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TECHNICAL CORRIGENDUM 1

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Information technology — Z formal specification notation — Syntax, type system and semantics —

TECHNICAL CORRIGENDUM 1

Technologies de l'information — Notation Z pour la spécification formelle — Syntaxe, système de caractères et sémantique —

RECTIFICATIF TECHNIQUE 1

Technical Corrigendum 1 to ISO/IEC 13568:2002 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 22, *Programming languages, their environments and system software interfaces.*

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ISO/IEC 13568:2002/Cor.1:2007

Defect 13568/001: Use of UCS

Page 18, in 6.1

At the end of the first paragraph, add the following sentences.

"Reference is also made to characters' General Category and to decimal digits' Decimal Digit Value, as defined for the characters by Unicode[18]. The characters are assumed to be in Normalization Form C[19]."

Page 19, in 6.2

In line 8, replace "*other UCS chars with* Number *property, but* Number, Decimal Digit" by "*any other UCS characters with General Category* `N*` *except* `Nd`".

In line 11, replace "Number, Decimal Digit *property*" by "*General Category* `Nd`".

In line 14, replace "*any characters of the mathematical toolkit with* letter *property*" by "*characters of the mathematical toolkit with General Category* `L*`".

In line 15, replace "letter *property*" by "*General Category* `L*`".

In lines 34-35, replace "*any characters of the mathematical toolkit with neither* letter *or* number *property*" by "*characters of the mathematical toolkit with General Category neither* `L*` *nor* `N*`".

In lines 36-37, replace "*neither* letter *or* number *property*" by "*General Category* `S*`*,* `P*` *or* `M*`".

Page 20, in 6.3

In line 4, replace "property" by "General Category".

Page 20, in 6.4.2

In line 5, replace "UCS defines a corresponding *decimal digit value*" by "Unicode defines a corresponding *Decimal Digit Value*".

Page 21, in 6.4.3.3

In line 1, replace "UCS *letter* property" by "General Category `L*`".

Page 21, in 6.4.4.1

In line 2, replace "`0000 02B9` MODIFIER LETTER PRIME" by "`0000 2032` PRIME".

Page 21, in 6.4.4.3

In line 10, replace "`0000 300A` LEFT DOUBLE ANGLE BRACKET" by "`0000 27EA` MATHEMATICAL LEFT DOUBLE ANGLE BRACKET".

In line 11, replace "`0000 300B` RIGHT DOUBLE ANGLE BRACKET" by "`0000 27EB` MATHEMATICAL RIGHT DOUBLE ANGLE BRACKET".

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Page 22, in 6.4.4.4

In line 6, replace "| 0000 2028 LINE SEPARATOR" by "– 0000 2500 BOX DRAWINGS LIGHT HORIZONTAL".

In line 10, replace "(new line) 0000 2029 PARAGRAPH SEPARATOR" by "└ 0000 2514 BOX DRAWINGS LIGHT UP AND RIGHT".

Page 22, in 6.4.4.5

In line 2, replace "0000 000A LINE FEED" by "0000 2028 LINE SEPARATOR".

At the end, add the following.

"Newlines represented in accordance with [20] shall all be treated as NLCHAR.
NOTE 1 This ensures the conventional interpretation of LINE FEED (LF), LINE TABULATION (VT), FORM FEED (FF), CARRIAGE RETURN (CR) and NEXT LINE (NEL).

All Unicode characters with General Category Zs shall be treated as SPACE.
NOTE 2 This includes the characters SPACE, EN SPACE, EM SPACE, THREE-PER-EM SPACE, FOUR-PER-EM SPACE, SIX-PER-EM SPACE, PUNCTUATION SPACE, THIN SPACE, HAIR SPACE, MEDIUM MATHEMATICAL SPACE. It excludes CHARACTER TABULATION."

Page 23, in 6.4.6.1

In line 11, replace "0000 005C REVERSE SOLIDUS" by "0000 2216 SET MINUS".

Page 24, in 6.4.6.5

In line 3, replace "0000 3008 LEFT ANGLE BRACKET" by "0000 27E8 MATHEMATICAL LEFT ANGLE BRACKET".

In line 4, replace "0000 3009 RIGHT ANGLE BRACKET" by "0000 27E9 MATHEMATICAL RIGHT ANGLE BRACKET".

Page 83, in A.2.4.3

In line 5, replace "U+300A" by "U+27EA".

In line 6, replace "U+300B" by "U+27EB".

Page 86, in A.2.5.1

In line 11, replace "U+005C" by "U+2216".

Page 87, in A.2.5.5

In line 6, replace "3008" by "27E8".

In line 7, replace "3009" by "27E9".

Page 175, in Bibliography

In line 9, delete "1)", and delete the corresponding footnote ("To be published").

Add the following references.

"[18] The Unicode Consortium, *The Unicode Standard, Version 5.0.0*, defined by: *The Unicode Standard, Version 5.0* (Boston, MA, Addison-Wesley, 2007. ISBN 0-321-48091-0)"

"[19] The Unicode Consortium, *Unicode Standard Annex #15: Unicode Normalization Forms* (http://www.unicode.org/reports/tr15/)"

"[20] The Unicode Consortium, *Unicode Standard Annex #14: Line Breaking Properties* (http://www.unicode.org/reports/tr14/)"

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Defect 13568/002: LaTeX zed environment

Page 88, in A.2.7.1

Replace this clause by "Each formal Z paragraph appears between a pair of `\begin{xxx}` and `\end{xxx}` LaTeX environment commands. Text not appearing between such commands is informal narrative."

Page 89

Insert new clause: "A.2.7.6 Other paragraph mark-up

Other unboxed formal paragraphs (those rendered without an outline) shall be enclosed in a LaTeX `zed` environment.

```
\begin{zed}
...
\end{zed}
```

The mark-up `\begin{zed}` shall be converted to a `ZEDCHAR` character. The mark-up `\end{zed}` shall be converted to an `ENDCHAR` character."

Defect 13568/003: LaTeX theorem environment

Page 89

Insert the following at beginning of the new A.2.7.6.

"Conjecture paragraphs shall be enclosed in a LaTeX `theorem` environment, which takes a single argument containing a name for the conjecture.

```
\begin{theorem}{name}
...
\end{theorem}
```

The mark-up `\begin{theorem}{name}` shall be converted to a `ZEDCHAR` character. The mark-up `\end{theorem}` shall be converted to an `ENDCHAR` character."

Page 184, in Index

Add the following entries.

"LaTeX mark-up environment,
axdef, 88
gendef, 88
schema, 88
theorem, 89
zed, 89"

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Defect 13568/004: Semantic equation for schema universal quantification expression

Page 76, in 15.2.5.13

Replace this semantic relation by

$$
\begin{aligned}
[\![\ \forall\ e_1 \bullet (e_2 \mathbin{⨾} \mathbb{P}[i_1 : \tau_1;\ ...;\ i_n : \tau_n]) \mathbin{⨾} \mathbb{P}\,\tau\ ]\!]^{\mathcal{E}} = \\
\lambda\ M : Model \bullet \\
\{t : [\![\ \tau\ ]\!]^{\mathcal{T}} M \mid \\
\forall\ t_1 : [\![\ e_1\ ]\!]^{\mathcal{E}} M \bullet \{i_1, ..., i_n\} \lhd (t_1 \cup t) \in [\![\ e_2\ ]\!]^{\mathcal{E}}(M \oplus t_1) \\
\bullet\ t\}
\end{aligned}
$$

In the narrative that follows, insert "appropriately restricted" before "union".

Repeat the same changes on page 133, in C.6.2.3.

Defect 13568/005: Range of operator precedences

Page 36, in 8.3

Add "NOTE 5 The range of an operator's `Prec NUMERAL` is not constrained."

Defect 13568/006: Lexis of punctuation characters

Page 19, in 6.2

In line 6, after "`LETTER`" insert "`| PUNCT`".

After line 25, before the definition of `SPECIAL`, insert the following new rule.

```
PUNCT  =  ',' | '; ' | ':' | '.' ;
```

In line 32, in the `SYMBOL` rule, delete "`':' | '; ' | ',' | '.' |` ".

In line 37, in the `SYMBOL` rule, replace "`SPECIAL`" with "`PUNCT` or `SPECIAL`".

Page 20, in 6.3

In lines 5 and 6, replace "`SPECIAL`" with "`PUNCT` or `SPECIAL`".

Page 21, before 6.4.4

Insert "6.4.4 Punctuation characters

Math	**Code position**	**Character name**
,	`0000 002C`	COMMA
;	`0000 003B`	SEMICOLON
:	`0000 003A`	COLON
.	`0000 002E`	FULL STOP"

Renumber subsequent clauses in 6.4.

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Page 22, in former 6.4.5

Delete the rows for COLON, SEMICOLON, COMMA and FULL STOP.

Page 25, in 7.2

Before line 16, in the definition of `WORD`, append the following new production.

```
  |  PUNCT , { PUNCT } , [ '=' ]
```

Page 26, in 7.3

Delete EXAMPLE 3.

Page 28, before 7.4.4

Insert "7.4.4 Punctuation keywords

Spelling Token Token name

:	:	colon
,	,	comma
::=	::=	free equals
.	.	select | dot
;	;	semi[colon]
,,	,,	list arg[ument]"

Renumber the former 7.4.4 and the reference to it from page 30 in the penultimate paragraph of 7.5.

Page 28, in 7.4.3

Delete the rows for colon, comma, free equals, select | dot, semi[colon] and list arg[ument].

Delete EXAMPLE 1.

Index

Add an entry for `PUNCT`.

Defect 13568/007: Newlines in paragraph headers

Page 30, in 7.5

Delete line 11, "All newlines are soft outside of a DeclPart or Predicate.", and delete the note that follows it.

After line 17 (in the AFTER section), add the box tokens "ZED AX SCH GENAX GENSCH".

After line 20 (in the BEFORE section), add the "END" token.

Make the penultimate paragraph be a NOTE, and move it to the end of the clause.

Page 31, in 8.2

In lines 15, 16 and 18, add "[NL] , " before "SchemaText".

Repeat the same change on page 116 in C.4.4.1, page 117 in C.4.5.1, and page 117 in C.4.6.1.

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Page 45, in 12.2.3.1

Insert at beginning "Any NL token is elided.

$$\texttt{SCH}\ i\ \texttt{NL}\ t\ \texttt{END} \implies \texttt{SCH}\ i\ t\ \texttt{END}"$$

Repeat the same change on page 116 in C.4.4.2.

Page 45

Insert new clause 12.2.3.2 "Generic axiomatic description paragraph

Any NL token is elided.

$$\texttt{GENAX}\ [i_1, ..., i_n]\ \texttt{NL}\ t\ \texttt{END} \implies \texttt{GENAX}\ [i_1, ..., i_n]\ t\ \texttt{END}"$$

Renumber subsequent clauses in 12.2.3 and the references to the former 12.2.3.4 from page 167 in D.6.2 and from page 169 in D.6.4.

Repeat insertion of the same text on page 117 as clause C.4.5.2, renumbering subsequent clauses in C.4.5.

Page 45, in former 12.2.3.2

Insert at beginning "Any NL token is elided.

$$\texttt{GENSCH}\ i\ [i_1, ..., i_n]\ \texttt{NL}\ t\ \texttt{END} \implies \texttt{GENSCH}\ i\ [i_1, ..., i_n]\ t\ \texttt{END}"$$

Repeat the same change on page 118 in C.4.6.2.

Page 183, in Index

In the entry for Generic axiomatic description paragraph, add
"syntactic transformation, 45, 117"

Defect 13568/008: Look-ahead in lexer

Page 38, in 8.4

Delete EXAMPLE 3, and replace the following paragraph with the following. "One solution to this problem is to try both parses and accept the one that works. Alternatively, the lexer could return different comma tokens to distinguish the two cases based on looking ahead over following alternating names (including operator names) and commas for a : or == token."

Defect 13568/009: Use of meta-language *decor* operator

Page 7, in 4.2.6

In Table 11, replace both occurrences of "+" by "*", and replace "stroke" by "strokes".

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Defect 13568/010: Operators in generic horizontal definitions

Page 31, in 8.2

In line 21, the syntax of generic horizontal definition, replace "`NAME`" by "`DeclName`".

Defect 13568/011: LaTeX rendering of multiple strokes

Page 82, in A.2.3.3

After the NOTE, insert the following new paragraph. "Mark-up for multiple strokes that results in them being rendered at the same horizontal position is deprecated, since it obfuscates the order in which the strokes appear.

EXAMPLE 3
The deprecated LaTeX mark-up '`x_1''` converts to the Z character sequence '$x \searrow 1 \nwarrow '$' and renders as 'x_1''.
The deprecated LaTeX mark-up '`x'_1`' converts to the Z character sequence '$x' \searrow 1 \nwarrow$' and renders as 'x_1''.
The preferred LaTeX mark-up '`x_1{}''` converts to the Z character sequence '$x \searrow 1 \nwarrow '$' and renders as '$x_1{}'$'.
The preferred LaTeX mark-up '`x'{}_1`' converts to the Z character sequence '$x' \searrow 1 \nwarrow$' and renders as 'x'_1'. "

Defect 13568/012: Informal text

Page 15, in 5.2.2

In line 6, replace "from that mark-up to" by "from the mark-up of the formal text of a specification (eliminating the informal text) to the UCS representation of".

Page 18, in 6.1

At the end of the first paragraph, add the following sentence.

"Only formal Z text is considered here: informal narrative is assumed to have already been eliminated."

Page 79, in A.1

In line 2, replace "from it to the UCS representation" by "from the mark-up of the formal text of a specification (eliminating the informal text) to the UCS representation of sequences of Z characters".

In line 3, after "identity function" insert "on formal text".

Defect 13568/013: Miscellaneous editorial corrections

Page 7, in 4.2.6

Replace "for" by "by" in "Names are needed for this International Standard."

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Page 15, in 5.1

In lines 5-6, replace "it does not show information flows" by "it does not show all information flows".

Page 22, in 6.4.4.4

In line 4, replace the NOTE by "These box characters are merely those used in the Z character representation: there is no intent to require their use in graphical renderings or mark-up of Z specifications."

Page 22, in 6.4.5

Replace heading "Symbol characters except mathematical toolkit characters" by "Symbol characters of the core language".

Page 24, in 7.1

In line 7, replace "stream" with "sequence" twice.

Page 25, in 7.2

In line 6, replace "TOKENSTREAM" with "TOKENSEQUENCE", also replacing the corresponding entry in the Index.

Page 26, in 7.3

In lines 2, 4 and 6, replace "strings" with "sequences".

Page 27, in 7.4.1

In line 2, replace "stream" with "sequence".

In line 5, replace "relevant" with "associated".

Page 29, in 7.4.4

In EXAMPLE 1, line 1, replace "$(\_ + \_)$ operator" with "$(\_ + \_)$ function".

In EXAMPLE 2, line 1, replace "$(\_ (\!| \_ |\!))$ operator" with "$(\_ (\!| \_ |\!))$ function".

In EXAMPLE 3, line 1, replace "(disjoint $\_$) operator" with "(disjoint $\_$) relation".

In EXAMPLE 4, line 1, replace "$(\langle \_ \rangle)$ operator" with "$(\langle , , \rangle)$ function".

Page 31, in 8.1

In line 3, replace "claue" by "clause".

Page 35, in 8.3

Delete NOTE 1, and append to the preceding paragraph the following.

"In an OpName, the names of the operator tokens shall all have the same STROKEs.

EXAMPLE 4 These names are acceptable in Templates and as OpNames.

the $\_$ is $\_$

These names are aceptable as OpNames but not in Templates.

the' $\_$ is' $\_$

These names are unacceptable in Templates and unacceptable as OpNames.

the' $\_$ is $\_$
the $\_$ is' $\_$"

Renumber subsequent example 5 as example 4, and notes 2, 3 and 4 as notes 1, 2 and 3.

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Page 36, in 8.4

In Example 1, replace "can be" by "is", and replace "and the third $'$ is syntactically part of a schema decoration expression, though that will be rejected by the type inference rules as only schemas can be decorated, not bindings" by "as can the third $'$. It would not make sense to treat the third $'$ as a schema decoration, as the type system does not allow decoration of a binding. Syntactically, the third $'$ could be made to be parsed as a schema decoration by adding parentheses, as in $(\theta S' \, ')'$." Also replace "first" by "innermost" and "third" by "outermost".

Page 37, in NOTE 4

In line 1, replace "stream" with "sequence".

Page 50, in 12.2.8

In line 4, replace "$\_$" by "argument placeholder".

After line 6, add "These syntactic transformation rules apply whether the argument placeholders are $\_$ or ,,."

Page 61, in 13.2.6.1

In lines 9 and 10, replace "(for the Instantiation clause to determine that this is a reference to a generic definition)" by "(to indicate that this reference expression should be a generic instantiation expression)".

Replace NOTE 4 by "Reference expressions that should be generic instantiation expressions are transformed by the rule in 13.2.3.3, after the implicit instantiations have been determined via constraints on the new type variables α_1, ..., α_n."

Page 71, in 15.1

At line 3, append "Irrelevant type annotations are omitted for brevity."

In line 4, replace "global variables" by "global names".

Page 76, in 15.2.5.12

Replace the set comprehension by

$\{t : [\![\, \tau \,]\!]^{\mathcal{T}} M \mid \exists \; t_1 : [\![\, e_1 \,]\!]^{\mathcal{E}} M; \; t_2 : [\![\, e_2 \,]\!]^{\mathcal{E}} M \bullet t_1 \cup t_2 = t \bullet t\}$

Repeat the same change on page 137, in C.6.11.3.

Page 82, in A.2.3.4

Replace all (four) occurrences of "bar" by "baa".

Pages 88-89, in A.2.7.2 through A.2.7.5

Replace "is converted" by "shall be converted".

Page 93, in A.3.5.5

In line 1, after "Unboxed formal paragraphs", insert "(those rendered without an outline)".

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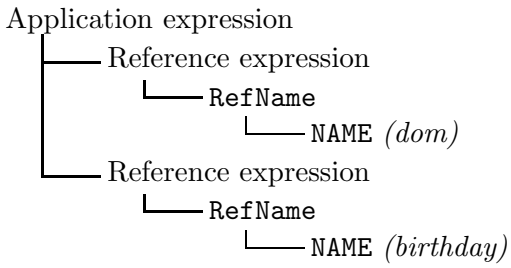
Page 161, in Figure D.1

Replace the Anonymous specification's Schema definition paragraph's SchemaText's Relation predicate's InfixRel's Application expression by the following.



Page 169, in D.7

In lines 3 and 4, add spaces around the ,, notation.

Page 184, in Index

Add to entry "looseness, semantic relations" references to pages 71, 74 and 76.

Add entries for "NAME" referring to pages 24 and 27.

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