

# Requirements For Circuit Breakers Used for Independent Pole Tripping on the New England Transmission System

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## Definition of Independent Pole Tripping

ISO New England uses the definition of independent pole tripping from IEEE Standard Definitions for Power Switchgear, Standard C.37.100-1992. The definition is:

**INDEPENDENT POLE TRIPPING** – The application of multipole circuit breakers in such a manner that a malfunction of one of more poles or associated control circuits will not prevent successful tripping of the remaining poles(s).

### Notes:

1. Circuit breakers used for independent pole tripping must inherently be capable of independent pole opening.
2. Independent pole tripping is applied on ac power systems to enhance system stability by maximizing the probability of clearing at least some phases of a multiple phase fault.

## Independent Pole Tripping Breaker Classification

To be classified as an independent pole tripping (IPT) breaker in New England, a circuit breaker must have the following specific features:

1. The circuit breaker must have no common ties (mechanical, pneumatic, or hydraulic) between poles that make automatic tripping of any pole dependent upon automatic tripping of another pole. A breaker may have common ties between poles for closing operations (“gang closing”) if the independent pole tripping is not compromised. A breaker may have common ties between poles, such as manual tripping devices, and still be considered IPT.
2. Dual trip coils must be provided for each operating mechanism, as required in Section 5.10 of the NPCC Reliability Reference Directory #4, Bulk Power System Protection Criteria, December 01, 2009, which states, “No single trip coil failure shall prevent both independent **protection groups** from performing the intended function. The design of a breaker with two trip coils shall be such that the breaker will operate if both trip coils are energized simultaneously. The correct operation of this design shall be verified by tests.
3. Each pole of the circuit breaker must have at least one and preferably two or more auxiliary switches are furnished. When two auxiliary switches are furnished, they should be driven as independently as possible. When two auxiliary switches are available, contacts from one auxiliary switch should be used in one protection circuit; contacts

from the second auxiliary switch should be used in the other protection circuit used to protect the same element.

Auxiliary contacts from each pole, connected in series or parallel groups, must be used in breaker internal control circuits. The series and parallel contact groups must be applied in such a way that the failure of a single auxiliary switch or auxiliary switch contacts will not result in the failure to trip of more than one pole in response to a protective relay operation. Auxiliary contacts from all three poles of a circuit breaker must be used in all control and protective relay circuits in which the failure of a single auxiliary contact to perform correctly would result in a the inability of any protective relay system to trip in response to a protective relay operation.

4. For circuit breakers which use series pressure switch contacts either to block tripping of to initiate tripping, dual pressure switches, one for each trip circuit, must be supplied. If one or both of the pressure switches utilizes an auxiliary relay, each pressure switch/auxiliary relay combination must receive dc from its respective trip circuit supply.