

Section 2.1 C++11

User-Defined Literals

```

static_assert(c0isdig || '\\' == c0 || '.' == c0,
               "Invalid fixed-point digit");
static_assert(!c0isdig || (maxData - (c0 - '0')) / 10 >= rawVal,
               "Fixed-point overflow");

// precision is
// (1) < 0 if a decimal point was not seen,
// (2) 0   if a decimal point was seen but no digits after the decimal point,
// (3) > 0 otherwise, incremented once for each digit after the decimal point.
    static constexpr int nextPrecision = ('\\' == c0    ? precision :
                                          '.' == c0    ?      0 :
                                          precision < 0 ?     -1 :
                                          precision + 1);

// Instantiate this template recursively to consume remaining characters.
using RecurseType = MakeFixedPoint<(c0isdig ? 10 * rawVal + c0 - '0' :
                                     rawVal), nextPrecision, c...>;

public:
    using type = typename RecurseType::type;
    static constexpr type makeValue() { return RecurseType::makeValue(); }
    // Return the computed fixed-point number.
};

```

This specialization consumes one character, `c0`, from the parameter pack. The first **static_assert** checks that `c0` is either a digit, digit separator (`'\\'`), or decimal point (`'.'`). The second **static_assert** checks that the computation is not in danger of overflowing the maximum value of a **long long**. The constant, `nextPrecision`, which will be passed to the recursive instantiation of this template, keeps track of how many digits have been consumed after the decimal point (or `-1` if the decimal point has not yet been consumed). The `RecurseType` alias is the recursive instantiation of this template with the updated raw value (after consuming `c0`), the updated precision, and the input character sequence after having dropped `c0`. Thus, each recursion gets a potentially larger `rawVal`, a potentially larger `precision`, and a shorter list of unconsumed characters. The definitions of `type` and `makeValue` simply defer to the definitions in the recursive instantiation.

Finally, we define the `_fixed` UDL operator template, instantiating `MakeFixedPoint` with an initial `rawVal` of `0`, an initial `precision` of `-1`, and with a `c...` parameter pack consisting of all of the characters in the naked literal:

```

template <char... c>
constexpr typename MakeFixedPoint<0, -1, c...>::type operator""_fixed()
{
    return MakeFixedPoint<0, -1, c...>::makeValue();
}

} // Close namespace literals
} // Close namespace fixedpoint

```