

N3781

2013-09-25

Lawrence Crowl ([lawrence@crowl.org](mailto:lawrence@crowl.org))

Richard Smith ([richard@metafoo.co.uk](mailto:richard@metafoo.co.uk))

Jeff Snyder ([jeff@caffeinated.me.uk](mailto:jeff@caffeinated.me.uk))

Daveed Vandevoorde ([daveed@edg.com](mailto:daveed@edg.com))

## Single-Quotation-Mark as a Digit Separator

### Notes

This paper describes wording changes to implement the use of a single quote (') as a digit separator. It is very similar to the wording changes proposed in N3448, but includes some small corrections and an addition to Appendix C.

The changes are against N3690.

### Wording Changes

Amend the token-grammar of 2.10 [lex.ppnumber] as indicated:

```
pp-number:  
  digit  
  . digit  
  pp-number digit  
  pp-number ' digit  
  pp-number ' nondigit  
  pp-number identifier-nondigit  
  pp-number e sign  
  pp-number E sign  
  pp-number .
```

Amend the token-grammar of 2.14.2 [lex.icon] as indicated:

```
decimal-literal:  
  nonzero-digit  
  decimal-literal ' opt digit  
  
octal-literal:  
  0  
  octal-literal ' opt octal-digit
```

(cont'd)

*hexadecimal-literal:*

**0x** *hexadecimal-digit*

**0X** *hexadecimal-digit*

*hexadecimal-literal* ' *opt* *hexadecimal-digit*

*binary-literal:*

**0b** *binary-digit*

**0B** *binary-digit*

*binary-literal* ' *opt* *binary-digit*

Amend 2.14.2 [lex.icon] paragraph 1 as indicated:

- 1 An *integer literal* is a sequence of digits that has no period or exponent part, with optional separating single quotes that are ignored when determining its value. ...  
 [ *Example:* The number twelve can be written **12**, **014**, or **0XC**. The literals **1048576**, **1'048'576**, **0X100000**, **0x10'0000**, and **0'004'000'000** all have the same value. — *end example* ]

Amend the token-grammar of 2.14.4 [lex.fcon] as indicated:

*digit-sequence:*

*digit*

*digit-sequence* ' *opt* *digit*

Amend 2.14.4 [lex.fcon] paragraph 1 as indicated:

- 1 Optional separating single quotes in a *digit-sequence* are ignored when determining its value. A floating literal ... value. [ *Example:* The literals **1.602'176'565e-19** and **1.602176565e-19** have the same value. — *end example* ] Either the ...

Insert a new subsection in C.3 [diff.cpp11]:

### C.3.1 Clause 2: Lexical conventions

[diff.cpp11.lex.ppnumber]

2.10 (\_lex.ppnumber\_)

**Change:** *pp-number* can contain one or more single quotes.

**Rationale:** Necessary to enable single quotes as digit separators.

**Effect on original feature:** Valid C++ 2011 code may fail to compile or may change meaning in this International Standard. For example, the following code is valid both in C++ 2011 and in this International Standard, but the macro invocation produces different outcomes

(cont'd)

because the single quotes delimit a character literal in C++2011, whereas they are digit separators in this International Standard:

```
#define M(x, ...) __VA_ARGS__  
int x[2] = { M(1'2,3'4) };  
    // C++2011: int x[2] = {};  
    // Now:    int x[2] = { 3'4 };
```