SHORT CIRCUIT PROTECTION

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800.0 SHORT CIRCUIT PROTECTION

800.1 GENERAL

The National Electrical Code, State, County and Municipal Codes and/or Regulations require that service entrance equipment shall be suitable for the short-circuit current available at its supply terminals.

It is the responsibility of the Customer to install service entrance equipment and protective devices (fuses or circuit breakers) capable of interrupting and withstanding the available fault current.

In cases where multiple service entrance sections are served from one transformer the utility fault current contribution may exceed the values noted. Please consult your Service Representative before ordering or designing your equipment and refer to section 800.5.

The fault current values are based on a bolted phase-to-ground, phase-to-phase or three phase fault, whichever is greater.

Arc Flash hazard calculations should be performed by a Registered Professional Engineer. The dynamic electric utility system grid makes it impractical to provide any further information other than the fault current values noted, in Table 800.2. APS will provide only maximum fault current values at the service entrance section. Customers can obtain additional information in order to calculate arc flash values by surveying APS field conditions (i.e. approximate wire distance obtained via field measurement). Table 800.2 represents worst case scenarios. Transformer sizes could be larger if serving multiple SESs (see Section 800.5). APS can only provide, upon request, transformer impedance ranges. Conductor lengths can be approximated by Customer field survey. An APS construction sketch identifying conductor length, number of conductors per phase and type was provided to the Customer's contractor during the construction phase of the project and may be available. APS can provide typical conductor information upon request. For secondary service customers, primary fault current data, actual transformer impedance nameplate information, and primary coordination information (i.e. upstream primary over-current protective device type, size and setting) will not be provided. For services 600V and larger, contact the local APS representative for assistance.

See Section 1000.2-1 (MEDIUM VOLTAGE METERING AND SERVICE EQUIPMENT) for information, primary fault current and protection scheme data.

Explanation of Short Circuit Transformer Size:

The transformers listed in the short circuit table 800.2 are based upon supplying 80% of the indicated SES size in Amps. This was established as a result of the NEC enforcement by the authority having jurisdiction. The NEC requires continuous and uniform load with an adder of 25% depending upon the type of load or building class. If established building occupant calculate and apply for a permit for any added load the existing and new load will be 80% or less of the SES size.

800.2-1 MAXIMUM SERVICE EQUIPMENT SHORT CIRCUIT CAPABILITIES

SES#	1 PH 120/240 POLE/PAD XFMR		3 PH 240/120V Closed Delta POLE TOP XFMR		3 PH 240/120V Open Delta POLE TOP XFMR		3 PH 240/120V Open Delta PAD XFMR (based upon a 167/75kva transformers)		3 PH 208Y/120V POLE TOP XFMR		3 PH 208Y/120V PAD XFMR		3 PH 480Y/277V POLE TOP XFMR		3 PH 480Y/277V PAD XFMR	
AMPS	**kVA**	**Isc**	**kVA**	**Isc**	**kVA**	**Isc**	**kVA**	**Isc**	**kVA**	**Isc**	**kVA**	**Isc**	**kVA**	**Isc**	**kVA**	**Isc**
100	50	8,890	3-25	9,948	75-75	19,953	167-75	23,971	3-25	8,895	112.5	12,684	75	5,192	112.5	8,688
125	50	8,890	3-25	9,948	75-75	19,953	167-75	23,971	3-25	8,895	112.5	12,684	150	9,613	112.5	8,688
150	50	8,890	3-25	9,948	75-75	19,953	167-75	23,971	3-25	8,895	112.5	12,684	150	9,613	112.5	8,688
200	75	14,318	3-25	10,478	75-75	25,625	167-75	33,705	3-25	10,483	112.5	16,178	150	10,347	150	12,076
***400**	100	20,955	3-50	20,034	75-75	28,369	167-75	39,681	3-50	21,553	150	27,478	300	20,938	300	25,573
600	167	32,755	3-75	28,369	100-75	35,297	167-75	44,187	3-75	33,789	225	39,066	500	31,615	500	25,773
800	167	36,451	3-100	33,208	167-75	44,186	167-75	44,187	**3-100	43,106	300	49,505			750	25,773
1,000									**3-100	45,740	300	53,011			750	25,773
1,200											500	53,011			1,000	25,773
1,600											500	56,194			1,500	32,990
2,000											750	56,194			1,500	33,207
2,500											750	56,194			2,000	44,250
3,000											1,000	56,194			2,000	44,346

*400 Amp, 120/240 V, Single Phase Panels: Second breaker is an APS Requirement and needs to be minimum 22K AIC rated

** Maintenance only, refer to 201.2, Note 4.

Notes:

1. For service equipment designed for underground feed using overhead transformers use the highest fault current between the OH and Pad XFMR values. This provides for proper bracing, if future conversions occur.
2. Please refer to the General Section 800.1 for additional information.
3. Table 800.2 indicates the minimum interrupting requirements for service entrance equipment, and is based on an infinite buss located on the transformer primary and 25 ft. of service conductor sized to serve at least 80% of the service entrance section. **WARNING:** Services less than 25' lateral may have higher fault current values. Check with APS for revised fault current values.
4. Current values are symmetrical amperes of three-phase faults on three-phase transformers and either phase-to-phase or phase-to-neutral, whichever is larger for single-phase transformers.
5. Values do not apply to primary services. Consult with APS, primary fault current value can be 26kA and spot network can be 200kA values.
6. **Arc Flash hazard calculations** should be performed by a Registered Professional Engineer. The dynamic electric utility system grid makes it impractical to provide any further information other than the fault current values noted in Table 800.2. APS will provide only maximum fault current values at the service entrance section. Primary fault current data and coordination information will not be provided, except primary services see section 1000.2-1. Customer's seeking typical secondary transformer impedance values and typical APS secondary conductor configurations can access the APS Arc-Flash guidelines available at www.aps.com/ESRM.
7. The maximum size transformer for new installation is limited to 2000kVA @ 480Y/277V and 1000kVA @ 208Y/120V. For **MAINTENANCE PURPOSES:** a 2,500kVA transformer rated at 480V with 25 feet (of 750 Cu) service length can produce fault current value of 55,219, also this requires 11-4" service conduits.

SES #	1Ph 120/208 Svc. Fed via a 3 Ph 208Y/120V Pad Xfmr		1Ph 120/240 Svc. Fed via 3Ph 240/120V Closed Delta Pole Xfmr		1Ph 120/240 Svc. Fed via 3Ph 240/120V Open Delta Xfmr	
AMPS	kVA	Isc	kVA	Isc	kVA	Isc
100	***1000	17431	3-100	16494	167-75	18122
200	***1000	26521	3-100	22943	167-75	26219
400	***1000	39298	3-100	29185	167-75	34700
600	***1000	48031	3-100	33781	167-75	41395
800	***1000	48031	3-100	34541	167-75	42542

***Transformer sizes may vary; information shown represents typical worst case yielding the largest fault current value. A 500 kVA 208Y/120V, 3Ph, 4W transformer may yield a higher fault current value based on typical average impedance values; however, the largest transformer APS will set could be a 1000 kVA. The total SESs served via a 208Y/120V single transformer shall not exceed 3000 Amps.

800.3 FAULT CURRENT FOR RESIDENTIAL MULTI-FAMILY APARTMENT PROJECTS

APS will design the following minimum criteria as a method to limit fault current for single phase (1Φ) 120/240, residential multi-family apartment projects to 22,000 amps or less:

1. Transformer size does not exceed 100 KVA.

2. Service wire runs will not be less than the following distances:

UA 1/0	-	6 Ft.
UA 4/0	-	12 Ft.
2-UA 4/0	-	27 Ft.
UA 500	-	23 Ft.
2-UA 500	-	46 Ft.

If the transformer size is larger or service length is shorter than shown, refer to Table 800.2 for available fault current.

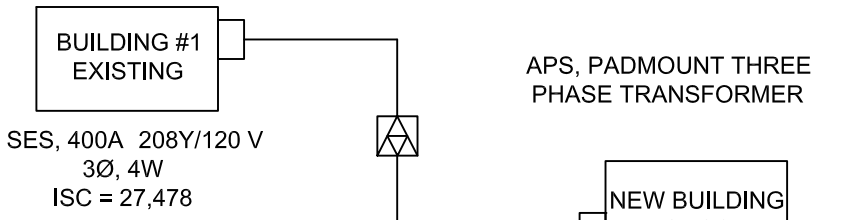
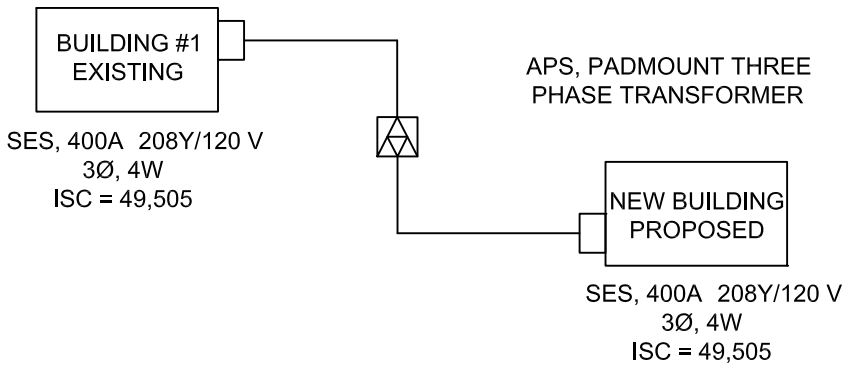
800.4 (RESERVED)

USE THE FOLLOWING TO DETERMINE THE FAULT CURRENT FOR MULTIPLE SERVICES FROM ONE THREE PHASE TRANSFORMER:

ADD ALL OF THE EXISTING AND PROPOSED SERVICE ENTRANCES (SES) AMPERE RATINGS. THEN USE THIS TOTAL SES AMP FIGURE TO FIND THE APPROPRIATE FAULT CURRENT USING, TABLE 800.2. EACH SES BEING SERVED FROM THIS TRANSFORMER NEEDS TO BE BRACED FOR THIS FAULT CURRENT LEVEL. ALSO, ENSURE THE NEW BUILDING PLANS INDICATE ON THE ONE-LINE THE PROPER BRACING OR AIC RATING FOR THE EQUIPMENT.

NOTE: THE MAXIMUM VALUE OF ALL SES'S ADDED TOGETHER CANNOT EXCEED A TOTAL OF 3,000AMPS FOR MULTI-SES'S SERVICE FROM ONE THREE PHASE TRANSFORMER.

FAULT CURRENT FOR MULTIPLE COMMERCIAL SERVICES FROM ONE TRANSFORMER



1. FIRST, TO DETERMINE THE NEW FAULT CURRENT LEVELS FOR ALL THE COMMERCIAL SES SERVED BY THE ONE TRANSFORMER:
   - ADD UP THE SES AMPS:
   - BUILDING #1 = 400 AMPS
     BUILDING #2 = 400 AMPS
     TOTAL OF ALL SES SIZE'S = 800 AMPS
2. FIND FROM THE FAULT CURRENT TABLE 800.2 ISC FOR 800 AMPS = 49,505 AMPS
3. EACH SES SERVED BY THE ONE TRANSFORMER WILL NEED TO BE BRACED FOR 49,505 AMPS OF FAULT CURRENT.
4. VERIFY THE EXISTING SES BRACING.
5. IF THE EXISTING SES IS NOT ADEQUATELY BRACED FOR THE NEW AVAILABLE FAULT CURRENT LEVEL, APS WILL CONSIDER INSTALLING A SEPARATE TRANSFORMER FOR THE NEW BUILDING.