Background Statement for SEMI Draft Document 5229
REVISION TO SEMI P44-0211, SPECIFICATION FOR OPEN ARTWORK SYSTEM INTERCHANGE STANDARD (OASIS®) SPECIFIC TO MASK TOOLS

Note: This background statement is not part of the balloted item. It is provided solely to assist the recipient in reaching an informed decision based on the rationale of the activity that preceded the creation of this document.

Note: Recipients of this document are invited to submit, with their comments, notification of any relevant patented technology or copyrighted items of which they are aware and to provide supporting documentation. In this context, "patented technology" is defined as technology for which a patent has issued or has been applied for. In the latter case, only publicly available information on the contents of the patent application is to be provided.

Note: Additions are indicated by underline and deletions are indicated by ~~strikethrough~~.

Background

After SEMI P44-0211 has been published, some ambiguities, errors, and tight restrictions that should be resolved in the specification of SEMI P44-0211 are found. The revision to SEMI P44 is needed for users of this standard. Below summarizes the suggested revisions to the specification of SEMI P44-0211.

- Section 5.2.11 and Figure 4: Addition of the definition and the example of "bottom level cell".
- Section 6.3.2.10.1 and Table 4: Change to <topcellname-offset> of the field name in the P44_LOCALIZATION property from <topcell-offset>.
- Section 6.3.3.3.2: Addition of resetting modal variables in a jump to an offset defined by a P44_GEOMETRY_OFFSET property.
- Section 6.3.3.4.9: Addition of resetting modal variables in a jump to an offset defined by a P44_LOCALIZATION_AREA property.
- Table 2, No.14, No.17, and No.18: Extension to 2^{*32}-1 of the maximum of the datatype-number in the RECTANGLE record, the TRAPEZOID record, and the CTRAPEZOID record.
- Table 2, No.20: Change to "X" of the propriety of the propname-string in the PROPERTY record.
- Table 3, No.5 – No.10: Addition of the restrictions of other OASIS standard properties.
- Table 5, No.3: Clarification of the restriction of geometric figures in the top cell.
- Appendix 1: Addition of a datatype-number in the first geometry record in each cell.
- Appendix 1, Figure 4: Correction of the values in the geometry records, the PLACEMENT records, and the PROPERTY records to correspond to the cell layout in Figure 4.
- Appendix 1, No.3, No.160: Correction of the property name in the comment.

The result of this ballot may be reviewed at next Japan Micropatterning Committee, which is scheduled on December 15, 2011, at SEMI Japan. If you have questions, please contact to the Mask Data Format for Mask Tools TF; Toshio Suzuki (Email: suzuki_toshio@mail.micro.dnp.co.jp) or SEMI Staff (Hiro'fumi Kanno / hkanno@semi.org)

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INFORMATIONAL (BLUE) BALLOT

REVISION TO SEMI P44-0211 SPECIFICATION FOR OPEN ARTWORK SYSTEM INTERCHANGE STANDARD (OASIS®) SPECIFIC TO MASK TOOLS

This Standard was technically approved by the global Micropatterning Committee. This edition was approved for publication by the global Audits & Reviews Subcommittee on December 21, 2010. Available at www.semiviews.org and www.semi.org in February 2011; originally published November 2005; previously published July 2009.

1 Purpose

1.1 This document defines the common mask data format specifications based on OASIS for mask tools, namely "OASIS.MASK".

2 Scope

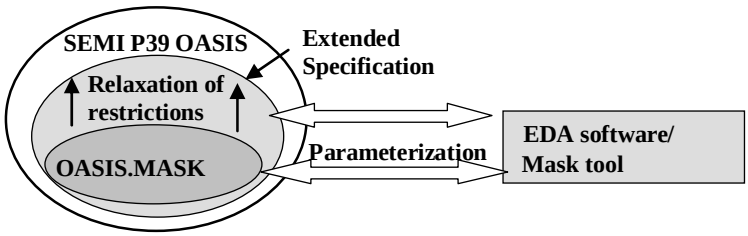
2.1 OASIS.MASK specification applies to the input data format for mask tools.

NOTICE: SEMI Standards and Safety Guidelines do not purport to address all safety issues associated with their use. It is the responsibility of the users of the documents to establish appropriate safety and health practices, and determine the applicability of regulatory or other limitations prior to use.

3 Limitations

3.1 In the future, a part of restrictions on OASIS.MASK may be relaxed, and OASIS.MASK specification may be extended. In view of this possible enhancement of the specification, mask tools, EDA software, and other products, which support OASIS.MASK format, are advised to parameterize these restrictions (see Figure 1). The details of these restrictions are shown in § 6.

3.2 This document will always be required to remain compliant with SEMI P39 OASIS, so that this document is always a formal subset of SEMI P39 OASIS.



Extension of OASIS.MASK Specification

4 Referenced Standards and Documents

4.1 *SEMI Standards*

SEMI P39 — OASIS® – Open Artwork System Interchange Standard

NOTICE: Unless otherwise indicated, all documents cited shall be the latest published versions.

5 Terminology

5.1 *Abbreviations and Acronyms*

5.1.1 *EDA* — electronic design automation

5.1.2 *OASIS®* — Open Artwork System Interchange Standard[1]

5.1.3 *OASIS.MASK* — Open Artwork System Interchange Standard (OASIS®) specific to mask tools

5.1.4 *UTC* — Coordinated Universal Time

5.1.5 *VSB* — variable shaped beam

5.2 *Definitions*

5.2.1 *cell size* — width and height of cell that is defined by S_BOUNDING_BOX of PROPERTY record.

5.2.2 *chip window* — a drawing area of mask tools.

5.2.3 *common cell* — a cell which is placed in multiple localization areas.

5.2.4 *data compaction* — expressions for reducing the data of repetition, modality, etc.

5.2.5 *empty cell* — a cell which has no figure in itself or in any cells under the cell.

5.2.6 *figure operation* — operations of modifying a figure, required when converting a layout data to a mask data.

5.2.7 *localization* — grouping cells according to the specified area size for the efficiency improvement of the input process and the parallel processing of OASIS.MASK. The records of each cell group are also localized in the OASIS.MASK file.

5.2.8 *localization area* — an area which contains one of the cell groups divided by the localization.

5.2.9 *localized cell* — a cell which is placed in single localization area.

5.2.10 *mask restrictions* — restrictions on OASIS format which enables to input the mask data to mask tools.

5.2.11 *bottom level cell* — a cell which has no lower level cell.

5.3 *Symbols*

5.3.1 *A* — acceptable record.

5.3.1.1 The records generated as needed in the input data for mask tools by the software. The mask tools perform processing according to the contents of the records.

5.3.2 *I* — ignore record.

5.3.2.1 The records that may be generated in the input data for mask tools by the software, but will be ignored by the mask tools. The mask tools do not respond to the records.

5.3.3 *M* — mandatory record.

5.3.3.1 The records that must be generated in the input data for mask tools by the software. If the records do not exist, the mask tools treat it as an error.

[1] OASIS® is a registered trademark of Thomas Grebinski, and is licensed for use by SEMI.

5.3.4 *X* — prohibited record.

5.3.4.1 The records prohibited to exist in the input data for mask tools. If the records exist, the mask tools treat it as an error.

6 Requirements

6.1 *Concept of OASIS.MASK*

6.1.1 The concept of OASIS.MASK is shown in Figure 1. OASIS.MASK is a format that defines restrictions to the OASIS format for mask tools. Therefore, OASIS.MASK can be used without modifying OASIS tools.

6.2 *OASIS Format Specification*

6.2.1 See SEMI P39 for OASIS Format Specification.

6.3 *Additional Records in OASIS.MASK*

6.3.1 In OASIS.MASK, following user properties are added to PROPERTY record.

6.3.2 *File-Level Properties*

6.3.2.1 The following file-level properties can be specified only once immediately after the START record.

6.3.2.2 *P44_FORMAT*

6.3.2.2.1 This property declares the format type of mask restrictions. Its value consists of a single a-string (or implied a-string) record. The value is "1" with this specification. It is a mandatory record in OASIS.MASK.

6.3.2.2.2 *EXCEPTION HANDLING* — The absence of a P44_FORMAT property in an OASIS.MASK file should be treated as a fatal error. A value of the format type which is not "1", should also be treated as a fatal error.

6.3.2.3 *P44_CHIP_WINDOW*

6.3.2.3.1 This property declares the size of a window in terms of the coordinate system of the top cell. Its value consists of four signed-integer records, <*x1*>, <*y1*>, <*x2*>, and <*y2*>. <*x1*> is the *x*-coordinate of the lower left corner of a window, <*y1*> is the y-coordinate of that lower left corner, <*x2*> is the *x*-coordinate of the upper right corner, and <*y2*> is the *y*-coordinate of that upper right corner. It is a mandatory record in OASIS.MASK.

6.3.2.3.2 *EXCEPTION HANDLING* — The absence of a P44_CHIP_WINDOW property in an OASIS.MASK file should be treated as a fatal error. A value of <x2> which is not larger than <x1>, should be treated as a fatal error. A value of <y2> which is not larger than <y1>, should also be treated as a fatal error. A geometric figure outside the window defined by this property should be treated as a fatal error.

6.3.2.4 *P44_VERSION*

6.3.2.4.1 This property declares the version of OASIS.MASK specification. Its value consists of a single a-string (or implied a-string) record. The value is "2.0" with this specification. It is a mandatory record in OASIS.MASK.

6.3.2.4.2 *EXCEPTION HANDLING* — The absence of a P44_VERSION property in an OASIS.MASK file should be treated as a fatal error. A value of the version which is not "2.0", should also also be treated as a fatal error.

6.3.2.5 *P44_FILE_SIZE*

6.3.2.5.1 This property declares the file size by the number of bytes. Its value consists of a single unsigned-integer record. It is a mandatory record in OASIS.MASK.

6.3.2.5.2 *EXCEPTION HANDLING* — The absence of a P44_FILE_SIZE property in an OASIS.MASK file should be treated as a fatal error. It is also a fatal error if the number of bytes defined by this property does not match the file size.

6.3.2.6 *P44_TOP_CELL_NUMBER*

6.3.2.6.1 This property declares the reference number of the top cell to accelerate the search of the top cell. Its value consists of a single unsigned integer record. It is a mandatory record in OASIS.MASK.

6.3.2.6.2 *EXCEPTION HANDLING* — The absence of a P44_TOP_CELL_NUMBER property in an OASIS.MASK file should be treated as a fatal error. Use of a reference-number for which there is no corresponding CELLNAME record within the same OASIS.MASK file should be treated as a fatal error.

6.3.2.7 *P44_CONVERSION_TOOL*

6.3.2.7.1 This property declares the name and the version number of the conversion tool which outputs the OASIS.MASK file. Its value list consists of the following two fields: <name> <version>. The name and version fields are a-strings (or implied a-strings). It is an optional record in OASIS.MASK.

6.3.2.8 P44_CONVERSION_DATE

6.3.2.8.1 This property declares the date when the OASIS.MASK file is output. Its value consists of the following three fields: <date> <time> <zone>. The date field is an a-string (or implied a-string) representing the date in the form of DD-MM-YYYY. DD, MM, and YYYY represent the day, month, and year respectively. The time field is an a-string (or implied a-string) representing the time in the form of HH:MM:SS. HH, MM, and SS represent the hour, minute, and second respectively. The zone field is a real number representing the time difference with UTC. The unit of the time difference is hour. It is a mandatory record in OASIS.MASK.

6.3.2.8.2 *EXCEPTION HANDLING* — The absence of a P44_CONVERSION_DATE property in an OASIS.MASK file should be treated as a fatal error.

6.3.2.9 *P44_BOUNDING_BOX_MAX*

6.3.2.9.1 This property declares the upper limit of the cell bounding box permitted in any cell except the top cell. This property declares not the largest cell bounding box but the upper limit of the cell bounding box except the top cell. Its value list consists of the following two fields: <width> <height>. The width and height fields are unsigned-integers. It is a mandatory record in OASIS.MASK.

6.3.2.9.2 *EXCEPTION HANDLING* — The absence of a P44_BOUNDING_BOX_MAX property in an OASIS.MASK file should be treated as a fatal error. It is also a fatal error if the bounding box defined by this property is smaller than any cell bounding box except the top cell defined by the S_BOUNDING_BOX property.

6.3.2.10 *P44_LOCALIZATION*

6.3.2.10.1 This property declares the upper limit for the localization area size and the localized and common cell record volume. It declares the number of localization areas that are defined by the OASIS.MASK file. This property declares the byte offset from the beginning of the OASIS.MASK file (byte 0) to the CELLNAME record of the top cell or it declares the byte offset from the beginning of the OASIS.MASK file (byte 0) to the CBLOCK record in which the CELLNAME record of the top cell is stored. Its value list consists of the following six fields: <localization-width> <localization-height> <localized-cell-volume> <common-cell-volume> <localization-area-count> <topcellname-offset>. All fields are unsigned-integers. Use of localization is optional. If this property is

defined, the OASIS.MASK file is localized in a manner as specified by the property. Otherwise, the OASIS.MASK file is not localized.

6.3.2.10.2 *EXCEPTION HANDLING* — It is a fatal error if the localization area size, the record volume, the localization area count, and the byte offset defined by this property do not match their values in the OASIS.MASK file.

6.3.2.11 *P44_GEOMETRY_OFFSET_AVAILABLE*

6.3.2.11.1 This property indicates whether or not P44_GEOMETRY_OFFSET properties appear in CELLNAME records. Its value list consists of a single unsigned-integer. A value of 0 means that P44_GEOMETRY_OFFSET properties are not provided. A value of 1 means that P44_GEOMETRY_OFFSET properties are provided for every CELLNAME record excluding the top cell and the bottom level cells. It is a mandatory record in OASIS.MASK.

6.3.2.11.2 *EXCEPTION HANDLING* — The absence of a P44_GEOMETRY_OFFSET_AVAILABLE property in an OASIS.MASK file should be treated as a fatal error. A value of the property which is other than 0 and 1, should also be treated as a fatal error.

6.3.3 *Cell-Level Properties*

6.3.3.1 These properties are cell-level user properties and can be specified immediately after the corresponding CELLNAME record.

6.3.3.2 *P44_GEOMETRY_COUNT*

6.3.3.2.1 This property declares the total count of the RECTANGLE record, the TRAPEZOID record, and the CTRAPEZOID record in each cell and appears only once immediately after the corresponding CELLNAME record. It includes only cell-native geometry and does not include expansion of repetitions. Its value list consists of a single unsigned-integer. It is a mandatory record in OASIS.MASK.

6.3.3.2.2 *EXCEPTION HANDLING* — The absence of a P44_GEOMETRY_COUNT property in an OASIS.MASK file should be treated as a fatal error. It is also a fatal error if the count defined by this property does not match the geometry record count in each cell.

6.3.3.3 *P44_GEOMETRY_OFFSET*

6.3.3.3.1 This property declares the byte offset from the beginning of the corresponding CELL record to the first geometry record or the CBLOCK record to which geometry records are stored in the cell. In case that this property is present, all PLACEMENT records in each cell are gathered and appear before geometry records (RECTANGLE/TRAPEZOID/CTRAPEZOID). If the CBLOCK record is used for the CELL record with this property, then a single CBLOCK record cannot contain the PLACEMENT records and geometry records together. It appears only once immediately after the corresponding CELLNAME record. Its value list consists of a single unsigned-integer. Whether this property is defined or not depends on P44_GEOMETRY_OFFSET_AVAILABLE.

6.3.3.3.2 This property enables the direct access to geometry records in the cell. Therefore, x and y values of the first geometry record in each cell should be specified in absolute mode when this property is present. Moreover, geometry records should not rely on the value of modal variables set in the PLACEMENT records and in other cells. Whenever the first geometry record in each cell is encountered, all modal variables with the exception of placement-x, placement-y, geometry-x, geometry-y, text-x, and text-y, are set to a state of undefined; the exceptions just mentioned are set to 0.

6.3.3.3.3 The value of the byte offset is zero (0) where there is no geometry record in the cell.

6.3.3.3.4 Note that this property is unnecessary for the top cell and the bottom level cells.

6.3.3.3.5 *EXCEPTION HANDLING* — It is a fatal error if the byte offset defined by this property does not indicate the first geometry record or the CBLOCK record to which geometry record are stored.

6.3.3.4 *P44_LOCALIZATION_AREA*

6.3.3.4.1 This property declares the bounding box of a localization area with other associated properties. It appears immediately after the CELLNAME record of the top cell and may be repeated if there are multiple localization areas. Its value list consists of the following 10 fields: <lower-left-x> <lower-left-y> <upper-right-x> <upper-right-y> <cell-offset> <cell-volume> <cellname-offset> <cellname-volume> <placement-offset> <placement-count>.

6.3.3.4.2 The bounding box fields are defined with respect to the coordinate system of the top cell and they are signed-integers.

6.3.3.4.3 CELL records of localized cells belonging to a particular localization area are contiguously defined in OASIS.MASK file. Cell-offset is the byte offset from the beginning of the file to the head of the CELL records of localized cells in the particular localization area, and cell-volume is the data volume of the contiguous CELL records of localized cells in the localization area. Cell-offset and cell-volume is zero where there is no placement of localized cells (but placements of common cells) in the localization area.

6.3.3.4.4 CELLNAME records of localized cells are also localized in the same manner. Then, cellname-offset declares the byte offset from the beginning of the file to the head of the CELLNAME records of localized cells belonging to the said localization area, and cellname-volume is the data volume of contiguous CELLNAME records of localized cells in the localization area. Cellname-offset and cellname-volume is zero where there is no placement of localized cells (but placements of common cells) in the localization area.

6.3.3.4.5 PLACEMENT records which belong to the same localization area are contiguously defined in the CELL record of the top cell. Placement-offset is the byte offset from the head of the CELL record of the top cell to either the head of the PLACEMENT record of the particular localization area or the CBLOCK record to which the PLACEMENT records of the particular localization area are stored. Placement-count is the count of the contiguous PLACEMENT records of the localization area. Any PLACEMENT record in the top cell should belong to a single localization area.

6.3.3.4.6 All of cell-offset, cell-volume, cellname-offset, cellname-volume, placement-offset, and placement-count are unsigned integers. This property must be defined for each localization area when an OASIS.MASK file is localized.

6.3.3.4.7 If CBLOCK is used for CELLNAME records in a localized OASIS.MASK file, CELLNAME records from two or more localization areas should not be compressed in the same CBLOCK record. The cell-volume and the cellname-volume are the volume after the CBLOCK compression.

6.3.3.4.8 If CBLOCK is used for the records of the top cell in localized OASIS.MASK file, PLACEMENT records from two or more localization areas should not be compressed in the same CBLOCK record.

6.3.3.4.9 This property enables direct access to the PLACEMENT records in each localization area defined in the top cell. Therefore, x and y values for the first PLACEMENT record in each localization area defined in the CELL record of the top cell should be specified in absolute mode. Moreover, PLACEMENT records should not rely on the value of modal variables set in preceding localization areas. Whenever the first geometry record in each cell is encountered, all modal variables with the exception of placement-x, placement-y, geometry-x, geometry-y, text-x, and text-y, are set to a state of undefined; the exceptions just mentioned are set to 0.

6.3.3.4.10 *EXCEPTION HANDLING* — It is a fatal error if the bounding box, the byte offset, the data volume, and the record count defined by this property do not match their values in the OASIS.MASK file. A value of <upper-right-x> which is not larger than <lower-left-x>, should be treated as a fatal error. A value of <upper-right-y> which is not larger than <lower-left-y>, should also be treated as a fatal error.

6.3.3.5 *P44_COMMON_CELL*

6.3.3.5.1 This property declares the byte offset and the data volume of CELL records and CELLNAME records of common cells. It appears only once and immediately after the CELLNAME record of the top cell. Its value list consists of the following 4 fields: <cell-offset> <cell-volume> <cellname-offset> <cellname-volume>.

6.3.3.5.2 CELL records of common cells are contiguously defined in OASIS.MASK file. Cell-offset is the byte offset from the beginning of the file to the head of the CELL records of the common cells, and cell-volume is the data volume of the contiguous CELL records of the common cells.

6.3.3.5.3 CELLNAME records of common cells are also defined in the same manner. Then, cellname-offset declares the byte offset from the beginning of the file to the head of the CELLNAME records belonging to the said common cells, and cellname-volume is the data volume of contiguous CELLNAME records of the common cells.

6.3.3.5.4 All of cell-offset, cell-volume, cellname-offset, and cellname-volume are unsigned integers. This property must be defined when an OASIS.MASK file is localized and a common cell is placed in the file.

6.3.3.5.5 If CBLOCK is used for CELLNAME records of common cells, the CBLOCK record cannot contain CELLNAME records of localized cells. The cell-volume and the cellname-volume are the volume after the CBLOCK compression.

6.3.3.5.6 This property is unnecessary when there is no common cell in OASIS.MASK file.

6.3.3.5.7 *EXCEPTION HANDLING* — It is a fatal error if the bounding box, the byte offset and the data volume defined by this property do not match their values in the OASIS.MASK file.

6.4 *Specification of the Mask Restrictions*

6.4.1 *Concept*

6.4.1.1 The restrictions are common among mask tools.

6.4.1.2 The specification reduces the load in the conversion process of mask tools as much as possible, and aims for the direct input to mask tools.

6.4.1.3 The specification maintains the data compaction expression in OASIS as much as possible.

6.4.2 *Restrictions on Figure Operation*

6.4.2.1 Figure operations described in Table 1 should be executed before generating of OASIS.MASK, since these are not done by mask tools.

6.4.3 *Restrictions on OASIS Record*

6.4.3.1 *Common Restrictions*

6.4.3.1.1 The 63 kinds of characters are allowed to be used for cell names and properties, including uppercase (A–Z), lowercase (a–z), numeric character (0–9), and underline (_).

6.4.3.2 *Individual Restrictions*

6.4.3.2.1 The restrictions on each record of OASIS are shown in Table 2. Also, Table 3 shows restrictions in OASIS.MASK to OASIS Standard Properties. The restrictions on user properties are shown in Table 4.

6.4.3.3 *Restrictions on Cell Hierarchy*

6.4.3.3.1 The restrictions on cell hierarchy of OASIS.MASK are shown in Table 5.

6.4.3.3.2 The restrictions on cell hierarchy of OASIS.MASK are shown in Figure 2.

6.4.3.3.3 An example of cell hierarchy is shown in Figure 3.

6.4.3.3.4 An example of localization is shown in Figure 4.

6.4.3.4 Restrictions on File Name

6.4.3.4.1 The restrictions on a file name of OASIS.MASK are shown in Table 6.

Table 1 Figure Operation List

No.	*Figure Operation*	*Content of Operation*
1	Window extraction	Generate the drawing window size and extract figures in the drawing area
2	Layer merge	Merge multiple layers into a single layer
3	Logical operation	Generate a new figure from the figures in different layers by logical operation on them
4	Sizing	Change the size of a figure
5	Scaling	Enlarge or reduce the size of the whole figure in a uniform ratio
6	Mask scaling	Apply mask scaling (such as x4, x5, etc.) to the whole data
7	Mirroring	Make the whole data reflective symmetry about X-axis or Y-axis
8	Inverting	Invert black/white coloring on the whole data
9	Rotation	Rotate a figure about the origin point
10	Overlap removal	Remove overlaps between two figures on the whole data
11	OPC	Correct the layout data for optical proximity effects
12	Trapezoid division	Divide a polygon geometry into trapezoid figures (including rectangles and triangles)

Table 2 Restrictions on OASIS Record

No.	*Record Name*		*Restriction Item*	*Content of Restriction*					*Propriety*[#2]
				Minimum	*Maximum*	*Step*	*Unit*	*Comment*	
1	PAD	-	Byte alignment	-	-	-	-	-	A
2	START	version-string	OASIS version	-	-	-	-	-	M
		unit	Grid/µm	1	1000000	1	grid	Recommended value is 1, 2, 4, 5, 8, 10, 16, 20, 25, 40, 50, 80, 100, 125, 200, 250, 400, 500, 625, 800, 1000, 1250, 2000, 2500, 5000, and 10000. The rounding error might occur in the calculation of coordinates when other units are specified.	M
		offset-flag	Table offset location	-	-	-	-	0 or 1	M
		cellname-flag propname-flag	Strict flags and byte-offset fields	-	-	-	-	Fixed to 1 when offset-flag is 0	A
		propstring-flag	Strict flags and byte-offset fields	-	-	-	-	Fixed to 1 when a PROPSTRING record is specified and offset-flag is 0	A
		textstring-flag layername-flag xname-flag	Strict flags and byte-offset fields	-	-	-	-	Refer to the specification of SEMI P39	I

No.	*Record Name*		*Restriction Item*	*Content of Restriction*					*Propriety*[#2]
				Minimum	*Maximum*	*Step*	*Unit*	*Comment*	
3	END	padding-string	Byte alignment	-	-	-	-	Necessary when the size of the END record except the padding-string is less than 256 bytes	A
		validation-scheme	Verification specification	-	-	-	-	Fixed to 1 or 2	M
		validation-signature	Contents of verification	-	-	-	-	Fixed to CRC32 or CHECK-SUM32	M
		cellname-flag propname-flag	Strict flags and byte-offset fields	-	-	-	-	Fixed to 1 when offset-flag is 1	A
		propstring-flag	Strict flags and byte-offset fields	-	-	-	-	Fixed to 1 when a PROPSTRING record is specified and offset-flag is 1	A
		textstring-flag layername-flag xname-flag	Strict flags and byte-offset fields	-	-	-	-	Refer to the specification of SEMI P39	I
4	CELLNAME	cellname-string	Cell name length	1	256	1	-		M
		reference-number	Reference number	-	-	-	-	Fixed to record type ‘3’	X
5	TEXTSTRING	text-string	Text string length	1	256	1	-		I
		reference-number	Reference number	0	$2^{32} - 1$	1	-		I
6	PROPNAME	propname-string	Property name length	1	256	1	-		M
		reference-number	Reference number	0	$2^{32} - 1$	1	-		A
7	PROPSTRING	prop-string	Property string length	1	256	1	-		A
		reference-number	Reference number	0	$2^{32} - 1$	1	-		A
8	LAYERNAME	layername-string	Layer name length	1	256	1	-		I
9	CELL	cellname-string	Cell name length	-	-	-	-	Fixed to record type ‘13’	X
		reference-number	Reference number	0	$2^{32} - 1$	1	-		M
10	XY ABSOLUTE	-	Modal variable xy-mode	-	-	-	-		A
11	XY RELATIVE	-	Modal variable xy-mode	-	-	-	-		A

No.	*Record Name*		*Restriction Item*	*Content of Restriction*					*Propriety*[#2]
				Minimum	*Maximum*	*Step*	*Unit*	*Comment*	
12	PLACEMENT	cellname-string	Cell name length	-	-	-	-		X
		reference-number	Reference number	0	$2^{32} - 1$	1	-		M
		x, y	Coordinate value	-2^{31}	$2^{31} - 1$	1	grid		A
		repetition-type	Repetition type	-	-	-	-	Fixed to TYPE 0–3	A
		x-dimension *y*-dimension	N (column) − 2, M (row) − 2	0	$2^{32} - 3$	1	-	"*x*-dimension" is used at TYPE 1 and 2, "*y*-dimension" is used at TYPE 1 and 3	A
		x-space *y*-space	Horizontal spacing, Vertical spacing	0	$2^{32} - 1$	1	grid	"*x*-space" is used at TYPE 1 and 2, "*y*-space" is used at TYPE 1 and 3	A
		magnification	Magnification	-	-	-	-	Fixed to 1.0	A
		placement-info-byte	Mirror	-	-	-	-	Fixed to 0	A
		angle	Rotation angle	-	-	-	-	Fixed to 0	A
13	TEXT	reference-number	Reference number	0	$2^{32} - 1$	1	-		I
		text-string	Text string length	1	256	1	-		I
		textlayer-number	Layer number	0	255	1	-		I
		texttype-number	Data type number	0	255	1	-		I
		x, y	Coordinate value	-2^{31}	$2^{31} - 1$	1	grid		I
		repetition-type	Repetition type	-	-	-	-		I

No.	*Record Name*		*Restriction Item*	*Content of Restriction*					*Propriety*[#2]
				Minimum	*Maximum*	*Step*	*Unit*	*Comment*	
		x-dimension *y*-dimension	N (column) − 2, M (row) − 2	0	$2^{32} - 3$	1	-		I
		x-space *y*-space	Horizontal spacing, Vertical spacing	0	$2^{32} - 1$	1	grid		I
14	RECTANGLE	*x*, *y*	Coordinate value	-2^{31}	$2^{31} - 1$	1	grid		A
		width height	Width and Height	1	$2^{32} - 1$	1	grid	zero-area (width=0 or height=0) is prohibited	A
		layer-number	Layer number	0	255	1	-	one file one layer	A
		datatype-number	Data type number	0	~~255~~2^{32}-1	1	-		~~I~~A
		repetition-type	Repetition type	-	-	-	-	Fixed to TYPE 0–3	A
		x-dimension *y*-dimension	N (column) − 2, M (row) − 2	0	$2^{32} - 3$	1	-	"*x*-dimension" is used at TYPE 1 and 2, "*y*-dimension" is used at TYPE 1 and 3	A
		x-space *y*-space	Horizontal spacing, Vertical spacing	0	$2^{32} - 1$	1	grid	"*x*-space" is used at TYPE 1 and 2, "*y*-space" is used at TYPE 1 and 3	A
15	POLYGON	-	-	-	-	-	-		X
16	PATH	-	-	-	-	-	-		X
17	TRAPEZOID[#1]	*x*, *y* delta-a delta-b	Coordinate value	-2^{31}	$2^{31} - 1$	1	grid		A
		width height	Width and Height	1	$2^{32} - 1$	1	grid	zero-area (width=0 or height=0) is prohibited	A
		layer-number	Layer number	0	255	1	-	one file one layer	A
		datatype-number	Data type number	0	~~255~~2^{32}-1	1	-		~~I~~A
		repetition-type	Repetition type	-	-	-	-	Fixed to TYPE 0–3	A
		x-dimension *y*-dimension	N (column) − 2, M (row) − 2	0	$2^{32} - 3$	1	-	"*x*-dimension" is used at TYPE 1 and 2, "*y*-dimension" is used at TYPE 1 and 3	A

No.	*Record Name*		*Restriction Item*	*Content of Restriction*					*Propriety*[#2]
				Minimum	*Maximum*	*Step*	*Unit*	*Comment*	
		x-space *y*-space	Horizontal spacing, Vertical spacing	0	$2^{32} - 1$	1	grid	"*x*-space" is used at TYPE 1 and 2, "*y*-space" is used at TYPE 1 and 3	A
18	CTRAPEZOID	ctrapezoid-type	CTRAPEZOID type	-	-	-	-	Types 0–25	A
		x, *y*	Coordinate value	-2^{31}	$2^{31} - 1$	1	grid		A
		width height	Width and Height	1	$2^{32} - 1$	1	grid	zero-area (width=0 or height=0) is prohibited	A
		layer-number	Layer number	0	255	1	-	one file one layer	A
		datatype-number	Data type number	0	~~255~~2^{32}-1	1	-		~~I~~A
		repetition-type	Repetition type	-	-	-	-	Fixed to TYPE 0–3	A
		x-dimension *y*-dimension	N (column) − 2, M (row) − 2	0	$2^{32} - 3$	1	-	"*x*-dimension" is used at TYPE 1 and 2, "*y*-dimension" is used at TYPE 1 and 3	A
		x-space *y*-space	Horizontal spacing, Vertical spacing	0	$2^{32} - 1$	1	grid	"*x*-space" is used at TYPE 1 and 2, "*y*-space" is used at TYPE 1 and 3	A
19	CIRCLE	-	-	-	-	-	-		X
20	PROPERTY	propname-string	Property name length	~~1~~	~~256~~	~~1~~	-		~~A~~X
		reference-number	Reference number	0	$2^{32} - 1$	1	-		A
21	XNAME	-	-	-	-	-	-		X
22	XELEMENT	-	-	-	-	-	-		X
23	XGEOMETRY	-	-	-	-	-	-		X
24	CBLOCK	-	-	-	-		-		A

#1 It is preferable that a trapezoid figure that can be represented by the CTRAPEZOID record is represented by not the TRAPEZOID record but the CTRAPEZOID record.

#2 M: Mandatory, A: Acceptable, I: Ignore, X: Prohibited.

Table 3 Restrictions On Standard Property

No	*Level*	*Property Name*	*Restriction Item*	*The Content of Restriction*					*Propriety*[#1]
				Minimum	*Maximum*	*Step*	*Unit*	*Comment*	
1	File	S_BOUNDING_BOXES_AVAILABLE	Bounding boxes available	-	-	-	-	Fixed to 2	M
2	Cell	S_BOUNDING_BOX (flags, lower-left-x, lower-left-y, width, height)	Flag	-	-	-	-	Fixed to 000	M
			Coordinate value	-2^{31}	$2^{31}-1$	1	grid		
			Width and height of bounding boxes (except a top cell)	1	1 mm	1	grid		
			Bounding boxes (top cell)	1	$2^{32}-1$	1	grid		
3	Cell	S_CELL_OFFSET	Cell offset value	1	$2^{64}-1$	1	byte		M
4	File	S_TOP_CELL	Top cell name length	1	256	1	-	Must be defined only once	A
5	File	S_MAX_SIGNED_INTEGER_WIDTH	-	-	-	-	-		A
6	File	S_MAX_UNSIGNED_INTEGER_WIDTH	-	-	-	-	-		A
7	File	S_MAX_STRING_LENGTH	-	-	-	-	-		A
8	File	S_POLYGON_MAX_VERICIES	-	-	-	-	-		X
9	File	S_PATH_MAX_VERTICIES	-	-	-	-	-		X
10	Element	S_GDS_PROPERTY	-	-	-	-	-		I

#1 M: Mandatory, A: Acceptable, I: Ignore, X: Prohibited.

Table 4 Restrictions On User Property

No.	*Level*	*Property Name*	*Restriction Item*	*The Content of Restriction*					*Propriety*[#1]
				Minimum	*Maximum*	*Step*	*Unit*	*Comment*	
1	File	P44_FORMAT	Format type	-	-	-	-	Fixed to 1	M
2	File	P44_CHIP_WINDOW (x1, y1, x2, y2)	Chip window size	-2^{31}	$2^{31}-1$	1	grid		M
3	File	P44_VERSION	OASIS.MASK version	-	-	-	-	Fixed to 2.0	M
4	File	P44_FILE_SIZE	File size	1	$2^{64}-1$	1	byte		M
5	File	P44_TOP_CELL_NUMBER	Top cell number	0	$2^{32}-1$	1	-		M
6	File	P44_CONVERSION_TOOL	Tool name	1	256	1	-		A
			Version number	1	256	1	-		A
7	File	P44_CONVERSION_DATE	Date	-	-	-	-	Fixed to DD-MM-YYYY	M
			Time	-	-	-	-	Fixed to hh:mm:ss	M
			Zone	−12	14	0.25	hour	UTC	M
8	File	P44_BOUNDING_BOX_MAX	Width and height	1	$2^{32}-1$	1	grid		M

No.	Level	Property Name	Restriction Item	The Content of Restriction					Propriety[#1]
				Minimum	Maximum	Step	Unit	Comment	
9	File	P44_LOCALIZATION	Width and height	1	$2^{32}-1$	1	grid	This property must be defined when an OASIS.MASK file is localized	A
			Localized cells volume	0	$2^{64}-1$	1	byte		
			Common cells volume	0	$2^{64}-1$	1	byte		
			Localization area count	1	$2^{32}-1$	1	-		
			Top cellname offset value	1	$2^{64}-1$	1	byte		
10	File	P44_GEOMETRY_OFFSET_AVAILABLE	Flag	-	-	-	-	0 or 1	M
11	Cell	P44_GEOMETRY_COUNT	Geometry record count	0	$2^{32}-1$	1	-		M
12	Cell	P44_GEOMETRY_OFFSET	Geometry record offset value	0	$2^{64}-1$	1	byte		A
13	Cell	P44_LOCALIZATION_AREA	Localization area (lower-left-x, lower-left-y, upper-right-x, upper-right-y)	-2^{31}	$2^{31}-1$	1	grid	This property must be defined when an OASIS.MASK file is localized	A
			Cell offset value	0	$2^{64}-1$	1	byte		
			Cell volume	0	$2^{64}-1$	1	byte		
			Cellname offset value	0	$2^{64}-1$	1	byte		
			Cellname volume	0	$2^{64}-1$	1	byte		
			Placement offset value	1	$2^{64}-1$	1	byte		
			Placement record count	1	$2^{32}-1$	1	-		
14	Cell	P44_COMMON_CELL	Cell offset value	1	$2^{64}-1$	1	byte	This property must be defined when an OASIS.MASK file is localized and a common cell is present	A
			Cell volume	1	$2^{64}-1$	1	byte		
			Cellname offset value	1	$2^{64}-1$	1	byte		
			Cellname volume	1	$2^{64}-1$	1	byte		

#1 M: Mandatory, A: Acceptable, I: Ignore, X: Prohibited.

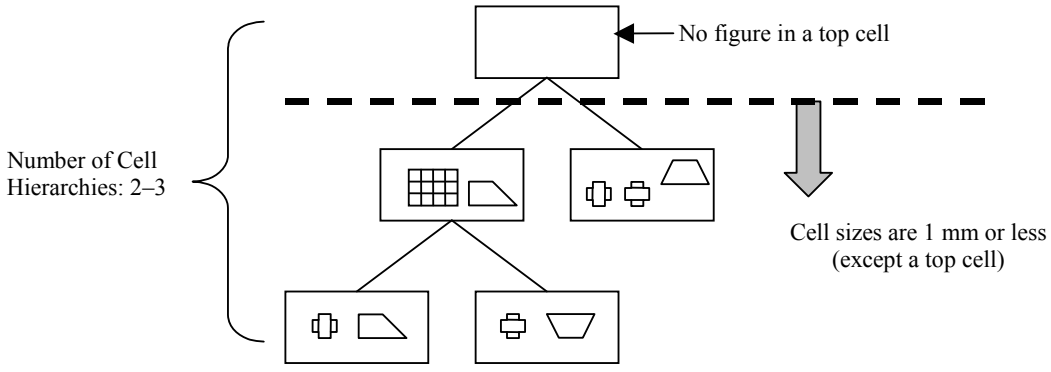
Table 5 Restrictions on OASIS.MASK Hierarchy

No.	Restriction Item	Content of Restriction	Related Record
1	Cell size	Refer to Table3, No.2 for minimum and maximum size[#1] For a top cell, Minimum = 1 grid and Maximum = $2^{32}-1$ grid. An empty cell is prohibited.	CELL PROPERTY (S_BOUNDING_BOX)
2	Number of hierarchies	Two or three hierarchies[#2] The 2nd level cells and the 3rd level cells can be placed at plural locations.	PLACEMENT

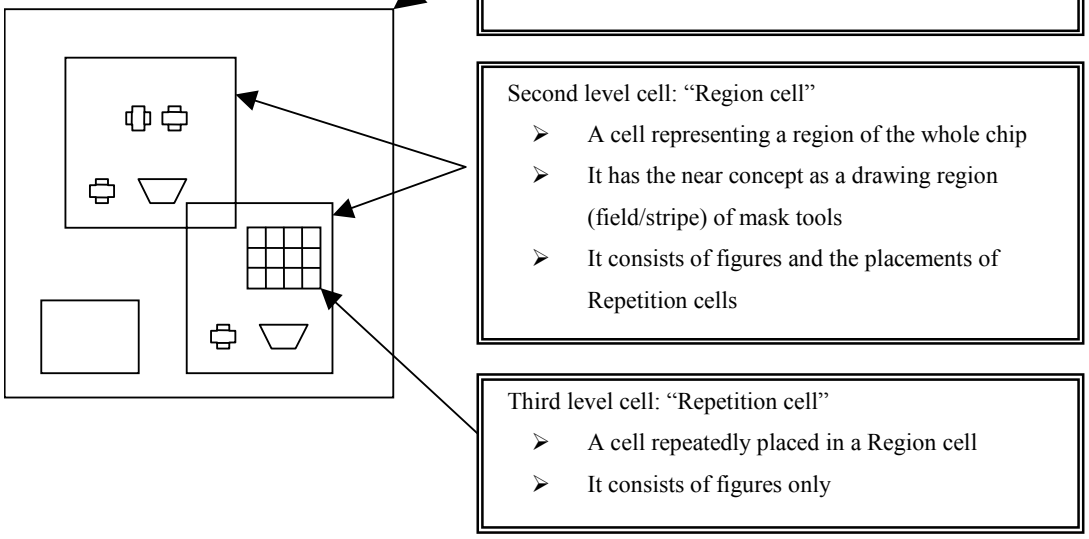
No.	*Restriction Item*	*Content of Restriction*	*Related Record*
3	Cell with figures	~~No figure in a top cell.~~Geometric figures are prohibited in the top cell. If P44_GEOMETRY_OFFSET_AVAILABLE is 1, the following conditions must be satisfied for cells other than the top cell and the bottom level cells. 1) All PLACEMENT records in each cell are gathered and appear before geometry records (RECTANGLE/TRAPEZOID/CTRAPEZOID). 2) When a CBLOCK record is used for a CELL record, a single CBLOCK record cannot contain both PLACEMENT records and geometry records.	CELL PLACEMENT RECTANGLE TRAPEZOID CTRAPEZOID CBLOCK
4	Reference cell	Referring to a cell in other OASIS.MASK files is prohibited. Any cell except the top cell in an OASIS.MASK file should be referenced by other cells in the file.	CELL PLACEMENT
5	Localization	The CELL records of localized cells in each localization area and the CELL records of common cells should be gathered into a single contiguous area pointed to by the P44_LOCALIZATION_AREA property and the P44_COMMON_CELL property respectively. The CELLNAME records of localized cells in each localization area and the CELLNAME records of common cells should be gathered into a single contiguous area pointed to by the P44_LOCALIZATION_AREA property and the P44_COMMON_CELL property respectively. PLACEMENT records which belong to the same localization area are contiguously defined in the CELL record of the top cell. Any PLACEMENT record in the top cell should belong to a single localization area. No PLACEMENT record in a localization area (empty localization area) is prohibited.	CELL CELLNAME PROPERTY (P44_LOCALIZATION, P44_LOCALIZATION_AREA, P44_COMMON_CELL)

#1 Since drawing performance depends on cell size, it is desirable to use an optimal cell size. The maximum cell size (1 mm) may change in future.

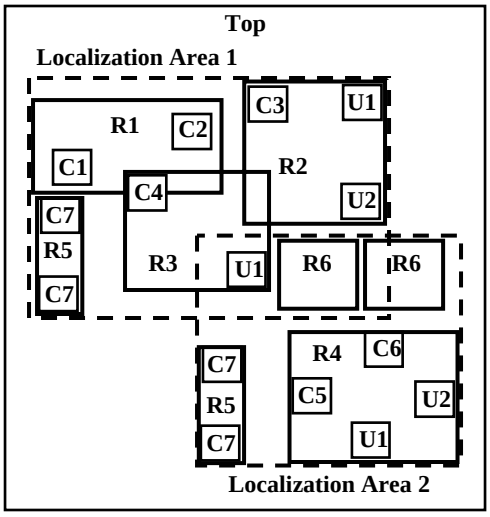
#2 Mask tools treat the data of four or more cell hierarchies as an error. The number of the maximum cell hierarchy (3) may change in future.



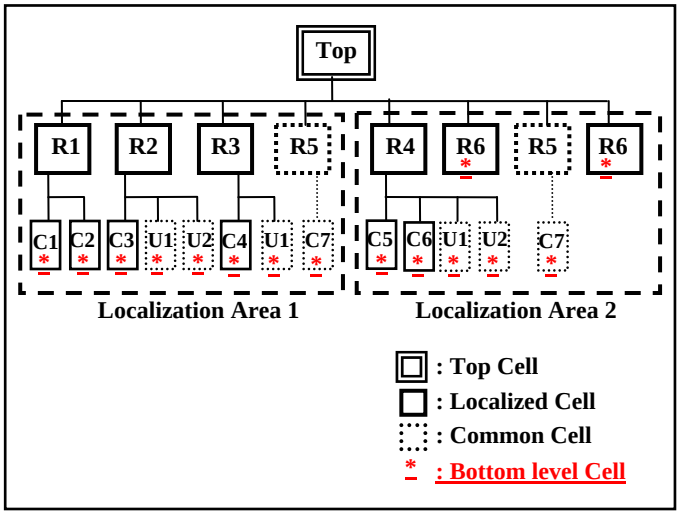
Cell Hierarchy of OASIS.MASK



Example of Cell Hierarchy



Cell Layout



Cell Hierarchy

START
PROPERTY (P44_LOCALIZATION)
CELL R1, R2, R3, C1, C2, C3, C4 (Localized Cells in Localization Area 1)
CELL R4, R6, C5, C6 (Localized Cells in Localization Area 2)
CELL R5, C7, U1, U2 (Common Cells)
CELL Top (Top Cell)
CELLNAME R1, R2, R3, C1, C2, C3, C4 (Localized Cells in Localization Area 1)
CELLNAME R4, R6, C5, C6 (Localized Cells in Localization Area 2)
CELLNAME R5, C7, U1, U2 (Common Cells)
CELLNAME Top (Top Cell)
PROPERTY (P44_LOCALIZATION_AREA) (Localization Area 1)
PROPERTY (P44_LOCALIZATION_AREA) (Localization Area 2)
PROPERTY (P44_COMMON_CELL) (Common Cells)
END

PLACEMENT R1
PLACEMENT R2
PLACEMENT R3
PLACEMENT R5
PLACEMENT R4
PLACEMENT R5
PLACEMENT R6
PLACEMENT R6

PLACEMENT Records in Localization Area 1

PLACEMENT Records in Localization Area 2

File Structure

Example of Localization

Table 6 Restrictions on File Name

No.	*Restriction Item*	*Content of Restriction*
1	File name length	Minimum = 1 character, Maximum = 64 characters (Maximum of 256 characters, when directory path is included)
2	Character kind	64 kinds of characters: uppercase (A–Z), lowercase (a–z), numeric character (0–9), underline (_), and period (.)

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APPENDIX 1
SAMPLE OASIS.MASK FILE

NOTICE: The material in this appendix is an official part of SEMI P44 and was approved by full letter ballot procedures on December 21, 2010.

NOTE 1: A sample OASIS.MASK file shown in Figure 4 is detailed in the text image as follows. "*O(N)*" shows the byte offset of the Nth record from the beginning of the sample file.

Record Serial Number	Record Contents
1	START (record-ID=1) version-string="1.0", unit=1000, offset-flag=0, table-offsets={cellname-flag=1, cellname-offset=*O(59)*, textstring-flag=0, textstring-offset=0, propname-flag=1, propname-offset=*O(14)*, propstring-flag=0, propstring-offset=0, layername-flag=0, layername-offset=0, xname-flag=0, xname-offset=0}
2	PROPERTY (record-ID =28) prop-info-byte={UUUU=1, V=0, C=1, N=1, S=1}, reference-number=0, property-value={type=12, value="Top"} *// S_TOP_CELL*
3	PROPERTY (record-ID =28) prop-info-byte={UUUU=1, V=0, C=1, N=1, S=1}, reference-number=1, property-value={type=8, value=2} *// S_BOUNDING_BOXES_AVAILABLE*
4	PROPERTY (record-ID =28) prop-info-byte={UUUU=1, V=0, C=1, N=1, S=0}, reference-number=4, property-value={type=10, value="1"} *//P44_FORMAT*
5	PROPERTY (record-ID =28) prop-info-byte={UUUU=4, V=0, C=1, N=1, S=0}, reference-number=5, property-value={type=9, value=~~0~~-1000000}, {type=9, value=~~0~~-1000000}, {type=9, value=~~3000000~~1000000}, {type=9, value=~~3000000~~1000000} *// P44_CHIP_WINDOW*
6	PROPERTY (record-ID =28) prop-info-byte={UUUU=1, V=0, C=1, N=1, S=0}, reference-number=6, property-value={type=10, value="2.0"} *// P44_VERSION*
7	PROPERTY (record-ID =28) prop-info-byte={UUUU=1, V=0, C=1, N=1, S=0}, reference-number=7, property-value={type=8, value=*filesize*} *// P44_FILE_SIZE*
8	PROPERTY (record-ID =28) prop-info-byte={UUUU=1, V=0, C=1, N=1, S=0}, reference-number=8, property-value={type=8, value=15} *// P44_TOP_CELL_NUMBER*
9	PROPERTY (record-ID =28) prop-info-byte={UUUU=2, V=0, C=1, N=1, S=0}, reference-number=9, property-value={type=10, value="OASIS.MASK CONVERTER"}, {type=10, value="00.01"} *// P44_CONVERSION_TOOL*
10	PROPERTY (record-ID =28) prop-info-byte={UUUU=6, V=0, C=1, N=1, S=0}, reference-number=10, property-value={type=10, value="01-01-2010"}, {type=10, value="12:00:00"}, {type=0, value=9} *// P44_CONVERSION_DATE*
11	PROPERTY (record-ID =28) prop-info-byte={UUUU=2, V=0, C=1, N=1, S=0}, reference-number=11, property-value={type=8, value=1000000}, {type=8, value=1000000} *// P44_BOUNDING_BOX_MAX*
12	PROPERTY (record-ID =28) prop-info-byte={UUUU=6, V=0, C=1, N=1, S=0}, reference-number=12, property-value={type=8, value=2000000}, {type=8, value=2000000}, {type=8, value=~~256000000~~(O(57)-O(32)) + (O(69)-O(57))},{type=8, value=~~256000000~~(O(78)-O(69))}, {type=8, value=2}, {type=8, value=*O(154)*} *// P44_LOCALIZATION*
13	PROPERTY (record-ID =28) prop-info-byte={UUUU=1, V=0, C=1, N=1, S=0}, reference-number=13, property-value={type=8, value=1} *// P44_GEOMETRY_OFFSET_AVAILABLE*
14	PROPNAME (record-ID=7) propname-string="S_TOP_CELL"
15	PROPNAME (record-ID=7) propname-string="S_BOUNDING_BOXES_AVAILABLE"
16	PROPNAME (record-ID=7) propname-string="S_BOUNDING_BOX"
17	PROPNAME (record-ID=7) propname-string="S_CELL_OFFSET"

PROPNAME (record-ID=7) propname-string="P44_FORMAT"
PROPNAME (record-ID=7) propname-string="P44_CHIP_WINDOW"
PROPNAME (record-ID=7) propname-string="P44_VERSION"
PROPNAME (record-ID=7) propname-string="P44_FILE_SIZE"
PROPNAME (record-ID=7) propname-string="P44_TOP_CELL_NUMBER"
PROPNAME (record-ID=7) propname-string="P44_CONVERSION_TOOL"
PROPNAME (record-ID=7) propname-string="P44_CONVERSION_DATE"
PROPNAME (record-ID=7) propname-string="P44_BOUNDING_BOX_MAX"
PROPNAME (record-ID=7) propname-string="P44_LOCALIZATION"
PROPNAME (record-ID=7) propname-string="P44_GEOMETRY_OFFSET_AVAILABLE"
PROPNAME (record-ID=7) propname-string="P44_GEOMETRY_COUNT"
PROPNAME (record-ID=7) propname-string="P44_GEOMETRY_OFFSET"
PROPNAME (record-ID=7) propname-string="P44_LOCALIZATION_AREA"
PROPNAME (record-ID=7) propname-string="P44_COMMON_CELL"
CELL (record-ID=13) reference-number=0 //R1
XYRELATIVE (record-ID=16)
PLACEMENT (record-ID=17) placement-info-byte={C=1, N=1, X=1, Y=1, R=0,AA=0,F=0}, reference-number=3, x=100000, y=~~50000~~30000
PLACEMENT (record-ID=17) placement-info-byte={C=1, N=1, X=1, Y=1, R=0,AA=0,F=0}, reference-number=4, x=~~650000~~500000, y=~~200000~~150000
XYABSOLUTE (record-ID=15)
RECTANGLE (record-ID=20) rectangle-info-byte={S=0, W=1, H=1, X=1, Y=1, R=0, D=~~0~~1, L=1}, layer-number=0, datatype-number=0, width=~~2000~~160000, height=~~1000~~160000, x=~~10000~~, y=~~1000~~220000
XYRELATIVE (record-ID=16)
CTRAPEZOID (record-ID=26) ctrapezoid-info-byte={T=1, W=1, H=1, X=1, Y=1, R=0, D=0, L=1}, layer-number=0, ctrapezoid-type=0, width=~~2000~~160000, height=~~1000~~160000, x=~~3000~~640000, y=~~0~~-220000
CELL (record-ID=13) reference-number=1 //R2
XYRELATIVE (record-ID=16)
PLACEMENT (record-ID=17) placement-info-byte={C=1, N=1, X=1, Y=1, R=0,AA=0,F=0}, reference-number=5, x=~~5000000~~, y=~~750000~~450000
PLACEMENT (record-ID=17) placement-info-byte={C=1, N=1, X=1, Y=1, R=0,AA=0,F=0}, reference-number=13, x=450000, y=0
PLACEMENT (record-ID=17) placement-info-byte={C=1, N=1, X=1, Y=1, R=0,AA=0,F=0}, reference-number=14, x=0, y=~~-700000~~-450000
CELL (record-ID=13) reference-number=2 //R3
XYRELATIVE (record-ID=16)
PLACEMENT (record-ID=17) placement-info-byte={C=1, N=1, X=1, Y=1, R=0,AA=0,F=0}, reference-number=6, x=~~500000~~, y=~~400000~~330000
PLACEMENT (record-ID=17) placement-info-byte={C=1, N=1, X=1, Y=1, R=0,AA=0,F=0}, reference-number=13, x=~~500000~~450000, y=~~-400000~~-330000
CELL (record-ID=13) reference-number=3 //C1
CTRAPEZOID (record-ID=26) ctrapezoid-info-byte={T=1, W=1, H=1, X=1, Y=1, R=0, D=~~0~~1, L=1}, layer-number=0, datatype-number=0, ctrapezoid-type=1, width=~~2000~~160000, height=~~1000~~160000, x=~~10000~~, y=~~10000~~
CELL (record-ID=13) reference-number=4 //C2

52 CTRAPEZOID (record-ID=26) ctrapezoid-info-byte={T=1, W=1, H=1, X=1, Y=1, R=0, D=~~0~~1, L=1}, layer-number=0, datatype-number=0, ctrapezoid-type=2, width=~~2000~~160000, height=~~1000~~160000, x=~~10000~~, y=~~10000~~

53 CELL (record-ID=13) reference-number=5 //C3

54 CTRAPEZOID (record-ID=26) ctrapezoid-info-byte={T=1, W=1, H=1, X=1, Y=1, R=0, D=~~0~~1, L=1}, layer-number=0, datatype-number=0, ctrapezoid-type=3, width=~~2000~~160000, height=~~1000~~160000, x=~~10000~~, y=~~10000~~

55 CELL (record-ID=13) reference-number=6 //C4

56 CTRAPEZOID (record-ID=26) ctrapezoid-info-byte={T=1, W=1, H=1, X=1, Y=1, R=0, D=~~0~~1, L=1}, layer-number=0, datatype-number=0, ctrapezoid-type=4, width=~~2000~~16000, height=~~1000~~16000, x=~~10000~~, y=~~10000~~

57 CELL (record-ID=13) reference-number=7 //R4

58 XYRELATIVE (record-ID=16)

59 PLACEMENT (record-ID=17) placement-info-byte={C=1, N=1, X=1, Y=1, R=0,AA=0,F=0}, reference-number=9, x=~~500000~~, y=~~300000~~200000

60 PLACEMENT (record-ID=17) placement-info-byte={C=1, N=1, X=1, Y=1, R=0,AA=0,F=0}, reference-number=10, x=300000, y=200000

61 PLACEMENT (record-ID=17) placement-info-byte={C=1, N=1, X=1, Y=1, R=0,AA=0,F=0}, reference-number=13, x=-50000, y=-400000

62 PLACEMENT (record-ID=17) placement-info-byte={C=1, N=1, X=1, Y=1, R=0,AA=0,F=0}, reference-number=14, x=~~250000~~290000, y=200000

63 CELL (record-ID=13) reference-number=8 //R6

64 CTRAPEZOID (record-ID=26) ctrapezoid-info-byte={T=1, W=1, H=1, X=1, Y=1, R=0, D=~~0~~1, L=1}, layer-number=0, datatype-number=0, ctrapezoid-type=5, width=~~2000~~320000, height=~~1000~~280000, x=~~10000~~, y=~~10000~~

65 CELL (record-ID=13) reference-number=9 //C5

66 CTRAPEZOID (record-ID=26) ctrapezoid-info-byte={T=1, W=1, H=1, X=1, Y=1, R=0, D=~~0~~1, L=1}, layer-number=0, datatype-number=0, ctrapezoid-type=6, width=~~2000~~160000, height=~~1000~~160000, x=~~10000~~, y=~~10000~~

67 CELL (record-ID=13) reference-number=10 //C6

68 CTRAPEZOID (record-ID=26) ctrapezoid-info-byte={T=1, W=1, H=1, X=1, Y=1, R=0, D=~~0~~1, L=1}, layer-number=0, datatype-number=0, ctrapezoid-type=7, width=~~2000~~160000, height=~~1000~~160000, x=~~10000~~, y=~~10000~~

69 CELL (record-ID=13) reference-number=11 //R5

70 XYRELATIVE (record-ID=16)

71 PLACEMENT (record-ID=17) placement-info-byte={C=1, N=1, X=1, Y=1, R=~~0~~1,AA=0,F=0}, reference-number=12, x=~~500000~~, y=~~300000~~0, repetition={TYPE=3, y-dimension=0, y-space=320000}

72 CELL (record-ID=13) reference-number=12 //C7

73 CTRAPEZOID (record-ID=26) ctrapezoid-info-byte={T=1, W=1, H=1, X=1, Y=1, R=0, D=~~0~~1, L=1}, layer-number=0, datatype-number=0, ctrapezoid-type=8, width=~~1000~~160000, height=~~2000~~160000, x=~~10000~~, y=~~10000~~

74 CELL (record-ID=13) reference-number=13 //U1

75 CTRAPEZOID (record-ID=26) ctrapezoid-info-byte={T=1, W=1, H=1, X=1, Y=1, R=0, D=~~0~~1, L=1}, layer-number=0, datatype-number=0, ctrapezoid-type=9, width=~~1000~~160000, height=~~2000~~160000, x=~~10000~~, y=~~10000~~

76 CELL (record-ID=13) reference-number=14 //U2

77 CTRAPEZOID (record-ID=26) ctrapezoid-info-byte={T=1, W=1, H=1, X=1, Y=1, R=0, D=~~0~~1, L=1}, layer-number=0, datatype-number=0, ctrapezoid-type=10, width=~~1000~~160000, height=~~2000~~160000, x=~~100~~00, y=~~10000~~

78 CELL (record-ID=13) reference-number=15 //Top

79 XYRELATIVE (record-ID=16)

80 PLACEMENT (record-ID=17) placement-info-byte={C=1, N=1, X=1, Y=1, R=0,AA=0,F=0}, reference-number=0, x=~~100000~~-900000, y=~~2000000~~280000

81 PLACEMENT (record-ID=17) placement-info-byte={C=1, N=1, X=1, Y=1, R=0,AA=0,F=0}, reference-number=1, x=~~1400000~~900000, y=~~-100000~~-130000

82 PLACEMENT (record-ID=17) placement-info-byte={C=1, N=1, X=1, Y=1, R=0,AA=0,F=0}, reference-number=2, x=~~-750000~~-500000, y=~~-400000~~-280000

83 PLACEMENT (record-ID=17) placement-info-byte={C=1, N=1, X=1, Y=1, R=0,AA=0,F=0}, reference-number=11, x=~~-650000~~-400000, y=-100000

84 XYABSOLUTE (record-ID=15)

85 PLACEMENT (record-ID=17) placement-info-byte={C=1, N=1, X=1, Y=1, R=0,AA=0,F=0}, reference-number=7, x=~~1700000~~200000, y=~~200000~~-850000

86 XYRELATIVE (record-ID=16)

87 PLACEMENT (record-ID=17) placement-info-byte={C=1, N=1, X=1, Y=1, R=1,AA=0,F=0}, reference-number=8, x=~~0~~-50000, y=~~1200000~~650000, repetition={TYPE=2, x-dimension=~~20~~, x-space=~~600000~~350000}

88 PLACEMENT (record-ID=17) placement-info-byte={C=1, N=1, X=1, Y=1, R=0,AA=0,F=0}, reference-number=11, x=~~-300000~~-350000, y=~~-1100000~~-500000

89 CELLNAME (record-ID=3) cellname-string="R1"

90 PROPERTY (record-ID =28) prop-info-byte={UUUU=5, V=0, C=1, N=1, S=1}, reference-number=2, property-value={type=8, value=0}, {type=9, value=0}, {type=9, value=0}, {type=8, value=~~1000000~~800000},{type=8, value=~~500000~~380000} *// S_BOUNDING_BOX*

91 PROPERTY (record-ID =28) prop-info-byte={UUUU=1, V=0, C=1, N=1, S=1}, reference-number=3, property-value={type=8, value=*O(32)*} *// S_CELL_OFFSET*

92 PROPERTY (record-ID =28) prop-info-byte={UUUU=1, V=0, C=1, N=1, S=0}, reference-number=14, property-value={type=8, value=2} *// P44_GEOMETRY_COUNT*

93 PROPERTY (record-ID =28) prop-info-byte={UUUU=1, V=0, C=1, N=1, S=0}, reference-number=15, property-value={type=8, value=*O*(37)-*O(32)*} *// P44_GEOMETRY_OFFSET*

94 CELLNAME (record-ID=3) cellname-string="R2"

95 PROPERTY (record-ID =28) prop-info-byte={UUUU=5, V=0, C=1, N=1, S=1}, reference-number=2, property-value={type=8, value=0}, {type=9, value=0}, {type=9, value=0}, {type=8, value=~~1000000~~610000},{type=8, value=~~1000000~~610000} *// S_BOUNDING_BOX*

96 PROPERTY (record-ID =28) prop-info-byte={UUUU=1, V=0, C=1, N=1, S=1}, reference-number=3, property-value={type=8, value=*O(40)*} *// S_CELL_OFFSET*

97 PROPERTY (record-ID =28) prop-info-byte={UUUU=1, V=0, C=1, N=1, S=0}, reference-number=14, property-value={type=8, value=0} *// P44_GEOMETRY_COUNT*

98 PROPERTY (record-ID =28) prop-info-byte={UUUU=1, V=0, C=1, N=1, S=0}, reference-number=15, property-value={type=8, value=0} *// P44_GEOMETRY_OFFSET*

99 CELLNAME (record-ID=3) cellname-string="R3"

100 PROPERTY (record-ID =28) prop-info-byte={UUUU=5, V=0, C=1, N=1, S=1}, reference-number=2, property-value={type=8, value=0}, {type=9, value=0}, {type=9, value=0}, {type=8, value=~~1000000~~610000},{type=8, value=~~800000~~490000} *// S_BOUNDING_BOX*

101 PROPERTY (record-ID =28) prop-info-byte={UUUU=1, V=0, C=1, N=1, S=1}, reference-number=3, property-value={type=8, value=*O(45)*} *// S_CELL_OFFSET*

102 PROPERTY (record-ID =28) prop-info-byte={UUUU=1, V=0, C=1, N=1, S=0}, reference-number=14, property-value={type=8, value=0} *// P44_GEOMETRY_COUNT*

103 PROPERTY (record-ID =28) prop-info-byte={UUUU=1, V=0, C=1, N=1, S=0}, reference-number=15, property-value={type=8, value=0} *// P44_GEOMETRY_OFFSET*

104 CELLNAME (record-ID=3) cellname-string="C1"

105 PROPERTY (record-ID =28) prop-info-byte={UUUU=5, V=0, C=1, N=1, S=1}, reference-number=2, property-value={type=8, value=0}, {type=9, value=0}, {type=9, value=0}, {type=8, value=~~100000~~160000},{type=8, value=~~100000~~160000} *// S_BOUNDING_BOX*

106 PROPERTY (record-ID =28) prop-info-byte={UUUU=1, V=0, C=1, N=1, S=1}, reference-number=3, property-value={type=8, value=*O(49)*} *// S_CELL_OFFSET*

107 PROPERTY (record-ID =28) prop-info-byte={UUUU=1, V=0, C=1, N=1, S=0}, reference-number=14, property-value={type=8, value=1} *// P44_GEOMETRY_COUNT*

108 CELLNAME (record-ID=3) cellname-string="C2"

109 PROPERTY (record-ID =28) prop-info-byte={UUUU=5, V=0, C=1, N=1, S=1}, reference-number=2, property-value={type=8, value=0}, {type=9, value=0}, {type=9, value=0}, {type=8, value=~~100000~~160000},{type=8, value=~~100000~~160000} *// S_BOUNDING_BOX*

110 PROPERTY (record-ID =28) prop-info-byte={UUUU=1, V=0, C=1, N=1, S=1}, reference-number=3, property-value={type=8, value=*O(51)*} *// S_CELL_OFFSET*

111 PROPERTY (record-ID =28) prop-info-byte={UUUU=1, V=0, C=1, N=1, S=0}, reference-number=14, property-value={type=8, value=1} *// P44_GEOMETRY_COUNT*

112 CELLNAME (record-ID=3) cellname-string="C3"

113 PROPERTY (record-ID =28) prop-info-byte={UUUU=5, V=0, C=1, N=1, S=1}, reference-number=2, property-value={type=8, value=0}, {type=9, value=0}, {type=9, value=0}, {type=8, value=~~100000~~160000},{type=8, value=~~100000~~160000} *// S_BOUNDING_BOX*

114 PROPERTY (record-ID =28) prop-info-byte={UUUU=1, V=0, C=1, N=1, S=1}, reference-number=3, property-value={type=8, value=*O(53)*} *// S_CELL_OFFSET*

115 PROPERTY (record-ID =28) prop-info-byte={UUUU=1, V=0, C=1, N=1, S=0}, reference-number=14, property-value={type=8, value=1} *// P44_GEOMETRY_COUNT*

116 CELLNAME (record-ID=3) cellname-string="C4"

117 PROPERTY (record-ID =28) prop-info-byte={UUUU=5, V=0, C=1, N=1, S=1}, reference-number=2, property-value={type=8, value=0}, {type=9, value=0}, {type=9, value=0}, {type=8, value=~~100000~~160000},{type=8, value=~~100000~~160000} *// S_BOUNDING_BOX*

118 PROPERTY (record-ID =28) prop-info-byte={UUUU=1, V=0, C=1, N=1, S=1}, reference-number=3, property-value={type=8, value=*O(55)*} *// S_CELL_OFFSET*

119 PROPERTY (record-ID =28) prop-info-byte={UUUU=1, V=0, C=1, N=1, S=0}, reference-number=14, property-value={type=8, value=1} *// P44_GEOMETRY_COUNT*

120 CELLNAME (record-ID=3) cellname-string="R4"

121 PROPERTY (record-ID =28) prop-info-byte={UUUU=5, V=0, C=1, N=1, S=1}, reference-number=2, property-value={type=8, value=0}, {type=9, value=0}, {type=9, value=0}, {type=8, value=~~1000000~~700000},{type=8, value=~~900000~~560000} *// S_BOUNDING_BOX*

122 PROPERTY (record-ID =28) prop-info-byte={UUUU=1, V=0, C=1, N=1, S=1}, reference-number=3, property-value={type=8, value=*O(57)*} *// S_CELL_OFFSET*

123 PROPERTY (record-ID =28) prop-info-byte={UUUU=1, V=0, C=1, N=1, S=0}, reference-number=14, property-value={type=8, value=0} *// P44_GEOMETRY_COUNT*

124 PROPERTY (record-ID =28) prop-info-byte={UUUU=1, V=0, C=1, N=1, S=0}, reference-number=15, property-value={type=8, value=0} *// P44_GEOMETRY_OFFSET*

125 CELLNAME (record-ID=3) cellname-string="R6"

126 PROPERTY (record-ID =28) prop-info-byte={UUUU=5, V=0, C=1, N=1, S=1}, reference-number=2, property-value={type=8, value=0}, {type=9, value=0}, {type=9, value=0}, {type=8, value=~~200000~~320000},{type=8, value=~~200000~~280000} *// S_BOUNDING_BOX*

127 PROPERTY (record-ID =28) prop-info-byte={UUUU=1, V=0, C=1, N=1, S=1}, reference-number=3, property-value={type=8, value=*O(63)*} *// S_CELL_OFFSET*

128 PROPERTY (record-ID =28) prop-info-byte={UUUU=1, V=0, C=1, N=1, S=0}, reference-number=14, property-value={type=8, value=1} *// P44_GEOMETRY_COUNT*

129 CELLNAME (record-ID=3) cellname-string="C5"

130 PROPERTY (record-ID =28) prop-info-byte={UUUU=5, V=0, C=1, N=1, S=1}, reference-number=2, property-value={type=8, value=0}, {type=9, value=0}, {type=9, value=0}, {type=8, value=~~100000~~160000},{type=8, value=~~100000~~160000} *// S_BOUNDING_BOX*

131 PROPERTY (record-ID =28) prop-info-byte={UUUU=1, V=0, C=1, N=1, S=1}, reference-number=3, property-value={type=8, value=*O(65)*} *// S_CELL_OFFSET*

132 PROPERTY (record-ID =28) prop-info-byte={UUUU=1, V=0, C=1, N=1, S=0}, reference-number=14, property-value={type=8, value=1} *// P44_GEOMETRY_COUNT*

133 CELLNAME (record-ID=3) cellname-string="C6"

134 PROPERTY (record-ID =28) prop-info-byte={UUUU=5, V=0, C=1, N=1, S=1}, reference-number=2, property-value={type=8, value=0}, {type=9, value=0}, {type=9, value=0}, {type=8, value=~~100000~~160000},{type=8, value=~~100000~~160000} *// S_BOUNDING_BOX*

135 PROPERTY (record-ID =28) prop-info-byte={UUUU=1, V=0, C=1, N=1, S=1}, reference-number=3, property-value={type=8, value=*O(67)*} *// S_CELL_OFFSET*

136 PROPERTY (record-ID =28) prop-info-byte={UUUU=1, V=0, C=1, N=1, S=0}, reference-number=14, property-value={type=8, value=1} *// P44_GEOMETRY_COUNT*

137 CELLNAME (record-ID=3) cellname-string="R5"

138 PROPERTY (record-ID =28) prop-info-byte={UUUU=5, V=0, C=1, N=1, S=1}, reference-number=2, property-value={type=8, value=0}, {type=9, value=0}, {type=9, value=0}, {type=8, value=~~200000~~160000},{type=8, value=~~240000~~480000} *// S_BOUNDING_BOX*

139 PROPERTY (record-ID =28) prop-info-byte={UUUU=1, V=0, C=1, N=1, S=1}, reference-number=3, property-value={type=8, value=*O(69)*} *// S_CELL_OFFSET*

140 PROPERTY (record-ID =28) prop-info-byte={UUUU=1, V=0, C=1, N=1, S=0}, reference-number=14, property-value={type=8, value=0} *// P44_GEOMETRY_COUNT*

141 PROPERTY (record-ID =28) prop-info-byte={UUUU=1, V=0, C=1, N=1, S=0}, reference-number=15, property-value={type=8, value=0} *// P44_GEOMETRY_OFFSET*

142 CELLNAME (record-ID=3) cellname-string="C7"

143 PROPERTY (record-ID =28) prop-info-byte={UUUU=5, V=0, C=1, N=1, S=1}, reference-number=2, property-value={type=8, value=0}, {type=9, value=0}, {type=9, value=0}, {type=8, value=~~100000~~160000},{type=8, value=~~100000~~160000} *// S_BOUNDING_BOX*

144 PROPERTY (record-ID =28) prop-info-byte={UUUU=1, V=0, C=1, N=1, S=1}, reference-number=3, property-value={type=8, value=*O(72)*} *// S_CELL_OFFSET*

145 PROPERTY (record-ID =28) prop-info-byte={UUUU=1, V=0, C=1, N=1, S=0}, reference-number=14, property-value={type=8, value=1} *// P44_GEOMETRY_COUNT*

146 CELLNAME (record-ID=3) cellname-string="U1"

147 PROPERTY (record-ID =28) prop-info-byte={UUUU=5, V=0, C=1, N=1, S=1}, reference-number=2, property-value={type=8, value=0}, {type=9, value=0}, {type=9, value=0}, {type=8, value=~~100000~~160000},{type=8, value=~~100000~~160000} *// S_BOUNDING_BOX*

148 PROPERTY (record-ID =28) prop-info-byte={UUUU=1, V=0, C=1, N=1, S=1}, reference-number=3, property-value={type=8, value=*O(74)*} *// S_CELL_OFFSET*

149 PROPERTY (record-ID =28) prop-info-byte={UUUU=1, V=0, C=1, N=1, S=0}, reference-number=14, property-value={type=8, value=1} *// P44_GEOMETRY_COUNT*

150 CELLNAME (record-ID=3) cellname-string="U2"

151 PROPERTY (record-ID =28) prop-info-byte={UUUU=5, V=0, C=1, N=1, S=1}, reference-number=2, property-value={type=8, value=0}, {type=9, value=0}, {type=9, value=0}, {type=8, value=~~100000~~160000},{type=8, value=~~100000~~160000} *// S_BOUNDING_BOX*

152 PROPERTY (record-ID =28) prop-info-byte={UUUU=1, V=0, C=1, N=1, S=1}, reference-number=3, property-value={type=8, value=*O(76)*} *// S_CELL_OFFSET*

153 PROPERTY (record-ID =28) prop-info-byte={UUUU=1, V=0, C=1, N=1, S=0}, reference-number=14, property-value={type=8, value=1} *// P44_GEOMETRY_COUNT*

154 CELLNAME (record-ID=3) cellname-string="Top"

155 PROPERTY (record-ID =28) prop-info-byte={UUUU=5, V=0, C=1, N=1, S=1}, reference-number=2, property-value={type=8, value=0}, {type=9, value=~~0~~-900000}, {type=9, value=~~0~~-850000}, {type=8, value=~~3000000~~01800000},{type=8, value=~~3000000~~1600000} *// S_BOUNDING_BOX*

156 PROPERTY (record-ID =28) prop-info-byte={UUUU=1, V=0, C=1, N=1, S=1}, reference-number=3, property-value={type=8, value=*O(78)*} *// S_CELL_OFFSET*

157 PROPERTY (record-ID =28) prop-info-byte={UUUU=1, V=0, C=1, N=1, S=0}, reference-number=14, property-value={type=8, value=0} *// P44_GEOMETRY_COUNT*

158 PROPERTY (record-ID =28) prop-info-byte={UUUU=10, V=0, C=1, N=1, S=0}, reference-number=16, property-value={type=9, value=~~100000~~-900000}, {type=9, value=~~1400000~~-250000}, {type=9, value=~~2500000~~600000}, {type=9, value=~~2500000~~750000}, {type=8, value=*O(32)*}, {type=8, value=*O(57)-O(32)*}, {type=8, value=*O(89)*}, {type=8, value=*O(120)-O(89)*}, {type=8, value=*O(80)-O(78)*}, {type=8, value=4} *// P44_LOCALIZATION_AREA*

159 PROPERTY (record-ID =28) prop-info-byte={UUUU=10, V=0, C=1, N=1, S=0}, reference-number=16, property-value={type=9, value=~~1200000~~-200000}, {type=9, value=~~200000~~-850000}, {type=9, value=~~2900000~~900000}, {type=9, value=~~1600000~~100000}, {type=8, value=*O(57)*}, {type=8, value=*O(69)-O(57)*}, {type=8, value=*O(120)*}, {type=8, value=*O(137)-O(120)*}, {type=8, value=*O(85)-O(78)*}, {type=8, value=3} *// P44_LOCALIZATION_AREA*

160 PROPERTY (record-ID =28) prop-info-byte={UUUU=4, V=0, C=1, N=1, S=0}, reference-number=17, property-value={type=8, value=*O(69)*}, {type=8, value=*O(78)-O(69)*}, {type=8, value=*O(137)*}, {type=8, value=*O(154)-O(137)*} *// P44_COMMON_CELL*

161 END (record-ID =2) validation-scheme=1, validation-signature=*CRC32-value*