

Lighting and Marking Recommendations for Animal-Drawn Carriages, Buggies and Wagons

Robert "Bobby" Grisso, Extension Engineer, Biological Systems Engineering, Virginia Tech
Don Ohanehi, Research Scientist, Engineering Science & Mechanics, Virginia Tech
S. Dee Jepsen, Assistant Professor, Agricultural Safety and Health, The Ohio State University
Kristen Pevarski, Former BSE Student, Department of Biological Systems Engineering, Virginia Tech
John Perumpral, Professor Emeritus, Department of Biological Systems Engineering, Virginia Tech
Kirk Ballin, Director, Virginia AgrAbility Project, Virginia Easter Seals

Introduction

Horse-drawn buggies or wagons and other animal-drawn carriages have been used by the Plain Communities as the primary means of transportation for generations. Equestrian sports and tourism business enterprises have also increased the number of horse-drawn carriages on streets and highways.

In this document, buggies, carriages, wagons, and other animal drawn vehicles will be referred to as buggies. While the use of buggy transportation has remained steady, population in rural communities have grown, and tourism in Plain Communities has increased. These changes have resulted in increased sharing of roadways by motor vehicles and buggies and more accidents. Universal buggy lighting and marking recommendations can be used effectively to reduce buggy/motor vehicle crashes and buggy users must be encouraged to use these recommendations to avoid or reduce the number of accidents.

Several state and county agencies and law enforcement agencies have been working together to develop recommendations for the marking and lighting of buggies. Currently, Virginia lacks recommendations or regulations with this regard except for the use of the Slow Moving Vehicle

(SMV) emblem. Information on the safe use of SMVs on motorways is available with the American Society of Agricultural and Biological Engineers (ASABE).

ASABE developed engineering standards for lighting and marking animal-drawn vehicles, and buggies. This standard provides a unique lighting and marking pattern for animal-drawn vehicles (Figures 1-3) and is the goal of this document.

ASABE standard recommends the use of a battery or generator powered lighting system. Batteries recommended are typical storage, deep-cycle, or gel cell batteries meeting the SAE J537 standard.

Battery systems, wiring and lighting kits, may be obtained from suppliers of specialty and recreational horse-driven vehicles. Less expensive sources of such kits may exist; but are not readily available from internet-based sources. An example of such a source in Virginia is:

Burkholder Buggy Shop
795 Mason Street, Dayton, VA 22821-9700
(540) 879-9260*

During installation, all wiring, connections and switches should be securely fastened to the vehicles and protected from moving parts, water

and corrosion. The recommended placement of lights and reflective devices are shown in Figures 1-3.

Generally battery is the only power source available on the vehicle for the light system. Therefore a fully charged battery is critical for keeping the lights on and improving vehicle visibility. Batteries require maintenance and for this and storage manufacturer's recommendation must be followed.



Battery with special terminals with charger connections (left) and the connection for the light system (lower right).

Battery and charging systems should be properly matched and easy to connect. Most buggies will securely mounted batteries under the seat or trunk with quick access for the charger clamps (see example above). If electric power is not available, solar panel chargers are an alternative. Solar panels can be mounted on the storage shed. Make sure that the wiring associated with charging system has no opportunity to get cut.

It is a good practice to recharge the battery when the carriage is not in use. This will assure fully charged lighting system for highway travel.

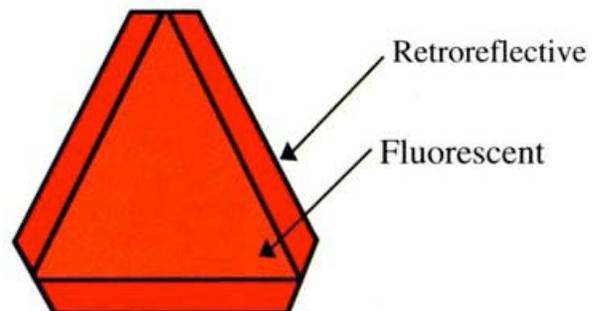
An important issue to consider is backup lighting in the event lights go out due to dead batteries, burned out bulbs, or malfunctioning of the total lighting system. Given the challenge of maintaining functional emergency backup systems, multiple backup measures are suggested. Passive markings generally used during day-time

should be upgraded to make it visible in dark if lighting system fails. Low-voltage systems, such as LED based systems are preferred as backup system. LED (light-emitting diode) systems are readily available and one or two additional units as backups would be desirable.

Also shown in Figures 1-3 are leg wraps for horses. Fluorescent ankle wraps for horses pulling the buggies “glow” in low light and captures the attention of motorists to slow down. Marking the horse as well as the vehicle will allow motorists to judge the total length of horse and buggy more accurately during passing or when making left hand turns.

The Slow Moving Vehicle (SMV) Emblem

The SMV emblem are widely used on vehicles traveling slower than 25 mph. Studies have shown that two out of three highway crashes involving slow-moving vehicles are rear-end collisions. Of these rear-end collisions; nine out of ten occur during day time. During the day time, the bright, fluorescent orange triangle of the SMV emblem gets the attention of the motorists from more than 1,000 feet away. This provides the motorists ample time to slow down before it is too late. At night, the reflective border of the SMV emblem glows brightly with bright headlights. The distinctive, retroreflective red triangle surrounding the fluorescent orange center immediately identifies a slow-moving vehicle.



References

ANSI/ASAE, EP576.1 July 2008, Lighting and Marking of Animal-Drawn Equipment, ASAE Standards, American Society of Agricultural and Biological Engineers (ASABE), St. Joseph, MI 49085.

Bean, T.L. 2008. Additional Marking of Horse Drawn Vehicles - Additional Safety. The Ohio State University, Extension Publication AEX-598.1-08. Available from: <http://www.agsafety.osu.edu> (accessed on 3/18/10)

Jepsen, S.D. and T. Calip. 2009. Lighting and Marking Recommendations for Animal-Drawn Carriages. The Ohio State University, Extension Publication AEX-596.7-09. Available from: <http://www.agsafety.osu.edu> (accessed on 3/18/10)

Jepsen, S.D. and T. Calip. 2009. Lighting and Marking Recommendations for Buggies and Wagons. The Ohio State University, Extension Publication AEX-596.4-09. Available from: <http://www.agsafety.osu.edu> (accessed on 3/18/10)

Resources

Carriage Association of America (CAA) Directory on Lamps. Available from: http://www.caaonline.com/caa_content.asp?PageType=Dept&Key=6&MType=LA&MTypeDesc=Lamps (assessed on 3/5/10)

Murphy, D.J., J.L. Shufran. 1998. Rx for SMV Highway Safety: Be Conspicuous, E-41, Agricultural and Biological Engineering, Cooperative Extension, Pennsylvania State University, University Park, PA. Available from: <http://www.abe.psu.edu/extension/factsheets/e/E41.pdf> (assessed on 3/5/10)

Pennsylvania DOT. 2008. Horse and Buggy Driver's Manual, PUB 632 (10-08). Available from: http://www.drivesafepa.org/Resources/Amish_Horse_and_Buggy_Manual.pdf (assessed on 3/5/10)

Pennsylvania DOT. 2008. Safe Driving in Amish Country, PUB 627 (6-08). Available from: <http://www.drivesafepa.org/Resources/Safe%20Driving%20in%20Amish%20Country.pdf> (assessed on 3/5/10)

ASABE. 2001. Retroreflective Material, American Society of Agricultural Engineers (ASAE), S279.11, April 2001.

ASABE. 2005. Lighting and Marking of Agricultural Equipment on Highways, ASAE S279.13, DEC. 2005.

ASABE. 2005. Slow-Moving Vehicle Identification Emblem, ASAE, S276.6, JAN 2005.

SAE. 1993. Headlamps for Agricultural Equipment, SAE J975, JUN 1993.

SAE. 2000. Tail Lamps (Rear Position Lamps) for Use on Motor Vehicles Less Than 2032 mm in Overall Width, SAE J585, MAR 2000.

SAE. 2000. Storage Batteries, SAE J537, SEPT 2000.

SAE. 2002. Flashing Warning Lamp for Agricultural Equipment, SAE J974, AUG 2002.

SAE. 2003. Reflex Reflectors, SAE J594, DEC 2003.

Table 1. Summary of the ASABE Engineering Practice recommendations.

Animal-Drawn Buggy Lighting and Marking				
Item	ASABE & Virginia Recommendations			Options
	Number	Color	Mounting	
SMV Emblem (Rear)	1	RED retroreflective border surrounding fluorescent ORANGE center	Rear center, 2 to 6 feet from the surface of the road.	No alternative options exist for an SMV emblem.
Headlights¹ (Front)	At least 2	WHITE	Symmetrically around centerline, mounted between 2.5 and 5 feet high, visible to the front and the rear.	As an alternative to headlamps and tail lamps, at least two double-faced lamps protruding from the sides at the widest point can be used. The lamps will have a CLEAR lens to the front and a RED lens to the rear.
Tail Lights¹ (Rear)	At least 2	RED	Symmetrically as widely spaced as possible, between 2.5 and 4 feet high.	A turn signal system may be incorporated into the rear RED tail lamps or the flashing AMBER lamps. In that case, the lamp that is positioned on the side of the turn should flash and the lamp on the side away from the turn should go to steady burn.
Hazard Flashers¹ (Front and Rear)	At least 2	AMBER	Symmetrically, visible to front and rear, between 2.5 and 7 feet high.	No other options exist for AMBER flashing lights. An LED light may be mounted on the top center.
Retroreflective Material (Rear)	2 inch x 9 inch strips	Alternating RED retroreflective and ORANGE RED fluorescent material	Outlining the sides and top of the rear of the vehicle.	Where local culture uses WHITE retroreflective material, it should be at least 1 inch wide. If this option is chosen, two red reflex reflectors or red retroreflective material should be mounted symmetrically around centerline, as widely spaced as possible.
Retroreflective Material (Side)	At least two 2 inch x 9 inch strips	YELLOW retroreflective material	Symmetrically along each side of vehicle frame. If vehicle has a tongue or shaft visible on the outside of the animal, at least one additional yellow strip should be placed on outside of the tongue or shaft.	Where local culture uses WHITE retroreflective material, it should be at least 1 inch wide. YELLOW or WHITE retroreflective material may be attached to the harness, to the animal's legs, or both.
¹ Animal-drawn vehicles with a lighting system should be equipped with a battery operated or generator powered system. Batteries may be typical storage, deep cycle or gel cell conforming to SAE J537. From: Ohio State University Extension, Jepsen and Calip 2009				

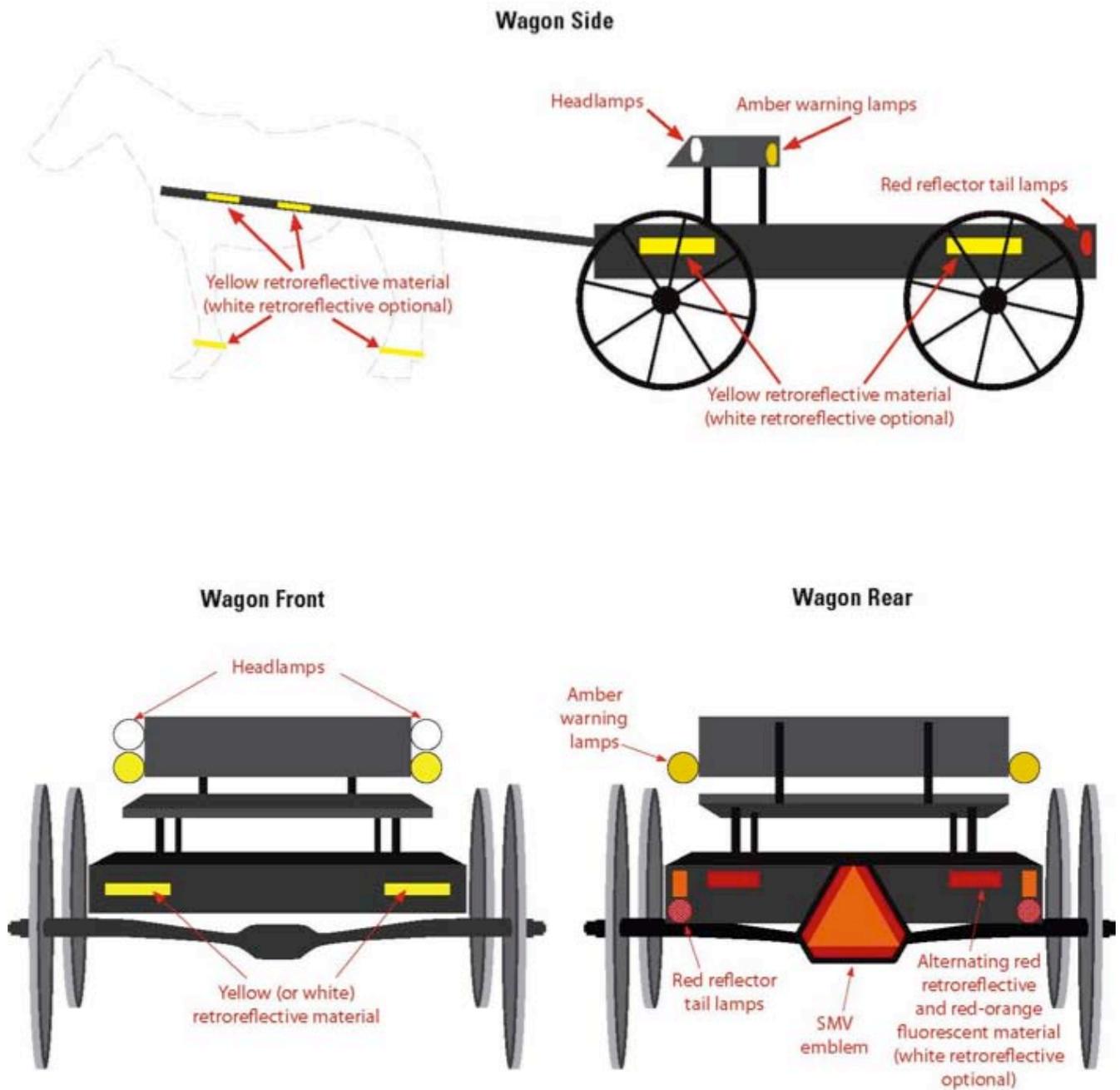


Figure 1. Recommended light and reflective materials for horse drawn wagons (From: Ohio State University Extension, Jepsen and Calip 2009).

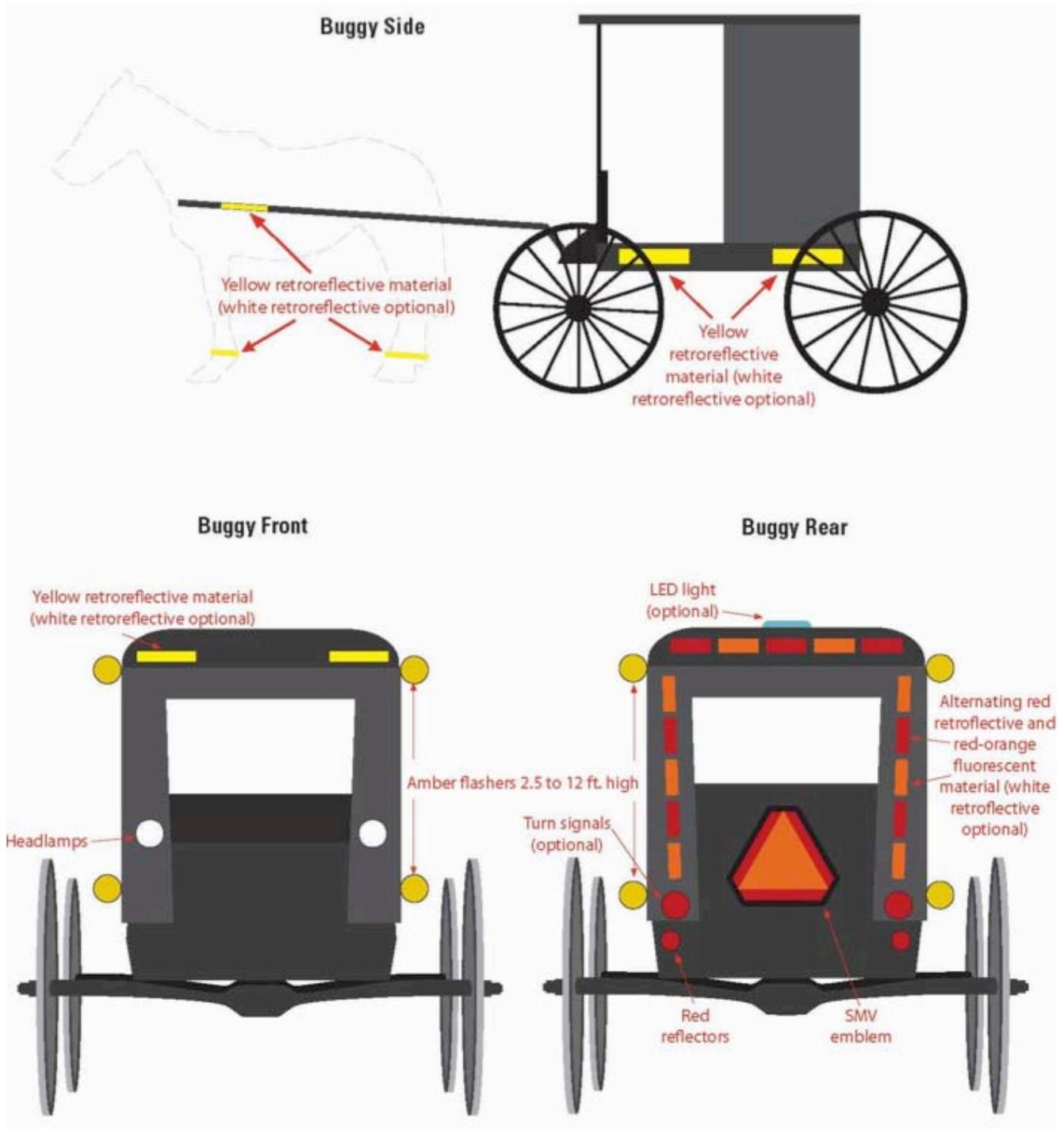


Figure 2. Recommended light and reflective materials for a horse-drawn buggy (From: Ohio State University Extension, Jepsen and Calip 2009).

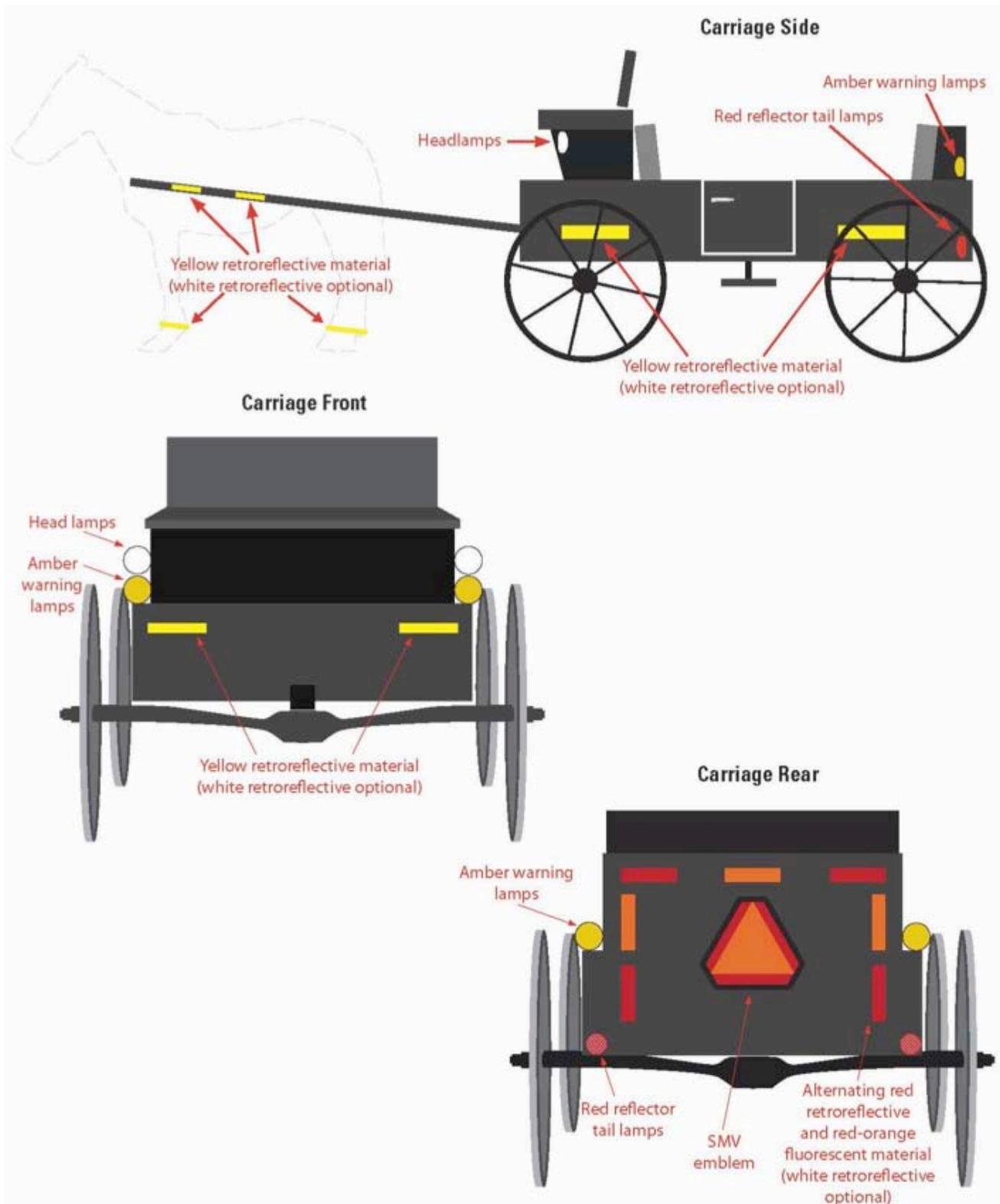


Figure 3. Recommended light and reflective materials for horse-drawn carriage (From: Ohio State University Extension, Jepsen and Calip 2009).