2017 National Electric Code

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Electrically Classified Locations are Excluded from the Self-Certification Program

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Electrically Classified (Hazardous) Locations are those where flammable or combustible materials are present in sufficient concentrations to be ignited by a spark, flame, hot surface, etc.

These are locations where fire or explosion hazards exist due to:

1. Flammable gases,
2. Flammable liquid produced vapors,
3. Combustible liquid produced vapors,
4. Combustible dusts, or
5. Ignitable fibers/flyings.

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Some Common Examples:

- Repair Garages
- Aircraft Hangars
- Spray Application
- Dipping
- Coating
- Battery charging
- Motor Fuel Dispensing
- Bulk Storage Plants
- Sewage Ejector pumps
- MMJ Extraction
- Solvent cleaning processes

Combustible dusts such as:

- wood dust
- aluminum dust
- magnesium dust
- grain dust
- sugar
- flour
- powdered milk

Available Fault Current Calculations & AIC / SCCR Ratings

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- Available Fault Current (AFC) calculations must start at the SES (service equipment) with the AFC values given in the utility company tables.
- AIC (Amps Interrupting Current) ratings must be indicated on the plans for all equipment intended to interrupt fault current.
- SCCR (Short Circuit Current Rating) ratings must be indicated for all equipment intended to withstand fault current until an overcurrent device interrupts the fault.

Load Calculations
(missing, not per code)

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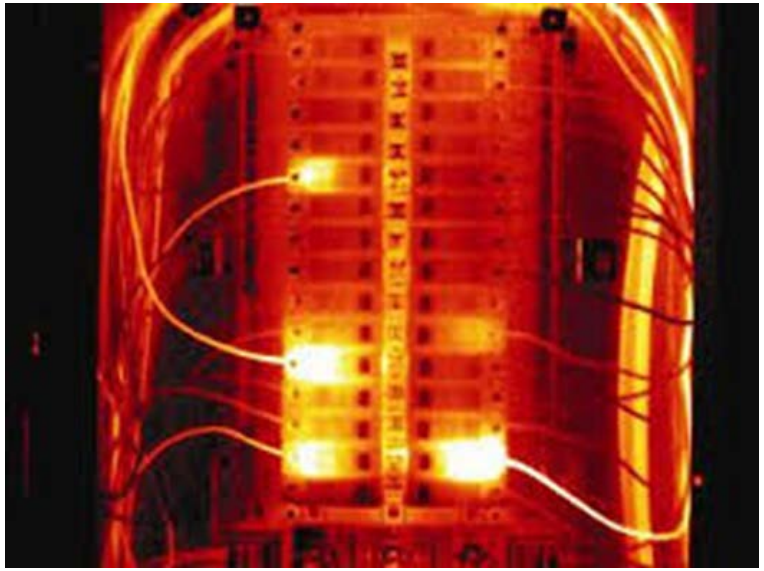
- Load calculations are required for all electrical distribution equipment, up to and including the SES, affected by the loads associated with the project
- Load calculations, including any demand factors applied, must be performed as permitted in NEC Article 220



Grounding and Bonding (missing, improperly sized)

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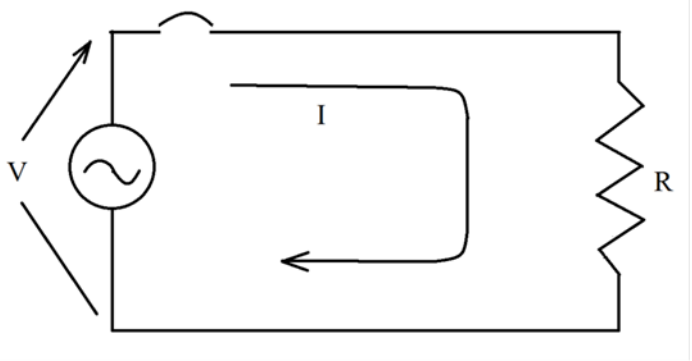
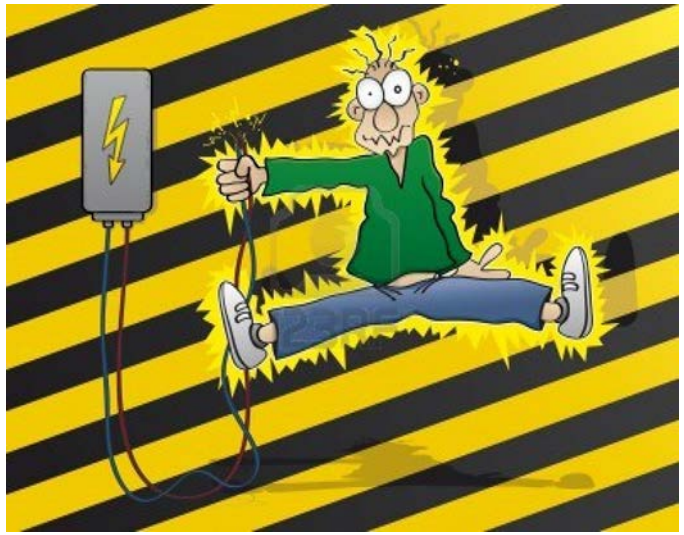
- Equipment grounding conductors must be sized based on the upstream overcurrent device
- Grounding electrode conductors, main/system bonding jumpers & supply side bonding jumpers must be sized on the derived phase conductor sizes
- Grounding details are required to be shown on the plans





Conductor & Raceway Sizing

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- Conductors must be sized to carry the load after any ampacity correction due to temperature or number of current carrying conductors has been applied
- Conductors must be protected by the overcurrent device (circuit breaker or fuse)
- Raceways must be sized based on the phase, neutral and ground conductor sizes and quantities within

Oil Insulated Transformer Location

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- Building must be protected from a fire in oil-insulated transformers
- Space separate based on construction type is typical method
- If transformers need to be located closer than 25 feet from the building, design needs to address building protection
- See outdoor oil-insulated transformer interpretation and address on plans

City of Phoenix
PLANNING & DEVELOPMENT DEPARTMENT

Transformers, Outdoor Oil Insulated
Interpretation

Issue Date	January 2009; Revised January 2019
Code/Section	2017 NEC 450.27
Approved:	Technical Review Team
Developed By:	Rob Runge
References:	Factory Mutual Global Property Loss Prevention Data Sheet 5-4 2017 NEC Article 450.27, 2018 IBC, IEEE 979

Issue:

NEC 450.27 states: "Combustible material, combustible buildings, and parts of buildings, fire escapes, and door and window openings shall be safeguarded from fires originating in oil-insulated transformers installed on roofs, attached to or adjacent to a building or combustible material.

In cases where the transformer installation presents a fire hazard, one or more of the following safeguards shall be applied according to the degree of hazard involved: (1) Space separations, (2) Fire-resistant barriers, (3) Automatic fire suppression systems, (4) Enclosures that confine the oil of a ruptured transformer tank …"

Questions arise as to how to consistently enforce this code section. How close can an oil-insulated transformer be to a building before it is considered a hazard?

Interpretation:

Since this code section is not prescriptive, the judgment of the design professional is intended to be relied upon to determine the hazard involved as well as the required safeguards necessary for the project specific case. For code enforcement purposes, sufficient justification must be presented to show that the specific hazards have been evaluated and safeguarded against.

Note: This guideline is intended to apply to all Oil-Insulated Transformers installed outdoors, including utility owned and/or customer owned transformers. The following methods are considered acceptable justification:

1. Use of a widely accepted, nationally recognized standard, (acceptable to the AHJ), which gives specific separation distances, with respect to construction type, and containment requirements. A commonly used standard of this type is the FM Global Property Loss Prevention Data Sheet 5-4 for transformers. For example: FM gives minimum horizontal and vertical separation distances based on type and quantity of oil and type of construction. Other similar standards, such as IEEE 979, may be utilized if found acceptable to the AHJ.

For more information or for a copy of this publication in an alternate format, contact Planning & Development at (602) 262-7811 voice or TTY use 7-1-1.

2. A fire hazard study, performed by a professional registrant in the State of Arizona who is competent to determine the hazards involved with a fire involving oil-insulated transformers in proximity to combustibles. The fire hazard study method is required to be submitted as a Code Modification per IBC 104.11. Equivalence, in accordance with nationally recognized standards, must be shown based on the hazards, materials and fire ratings of the building construction.

Consideration must be given to building construction type/fire-resistive rating, wall and roof openings within required separation distances, proximity to means of egress doors, fire resistant barriers, etc.

- Ideally, space separation (as described in the FM Data Sheet) would be employed as the safeguarding means with design of the adjacent building conforming to the construction ratings indicated. If these distances cannot be attained, additional safeguarding means must be employed such as fire resistant barriers and/or fire suppression systems. As interpreted by FM, openings such as doors and windows located in the wall that is adjacent to the oil-insulated transformer will be required to maintain the same construction rating required for the wall.
- Typically, containment would be required unless the finished grade slopes away from the building where the transformer is located.
- Elements of the means of egress such as exit doors, exit courts, exterior stairs, etc. shall be a minimum of 10' from the oil-insulated transformer (based on IBC Sections 1019.4 and 1026.5).

Unless other means are justified, as described in the above methods, the following minimum space separation distances will be used to verify compliance with NEC 450.27:

For Three-Phase Transformers:

	Provide rating to 25' vertical height Minimum Horizontal Distance to Building		
Construction type	2-hour	Non-Combustible	Combustible
Less than 500 gallons	5'	15'	25'

For Single-Phase Transformers:
Less than 100 gallons, 10' minimum horizontal distance to combustible construction

Questions?

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