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**ISO-IEC\_**

ISO/IEC TC /SC 34/WG 4

Secretariat:

**Introductory element — Main element — Complementary element**

*Élément introductif — Élément central — Élément complémentaire*

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## Foreword

Slightly unsure as to what goes in here – Chris Rae

## Introduction

IS 29500:1 incorporates several features designed to allow the use of ISO 8601 lexical date formats for spreadsheet cell values. Several issues exist with those features, primarily:

1. No guidance is provided on entities covered. ISO 8601 covers many entities alongside straightforward date/time representations, and IS 29500 gives no guidances as to which of those is permitted in spreadsheet cells.
2. No guidance is given on date/time precision or restrictions on range.
3. Lexical representations not specified. A large set of possible representations are covered by ISO 8601 – guidance should be given as to what subset an application should support for IS 29500 compliance.
4. The standard states that all dates and times are in UTC, but neglects to describe how to treat non-UTC or local dates. This makes time zone treatment implementer-defined, and does not reflect the expectation of users.
5. The leap year bug is not removed from IS 29500 strict. The strict variant of IS 29500 retains a date base which treats 1900 as a leap year.
6. ISO 8601 dates are permitted in both Strict and Transitional variants. In other aspects, Transitional IS 29500 is identical to Ecma 376 but applications able to read Ecma 376 will regard IS 29500 Transitional documents containing ISO 8601 dates as corrupt.

This amendment is intended to address the above issues. The changes contained are:

1. Entities covered are limited to to date, time and dateTime, with specific lexical representations defined.
2. The dateCompatibility attribute (used to determine whether leap year bug exists) has been omitted from *both* Parts 1 and 4 (in Part 1 there is no leap year bug for the 1900 date base; in Part 4 there's always a leap year bug)
3. Dates and times are specified in local time, with no timezone designation permitted.
4. The range of possible dates is changed from years [-9999, 9999] to years [0001, 9999].
5. ISO 8601 dates are removed from Transitional IS 29500.
6. The 1904 date base was renamed „1904 backward-compatibility“ when compared to Ecma-376; this has been reverted to „1904“ as WG4 know of no reason as to why the 1904 date base should have been made a second-class citizen



## Introductory element — Main element — Complementary element

### 1 Scope

This Amendment encompasses several changes to Parts 1 and 4 of IS 29500:1. These changes effect the alterations described in the introduction above.

### 2 Changes to Part 1

#### 2.1 Changes to section 18.2.27 workbook (Workbook)

The workbook element is the top level element. It contains elements and attributes that encompass the data content of the workbook. The workbook's child elements each have their own subclause references, and these are shown in the child elements table below. A partial list of the workbook's structures that these elements represent are:

- Sheets: represents the collection of worksheets in the workbook. The sheets are the central structure within a workbook, and contain the text, numbers, dates, formulas, and other elements of a workbook.
- Views: SpreadsheetML defines a collection of Workbook views that define basic window dimensions and position of the workbook if it is ever displayed by a spreadsheet application. It also defines a collection of Custom Workbook Views that allows SpreadsheetML to describe one or more views of the data within a workbook.
- Properties: the workbook has several property collection that store basic workbook settings, such as the date system to use, file protection settings, calculation settings, and smart tag behaviors.
- Names: words or strings of characters that represent cells, ranges of cells, formulas, or constant values.

[Example:

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<workbook xmlns="http://schemas.openxmlformats.org/spreadsheetml/2006/5/main"
xmlns:r="http://schemas.openxmlformats.org/officeDocument/2006/relationships">
  <fileVersion lastEdited="4" lowestEdited="4" rupBuild="4017"/>
  <workbookPr dateCompatibility="false" vbName="ThisWorkbook"
defaultThemeVersion="123820"/>
  <bookViews>
    <workbookView xWindow="120" yWindow="45" windowWidth="15135"
windowHeight="7650" activeTab="4"/>
  </bookViews>
```

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```

<sheets>
  <sheet name="Sheet1" sheetId="1" r:id="rId1"/>
  <sheet name="Sheet2" sheetId="2" r:id="rId2"/>
  <sheet name="Sheet5" sheetId="3" r:id="rId3"/>
  <sheet name="Chart1" sheetId="4" type="chartsheet" r:id="rId4"/>
</sheets>
<definedNames>
  <definedName name="MyDefinedName">Sheet3!$A$1:$C$12</definedName>
</definedNames>
<calcPr calcId="122211" calcMode="autoNoTable" refMode="R1C1" iterate="1"
  fullPrecision="0"/>
<customWorkbookViews>
  <customWorkbookView name="CustomView1"
    guid="{CE6681F1-E999-414D-8446-68A031534B57}" maximized="1" xWindow="1"
    yWindow="1" windowWidth="1024" windowHeight="547" activeSheetId="1"/>
</customWorkbookViews>
<pivotCaches>
  <pivotCache cacheId="0" r:id="rId8"/>
</pivotCaches>
<smartTagPr embed="1" show="noIndicator"/>
<smartTagTypes>
  <smartTagType namespaceUri="urn:schemas-openxmlformats-org:office:smartrags"
    name="date"/>
</smartTagTypes>
<webPublishing codePage="1252"/>
</workbook>

```

end example]

Parent Elements
Root element of SpreadsheetML Workbook part

Child Elements	Subclause
bookViews (Workbook Views)	<b>§Error! Reference source not found.</b>

Child Elements	Subclause
calcPr (Calculation Properties)	§Error! Reference source not found.
customWorkbookViews (Custom Workbook Views)	§Error! Reference source not found.
definedNames (Defined Names)	§Error! Reference source not found.
externalReferences (External References)	§Error! Reference source not found.
extLst (Future Feature Data Storage Area)	§Error! Reference source not found.
fileRecoveryPr (File Recovery Properties)	§Error! Reference source not found.
fileSharing (File Sharing)	§Error! Reference source not found.
fileVersion (File Version)	§Error! Reference source not found.
functionGroups (Function Groups)	§Error! Reference source not

Child Elements	Subclause
	found.
oleSize (Embedded Object Size)	§Error! Reference source not found.
pivotCaches (PivotCaches)	§Error! Reference source not found.
sheets (Sheets)	§Error! Reference source not found.
smartTagPr (Smart Tag Properties)	§Error! Reference source not found.
smartTagTypes (Smart Tag Types)	§Error! Reference source not found.
webPublishing (Web Publishing Properties)	§Error! Reference source not found.
webPublishObjects (Web Publish Objects)	§Error! Reference source not found.
workbookPr (Workbook Properties)	§2.2
workbookProtection (Workbook Protection)	§Error! Reference source not

Child Elements	Subclause
	found.

Attributes	Description
conformance (Document Conformance Class)	<p>Specifies the conformance class (§<b>Error! Reference source not found.</b>) to which the SpreadsheetML document conforms.</p> <p>If this attribute is omitted, its default value is <code>transitional</code>.</p> <p>[<i>Example</i>: Consider the following SpreadsheetML Workbook part markup:</p> <pre>&lt;workbook conformance="strict"&gt; ... &lt;/workbook&gt;</pre> <p>This document has a conformance attribute value of <code>strict</code>, therefore it conforms to the SML Strict conformance class. <i>end example</i>]</p> <p>The possible values for this attribute are defined by the <code>ST_ConformanceClass</code> simple type (§<b>Error! Reference source not found.</b>).</p>

[*Note*: The W3C XML Schema definition of this element's content model (CT\_Workbook) is located in §2.1. *end note*]

## 2.2 Changes to section 18.2.28 workbookPr (Workbook Properties)

This element defines a collection of workbook properties.

[*Example*:

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```
<workbookPr dateCompatibility="false" showObjects="none"
saveExternalLinkValues="0"
defaultThemeVersion="123820"/>
```

end example]

Parent Elements
workbook (§2.1)

Attributes	Description
allowRefreshQuery (Allow Refresh Query)	<p>Specifies a boolean value that indicates whether the application will refresh query tables in this workbook.</p> <p>A value of 1 or true indicates the application will refresh query tables when the workbook is loaded.</p> <p>A value of 0 or false indicates the application will not refresh query tables.</p> <p>The default value for this attribute is false.</p> <p>The possible values for this attribute are defined by the W3C XML Schema boolean datatype.</p>
autoCompressPictures (Auto Compress Pictures)	<p>Specifies a boolean value that indicates the application automatically compressed pictures in the workbook.</p> <p>A value of 1 or true indicates the application automatically compresses pictures of the workbook. When a picture is compressed, the application:</p> <ul style="list-style-type: none"> <li>• Reduces resolution (to 96 dots per inch (dpi) for Web and 200 dpi for print), and unnecessary information is discarded.</li> <li>• Discards extra information. [Example: When a picture has been cropped or resized, the "hidden" parts of the picture are stored in the file. end</li> </ul>

Attributes	Description
	<p><i>example]</i></p> <ul style="list-style-type: none"> <li>Compress the picture, if possible.</li> </ul> <p>A value of 0 or <code>false</code> indicates the application does not compress pictures in this workbook.</p> <p>The default value for this attribute is <code>true</code>.</p> <p>The possible values for this attribute are defined by the W3C XML Schema boolean datatype.</p>
backupFile (Create Backup File)	<p>Specifies a boolean value that indicates whether the application creates a backup of the workbook on save.</p> <p>A value of 1 or <code>true</code> indicates the application creates a backup of the workbook on save.</p> <p>A value of 0 or <code>false</code> indicates the application does not create a backup.</p> <p>The default value for this attribute is <code>false</code>.</p> <p>The possible values for this attribute are defined by the W3C XML Schema boolean datatype.</p>
checkCompatibility (Check Compatibility On Save)	<p>Specifies a boolean value that indicates whether the application checks for compatibility when saving this workbook to older file formats.</p> <p>A value of 1 or <code>true</code> indicates the application performs a compatibility check when saving to legacy binary formats.</p>

Attributes	Description
	<p>A value of <code>0</code> or <code>false</code> indicates the application does not perform a compatibility check when saving to legacy binary formats.</p> <p>The default value for this attribute is <code>false</code>.</p> <p>The possible values for this attribute are defined by the W3C XML Schema boolean datatype.</p>
codeName (Code Name)	<p>Specifies the codename of the application that created this workbook. Use this attribute to track file content in incremental releases of the application.</p> <p>The possible values for this attribute are defined by the W3C XML Schema string datatype.</p>
date1904 (Date 1904)	<p>Value that indicates whether to use a 1900 or 1904 date base when converting serial values in the workbook to dates. <del>[Note: If the dateCompatibility attribute is 0 or false, this attribute is ignored. end note]</del></p> <p>A value of <code>1</code> or <code>true</code> indicates the workbook uses the 1904 <del>backward compatibility</del> date system.</p> <p>A value of <code>0</code> or <code>false</code> indicates the workbook uses a <del>date system based in the</del> 1900 date system, <del>as specified by the value of the dateCompatibility attribute.</del></p> <p>(See §2.4 for the definition of the date bases.)</p> <p>The default value for this attribute is <code>false</code>.</p>

Attributes	Description
	The possible values for this attribute are defined by the W3C XML Schema boolean datatype.
dateCompatibility (Date Compatibility)	<p><del>Specifies whether the date base should be treated as a compatibility date base or should support the full ISO 8601 date range.</del></p> <p><del>A value of 1 or true indicates that the date system in use is either the 1900 backward compatibility date base or the 1904 backward compatibility date base, as specified by the value of the date1904 attribute.</del></p> <p><del>A value of 0 or false indicates that the date system is the 1900 date base, based on the ISO 8601 date range.</del></p> <p><del>(See §2.4 for the definition of the date bases.)</del></p> <p><del>The default value for this attribute is true.</del></p> <p><del>The possible values for this attribute are defined by the W3C XML Schema boolean datatype.</del></p>
defaultThemeVersion (Default Theme Version)	<p>Specifies the default version of themes to apply in the workbook.</p> <p>The value for defaultThemeVersion depends on the application. SpreadsheetML defaults to the form [version][build], where [version] refers to the version of the application, and [build] refers to the build of the application when the themes in the user interface changed.</p> <p>The possible values for this attribute are defined by the W3C XML Schema unsignedInt datatype.</p>
filterPrivacy (Filter)	Specifies a boolean value that indicates whether the application has inspected the workbook for personally identifying information (PII). If this flag is set, the

Attributes	Description
Privacy)	<p>application warns the user any time the user performs an action that will insert PII into the document. [<i>Example</i>: Inserting a comment might insert the user's name. <i>end example</i>]</p> <p>A value of 1 or <code>true</code> indicates the application will warn the user when they insert PII into the workbook.</p> <p>A value of 0 or <code>false</code> indicates the application will not warn the user when they insert PII into the workbook; the workbook has not been inspected for PII.</p> <p>The default value for this attribute is false.</p> <p>The possible values for this attribute are defined by the W3C XML Schema boolean datatype.</p>
hidePivotFieldList (Hide Pivot Field List)	<p>Specifies a boolean value that indicates whether a list of fields is shown for pivot tables in the application user interface.</p> <p>A value of 1 or <code>true</code> indicates a list of fields is show for pivot tables.</p> <p>A value of 0 or <code>false</code> indicates a list of fields is not shown for pivot tables.</p> <p>The default value for this attribute is false.</p> <p>The possible values for this attribute are defined by the W3C XML Schema boolean datatype.</p>
promptedSolutions (Prompted	<p>Specifies a boolean value that indicates whether the user has received an alert to load Smart Document components.</p>

Attributes	Description
Solutions)	<p>A value of 1 or true indicates the user received an alert to load SmartDoc.</p> <p>A value of 0 or false indicates the user did not receive an alert.</p> <p>The default value for this attribute is false.</p> <p>The possible values for this attribute are defined by the W3C XML Schema boolean datatype.</p>
publishItems (Publish Items)	<p>Specifies a boolean value that indicates whether the publish the workbook or workbook items to the application server.</p> <p>A value of 1 or true indicates that workbook items are published.</p> <p>A value of 0 or false indicates that the workbook is published.</p> <p>The default value for this attribute is false.</p> <p>The possible values for this attribute are defined by the W3C XML Schema boolean datatype.</p>
refreshAllConnections (Refresh all Connections on Open)	<p>Specifies a boolean value that indicates whether the workbok shall refresh all the connections to data sources during load.</p> <p>The default value for this attribute is false.</p>

Attributes	Description
	<p>The possible values for this attribute are defined by the W3C XML Schema boolean datatype.</p>
<p>saveExternalLinkValues (Save External Link Values)</p>	<p>Specifies a boolean value that indicates whether the application will cache values retrieved from other workbooks via an externally linking formula. Data is cached at save.</p> <p>A value of 1 or true indicates data from externally linked formulas is cached. A supporting part is written out containing a cached cell table from the external workbook.</p> <p>A value of 0 or false indicates data from externally linked formulas is not cached.</p> <p>The default value for this attribute is true.</p> <p>The possible values for this attribute are defined by the W3C XML Schema boolean datatype.</p>
<p>showBorderUnselectedTables (Show Border Unselected Table)</p>	<p>Specifies a boolean value that indicates whether a border is drawn around unselected tables in the workbook.</p> <p>A value of 1 or true indicates borders are drawn around unselected tables.</p> <p>A value of 0 or false indicates borders are not drawn around unselected tables.</p> <p>The default value for this attribute is true.</p> <p>The possible values for this attribute are defined by the W3C XML Schema boolean datatype.</p>

Attributes	Description
showInkAnnotation (Show Ink Annotations)	<p>Specifies a boolean value that indicates whether the book shows ink annotations.</p> <p>A value of 1 or <code>true</code> indicates that ink annotations are shown in the workbook.</p> <p>A value of 0 or <code>false</code> indicates that ink annotations are not shown in the workbook.</p> <p>The default value for this attribute is <code>true</code>.</p> <p>The possible values for this attribute are defined by the W3C XML Schema boolean datatype.</p>
showObjects (Show Objects)	<p>Specifies how the application shows embedded objects in the workbook.</p> <p>This attribute is optional.</p> <p>The default value for this attribute is "all."</p> <p>The possible values for this attribute are defined by the ST_Objects simple type (<b>\$Error! Reference source not found.</b>).</p>
showPivotChartFilter (Show Pivot Chart Filter)	<p>Specifies a boolean value that indicates whether filtering options are shown for pivot charts in the workbook.</p> <p>A value of 1 or <code>true</code> indicates filtering options shall be shown for pivot charts.</p> <p>A value of 0 or <code>false</code> indicates filtering options shall not be shown.</p>

Attributes	Description
	<p>The default value for this attribute is false.</p> <p>The possible values for this attribute are defined by the W3C XML Schema boolean datatype.</p>
<p>updateLinks (Update Links Behavior)</p>	<p>Specifies how the application updates external links when the workbook is opened.</p> <p>The default value for this attribute is userSet.</p> <p>The possible values for this attribute are defined by the ST_UpdateLinks simple type (<b>\$Error! Reference source not found.</b>).</p>

[Note: The W3C XML Schema definition of this element's content model (CT\_WorkbookPr) is located in §2.1. *end note*]

**Changes to section 18.3.1.96 v (Cell Value)**

This element expresses the value contained in a cell. If the cell contains a string, then this value is an index into the shared string table, pointing to the actual string value. Otherwise, the value of the cell is expressed directly in this element. Cells containing formulas express the last calculated result of the formula in this element.

For applications not wanting to implement the shared string table, an 'inline string' can be expressed in an <is> element under <c> (instead of a <v> element under <c>), in the same way a string would be expressed in the shared string table. [Note: See <is> for an example. *end note*]

[Example: In this example cell B4 contains the number "360" and C4 contains the ~~UTC~~ local date 22 November 1976, 08:30.

```
<c r="B4">
  <v>360</v>
</c>
<c r="C4" t="d">
  <v>1976-11-22T08:30Z</v>
</c>
```

*end example*]

The possible values for this element are defined by the ST\_Xstring simple type (§Error! Reference source not found.).

Parent Elements
c (§Error! Reference source not found.); cell (§Error! Reference source not found.); nc (§Error! Reference source not found.); oc (§Error! Reference source not found.); tp (§Error! Reference source not found.)

[Note: The W3C XML Schema definition of this element's content model (ST\_Xstring) is located in §Error! Reference source not found.. end note]

### 2.3 Changes to section 18.17.4 Dates and Times

~~Each unique instant~~Dates and times in SpreadsheetML time ~~is~~ are stored as ~~an ISO 8601-formatted~~ strings, ~~which is made up of a date component, a time component, and a timezone component~~ using the ISO 8601 lexical formats defined below. The earliest date permitted is 0001-01-01, 00:00 (midnight on the first of January, in the year 1). The latest date permitted is 9999-12-31, 23:59:59.

Values with only a date component shall be stored using the Complete, Extended Format Calendar Date format, as defined in [reference to ISO 8601, B.1.1 and B2.1].

[Example: The date 22 November 1976 would be represented in the following way within SpreadsheetML:

1976-11-22  
end example]

Values with only a time component shall be stored using the Complete, Extended Format Time Of Day format, as defined in [reference to ISO 8601, B.1.2 and B2.2]. The decimal separator shall be a full stop (period) and decimal places shall be limited to 3.

[Example: The time 08:30 could be represented in the following ways within SpreadsheetML:

08:30  
08:30:00  
08:30:00.000  
end example]

Values with both date and time components shall be stored using the Complete, Extended Format Calendar Date and Time Of Day format, as defined in [reference to ISO 8601, B.1.3 and B2.3]. For the time component, the decimal separator shall be a full stop (period) and decimal places shall be limited to 3.

[Example: The date 22 November 1976 at time 08:30 could be represented in the following ways within SpreadsheetML:

1976-11-22T08:30  
1976-11-22T08:30:00  
1976-11-22T08:30:00.000  
end example]

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Numerous functions take dates and/or times as arguments. Functions that care only about the date shall ignore any time information that is provided. Functions that care only about the time shall ignore any date information that is provided.

~~[Example: The date 22 November 1976 at exactly 08:30 Pacific Standard Time (+08:00 UTC) could be represented in the following (non-exhaustive list of) ways within SpreadsheetML:~~

~~1976-11-22T08:30:00.000+08:00~~

~~1976-11-22T16:30Z~~

~~end example]~~

~~For compatibility with existing spreadsheet applications, a consuming application should allow certain numeric serial values to be interpreted as dates and times for display or for use in calculations. When used in calculations, formulas specified in this specification, dates and times are should be converted to serial date-values. These values should behave as defined in §2.4, §Error! Reference source not found., and §2.5.~~

### 2.4 Changes to section 18.17.4.1 Date Conversion for Serial Values

~~All date values stored in cells within a SpreadsheetML file are stored in the ISO 8601 format.~~

~~For compatibility, a SpreadsheetML application can interpret serial number values in cells or in formulas as dates. This subclause describes how serial number values can be converted to date values depending on the compatibility mode.~~

~~A date that can be interpreted as a numeric value that can be interpreted as a date and time is a *serial value*. This is made up of a signed value representing a number of days since the base date for the selected date base system, integer date component and an unsigned fractional time component. Going forward in time, the date component of a serial value increases by 1 each day. If a serial value has a noninteger component, the fractional portion represents fractions of a day. [Example: When using the 1900 date base system, a serial value of 1.5 represents midday on the 31<sup>st</sup> December 1899, or 1899-12-31T12:00. end example] A serial value represents a UTC-local date and time, and, as such, has no timezone information.~~

~~Three~~Two different bases can be used for converting ISO 8601 conformant dates into serial values:

- ~~In the 1900 date base system, the lower limit is January 1, -99990001 00:00:00, which has a serial value of -6935934346048. The upper limit is December 31, 9999, 23:59:59, which has a serial value of 2,958,465.9999884. The base date for this date base system is December 30, 1899, which has a serial value of 0.~~
- ~~In the 1900 backward compatibility date base system, the lower limit is January 1, 1900, 00:00:00, which has serial value 1. The upper limit is December 31, 9999, 23:59:59, which has serial value 2,958,465.9999884. The base date for this date base system is December 31, 1899, which has a serial value of 0.~~
- ~~In the 1904 backward compatibility date base system, the lower limit is January 1, 19040001, 00:00:00, which has a serial value of 0-695055. The upper limit is December 31, 9999, 23:59:59, which has a serial value of 2,957,003.9999884. The base date for this date base system is January 1, 1904, which has a serial value of 0.~~

~~A serial value outside of the range for its date base system is invalid and ill-formed.~~

**Comment [A1]:** Not really removed - this is already mentioned in 18.17.6.7

**Comment [A2]:** This means that, in strict at least, dates and times cannot be serial in cells. Similar paragraph added to Part 4.

[~~Note: The 1900 date-base system is the preferred system to be used by applications when converting serial values to dates. The use of the 1900 backward compatibility or 1904 backward compatibility date-base system should be avoided. end note~~]

The ~~date-base system is specified~~recorded in the Workbook part's XML by the ~~presence or absence of the dateCompatibility and~~value of the ~~date1904~~ attributes of the workbookPr element. [Example:

```
1900 date-base system: <workbookPr dateCompatibility="0" showObjects="all"/>
1900 backward compatibility date-base system: <workbookPr dateCompatibility="1"
showObjects="all"/>
1904 backward compatibility date-base system: <workbookPr dateCompatibility="1" date1904="1"
showObjects="all"/>
```

~~end example]~~

For legacy reasons, an implementation using the 1900 backward compatibility date-base system shall treat 1900 as though it was a leap year. [~~Note: That is, serial value 59 corresponds to February 28, and serial value 64 corresponds to March 1, the next day, allowing the (non-existent) date February 29 to have the serial value 60. end note~~] A consequence of this is that for dates between January 1 and February 28, WEEKDAY shall return a value for the day immediately prior to the correct day, so that the (non-existent) date February 29, 1900, has a day-of-the-week that immediately follows that of February 28, and immediately precedes that of March 1, 1900.

[Example: For the 1900 date base system:

The serial value	-2338.000000...	represents	1893-08-05
The serial value	2.000000...	represents	1900-01-01
The serial value	3687.000000...	represents	1910-02-03
The serial value	38749.000000...	represents	2006-02-01
The serial value	2958465.000000...	represents	9999-12-31

For the 1904 backward compatibility date base system:

The serial value	-3800.000000...	represents	1893-08-05
The serial value	0.000000...	represents	1904-01-01
The serial value	2225.000000...	represents	1910-02-03
The serial value	37287.000000...	represents	2006-02-01
The serial value	2957003.000000...	represents	9999-12-31

~~end example]~~

## 2.5 Changes to section 18.17.4.3 Combined Date and Time Conversion for Serial Values

Any date component can be added to any time component to produce a serial value for that date/time combination. The resulting serial value encodes that date whose (positive or negative) time span from base date in the respective date-base equals the serial value.

[Note: In the 1900 date base system, the serial value -1.25 represents December 28, 1899, 18:00. end note]

[Example: For the 1900 date base system:

The serial value	-2337.999989...	represents	1893-08-05T00:00:01Z
The serial value	3687.4207639...	represents	1910-02-03T10:05:54Z

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The serial value 1.500000... represents 1900-01-01T12:00:00Z  
 The serial value 2958465.9999884... represents 9999-12-31T23:59:59Z

For the 1904 ~~backward compatibility~~ date base system:

The serial value -3799.999989... represents 1893-08-05T00:00:01Z  
 The serial value 2225.4207639... represents 1910-02-03T10:05:54Z  
 The serial value 0.500000... represents 1904-01-01T12:00:00Z  
 The serial value 2957003.9999884... represents 9999-12-31T23:59:59Z

end example]

### 2.6 Changes to section 18.17.6.7 Dates and Times

A date and/or time in a cell is stored as an ISO 8601 string. All date, time and datetime values stored in cells within a SpreadsheetML file shall be stored as a string conforming to one of the ISO 8601 lexical formats specified in 18.17.4.

The date base system is recorded shall be specified in the Workbook part's XML by the ~~dateCompatibility~~ and value of the date1904 attributes of the workbookPr element. [Example:

```
1900 date-base: <workbookPr dateCompatibilitydate1904="false" showObjects="all"/>
1904 backward compatibility date-base: <workbookPr dateCompatibility="true"
date1904="true" showObjects="all"/>
```

end example]

### 2.7 Changes to section 18.17.7.74 DATE

Syntax:

DATE ( year , month , day )

Description: Computes the serial value for the given date.

Arguments:

Name	Type	Description
year	number	<p>A positive number, truncated to an integer representing the year, that together with <i>month</i> and <i>day</i> specifies the date whose serial value is to be computed.</p> <p>For the 1900 date base system:</p> <ul style="list-style-type: none"> <li>If <i>year</i> is in the range 0–99, inclusive, the year shall be interpreted as <i>year</i> + 1900.</li> <li>If <i>year</i> is in the range -9999–1, inclusive, or</li> </ul>

**Comment [A3]:** This needs to have wider review and more needs to be more precise, perhaps referring back to 18.17.4

**Comment [CLR4]:** Fixed it up, hopefully to your liking. Good point.

**Comment [A5]:** Date Compat needs to be removed and the formulas replicated in Part 4.

**Comment [CLR6]:** I've removed the back-compatness of the examples here. As to whether we need to recreate these in part 4, I say no... there's enough info in there already to understand what the 1904BC date base is, and trying to replicate single function definitions just in order to get a couple of examples will be more of a nuisance than it is a benefit.

Name	Type	Description
		<p>100–9999, inclusive, the year shall be interpreted as <i>year</i>.</p> <p>For the <del>1900 backward compatibility date base</del> and <del>1904 backward compatibility date base</del> systems:</p> <ul style="list-style-type: none"> <li>• If <i>year</i> is in the range 0–1899, inclusive, the year shall be interpreted as <i>year</i> + 1900.</li> <li>• If <i>year</i> is in the range 1900–9999, inclusive, the year shall be interpreted as <i>year</i>.</li> </ul>
<i>month</i>	number	<p>A month, truncated to integer, that together with <i>year</i> and <i>day</i> specifies the date whose serial value is to be computed.</p> <p><i>month</i> shall be interpreted as the number of months relative to the final month of the year prior to the specified year.</p>
<i>day</i>	number	<p>A day, truncated to integer, that together with <i>month</i> and <i>year</i> specifies the date whose serial value is to be computed.</p> <p><i>day</i> shall be interpreted as the number of days relative to the last day of the month (and its associated year) prior to the month (and its associated year) as determined from <i>month</i> and <i>year</i> (see below).</p>

The value of *month* or *day* in a *year-month-day* argument triplet can be out of range. *month* is simply an instance of counting a given number of months, minus one, relative to January of the year specified, using the Gregorian calendar [ISO 8601]. This calendar defines that there are 12 months in a year, and that when counting forward, the month following December of one year is January of the following year, and when counting backward, the month preceding January of one year is December of the previous year. Likewise, *day* is simply an instance of counting a given number of days, minus one, relative to the first day of the adjusted month, using the Gregorian calendar. This calendar defines the number of days in each month, and that when counting forward, the day following the final day of one month is the first day of the following month, and when counting backward, the day preceding the first day of one month is the final day of the previous month. [Example: The *year-month-day* argument triplets (2007, 12,32), (2007,13,1), and (2008,1,1) all result in the same serial date. end example]

[Note: One way to handle out-of-range values for *month* or *day* is as follows:

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Compute  $\text{yearAdjust} = \text{INT}((\text{month} - 1)/12)$   
 Compute  $\text{adjustedMonth} = \text{month} - (\text{yearAdjust} * 12)$   
 Compute  $\text{adjustedYear} = \text{year} + \text{yearAdjust}$ .

A serialDateBase can now be computed for the first day of the adjustedYear and adjustedMonth. Finally, compute the serial date for the full triplet by adding (*day-1*) to this serialDateBase. *end note*]

**Return Type and Value:** number – The serial value for the given date.

However, if *year* is outside the acceptable range for the date base currently in use, #NUM! is returned.

[*Example:* For the 1900 ~~backward compatibility~~ date-base date base system:

DATE(0,1,1) results in a serial value of 12  
 DATE(1899,1,1) results in a serial value of 693598-363  
 DATE(1900,1,1) results in a serial value of 12  
 DATE(9999,12,31) results in a serial value of 2958465

For the 1904 ~~backward compatibility~~ date-base date base system:

DATE(4,1,1) results in a serial value of 0  
 DATE(1899,1,1) results in a serial value of 692136  
 DATE(1904,1,1) results in a serial value of 0  
 DATE(9999,12,31) results in a serial value of 2957003

*end example]*

**2.8 Changes to section A.2 SpreadsheetML**

```

1 <xsd:complexType name="CT_WorkbookPr">
2 <xsd:attribute name="date1904" type="xsd:boolean" use="optional" default="false"/>
3 <xsd:attribute name="dateCompatibility" type="xsd:boolean" use="optional" default="true"/>
4 <xsd:attribute name="showObjects" type="ST_Objects" use="optional" default="all"/>
5 <xsd:attribute name="showBorderUnselectedTables" type="xsd:boolean" use="optional"
6 default="true"/>
7 <xsd:attribute name="filterPrivacy" type="xsd:boolean" use="optional" default="false"/>
8 <xsd:attribute name="promptedSolutions" type="xsd:boolean" use="optional" default="false"/>
9 <xsd:attribute name="showInkAnnotation" type="xsd:boolean" use="optional" default="true"/>
10 <xsd:attribute name="backupFile" type="xsd:boolean" use="optional" default="false"/>
11 <xsd:attribute name="saveExternalLinkValues" type="xsd:boolean" use="optional"
12 default="true"/>
13 <xsd:attribute name="updateLinks" type="ST_UpdateLinks" use="optional" default="userSet"/>
14 <xsd:attribute name="codeName" type="xsd:string" use="optional"/>
15 <xsd:attribute name="hidePivotFieldList" type="xsd:boolean" use="optional" default="false"/>
16 <xsd:attribute name="showPivotChartFilter" type="xsd:boolean" default="false"/>
17 <xsd:attribute name="allowRefreshQuery" type="xsd:boolean" use="optional" default="false"/>
18 <xsd:attribute name="publishItems" type="xsd:boolean" use="optional" default="false"/>
19 <xsd:attribute name="checkCompatibility" type="xsd:boolean" use="optional" default="false"/>
20 <xsd:attribute name="autoCompressPictures" type="xsd:boolean" use="optional" default="true"/>
    
```

```
21 <xsd:attribute name="refreshAllConnections" type="xsd:boolean" use="optional"  
22   default="false"/>  
23 <xsd:attribute name="defaultThemeVersion" type="xsd:unsignedInt" use="optional"/>  
24 </xsd:complexType>
```

ISO-IEC\_

## 2.9 Changes to section B.2 SpreadsheetML

```
sml_CT_WorkbookPr =
## default value: false
attribute date1904 { xsd:boolean }?,
## default value: true
attribute dateCompatibility { xsd:boolean }?,
## default value: all
attribute showObjects { sml_ST_Objects }?,
```

## 2.10 Changes to section M.2.15.4.4 Single Cell XML

Contents of tableSingleCells.xml

```
<singleXmlCells
xmlns="http://schemas.openxmlformats.org/spreadsheetml/2006/5/main">
  <singleXmlCell id="1" name="Table1" displayName="Table1" r="B3"
connectionId="1">
    <xmlCellPr id="1" uniqueName="currency">
      <xmlPr mapId="1" xpath="/expense-report/@currency"
xmlDataType="string"/>
    </xmlCellPr>
  </singleXmlCell>
  <singleXmlCell id="2" name="Table2" displayName="Table2" r="C3"
connectionId="1">
    <xmlCellPr id="1" uniqueName="detailed">
      <xmlPr mapId="1" xpath="/expense-report/@detailed"
xmlDataType="boolean"/>
    </xmlCellPr>
  </singleXmlCell>
  <singleXmlCell id="3" name="Table3" displayName="Table3" r="D3"
connectionId="1">
    <xmlCellPr id="1" uniqueName="total-sum">
      <xmlPr mapId="1" xpath="/expense-report/@total-sum"
xmlDataType="double"/>
    </xmlCellPr>
  </singleXmlCell>
  <singleXmlCell id="4" name="Table4" displayName="Table4" r="B6"
connectionId="1">
    <xmlCellPr id="1" uniqueName="First">
      <xmlPr mapId="1" xpath="/expense-report/Person/First"
xmlDataType="string"/>
    </xmlCellPr>
  </singleXmlCell>
  <singleXmlCell id="5" name="Table5" displayName="Table5" r="C6"
connectionId="1">
```

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```
<xmlCellPr id="1" uniqueName="Last">
  <xmlPr mapId="1" xpath="/expense-report/Person/Last"
xmlDataType="string"/>
</xmlCellPr>
</singleXmlCell>
<singleXmlCell id="6" name="Table6" displayName="Table6" r="D6"
connectionId="1">
  <xmlCellPr id="1" uniqueName="Email">
    <xmlPr mapId="1" xpath="/expense-report/Person/Email"
xmlDataType="string"/>
  </xmlCellPr>
</singleXmlCell>
</singleXmlCells>
```

A single cell which has been mapped to an XML node is expressed in much the same way that an entire table is expressed.

The `<singleXmlCell>` collection is the top level object, like the Table, which identifies the cell in question.

The `<xmlCellPr>` collection identifies the name for the only 'column' in this structure, the single cell. In this way it is much like a table column definition and the table column-level properties.

The `<xmlPr>` collection expresses the xml properties for this cell.

## Formulas

### Changes to section M.2.16.9.1 Date Conversion for Serial Values

All date values stored in cells within a SpreadsheetML file are stored in the ISO 8601 format.

For compatibility, a SpreadsheetML application can interpret serial number values in cells or in formulas as dates. This subclause describes how serial number values can be converted to date values depending on the compatibility mode.

A date that can be interpreted as a numeric value is a *serial value*. This is made up of a signed integer date component and an unsigned fractional time component. Going forward in time, the date component of a serial value increases by 1 each day. A serial value represents a UTC local date and time, and, as such, has no timezone information.

Three different bases can be used for converting dates into serial values:

- In the *1900 date base system*, the lower limit is January 1, 00000001 00:00:00, which has serial value -4346018695055. The upper limit is December 31, 9999, 23:59:59, which has serial value 2,958,465.9999884. The base date for this date base system is December 31, 1899, which has a serial value of 0.
- In the *1900 backward compatibility date base system*, the lower limit is January 1, 1900, 00:00:00, which has serial value 1. The upper limit is December 31, 9999, 23:59:59, which has serial value 2,958,465.9999884. The base date for this date base system is December 31, 1899, which has a serial value of 0.
- In the *1904 backward compatibility date base system*, the lower limit is January 1, 1904, 00:00:00, which has serial value 0. The upper limit is December 31, 9999, 23:59:59, which has serial value 2,957,003.9999884. The base date for this date base system is January 1, 1904, which has a serial value of 0.

**Comment [A7]:** Should we ditch this? It seems to be unnecessary duplication.

For the 1900 date base system:

The serial value	-2338.000000...	represents	1893-08-05
The serial value	2.000000...	represents	1900-01-01
The serial value	3687.000000...	represents	1910-02-03
The serial value	38749.000000...	represents	2006-02-04
The serial value	2958465.000000...	represents	9999-12-31

For the 1904 backward compatibility date base system:

The serial value	-3800.000000...	represents	1893-08-05
The serial value	0.000000...	represents	1904-01-01
The serial value	2225.000000...	represents	1910-02-03
The serial value	37287.000000...	represents	2006-02-04
The serial value	2957003.000000...	represents	9999-12-31

## 2.11 Changes to section N.2 SpreadsheetML

The following changes occurred to the SpreadsheetML schema:

- The algorithmName, hashValue, saltValue, and spinCount attributes were added to sheetProtection (§Error! Reference source not found.; §Error! Reference source not found.), protectedRange (§Error! Reference source not found.), sheetProtection (§Error! Reference source not found.), and fileSharing (§Error! Reference source not found.)
- The anchor element (§Error! Reference source not found.) was added
- The characterSet attribute was added to the textPr element (§Error! Reference source not found.) and the webPublishing element (§Error! Reference source not found.)
- The codePage attribute was removed from the textPr element (§Error! Reference source not found.)
- The codePage attribute was removed from the webPublishing element (§Error! Reference source not found.)
- The commentPr element (§Error! Reference source not found.) was added
- The conformance attribute was added to the workbook element (§2.1)
- The controlPr element (§Error! Reference source not found.) was added
- The dateCompatibility attribute was added to the workbookPr element (§2.2)
- The drawingHF element (§Error! Reference source not found.) was added
- The end element (§Error! Reference source not found.) was added
- The left element was deleted
- The leftLabels attribute was removed from the dataConsolidate element (§Error! Reference source not found.)
- The legacyDrawing element was deleted
- The legacyDrawingHF element was deleted
- The objectPr element (§Error! Reference source not found.) was added
- The paperHeight and paperWidth attributes were added to the pageSetup element (§Error! Reference source not found.)
- The paperHeight and paperWidth attributes were added to the pageSetup element (§Error! Reference source not found.)
- The password attribute was removed from sheetProtection (§Error! Reference source not found.; §Error! Reference source not found.), protectedRange (§Error! Reference source not found.), and the sheetProtection elements (§Error! Reference source not found.)
- The refreshedDate attribute was removed from the pivotCacheDefinition element (§Error! Reference source not found.)

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- The refreshedDateIso attribute was added to the pivotCacheDefinition element (§Error! Reference source not found.)
- The reservationPassword attribute was removed from the fileSharing element (§Error! Reference source not found.)
- The right element was deleted
- The Schema element (§Error! Reference source not found.) now allows mixed content
- The SchemaLanguage attribute was added to the schema element (§Error! Reference source not found.)
- The securityDescriptor attribute was removed from the protectedRange element (§Error! Reference source not found.)
- The securityDescriptor element (§Error! Reference source not found.) was added
- The shapeId attribute was added to the comment element (§Error! Reference source not found.)
- The ST\_CalendarType simple type (§Error! Reference source not found.) now allows an enumeration value of saka
- The ST\_CellType simple type (§Error! Reference source not found.) now allows an enumeration value of d
- The ST\_FileType simple type (§Error! Reference source not found.) now allows enumeration values of lin and other
- The ST\_PivotAreaType simple type (§Error! Reference source not found.) no longer allows an enumeration value of topRight
- The ST\_PivotAreaType simple type (§Error! Reference source not found.) now allows an enumeration value of topEnd
- The ST\_TextHAlign simple type (§Error! Reference source not found.) was added
- The ST\_TextVAlign simple type (§Error! Reference source not found.) was added
- The ST\_XmlDataType simple type (§Error! Reference source not found.) was modified to allow any xsd:string
- The start element (§Error! Reference source not found.) was added
- The startLabels attribute was added to the dataConsolidate element (§Error! Reference source not found.)
- The val and maxVal attributes were removed from the dynamicFilter element (§Error! Reference source not found.)
- The valIso and maxValIso attributes were added to the dynamicFilter element (§Error! Reference source not found.)
- The workbookPassword, workbookPasswordCharacterSet, revisionsPassword, and revisionsPasswordCharacterSet attributes were removed from the workbookProtection element (§Error! Reference source not found.)
- The workbookPasswordCharacterSet, revisionsPasswordCharacterSet, revisionsAlgorithmName, revisionsHashValue, revisionsSaltValue, revisionsSpinCount, workbookAlgorithmName, workbookHashValue, workbookSaltValue, and workbookSpinCount attributes were added to the workbookProtection element (§Error! Reference source not found.)

### 3 Changes to Part 4

#### 3.1 To part 4, new section before 10.2 – Workbook. New section entitled “Formulas”.

##### Modified text for Date Conversion for Serial Values (Part 1, §18.17.4.1)

This section must be replaced by the following text when interpreting a document of a transitional conformance class:

~~All date values stored in cells within a SpreadsheetML file are stored in the ISO 8601 format.~~

**Comment [CR8]:** Deleted (but existed in part 4)

For compatibility, A SpreadsheetML application shall interpret serial-number values in cells or in formulas as dates. This subclause describes how serial number values can be converted to date values depending on the compatibility mode.

**Comment [CR9]:** Deleted (but existed in part 1)

**Comment [CLR10]:** Was "can" when this text lived in part 1

A date that can be interpreted as a numeric value is a *serial value*. This is made up of a signed integer date component and an unsigned fractional time component. Going forward in time, the date component of a serial value increases by 1 each day. A serial value represents a UTC date and time, and, as such, has no timezone information.

Three different bases can be used for converting dates into serial values:

**Comment [CR11]:** Altered from what this was in part 1

- In the 1900 date base system, the lower limit is January 1, 1900, 00:00:00, which has serial value -4346018. The upper limit is December 31, 9999, 23:59:59, which has serial value 2,958,465.9999884. The base date for this date base system is December 30, 1899, which has a serial value of 0.
- In the 1900 backward compatibility date-base system, the lower limit is January 1, 1900, 00:00:00, which has serial value 1. The upper limit is December 31, 9999, 23:59:59, which has serial value 2,958,465.9999884. The base date for this date base system is December 31, 1899, which has a serial value of 0.
- In the 1904 date-base system, the lower limit is January 1, 1904, 00:00:00, which has serial value 0. The upper limit is December 31, 9999, 23:59:59, which has serial value 2,957,003.9999884. The base date for this date base system is January 1, 1904, which has a serial value of 0.

**Comment [CR12]:** Deleted (but existed in part 1)

**Comment [CLR13]:** Interesting point as to whether this should still be called "backward compatibility" or just be called "the 1900 date base", with the assumption that it's backward-compatibility in Transitional document

**Comment [CR14]:** These both also exist in strict, but it's hard to make this readable without repeating this information. Ideas appreciated

A serial value outside of the range for its date base system is ill-formed.

[Note: The 1900 date base system is the preferred system to be used by applications when converting serial values to dates. The use of the 1900 backward compatibility or 1904 backward compatibility date base system should be avoided. end note]

**Comment [CR15]:** Deleted (but existed in part 1). In ECMA 376 there was no preference given to one date base over another

The date-base system is recorded in the Workbook part's XML by the presence or absence of the dateCompatibility and date1904 attributes of the workbookPr element. [Example:

**Comment [CLR16]:** Deleted (but existed in part 1)

1900 date base system: <workbookPr dateCompatibility="0" showObjects="all"/>  
 1900 backward compatibility date-base system: <workbookPr dateCompatibility="1" showObjects="all"/>  
 1904 date-base system: <workbookPr dateCompatibility="1" date1904="1" showObjects="all"/>

**Comment [CLR17]:** Deleted (but existed in part 1)

**Comment [CLR18]:** Deleted (but existed in part 1)

end example]

**Comment [CLR19]:** Deleted (but existed in part 1)

For legacy reasons, an implementation using the 1900 backward compatibility date base system shall treat 1900 as though it was a leap year. [Note: That is, serial value 59 corresponds to February 28, and serial value 61 corresponds to March 1, the next day, allowing the (non-existent) date February 29 to have the serial value 60. end note] A consequence of this is that for dates between January 1 and February 28, WEEKDAY shall return a value for the day immediately prior to the correct day, so that the (non-existent) date February 29, 1900, has a day-of-the-week that immediately follows that of February 28, and immediately precedes that of March 1, 1900.

**Comment [CLR20]:** Deleted (but existed in part 1)

[Example: For the 1900 date base system:

The serial value -2338.000000... represents 1893-08-05  
 The serial value 2.000000... represents 1900-01-01  
 The serial value 3687.000000... represents 1910-02-03  
 The serial value 38749.000000... represents 2006-02-04  
 The serial value 2958465.000000... represents 9999-12-31

**Comment [CLR21]:** Deleted (but existed in part 1)

For the 1904 date base system:

The serial value -3800.000000... represents 1893-08-05  
 The serial value 0.000000... represents 1904-01-01

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The serial value 2225.0000000... represents 1910-02-03  
The serial value 37287.0000000... represents 2006-02-01  
The serial value 2957003.0000000... represents 9999-12-31

*end example]*

### 3.2 Removed Enumeration Values for ST\_CellType (18.18.11)

The enumeration “d” (ISO 8601 format) is removed from ST\_CellType for transitional documents.

This enumeration value should also be removed from the normative XSD schema (Annex A) and informative RELAX NG schema (Annex B).

### 3.3 Changes to Part 4, Appendix D.2

...

- The conformance attribute was added to the workbook element (Part 1, §18.2.27)
- The controlPr element (Part 1, §18.3.1.20) was added
- ~~The dateCompatibility attribute was added to the workbookPr element (Part 1, §18.2.28)~~
- The drawingHF element (Part 1, §18.3.1.37) was added
- The end element (Part 1, §18.8.16) was added

...

Comment [CLR22]: deleted