applicable, then centermost feature shall be symbolized.
 - (c) If features are < 61 m HGT or PHT, whichever is applicable, then the centermost feature shall be symbolized.
 - (d) A numeric tally accounting for all identical features in window area shall be placed in parentheses below respective symbol.
- T-7012** Select order for omission of Aircraft Facility (1U030) features due to area congestion shall be made as follows:
- (a) Abandoned (EXS-006) or reported (EXS-003).
 - (b) Minor feature (open circle) other than military (USE 008).
 - (c) Minor feature (open circle) military (USE 008).
- T-7013** If two or more features exist within a window size of 2,000 m x 2,000 m:
- (a) The highest (from HGT or PHT, whichever is applicable) feature shall be symbolized if HGT or PHT, whichever is applicable, >= 61 m.
 - (b) When all features are equal HGT or PHT, whichever is applicable, then centermost feature shall be symbolized.
 - (c) If features are > 61 m HGT or PHT, whichever is applicable, then the centermost feature shall be symbolized.
 - (d) A numeric tally accounting for all identical features in window area shall be placed in parentheses below respective symbol.

APPENDIX B

OPERATIONAL NAVIGATION CHARTS (ONC) STYLE SHEET

10. SCOPE

10.1 Scope. This APPENDIX provides a graphic illustration of the design, composition, and location of the margin data for the Operational Navigation Chart (ONC). This APPENDIX is a mandatory part of the specification and the information contained herein is intended for compliance.

20. APPLICABLE DOCUMENTS

20.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the current Department of Defense Index of Specifications and Standards (DODISS) and the supplement thereto, cited in the solicitation (See 6.2).

MILITARY STANDARDS

MIL-STD-2402 (DMA)	-	MC&G Symbology
MIL-STD-2403 (DMA)	-	MC&G Product Rules
MIL-STD-2408 (DMA)	-	Glossary of MC&G Feature and Attribution Definitions
MIL-STD-2410 (DMA)	-	MC&G Reproduction and Printing
MIL-STD-2414 (DMA)	-	DMA Stock Number Bar Coding

20.1.2 Other government documents, drawings, and publications.

- a. DMA Standard Supporting Mark 90, Section 500 - Geographic Names.

20.1.3 Non-government publications.

This section is not applicable to this APPENDIX.

20.2 Order of precedence. In the event of a conflict between the text of this APPENDIX and either TABLE I of this specification, or MIL-STD-2402, 2410 and 2414 cited above, the TABLE I, MIL-STD-2402, 2410, and 2414 take precedence.

30. REQUIREMENTS

30.1 15° GEOREF quadrangles. See FIGURE 1 for the required GEOREF zones.

30.2 Chart front. The specification shall be used in conjunction with the APPENDIX to assure design, composition and margin data are achieved for the front of the chart.

30.3 Style sheet. See next page for ONC style sheet information.

90°N	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	U	V	W	X	Y	Z	180°W	165°	150°	135°	120°	105°	90°	75°	60°	45°	30°	15°	0°	15°	30°	45°	60°	75°	90°	105°	120°	135°	150°	165°	180°E																													
M	AM	BM	CM	DM	EM	FM	GM	HM	JM	KM	LM	MM	NM	PM	QM	RM	SM	TM	UM	VM	WM	XM	YM	ZM	75°	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	75°	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z																						
L	AL	BL	CL	DL	EL	FL	GL	HL	JL	KL	LL	ML	NL	PL	QL	RL	SL	TL	UL	VL	WL	XL	YL	ZL	60°	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	60°	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z																				
K	AK	BK	CK	DK	EK	FK	GK	HK	JK	KK	LK	MK	NK	PK	QK	RK	SK	TK	UK	VK	WK	XK	YK	ZK	45°	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	45°	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z																		
J	AJ	BJ	CJ	DJ	EJ	FJ	GJ	HJ	JJ	KJ	LJ	MJ	NJ	PJ	QJ	RJ	SJ	TJ	UJ	VJ	WJ	XJ	YJ	ZJ	30°	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	30°	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z														
H	AH	BH	CH	DH	EH	FH	GH	HH	JH	KH	LH	MH	NH	PH	QH	RH	SH	TH	UH	VH	WH	XH	YH	ZH	15°	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	15°	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z												
G	AG	BG	CG	DG	EG	FG	GG	HG	JG	KG	LG	MG	NG	PG	QG	RG	SG	TG	UG	VG	WG	XG	YG	ZG	0°	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	0°	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z										
F	AF	BF	CF	DF	EF	FF	GF	HF	JF	KF	LF	MF	NF	PF	QF	RF	SF	TF	UF	VF	WF	XF	YF	ZF	15°	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	15°	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z								
E	AE	BE	CE	DE	EE	FE	GE	HE	JE	KE	LE	ME	NE	PE	QE	RE	SE	TE	UE	VE	WE	XE	YE	ZE	30°	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	30°	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z						
D	AD	BD	CD	DD	ED	FD	GD	HD	JD	KD	LD	MD	ND	PD	QD	RD	SD	TD	UD	VD	WD	XD	YD	ZD	45°	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	45°	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z				
C	AC	BC	CC	DC	EC	FC	GC	HC	JC	KC	LC	MC	NC	PC	QC	RC	SC	TC	UC	VC	WC	XC	YC	ZC	60°	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	60°	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z		
B	AB	BB	CB	DB	EB	FB	GB	HB	JB	KB	LB	MB	NB	PB	QB	RB	SB	TB	UB	VB	WB	XB	YB	ZB	75°	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	75°	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
A	AA	BA	CA	DA	EA	FA	GA	HA	JA	KA	LA	MA	NA	PA	QA	RA	SA	TA	UA	VA	WA	XA	YA	ZA	90°S	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	90°S	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z

FIGURE 1. 15° GEOREF quadrangles.

The digital copy of MIL-O-89102, dated 31 January 1995 does not include appendix "B". If you require a copy of this appendix it must be ordered separately. Please fax this page to 215-697-1462 and include your complete mailing address below.

Mailing Address: _____

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Custodians:

DMA-MP

Preparing activity:

DMAAC-MP

Review activities:

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3. DOCUMENT TITLE Military Specification for Operational Navigation Chart (ONC)		
4. NATURE OF CHANGE <i>(Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed)</i>		
5. REASON FOR RECOMMENDATION		
6. SUBMITTER		
a. NAME <i>(Last, First, Middle Initial)</i>	b. ORGANIZATION	
c. ADDRESS <i>(Include Zip Code)</i>	d. TELEPHONE <i>(Include Area Code)</i> (1) Commercial (2) AUTOVON <i>(if applicable)</i>	7. DATE SUBMITTED (YYMMDD)
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