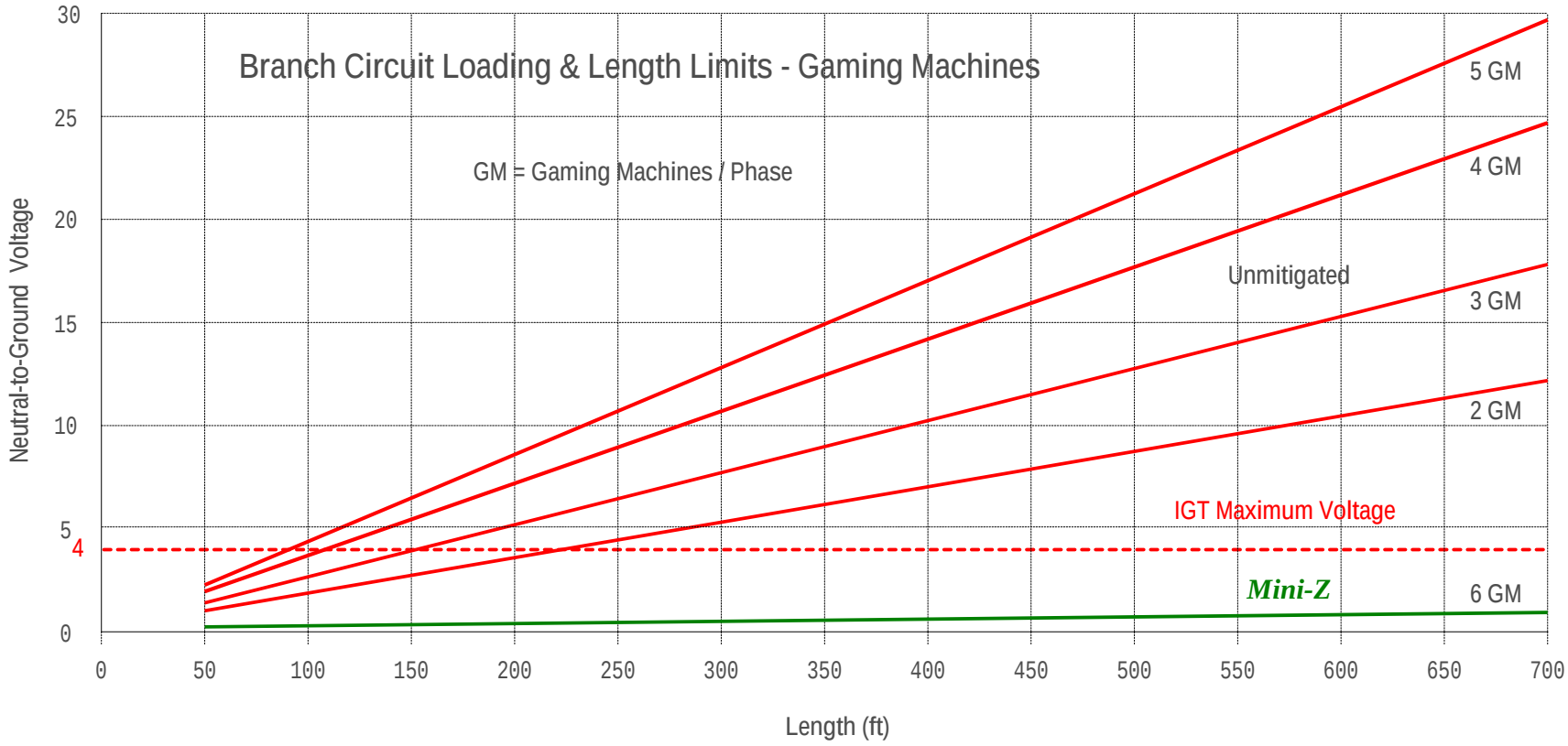

Neutral-to-Ground Voltage vs. Branch Circuit Loading and Length for Typical Non-Linear Electronic Gaming Machine Loads

Notes:

1) International Gaming Technologies (IGT) requires <4V neutral-to-ground at gaming machines (with all machines on-line), in order to authorize use and provide a warranty.

2) Since the neutral-to-ground voltages shown in the graph are approximately zero at the line-end of the branch circuits (the distribution panel), the graph assumes that the distribution system's neutral conductor is grounded within a few feet of the panel. If the panel is remote from the neutral's grounding point (distribution transformer), approximately 1 volt / 100 feet of neutral-to-ground voltage will be generated by the feeder circuit, regardless of the conductor size. This can be factored into the graph by subtracting this voltage from the 'IGT Maximum' (i.e. with 50' of feeder circuit between the distribution transformer, the grounding point, and the distribution panel, the 4 volt IGT limit must be reduced to a 3.5 volt limit).

3) Where feeder circuit length imposes an unreasonable reduction in branch circuit length and/or loading, an I_0Filter™ (zero-sequence harmonic filter) may be applied at the distribution panel that supplies the branch circuits.

4) Where feeder circuit and/or branch circuit lengths impose an unreasonable reduction in branch circuit length and/or loading, a Mini-Z®(zero-sequence harmonic filter) may be applied at the load-end of the three-phase, four-wire 'shared neutral' or three-phase, six-wire branch circuits (i.e. at the branch circuit's 'home run' junction box).

5) The branch circuits considered in this graph are three-phase, four-wire 'shared neutral' circuits. If the branch circuits are configured with a separate neutral conductor for each phase conductor, zero sequence neutral currents will be reduced by approximately 66%. However, neutral current will now include the fundamental and all positive- and negative- sequence harmonic currents. The reduction of neutral-to-ground voltages is marginal. However, circuits with separate neutral conductors produce twice the 'voltage drop'. All issues considered, 'shared neutral' circuits are preferred.