

Submitted by:  
Sally Moss  
District 6 Supervisor

May 6, 2015

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## **Multi-Modal Paths Safety - Part 2**

I am attaching copies of emails between District Counsel and myself along with attachments further explaining one of the main reasons Golf Carts are traveling at speeds faster than what they are designed for on our Multi-Modal Paths and Roads in The Villages. We were informed at the Multi-Modal Path Discussion Meeting on May 5th that our Multi-Modal Paths were designed for a speed from 18 to no more than 20 mph for safety reasons.

The definitions of a Golf Cart and a LSV (Low Speed Vehicle) according to Florida Statutes Chapter 320 states a Golf Cart is not capable of exceeding 20 mph. A LSV top speed is greater than 20 mph but not greater than 25 mph. (See attachment)

Also attached is a portion of Chapter 316 of the Florida Statutes defining the operations and necessary equipment of a Low Speed Vehicle.

As shown in attachments from two websites are ways to increase the speed of a golf cart. The number one way to increase the speed of a golf cart is to install larger tires. It seems that all Yamaha Gas Golf Carts sold in The Villages have had their 8" tires, which are factory installed, replaced with 10" tires. Other Golf Carts have also had their tires replaced from the Factory installed 8" tires to 10" tires and sometimes 12" tires. Here lies the culprit .....

The Gear Ratio and Braking System remains the same as installed at the factory, but the tires have been changed. This not only increases the speed of the Carts and changes its center of gravity, it also changes the vehicle from a "Golf Cart" to a "Low Speed Vehicle" according to the definitions for the Florida Statutes.

According to Digital Overdrive Systems, a speed calculator easily shows how just changing the tire size increases the speed of a golf cart. Attached is a photo of calculations based on a Golf Cart with 8" tires, maximum speed of 19.5 mph showing the gear ratio of 364.3. By changing to 10" tires, the speed increases by 13% and changing to 12" tires, the speed increases by 45%!

This calculation clearly shows the dangerous situation that develops by changing the size of the tires on a Golf Cart. The Villages Resident may think the increase of tire size is for looks only and may not realize that the speed increases and the safety of his cart has been jeopardized.

The Districts may not have the power to enforce the speed limit on the Multi-Modal Paths, but if we can regulate the 'equipment' that is used on our Multi-Modal Paths, regulating the size of the tires used on the Multi-Modal Paths may fall under this purview. Another way of saying this would be that 'Low Speed Vehicles' are not allowed on the Multi-Modal Paths .... Remember, if

a Golf Cart exceeds 20 mph, it is not longer a Golf Cart but a Low Speed Vehicle and this can only be obtained by changing the tire size, changing the gear ratio or changing the motor.

On the County Roadways, there should be more enforcement of speeding if a 'Golf Cart' is traveling more than 20 mph. On our Multi-Modal Paths, it seems that our only way to enforce the speed limit is by regulating the size of the tires or equipment allowed on the Multi-Modal Path.

Safety on our Multi-Modal Paths has to remain our number one priority. Golf Courses have regulated the size of tires and weight of vehicles allowed on their property for safety and damage control .... We should do the same.

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**320.01 Definitions, general.**—As used in the Florida Statutes, except as otherwise provided, the term:

(22) “Golf cart” means a motor vehicle that is designed and manufactured for operation on a golf course for sporting or recreational purposes and that is not capable of exceeding speeds of 20 miles per hour.

41) “Low-speed vehicle” means any four-wheeled vehicle whose top speed is greater than 20 miles per hour but not greater than 25 miles per hour, including, but not limited to, neighborhood electric vehicles. Low-speed vehicles must comply with the safety standards in 49 C.F.R. s. 571.500 and s. [316.2122](#).

**316.2122 Operation of a low-speed vehicle or mini truck on certain roadways.**—The operation of a low-speed vehicle as defined in s. [320.01](#) or a mini truck as defined in s. [320.01](#) on any road is authorized with the following restrictions:

(1) A low-speed vehicle or mini truck may be operated only on streets where the posted speed limit is 35 miles per hour or less. This does not prohibit a low-speed vehicle or mini truck from crossing a road or street at an intersection where the road or street has a posted speed limit of more than 35 miles per hour.

(2) A low-speed vehicle must be equipped with headlamps, stop lamps, turn signal lamps, taillamps, reflex reflectors, parking brakes, rearview mirrors, windshields, seat belts, and vehicle identification numbers.

(3) A low-speed vehicle or mini truck must be registered and insured in accordance with s. [320.02](#) and titled pursuant to chapter 319.

(4) Any person operating a low-speed vehicle or mini truck must have in his or her possession a valid driver license.

(5) A county or municipality may prohibit the operation of low-speed vehicles or mini trucks on any road under its jurisdiction if the governing body of the county or municipality determines that such prohibition is necessary in the interest of safety.

(6) The Department of Transportation may prohibit the operation of low-speed vehicles or mini trucks on any road under its jurisdiction if it determines that such prohibition is necessary in the interest of safety.



## Free Speed Calculators

Calculating the speed after installing bigger tires on your Club Car (or anything else) is easy if you have a few pieces of key data. Say you have a cart that goes 13 MPH and you want to know how fast it will go using a larger diameter tire. Enter your known speed with the tire diameter first. That will tell you the axle RPM. Use the axle RPM in the next box along with the proposed tire diameter and you will get the new speed, or with desired speed find the tire diameter needed. Remember though, these are "ideal" calculations. Going to too tall of a tire or high of a gear ratio, will affect your torque (acceleration ability) and some motors may not be able to supply enough torque to achieve the calculated speed.

Use this calculator to predict Tire Height, MPH or Axle RPM. Be sure to retype the correct Axle speed to get an accurate comparison in the second or third row. Mouse click on the yellow for the result.

8"	Tire Height	MPH	Axle RPM
	18	19.5	364.3
10"	Tire Height	MPH	Axle RPM
	20	21.7	364.3
12"	Tire Height	MPH	Axle RPM
	26.0	28.2	364.3

13% increase  
of Speed

45% increase  
of Speed

Source: DigitalOverDriveSystems.com



If you have just a standard cart and use it on basically flat ground, you have a few more options:



**Taller Tires** - Increasing the diameter of the drive tires increases the distance they will roll for each revolution of the axle, thus increasing the speed your cart will go. You first need to know how fast you can go with the standard 18.5 inch tall tires. Most portable GPS units can be used as a speedometer to find that. If you don't want to crunch the math, there are several free online calculators to help you determine how much speed you will gain with the new taller tires, based on their size. See below for our free calculator tools which can be used to find the various relationships between speeds and diameters. Although increasing the tire size will increase your speed, the torque will suffer somewhat. That means you may have to leave your mother-in-law home! Tire size is also limited by the wheel opening. Most large tires require the cart be "lifted" which may not always be desirable and can be costly and the speed gain is relatively small (a couple of mph increase)

**High Speed Gear Set** - In the differential housing or rear axle reside a gear reduction system. The motor has a small gear that drives the axle's larger gear. Typically the motor rotates about 12 times for every one revolution of the axle. This is how the relatively low power motor gains a mechanical advantage to propel the cart. Like the gears on a bicycle, it is easier to pedal when the drive sprocket is on the small diameter one. To go faster, you need to advance to the larger drive sprocket. The bike goes faster, but it is harder to pedal. In a golf cart speed gear set, the ratio is similarly changed by increasing the drive gear diameter, and the cart runs faster. Like the bicycle though, the motor has to provide more force "torque" to the axle. This type of modification is great for speed but will sacrifice low speed torque (your mother-in-law again) and is not recommended for hilly areas. Installation can be messy due to the gear lubricant and requires some skill and knowhow.

**Increase Motor RPM** - Increasing the Revolutions per Minute or RPM's of the motor is one of the most popular techniques for increasing a golf cart's speed. This type of modification does not sacrifice low end torque like the two previously mentioned ones. Golf cart electric motors are designed to operate at a certain maximum RPM (typically around 3600 RPM) at either 36 volts or 48 volts and provide a good balance between speed and torque of the end product. Aftermarket motors have their field and armature windings redesigned such that they achieve greater RPM than the stock ones. If the motor spins at twice the original RPM, a 12 mph cart could reach as much as 24mph. The motors are safe and reliable but can require the addition of a high current Controller to operate at full potential. Aftermarket "speed motors" are available from a number of vendors but can be rather expensive due to all the copper wire in the windings. There is one vendor that provides a really simple and easy upgrade for Club Car IQ carts called a SpeedyLink, which increases the RPM of the stock motor without any additional modifications.



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## Speed & Carts Information

### Speed, Motors & Carts

Any modifications you make should comply with local, state & federal laws.  
Courtesy of LG

#### • If you have a Gas Golf Car:



1. Install larger tires - the easiest and cheapest way.
2. Remove the governor - may reduce the life expectancy of the engine. NOT RECOMMENDED
3. Reset the governor settings to increase torque - a mechanic can do it or provide the technical assistance for do-it-yourselfer.
4. Change to high-speed gears - maybe the best alternative but use the services of a skilled mechanic to make sure there is no added rear-end noise.

#### • If you have an Electric Golf Car:



1. Install larger tires.
2. Change to high-speed gears.
3. Field coil upgrade - most cost effective with adequate results without requiring advanced mechanical skill. Change the field coil in a 2-hp motor (a standard in golf cars) and it can become a 3.5 hp motor. Does not need to upgrade the controller.
4. Change to a high-speed motor - next easiest but may require changing the controller depending upon the demands made on the motor. See notes on the controllers below.
5. High-speed gears with high-speed motors is not recommended. Better option, depending on terrain, is installing a high-speed motor with a high-performance motor controller and using larger tires.



#### • Special Notes On Electric Golf Cars:

- If you set up your electric golf car to go over 25 mph it may result in SERIOUS INJURY OR DEATH.
- Please note that the Federal Motor Vehicle standard speed for low-speed neighborhood vehicles can not exceed 25 mph. Thus, do not operate your high-speed golf car on public roads at speeds of more than 25-mph.
- To calculate the top speed of an electric golf car, use the equation below:  
$$\text{RPM's of motor} \times \text{Tire Radius (in inches)} / \text{Gear Ratio} \times 168 = \text{Miles per Hour}$$

Example: A golf car with 3000 RPM motor with an 8" tire and a 12.44:1 gear ratio (a standard in golf cars):

$$3000 \times 8 / 12.44 \times 168 = 11.48 \text{ mph (standard speed for golf cars)}$$
  - with 10" tires, top speed is 14.35 mph
  - with 12" tires, top speed is 17.23 mph

- Available gear ratios: 8:1 and 6:1

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n Mon, Apr 27, 2015 at 11:22 AM, Moss, Sally (District Board) <[Sally.Moss@districtgov.org](mailto:Sally.Moss@districtgov.org)> wrote:

Valérie,

In your continued effort to research if there are other means to control the issue of speeding in golf carts, I have continued to research the issue also. I have found factual information that is the reason why golf carts are traveling faster than 20mph when their gear ratio is set to only go a maximum of 19.5mph. It is the 10" tires that are put on all golf carts sold now to replace the 8" tires installed at the factory. You may already be aware of this, but I was not.

It seems to be one of the ways to increase speed on a truck, off road vehicle and golf carts without doing anything to the engine. My husband and I have wondered why everyone seems to pass us by on the road and multi-modal paths .... We have 8" tires on our cart and our maximum speed is 19.5 mph, and this we have confirmed with a speedometer test. A cart with 10" tires increases its speed to 22mph and there lies the answer. Also, 12" tires that are on some carts can go a speed of 28mph. As far as the owner knows, his cart is manufactured to go 19.5 mph and without a speedometer, since most carts do not have one, he thinks he is doing 19.5 mph and the 8" tire cart is just 'going to slowly' ...

I would be very happy to share the information I have gathered from different sources if this information is new to you .... I also don't think the residents are aware of this and it might be a good idea to inform them so they are aware of the cause and effect of 10" tires installed by the local golf cart sellers.

This is a serious problem and I am trying to do my part in finding a solution .... I am attaching a photo of a Speed Test: 8" tires are 18" in height; 10" tires are 20" in height and 12" tires are 26" in height. If the photo does not come through, please let me know and I will send it by other means.

Regards,

Sally Moss  
District 6  
Phone: [352-561-8431](tel:352-561-8431)

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Reply

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Help

You replied on 4/27/2015 11:53 AM.

From: valerie fuchs [valfuchs@gmail.com]

To: Moss, Sally (District Board)

Cc: Tutt, Janet

Subject: Re: Golf Cart Speeding

Attachments:

Sent: Mon 4/27/2015 11:33 AM

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Good morning.

Thank you for the info. I knew about the wheel difference due to research I had previously conducted in regards to SUV's. Although, we can not regulate what type of tires the residents desire to place on their carts, I agree with you that it is great info to pass along to the residents since, as you point out, some cart owner's may not be aware that the tire difference impacts the speed and safety of their cart.

In the past the Sheriff's office has offered 'cart-speed days' where they offer to test the carts' speed, for free and w/o consequence, to assist the owners in identifying if their carts are going top fast and need adjustment. I'm not sure when the last time they offered that service or if there are plans to have a 'speed day' in the near future. Perhaps the internet has more information in this regard.

Please keep passing along any additional ideas, info or concerns you have.

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From: Moss, Sally (District Board)

To: valerie fuchs

Cc: Tutt, Janet; McQueary, Jennifer

Subject: RE: Golf Cart Speeding

Attachments:

Sent: Mon 4/27/2015 12:04 P

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Valerie,  
I appreciate your response and glad to know you found this information useful. I am going to ask Jennifer & Janet to place the subject of Multi-modal Path Safety on the Agenda for our District 6 Board Meeting on May 15th so I can present this information as a follow-up to my report in April. I will most definitely pass along any future information I come across to you.

Regards,  
Sally