

---

**Rule 0.1** *⟨Replace Require with Custom Error⟩*

---

<pre>[...] <b>contract</b> A {   [...]   <b>function</b> f(pds) {     [...]     <b>require</b>(cond, msg);     stmts   }   [...] }</pre>	=	<pre>[...] <b>contract</b> A' {   [...]   <b>error</b> CustomError();   [...]   <b>function</b> f(pds) {     [...]     <b>if</b> (¬cond)       <b>revert</b> CustomError();     stmts   }   [...] }</pre>
--	---	---

**where**

- cond* is a boolean condition being validated;
- msg* is the revert reason string used in the **require** statement;
- CustomError* is a custom error type defined in contract *A'*;
- stmts* represents the sequence of statements following the validation.

**provided**

- The custom error *CustomError* is declared at the contract level in *A'*;
- The condition *cond* is side-effect free (does not modify state);
- The revert behavior is semantically equivalent in both versions.

**Invariant:**

- Let  $s_i$  and  $s'_i$  be the initial state of *A* and *A'*, respectively.
- Let  $s_f$  and  $s'_f$  be the state reached by *A* and *A'*, respectively, after *A.f()* and *A'.f()* are executed from  $s_i$  and  $s'_i$ , respectively.
- Then, the coupling invariant is

$$\forall s_i, s'_i . (s_i = s'_i) \rightarrow (s_f = s'_f)$$

---