

## Section 3.1 C++11

## noexcept Specifier

whether any part of the **expression** — the function as well any **expressions** used in its **arguments** — might throw. Failing to grasp this subtlety can result in a function being marked **noexcept(false)** even when the **expression** required by the implementation does not throw. Consider a function template `eval1` that takes an **invocable** object `f` of the **template parameter** type `F` and calls it with a string argument, `stringArg`, of type `const std::string&`. We want `eval1` to have the same exception specification as `f::operator()`:

```
#include <string> // std::string

template <typename F>
void eval1(F f, const std::string& stringArg) noexcept(noexcept(f(""))) // Bug
{
    f(stringArg);
}
```

Here, we are making a concerted effort to pass the **exception specification** from `f` through to the **exception specification** of `eval1`. For conciseness, we pass an empty string as a **placeholder** for the string argument in the **expression** given to the **noexcept** operator, reasoning that the **expression** is *unevaluated* and hence can be safely abbreviated. Alas, if the argument to `f` has type `const std::string&`, then passing `""` requires a call to the potentially throwing **converting constructor**, `std::string(const char*)`. Consequently, `noexcept(f(""))` would be **false** because `noexcept(std::string(""))` is **false** regardless of whether the call to `f` is guaranteed not to throw when called with an already constructed `std::string`, such as the object referred to by `stringArg`.

The obvious fix in this case is to use exactly the same **expression** in the **noexcept** specifier that is used in the **return statement**, i.e., `f(stringArg)`. Before we explore this approach, let's consider a couple of alternatives that might be more appealing in the case of more complex **expressions**. The argument to `f` must be a nonthrowing **expression** that can bind to a `const std::string&` without invoking any possibly throwing conversions. A simple fix in this case, therefore, would be to simply switch our placeholder string to an invocation of the default constructor for `std::string`, which is declared **noexcept**:

```
#include <string> // std::string

template <typename F>
void eval2(F f, const std::string& stringArg)
    noexcept(noexcept(f(std::string()))) // OK
{
    f(stringArg);
}
```

This fix, however, does not generalize to the case where `F` is passed an argument that is dependent on a **template parameter** type, perhaps using **perfect forwarding** (see Section 2.1. “Forwarding References” on page 377). Because the type of the argument to `f` is not known until the template is instantiated, it is not known whether it has a **default constructor** nor whether any such **default constructor** is **noexcept**. Rather than place an