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:

\[
\text{pp-number:}
\begin{align*}
\text{digit} \\
\text{. digit} \\
\text{pp-number digit} \\
\text{pp-number \text{' digit}} \\
\text{pp-number \text{' nondigit}} \\
\text{pp-number identifier-nondigit} \\
\text{pp-number e sign} \\
\text{pp-number E sign} \\
\text{pp-number .}
\end{align*}
\]

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

\[
\text{decimal-literal:}
\begin{align*}
\text{nonzero-digit} \\
\text{decimal-literal \text{'opt} digit}
\end{align*}
\]

\[
\text{octal-literal:}
\begin{align*}
\text{0} \\
\text{octal-literal \text{'opt} octal-digit}
\end{align*}
\]
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:

\[ \text{digit-sequence:} \]
\[ \text{digit} \]
\[ \text{digit-sequence}'\text{opt} \text{digit} \]

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 ...

[ Example: The literals 1.602176565e-19 and 1.602'176'565e-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

2.10 (_lex.ppnumber_) [diff.cpp11.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:

```cpp
#define M(x, ...) __VA_ARGS__

int x[2] = { M(1'2,3'4) };

// Now:     int x[2] = { 3'4 };
```