

ARTICLE 511

COMMERCIAL GARAGES, REPAIR, AND STORAGE

Introduction to Article 511—Commercial Garages, Repair, and Storage

Article 511 covers locations used for the service and repair of vehicles that use volatile flammable liquids or flammable gases for fuel. If there's any fuel dispensing done in the building, then the requirements of Article 514 also apply. As long as there's no fuel dispensing taking place, the requirements are fairly straightforward.

First of all, it's essential to understand whether the facility is a major repair or minor repair garage. Pay careful attention to these definitions as you study this Article. The next factor that makes a difference in the classification of a location is the presence or absence of a below-floor pit. Finally, mechanical ventilation is critical and can change the classification of a location. Read this material carefully, review the illustrations, and you'll find that the Article 511 requirements aren't that difficult.

511.1 Scope

Article 511 applies to areas used for the service and repair operations of self-propelled vehicles including passenger automobiles, buses, trucks, tractors, and so on, in which volatile flammable liquids or flammable gases are used for fuel or power. **Figure 511–1**

Author's Comment:

- Installations within the scope of Article 511 include automobile service/repair centers, service/repair garages for commercial vehicles such as trucks and tractors, service/repair garages for fleet vehicles such as cars, buses, and trucks, and shops that service motorcycles and all-terrain vehicles (ATVs).
- This article doesn't apply to garages for diesel fueled or electric vehicle service garages.

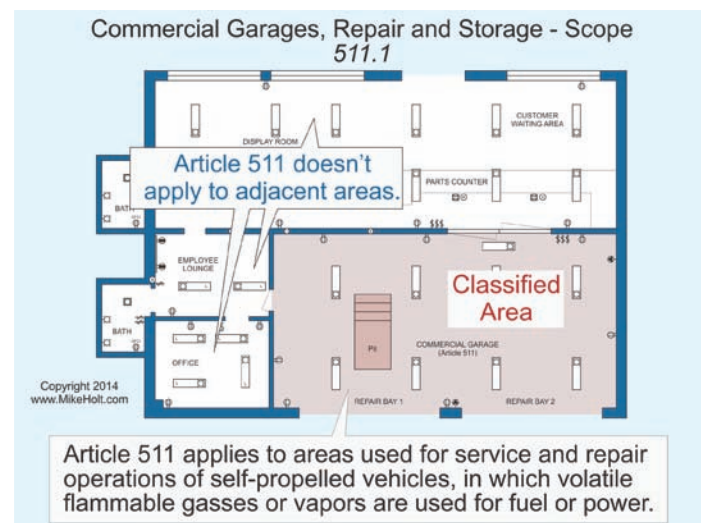


Figure 511–1

511.2 Definitions

Major Repair Garage. A building or portions of a building where engine overhauls, painting, body and fender work, and repairs that require draining of the motor vehicle fuel tank are performed, including floor space used for offices, parking, or showrooms.

Minor Repair Garage. A building or portions of a building used for lubrication, inspection, engine tune-ups, replacement of parts, fluid changes (for example, oil, antifreeze, transmission fluid, brake fluid, air-conditioning refrigerants, and so forth), brake system repairs, tire rotation, and similar routine maintenance work, including floor space used for offices, parking, or showrooms.

511.3 Classification of Hazardous Areas

(A) Parking Garages. Parking or storage garages aren't required to be classified.

(B) Repair Garages, With Dispensing. Major and minor repair garages that dispense motor fuels must have the dispensing functions classified in accordance with Table 514.3(B)(1).

(C) Major Repair Garages. If gasoline, or gaseous fuels, such as natural gas, hydrogen, or LPG, won't be dispensed, but repair activities that involve the transfer of such fluids or gases are performed, the classification rules in (1), (2), and (3) apply.

(1) Floor Areas.

(a) Ventilation Provided. The floor area is unclassified if there's mechanical ventilation providing a minimum of four air changes per hour for each square foot of floor area. [Figure 511-2](#)

(b) Ventilation Not Provided. The entire floor area is classified as Class I, Division 2 up to 18 in. above the floor. [Figure 511-3](#)

(2) Ceiling Areas. If vehicles fueled with natural gas or hydrogen are repaired or stored, the area within 18 in. of the ceiling is considered for classification in accordance with (a) and (b).

(a) Ventilation Provided. The ceiling area is unclassified if ventilation is provided from not more than 18 in. from the highest point in the ceiling to exhaust the ceiling area at a rate of at least 1 cfm/sq ft at all times that the building is occupied, or when vehicles using lighter-than-air gaseous fuels are parked below this area.

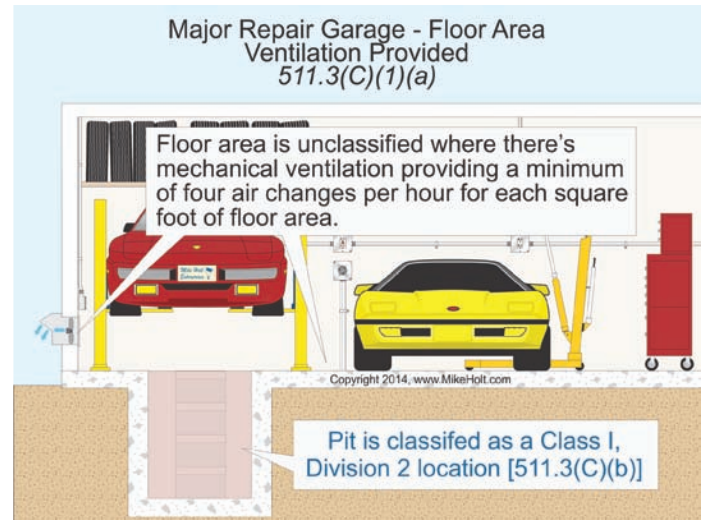


Figure 511-2

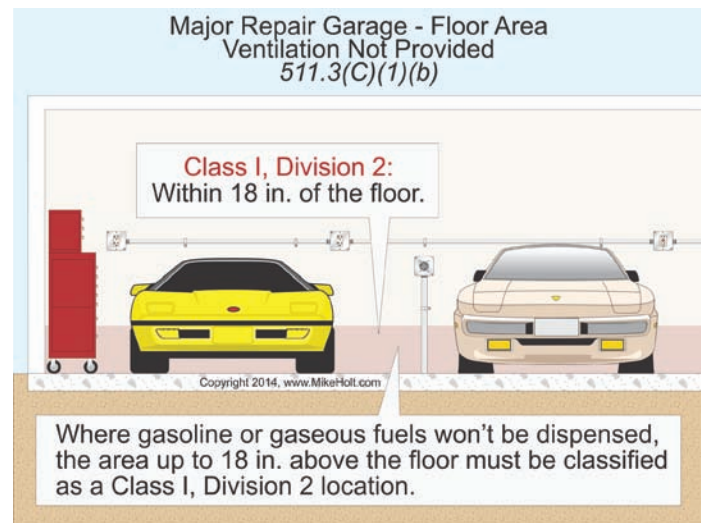


Figure 511-3

(b) Ventilation Not Provided. The ceiling area is classified as Class I, Division 2. [Figure 511-4](#)

(3) Pit Areas in Lubrication or Service Room. The pit area is classified as provided in (a) or (b). [Figure 511-5](#)

(a) Ventilation Provided. The pit area is classified as Class I, Division 2 if there's mechanical ventilation providing a minimum of six air changes per hour.

(b) Ventilation Not Provided. The pit area is classified as Class I, Division 1 up to the floor level.

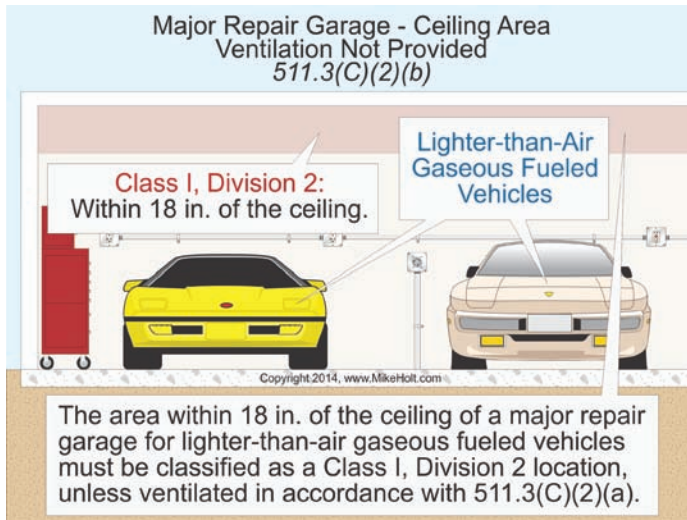


Figure 511-4

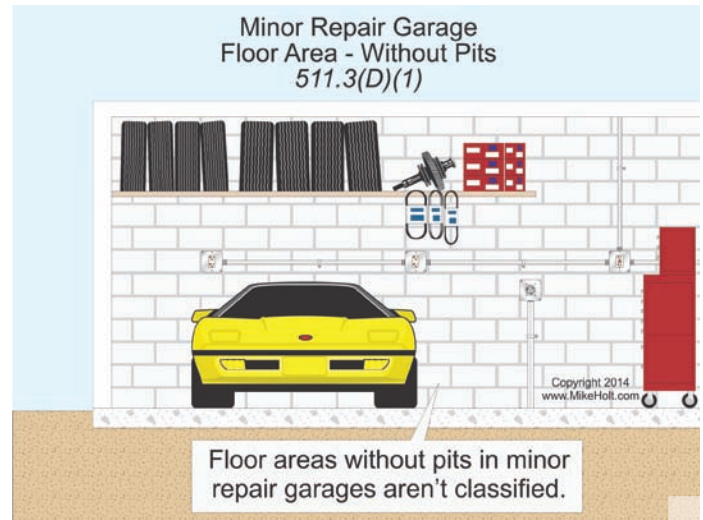


Figure 511-6

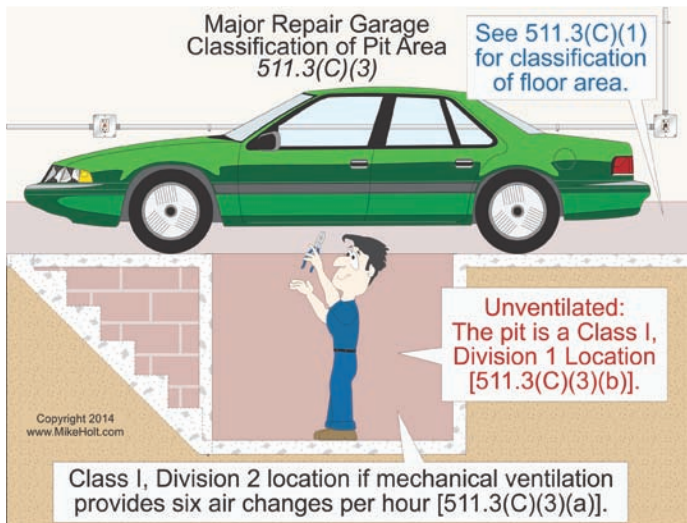


Figure 511-5

(D) Minor Repair Garages. If flammable liquids won't be dispensed or transferred, the classification rules of (D)(1), (D)(2), and (D)(3) apply to the lubrication and service rooms.

(1) Floor Areas. Floor areas are unclassified, except pit areas are classified according to (a) or (b). **Figure 511-6**

(a) Ventilation Provided. The pit area can be unclassified if there's mechanical ventilation providing a minimum of four air changes per hour.

(b) Ventilation Not Provided. The pit area is classified as Class I, Division 2 up to a level of 18 in. above the floor level and extending out 3 ft. **Figure 511-7**

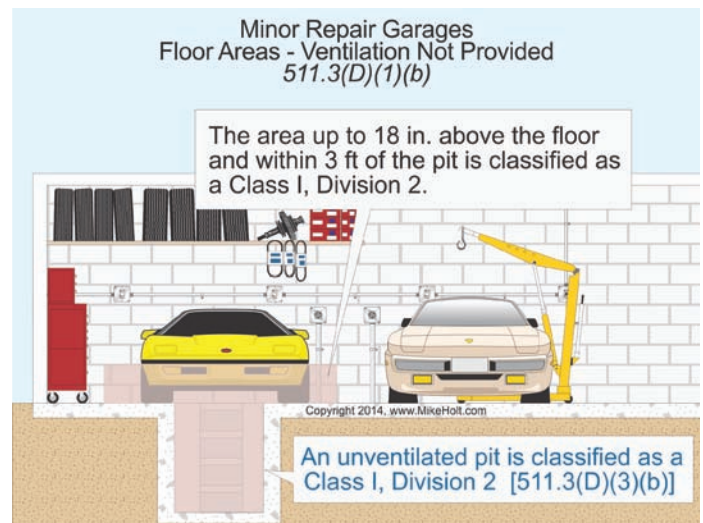


Figure 511-7

(2) Ceiling Areas. The ceiling area is unclassified if natural gas or hydrogen won't be transferred. **Figure 511-8**

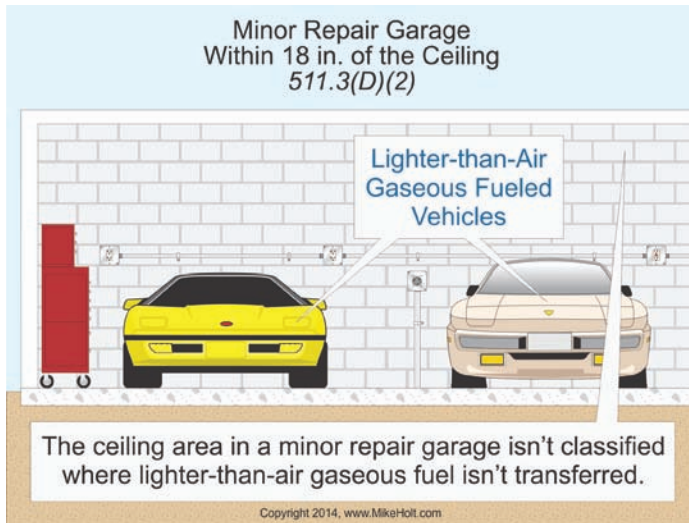


Figure 511-8

(b) Ventilation Not Provided. The pit area is classified as Class I, Division 2 up to the floor level. **Figure 511-10**

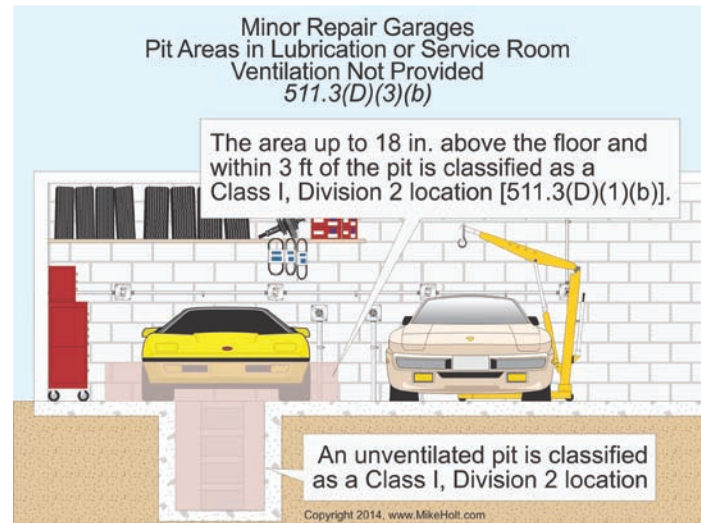


Figure 511-10

(3) Pit Areas in Lubrication or Service Room. Pit areas must be classified according to (a) or (b).

(a) Ventilation Provided. The pit area is unclassified if there's a minimum of 1 cfm/sq ft of the floor area at all times that the building is occupied or when vehicles are parked in or over this area. **Figure 511-9**

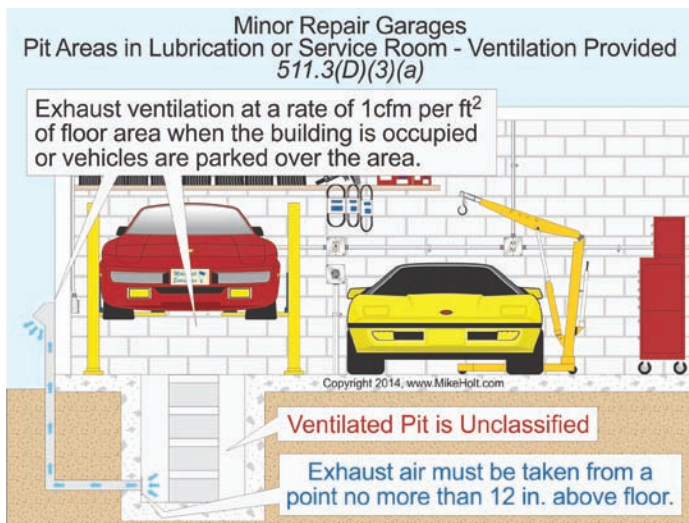


Figure 511-9

(E) Modifications to Classification.

(1) Classification of Adjacent Areas. Areas adjacent to classified locations aren't classified if mechanically ventilated at a rate of four or more air changes per hour, or when walls or partitions effectively cut off the adjacent area. **Figure 511-11**

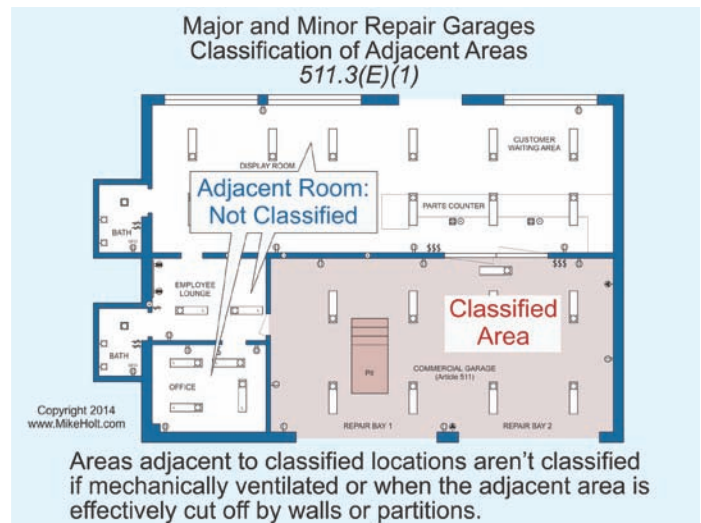


Figure 511-11

(2) Alcohol-Based Windshield Washer Fluid. Areas used for the storage, handling, or dispensing into motor vehicles of alcohol-based windshield washer fluid in repair garages are unclassified unless otherwise classified by a provision of 511.3.

Author's Comment:

- Windshield washer fluid isn't flammable.

511.4 Wiring and Equipment in Hazardous (Classified) Locations

(A) Wiring Located in Class I Locations. Wiring within a Class I location must be installed in accordance with Article 501. [Figure 511-12](#)

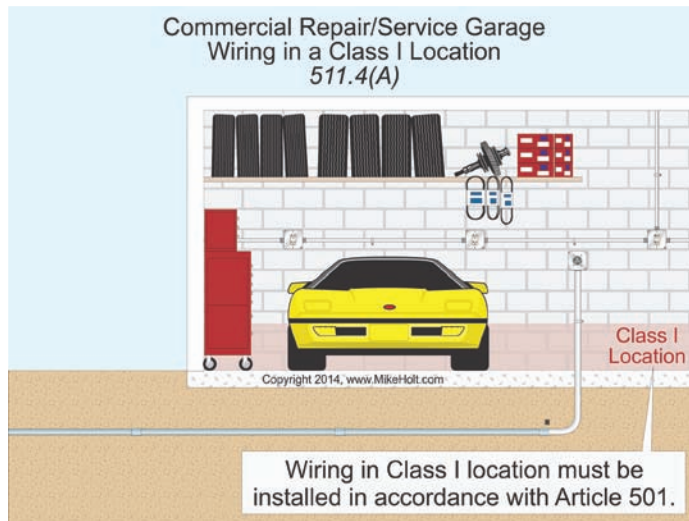


Figure 511-12

(B) Equipment Located in Class I Locations. Equipment within a Class I location must be installed in accordance with Article 501.

(1) Fuel-Dispensing Units. The installation of fuel-dispensing units located within buildings must comply with Article 514.

(2) Portable Lighting Equipment. The lamp and cord of portable lighting equipment must be supported or arranged in such a manner that it can't be used in a hazardous (classified) location [511.3(B)], or it must be identified for a Class I, Division 1 location [501.130(B)].

511.7 Wiring and Equipment Above Hazardous (Classified) Locations

(A) Wiring in Spaces Above Class I Locations.

(1) Fixed Wiring Methods. Fixed wiring above a Class I hazardous (classified) location must be in raceways, Types AC, MC, or MI cable, manufactured wiring systems, PLTC cable in accordance with Article 725, or Type TC or Type ITC cable in accordance with Article 727.

[Figure 511-13](#)

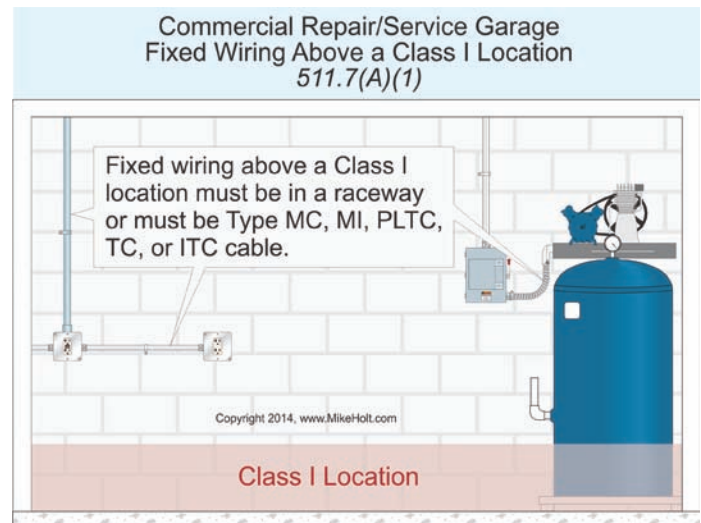


Figure 511-13

(2) Pendant Cords. Pendant cords above a Class I hazardous (classified) location must be suitable for the type of service and listed for hard usage in accordance with Table 400.4.

(B) Equipment Above Class I Locations.

(1) Fixed Electrical Equipment.

(a) Arcing Equipment. Equipment with make-and-break contacts installed less than 12 ft above the floor level (excluding receptacles, lamps, and lampholders) must be of the totally enclosed type or constructed to prevent sparks or hot metal particles from escaping.

(b) Fixed Lighting. Lampholders and lamps for fixed lighting over travel lanes or where exposed to physical damage must be located not less than 12 ft above floor level, unless the luminaires are of the totally enclosed type or constructed to prevent sparks or hot metal particles from escaping. [Figure 511-14](#)

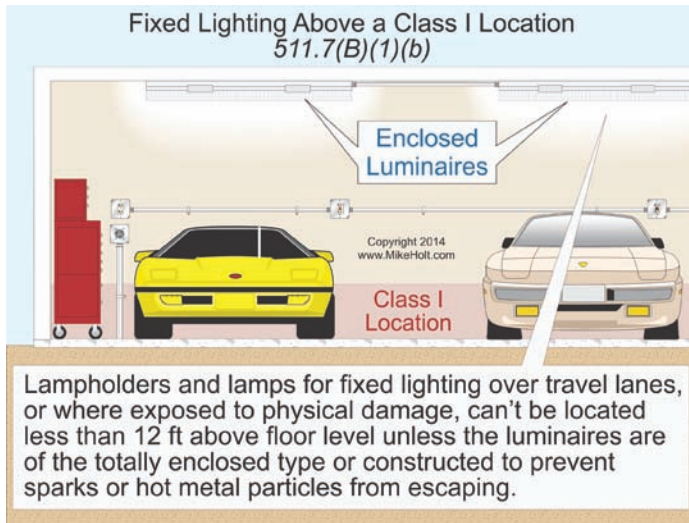


Figure 511-14

511.9 Seals

Raceway, cable, and boundary seals must be installed in accordance with 501.15, and apply to horizontal as well as vertical boundaries of the defined Class I locations.

Author's Comment:

- If the Class I, Division 1 boundary is beneath the ground, the sealing fitting can be installed after the raceway leaves the ground. However, there must not be any unions, couplings, boxes, or fittings (except explosionproof reducing bushings) between the seal fitting and the point where the raceway leaves the earth [501.15(A)(4) Ex 2]. [Figure 511-15](#)

511.10 Special Equipment

(A) Battery Charging Equipment. Battery chargers and batteries being charged must not be located within an area classified in accordance with 511.3(B).

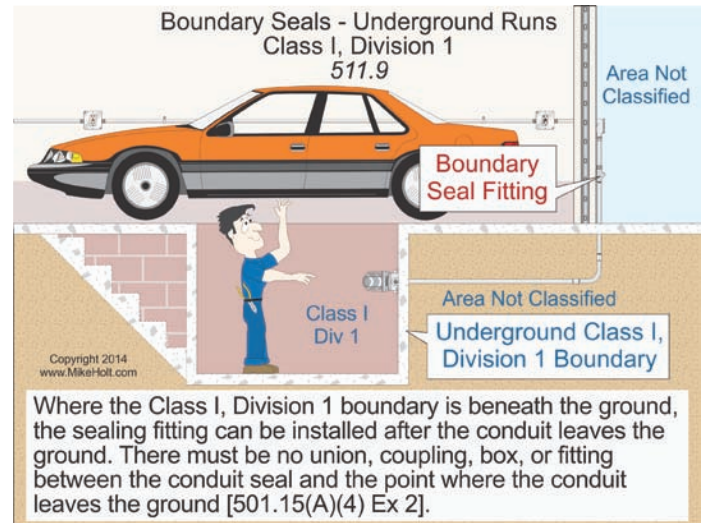


Figure 511-15

511.12 GFCI-Protected Receptacles

GFCI protection is required for 15A and 20A, 125V receptacles installed in service and repair areas where equipment such as electrical automotive diagnostic equipment, electric hand tools, portable lighting devices, and so on are to be used. [Figure 511-16](#)

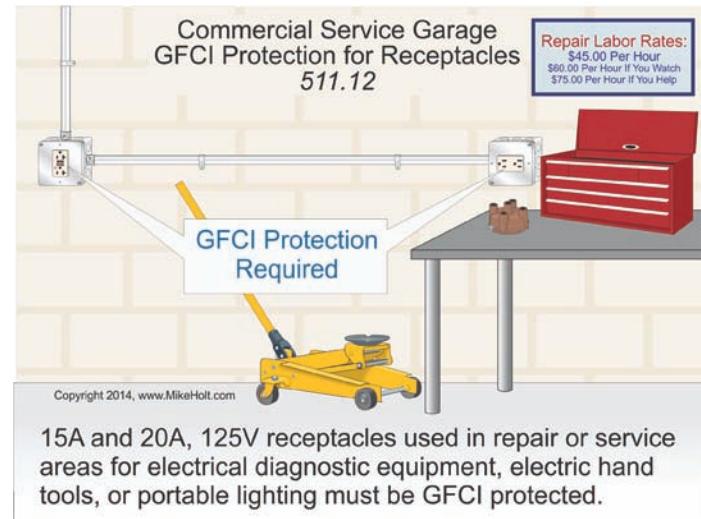


Figure 511-16

Author's Comment:

- Although this rule only applies to receptacles for equipment like hand tools, diagnostic equipment, and portable lighting, 210.8(B)(8) requires all of the 125V, 15A or 20A receptacles in a nondwelling unit garage to be GFCI protected. So which rule applies? According to 90.3, Chapters 5 through 7 supplement and modify the general rules of Chapters 1 through 4. With that in mind, this rule is more specific than the rule in 210.8(B)(8) and is therefore modifying that general rule. A garage outside the scope of this article (diesel fuel or electric vehicles only) would have stricter requirements despite having fewer hazards! The *Code* is always a work in progress, and mistakes are bound to be made. Perhaps this will be fixed in the 2017 edition.
- See the definition of "Ground-Fault Circuit Interrupter" in Article 100.