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PUBLICLY AVAILABLE SPECIFICATION

PRE-STANDARD

colour inside

Generic requirements for printed board assembly products manufacturing description data and transfer methodology

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

GENERIC REQUIREMENTS FOR PRINTED BOARD ASSEMBLY PRODUCTS MANUFACTURING DESCRIPTION DATA AND TRANSFER METHODOLOGY

FOREWORD

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IEC PAS 61182-12, submitted by IPC has been processed by IEC technical committee 91: Electronics assembly technology. It is based on IPC-2581B. It is published as a double-logo PAS. The structure and editorial rules used in this PAS reflect the practice of the organization which submitted it.

The text of this PAS is based on the following document:	This PAS was approved for publication by the P-members of the committee concerned as indicated in the following document
Draft PAS	**Report on voting**
91/1182/PAS	91/1192/RVD

Following publication of this PAS, the technical committee or subcommittee concerned may transform it into an International Standard.

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Generic Requirements for Printed Board Assembly Products Manufacturing Description Data and Transfer Methodology

1 SCOPE

This standard specifies the XML schema that represents the intelligent data file format used to describe printed board and printed board assembly products with details sufficient for tooling, manufacturing, assembly, and inspection requirements. This format may be used for transmitting information between a printed board designer and a manufacturing or assembly facility. The data is most useful when the manufacturing cycle includes computer-aided processes and numerical control machines.

The data can be defined in either English or International System of Units (SI) units. The format is a convergence of the IPC-2511 “GenCAM” and the Valor Computerized Systems “ODB-X” format structure.

1.1 Focus and intent

The generic format requirements are provided in a series of standards focused on printed board manufacturing, assembly, and inspection testing. This standard series consists of a generic standard (IPC-2581) that contains all the general requirements. There are seven sectional standards that are focused on the XML details necessary to accumulate information in the single file, that addresses the needs of the manufacturing disciplines producing a particular product.

The sectional standards (IPC-2582 through 2588) paraphrase the important requirements and provide suggested usage and examples for the topic covered by the sectional standard.

1.2 Notation

Although the data would be contained in a single file, the file can have different purposes as described in Section 4. The XML schema used for this standard follows the notations set forth by the W3C and is as follows:

element – Element appears exactly one time

element? – Element may appear 0 or 1 times

element* – Element may appear 0 or more times

element+ – Element may appear 1 or more times

Any IPC-258X file is composed of a high level element (IPC-2581) that contains up to six sub-elements:

Content – information about the contents of the 258X file

LogisticHeader – information pertaining to the order and supply data

HistoryRec – change information of the file

Bom – Bill of Materials (Material List) information

Ecad – Computer Aided Design (engineering) information

Avl – Approved Vendors List information

2 APPLICABLE DOCUMENTS

The following documents contain requirements which, when referenced, constitutes provisions of IPC-2581. At the time of publication, the editions indicated were valid. All documents are subject to revision and parties entering into agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the documents indicated below.

The revision of the document in effect at the time of solicitation **shall** take precedence.

IPC-T-50 *Terms and Definitions for Interconnecting and Packaging Electronic Circuits*

IPC-2501 *Definition for Web-Based Exchange of XML Data*

IPC-2524 *PWB Fabrication Data Quality Rating System*

IPC-2511 *Generic Requirements for Implementation of Product Manufacturing Description Data and Transfer XML Schema Methodology*

IPC-2571 *Generic Requirements for Electronics Manufacturing Supply Chain Communication - Product Data eXchange (PDX)*

IPC-2576 *Sectional Requirements for Electronics Manufacturing Supply Chain Communication of As-Built Product Data - Product Data eXchange*

IPC-2577 *Sectional Requirements for Supply Chain Communication of Manufacturing Quality Assessment - Product Data eXchange (PDX)*

IPC-2578 *Sectional Requirements for Supply Chain Communication of Bill of Material and Product Design Configuration Data - Product Data eXchange*

IPC-7351 *Generic Requirements for Surface Mount Design and Land Patterns*

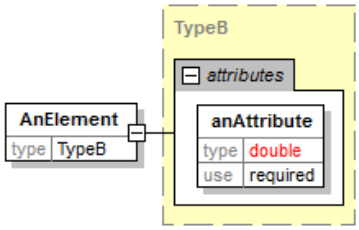
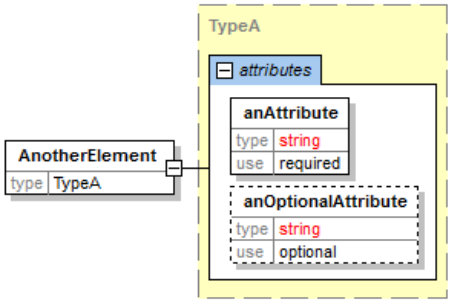
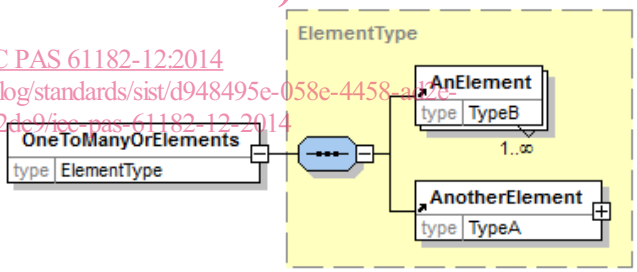
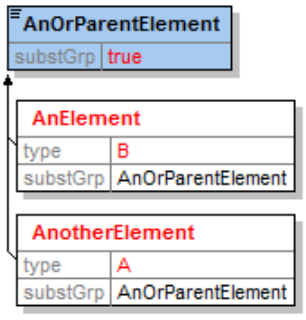
2.1 Documentation conventions

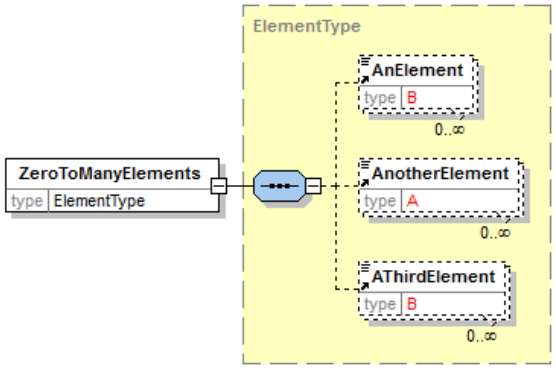
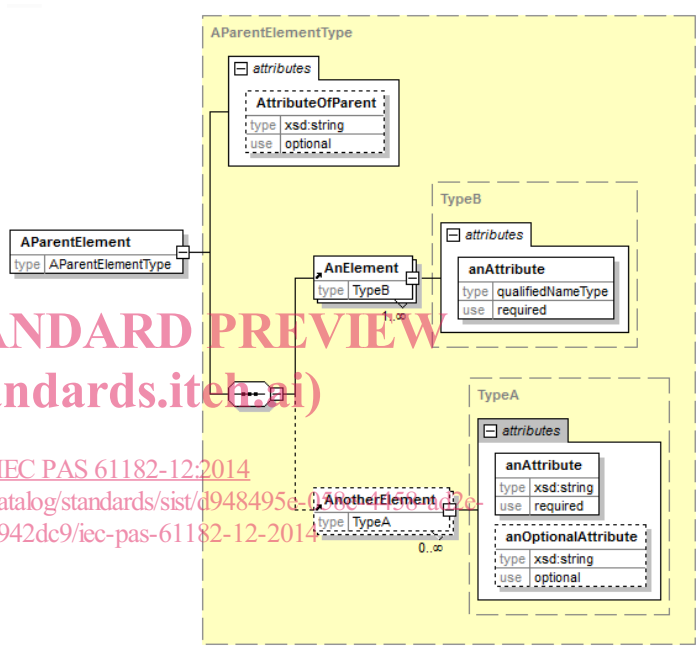
The XML file format standard and the XML Schema definition language standard, as defined the by World Wide Web Consortium (W3C), have been adopted by IPC for use in the IPC-2500 series of standards.

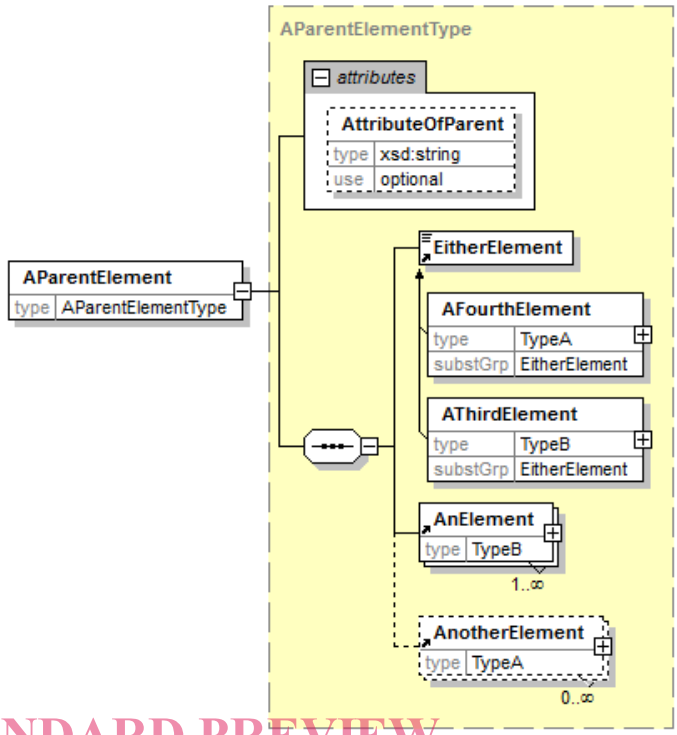
In addition to the text based schema notation, this document provides graphical representation of the structure of the file format. The XML diagrams are designed to effectively illustrate the structure and cardinality of elements and attributes that make up any IPC-258X file. The notation in the graphics does not provide a complete visualization of the schema definition for the file format, but it does provide a good top down overview. Should there be any conflict between the graphical notation and the schema notation, the authoritative definition is the schema notation.

Table 1 provides an overview of the graphical notation used in the document.

Table 1 Graphical Notation Overview

<table>
<tr><td>This diagram depicts an element named AnElement that is of type TypeB. There is one attribute, named anAttribute, that is of type double. The attribute is required.</td><td> 
</td></tr>
<tr><td colspan="2">Example:
<AnElement anAttribute=”14.44e-3”/>
Note that all attribute values must be enclosed in quotes, regardless of type.</td></tr>
<tr><td>This diagram depicts an element named AnotherElement that is of type TypeA with two attributes. The attribute anAttribute is required. The second attribute, anOptionalAttribute, is optional. Both attributes are of type string.</td><td> 
</td></tr>
<tr><td>Examples:
<AnotherElement anAttribute=”red” anOptionalAttribute=”a string” />
<AnotherElement anAttribute=”blue” /></td><td></td></tr>
<tr><td>The ElementType OneToManyOrElements is the parent of an unordered list of one or more instances of the elements AnElement and AnotherElement. The type TypeA occurs only once while TypeB can occur many times.</td><td> 
</td></tr>
<tr><td>The arrow indicates a substitution of the element named AnOrParentElement. The substitution declares that one and only one occurrence is allowed. The AnOrParentElement can have one of AnElement or AnotherElement as a child element.</td><td> 
</td></tr>
</table>

The optional indication for the three element children shows that none may be present or many versions of all three are possible.	
This diagram depicts an element, AParentElement, of type AParentElementType. This element has one attribute, attributeOfParent, which is optional. The lines indicate that occurrences of AnElement and AnotherElement appear in the order with AnElement indicated as required while AnotherElement is optional. Both elements have a required attribute; however, if AnotherElement is instantiated, anOptionalAttribute is also possible.	

This diagram depicts a type, AParentElementType, that contains a sequence starting with one of AThirdElement or AFourth element followed by 1-n AnElement and an optional final AnotherElement. The AParentElement also has an optional attribute.	

3 REQUIREMENTS

The XML schema contained in this document describes the structure of a generic computer-aided manufacturing 258X exchange format. The document specifies data elements specifically designed to establish the information exchange related to the data needed by printed board manufacturing, and assembly including inspection of those products.

The XML schema defines the configuration of mandatory and optional elements, as well as mandatory and optional attributes. The Top Level (TopElement) of the schema contains six major elements. The schema notation specifies that the 6 top-level elements are required to appear in the order shown in Figure 1. The order of appearance in the file is significant. For instance, the appearance of graphics on a layer is dependent on the order of appearance in the file. The order is also important because elements often reference information that is defined elsewhere in the file in order to eliminate redundancy within the file. The file is structured to allow all references to be resolved in one pass.

An implementation of the XML schema must be able to facilitate the reading and/or writing of all characteristics defined within the requirements stated in the `Mode` function of this standard. Some tools may have only read capability; some may have only write capability. Some tools may have both read/write capability. All schema defined in the standard as mandatory (1-1, 1-n occurrences) **shall** be executed as appropriate. Tool providers **shall** identify their capability by Mode Level (USERDEF 1, Design 1, 2 or 3, Fabrication 1, 2, or 3 etc.) plus 2581R; 2581W; or 2581RW.

Each element has a specific function or task. Accordingly, the information interchange for a specific purpose is possible only if that element is populated. The ability to select those characteristics that are appropriate for a given task makes the schema a robust methodology for defining only those areas and characteristics that are necessary to produce a given product. Figure 1 shows the potential children elements of the Top Element (IPC-2581).