General Company Knowledge

MASTERY STATEMENT:

When you have successfully completed this section you will understand Grote's:

The first name in vehicle safety systems®

GROTE INDUSTRIES

Company & History

In 1901, after receiving his degree in Pharmacology, William D. Grote founded what we now call Grote Industries in Cincinnati, Ohio. It all started in 1901 when he purchased American Chemical Company and Missouri Chemical Company. His primary focus was chemicals for laundry and home cleaning. The business flourished and in 1922 he purchased Midwest Oxygen Company.

That same year William's son, Walter F. Grote, Sr., joined the firm. William decided that the business needed to head in new direction. Accordingly, in 1926 the father and son team purchased the National Colortype Company in Bellevue, Kentucky. National Colortype produced street signs that were reflectorized using spherical glass beads, the first of many Grote patents.

During the 1920's the company shifted its focus to making products for the automotive market. William redirected National Colortype to start manufacturing tail lights, directional signs, and spot lights for mounting on automobile running boards. As the automotive business began to grow, William sold the American Chemical Company and Missouri Chemical Company to focus the family's efforts in the more profitable automotive market.

The onset of the Great Depression caused the automobile to become more of a luxury than a necessity. A reflector William perfected to illuminate road signs at night sold for 10 cents in 1929. It proved to be the key for Grote's survival during the Great Depression as Franklyn Roosevelt's WPA public works program gained steam.

Walter Grote, Sr., taking an active role in the future of the family business, soon realized that plastics would be the wave of the future. He formed Grote Light Manufacturing. Walter Sr. is best known for the invention of the world's first fully automatic plastic injection molding machine. This led to his induction into Plastic's Hall of Fame and Grote's introduction of the first plastic reflector.

In 1943 all existing companies combined to form Grote Manufacturing with William assuming the role of Chairman and Walter Sr. as President. As America was plunged into the grips of World War II, Grote joined many other companies in helping support the war effort. Instead of concentrating on reflectors, Grote manufactured everything from blackout lights, shell and bomb casings, and paravanes for mine-sweepers, winning the coveted "E" Award for Excellence. At the end of the war the company converted its metal stamping machines to make medicine cabinets, a perfect move for the upcoming housing boom. Medicine cabinets dominated Grote's sales, but Walter Sr. knew that automotive innovations would be the future for the company.

By 1947 Grote was manufacturing lamps for trucks, buses and trailers. Walter Sr. carried on the innovative spirit with a number of breakthrough designs and processes including a tooling technique for reflectors called electroforming, a Grote innovation still in use today.

In 1960 Grote Manufacturing Company moved to its current headquarters in Madison, Indiana. The family tradition continued with all four of Walter Sr.'s sons, Walter Jr. (Buzz), Hugh Christopher (Chris), Ken, and William D. III (Bill). Throughout the next 40 years, Grote continued to increase the flow of new products and processes. In the 1960's, the company developed a shock absorbent material called Duramold. A few years later the company utilized this material to make the first non-metallic lamps.
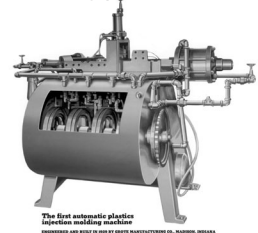
The next innovation from Grote was the Turtleback® lens design, which became an

Founder of Grote

William D. Grote

First plastic injection molding press

Second generation

Walter Grote

Third generation

Walter Jr. "Buzz" Grote

industry standard and still in use today. This unique design made the lamp virtually indestructible. In 1969, Walter Sr. was named chairman and son Walter Jr. (Buzz) was appointed president. Grote began to concentrate solely on lamps for automobiles, trucks and trailers.

In 1977, Grote introduced the first repairable, long-life lamps featuring a breakthrough torsion mount shock dampening system. Today this torsion mount design is on its third generation featuring a gel-mount foam cradle.

In the 1980's Grote introduced ULTRA-BLUE-SEAL® (UBS) harness. UBS was the world's first modular trailer wiring system that soon became the industry standard. This eliminated the need to cut, splice and tape trailer wires. By listening to customers and understanding their needs, Grote was able to make one of the decade's most significant trucking industry innovations. It was innovations like this that solidified Grote's innovative reputation leading the company to be selected to design and manufacture the first high mount stop lights used by the Ford Motor Co.

During the 1970's and 1980's Walter Jr. (Buzz) led and oversaw the expansion of Grote Industries. The Madison headquarters grew from an 80,000 sq. ft. facility with 85 employees to a 451,000 sq. ft. facility with 700 employees. A joint venture was also established to create Grote of Canada under Walter Jr.'s tenure.

Third generation

William D. III Grote

In 1989 William D. III (Bill) took over as president, the international expansion continued under his leadership with Grote opening a new facility in Mexico. Shortly after Mexico's plant opening, Grote Electronics was established in Waterloo, Canada. During this time Grote pioneered the complete system approach to vehicle lighting, developing wire and components that form a totally integrated system. Fleets now could go to one source for their electrical and lighting safety needs. At this time, Grote also received the Ford Motor Co. Q1 Award. Ford presents their award only to suppliers who can meet the highest standards in quality, productivity and service.

In the 1990's Grote introduced LED technology to the industry. This achievement is recognized as one of the most significant introductions to the trucking industry in the last two decades. Demonstrating Grote's ability to lead the industry with products that would change an industry.

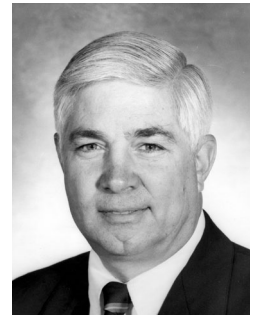First and only non-Grote president

Eric Morris

During the 1990's and into 2000 and beyond Grote continues to introduce innovative LED products for the automotive and trucking industry such as SuperNova®, Hi Count® and Grote Select® LED lights. The latest Grote lighting breakthrough is LED WhiteLight™, available for the trucking industry in interior and forward lighting products. WhiteLight products will also spread to lighting applications across the board in many industrial, commercial, and consumer applications.

In 2004 Grote Industries announced the appointment of Eric Morris to the newly created post of President and Chief Operating Officer with William D. (Bill) Grote III assuming the duties of Chairman and Chief Executive Officer.

In August of 2009, Dominic Grote was named President and Chief Operating Officer of Grote Industries with global responsibility for managing the company's business. Before Dominic moved to his new role he served as the organization's vice president of sales & marketing, reshaping the company's business through the development and introduction of advanced, high-performance LED lighting technologies for the commercial and military vehicle markets. Since starting his career with Grote in 1993, he has held various management positions in sales, marketing and product development.

Fourth generation

Dominic Grote

Three other Grote family members currently serve in key company roles: John Grote - Sales and Marketing, Rick Grote - Engineering and Michael Grote - Manufacturing.

Perhaps the best measure of Grote's ground-breaking philosophy is the number of "Firsts" attributed to the Company.

1920's	• The nation's first injection molded plastic products (1922)
	• First fully automatic plastic injection molding machine (1929)
	• World's first retro-reflective reflector, the universal basis for today's reflectors (1929)
1930's	• First commercially available injection molding material (1936)
1960's	• Introduction of the Turtleback® Marker Lamp, the Industry's first all non-metallic lamp
	• Industry's first no-splice wiring system (1965)
1970's	• Industry's first repairable, long-life lamp (1977)
1980's	• Introduction of ULTRA-BLUE-SEAL®, the World's first modular trailer wiring system, (1983)
	• First LED marker light (1989)
1990's	• First refrigerated trailer fluorescent lamp (1998)
2001	• First HID/HIR headlamp for the heavy truck industry (2001)
2002	• First solid state, electronic turn signal switch (2002)
	• First LED license plate lamp with active reflector optics (2002)
2003	• First manufacturer in the industry to receive TS16949 Certification (2003)
	• First LED Side Turn Compliant in all 50 States (2003)
2004	• First LED Forward Lighting on the road (2004)
2005	• First all LED Military signal lighting (2005)
2006	• First all LED Military interior tactical lighting (2006)
2007	• First all LED High Powered Driving light (Exceeds HID) (2007)
	• Introduction of the next generation J 560 Ultra-Box Receptacle. (2007)
2008	• Introduction of LED WhiteLight™ exterior work lamps and interior dome lamps (2008)
	• First all LED tactical interior lighting offerings (2008)
	• Introduction of Infrared Motion-Activated LED Interior Dome Lamps (2008)
2009	• Introduction of LightForm™ Technology (2009)
2010	• Introduction of the Trilliant® 36 LED WhiteLight™ Conversion Bulb, which converts Par 36 Incandescent Lamps to LED (2010)
	• Grote starts manufacturing their own coil cords (2010)
2011	• Introduction of MicroNova® DOT marker lamp (2011)
	• Introduction of Trilliant® Cube LED WhiteLight™ work lamp (2011)

With a track record like this, it's easy to see why Grote has earned a reputation as "The First Name in Vehicle Safety Systems."

GROTE AWARDS AND ACHIEVEMENTS
More Than 110 Years of Proven Quality, Dependability and Performance.

Plastics Hall of Fame	**SEER Awards**
AWDA Automotive Leader of the Year	**Indiana Manufactures Awards**
Ford Q1	**TWNA Technical Achievement Award**
Mitsubishi Supplier Awards	**Heavy Duty Trucking Magazine's Nifty Fifty Awards**
International Diamond Supplier Awards	**EIA Idea of the Year Awards**
NAPA Supplier Awards	**WB Automotive Communications Awards**
CARQUEST Supplier Awards	**INvision Southeast Award of Excellence**
Freightliner Master Quality Awards	**2008 Progressive Manufacturing Top 50**
QS 9000 Certified	
ISO 9001	

GROTE CAPABILITIES

- Six facilities worldwide
    - Full Grote facility distribution support for North America, South America, Europe and Asia
    - Partnership support for Australia distribution
- Full channel access - OE, Heavy Duty Aftermarket, Automotive Aftermarket
- Fully integrated supplier of lighting and harness products for the commercial vehicle market
- The first lighting manufacturer with sales, manufacturing and distribution headquartered in each of the three NAFTA countries

Manufacturing capabilities
- 725,000 square feet manufacturing capability worldwide
- Over 1,000 employees worldwide
- 3 shift operation
- 36 injection molding presses ranging from 85-750 ton
- LED circuit board mfg. facility in Waterloo, Ontario
    - LED surface mount and through-hole capability
- Dedicated vacuum metallizing facility in Madison
- LEAN manufacturing system (Grote Production System - GPS) process in all Grote facilities
- TS16949 certification at all North America Facilities
- ISO 14001 environmental certification
- Accessory wire spooling operations in Grote Canada (Toronto)
- Same day shipping available
- 95% ship level average 3 days or less - Aftermarket
- Three weeks standard lead time on OEM shipments

Grote Canada

Grote Canada

Product Support Capabilities
- Full CAD and engineering resources dedicated to consistently developing new products
- Over 30 design engineers
- Full direct sales force dedicated to serve our global customer base
- Advanced testing capabilities including LMT machine with Goniophotometer and severe environment testing
- On-site physical testing facility
    - Shock
    - SAE Vibration
    - Salt/Water Spray
    - Dust
    - Thermal cycling
    - Full trailer simulation testing
- Dedicated advance technology LED lab
- Dedicated Model and Prototype shop
    - 3D solid modeling
    - CNC 3-axis milling machine
- Advanced new product development based on AIAG (Automotive Industry Action Group) and APQP (Advanced Product Quality Planning) 12 milestone process which is integral to Grote's total quality management system

Grote Electronics

Grote Madison

Customer Support Capabilities
- Web site information access
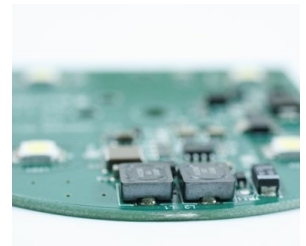- Full product literature support
- Full color catalog
- G24/7 online ordering
- Advanced merchandising product options
- Dedicated Plan-O-Gramming software
- Fleet training programs
- Grote Know How programs
- Fully electronic order fulfillment system
    - Online Sales training via WebEx
    - EDI (Electronic Data Interchange) and ASN (Advanced Shipping Notice) capabilities

Grote Madison

Grote products are used as original equipment on semi-tractors and trailers, passenger cars, buses, industrial vehicles, recreational vehicles and agricultural machinery. Grote products are also sold in the heavy-duty aftermarket, the automotive retail environment and the marine and recreational market.

Products include:

- Clearance/Marker Lamps
- Stop, Tail, and Turn Lamps
- RV, Marine and Utility Trailer Lighting
- License and Backup
- Interior Lighting
- Forward Lighting
- Warning and Hazard
- Flashers and Turn Signal Switches

- Mirrors
- Trailer Wiring and Communications Systems
- Pigtails, Brackets and Grommets
- Reflectors
- Lenses
- Tools and Repair kits
- Military Lighting
- European Approved Lighting

Grote provides a wide range of components for original equipment manufacturers and the vehicle aftermarket.

Grote provides a full line accessory program.

CORPORATE FACILITIES

A truly international company, Grote is headquartered in Madison, Indiana; with additional facilities in Toronto and Waterloo, Canada; Monterrey, Mexico; Niederwinkling, Germany and Shanghai, China. More than Grote 1,000 employees work in every phase of production, from design and engineering to manufacturing, testing, marketing and distribution.

Grote Headquarters - Madison, Indiana, not only is the corporate headquarters, it is also the facility that builds and ships Grote lighting product. This full featured facility establishes the base for engineering and manufacturing of our core products. Grote Madison supplies all its subsidiaries the core products needed to establish its many bases of operation. Grote Madison is on the forefront of lean manufacturing in all its processes and is continually redefining the art of lighting technology in the vehicle safety market.

Grote Canada - Markham, Ontario is the headquarters for the Grote Accessory line, which includes battery Lugs, Clamps, Cable Ties & Clamps Kits, Tools, Switches, Sockets, Fuses, Terminals & Connectors, Trailer Connectors Wire & Cable and Retail Merchandising/Displays. Grote Canada serves both the OE and Aftermarket channels for the entire Canadian market. Grote Canada's new state-of-the-art facility operates at the forefront of industry manufacturing and distribution efficiency.

Grote Electronics - Waterloo, Canada, is a state-of-the-art, high-volume manufacturing facility where Grote's light emitting diode (LED) circuit boards and electronic-based specialty products are assembled. Grote electronics was the pioneer of our white lighting program, producing the fluorescent interior lights for the trucking industry. Grote Electronics, located in Canada's technology triangle, keeps Grote on cutting edge for LED development.

Grote Mexico - Monterrey, Mexico, is the headquarters for Grote's patented ULTRA-BLUE-SEAL® pigtail and harness system. Grote De Mexico also assembles many of Grote's key incandescent lamps such as the 4581 & 4582 series products. Grote De Mexico facility also serves as our Mexican and South American Distribution facility serving both OE and Aftermarket customers.

Grote Europe - Niederwinkling, Germany, is the new European headquarters. The new base of operation services the growth and the increased market demand for LED interior lamps and LED work lamps, along with modular harness and power delivery systems. Grote Industries expects this new site established our global footprint into many new foreign markets.

Grote China - Shanghai, China is a wholly-owned, foreign enterprise of Grote Industries. Formed in November 2007 as an answer to continuous cost reduction and consolidation of imported products, China operations currently are regional in scope with future growth slated for all of Asia and Europe.

MARKET CHANNELS

Grote Industries goes to market several different ways:
• ORIGINAL EQUIPMENT MANUFACTURERS (OEM),
• ORIGINAL EQUIPMENT SERVICE CENTERS "DEALER NETWORK" (OES),
• HEAVY DUTY AFTERMARKET SALES - INDEPENDENTLY OPERATED BUYING GROUPS AND
  OWNED DISTRIBUTION GROUPS
• TRADITIONAL MARKET CHANNEL - 3 OR 4 STEP, INDEPENDENTLY OPERATED BUYING
  GROUPS, AND RETAIL

LIGHTING AND LAMPS HISTORY

The discovery of electricity changed the world. For the first time in history, electrical power offered inexpensive and convenient energy for homes and businesses. It has also made possible the internal combustion engine and many of the functions we take for granted on the cars and trucks we drive.

How Incandescent Lamps Work
Incandescent light bulbs create light by electricity flowing through a filament inside the bulb; the filament has resistance to electricity, which makes the filament heat to a high temperature. The heated filament glows, radiating light.

First Electric Incandescent Lamp
The invention of the incandescent light bulb has a history spanning from the early 1800s. Until that time, available light sources consisted of candles, oil lanterns, and gas lamps. In 1809, an English chemist, Humphrey Davy, paved the way towards the invention of a practical incandescent light source with the invention of the first arc lamp. Using a high power battery, he induced current to jump a gap between two charcoal strips, producing an intense incandescent light.

Warren De la Rue

In 1820, Warren De la Rue made the first known attempt to produce an incandescent light bulb. He enclosed a platinum coil in an evacuated tube and passed an electric current through it. The high melting point of platinum allows it to operate at high temperatures. The evacuated chamber leaves less gas atoms to react with the platinum, improving its longevity. Although it was an efficient design, the cost of the platinum made it impractical for commercial use.

Throughout the 1800s, many scientists and inventors strove to create a practical, cost effective, long-life incandescent light bulb. The essential problem was in creating a long-life, high-temperature filament--the key to a practical incandescent light. Hundreds of high-melting-point materials were tested in inert/evacuated chambers in the process.
Men such as William Robert Grove, Frederik de Moleyns, W.E. Staite, John Daper, Edward G. Shepard, Heinrich Gobel, C. de Chagny, John T. Way, Alexander de Lodyguine, Joseph Wilson Swan, and Thomas A. Edison dedicated their time and efforts in the race to develop the first practical incandescent light bulb. Breakthroughs for Edison and Swan came in 1879, when they independently developed the first incandescent lamp that lasted a practical length of time – at best a mere 13.5 hours.

Thomas A. Edison

Their designs were based on a carbon fiber filament derived from cotton. The next stage of development focused on extending the practical life of the carbon filament bulb. Edison developed bamboo-derived filaments in 1880 that lasted up to an amazing 1200 hours. Then the invention of ductile tungsten, a much improved filament material, sparked the development of the modern tungsten filament incandescent light bulb by the General Electric Company and William Coolidge in 1906-1910. This is the light bulb we know today. Ductile tungsten has many favorable properties.

• High melting point: 3,410oC /6,170oF
• Low evaporation rate at high temperatures: 10-4 torr at 2,757oC / 4,995oF
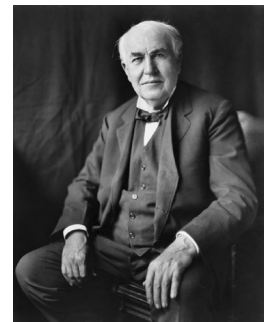
• Tensile strength greater than steel

Because of its strength, ductility and workability, tungsten can readily be formed into the filament coils, used to enhance performance in modern incandescent bulbs. Due to its high melting point, tungsten can be heated to 3000°C /5,432°F, where it glows white hot, providing excellent brightness. However, the early tungsten filaments sublimed too quickly at such high temperatures. As they sublimed, they also coated the bulbs with a thin black tungsten film, reducing their light output.

STATE-OF-THE-ART AUTOMOTIVE LIGHTING

Kerosene lamps were first used for early cars and trucks. Electric lights began to be used for automotive applications in the 1910's. Dynamos were installed at this stage solely for electrical lighting. In the 30's and 40's, optical systems for lighting were developed to include the first projection systems. In the 1950's legal regulations began to cover vehicle lights. In the 60's halogen light sources became available and 12 volts became the universal voltage. In the 80's the aerodynamic headlamp began to replace the reflector bulb, also known as "sealed beam", which had become a standard for head lamps in the United States and Scandinavia. In the 1990's the gas discharge light source, referred to also as "xenon" was introduced. It offered considerably more light and almost vehicle life longevity. Headlamp leveling became mandatory in Europe. In the first decade of the 21st century, abandonment of standard sealed beam technology led to advances in lighting design. Also dynamic head lamps that followed the bends of the road were developed and the first LED head lamps and night vision systems were being introduced.

Milestones in Lighting
- 1908 - Use of electric bulb in motor vehicle (dynamo, headlamp, side and number plate lamps)
- 1915 – Introduction of red tail lamps and yellow brake lights
- 1919 – Introduction of dipped beams against glare
- 1925 – First double filament bulbs for high and dipped beams
- 1936 – Launch of incandescent sealed beam lamp
- 1940 – Flashing turn signal on front and rear with self-cancelling circuitry
- 1945 – Integration of head lamps into vehicle body
- 1960 – Introduction of first halogen lamp in Europe
- 1979 – Introduction of first halogen sealed beams in U.S.
- 1983 – Introduction of first composite replaceable bulb lamp in U.S.
- 1989 – First LED lighting for commercial vehicle (Grote Industries)
- 1991 – Introduction of high intensity discharge (xenon) in Europe
- 1993 – LED tail lamp (Ford Thunderbird)
- 1996 – Mandatory head lamp leveling in Europe
- 2003 – First steerable dipped beam head lamps (pre/AFS)

THE DEVELOPMENT OF LED LIGHTS

LED lights were first identified at the beginning of the 20th century by Russian researcher and radio technician, Oleg V. Losev. He found that diodes emit light when electricity passes through them. His finding went without any commercial interest for almost 70 years. In 1970, Nick Holonayk, known as the Father of Light Emitting Diodes, started his research and developments on the LED. He managed to improve Oleg's invention by increasing brightness and introducing yellow and red coloring.

As development continued, brighter LED designs and added colors were developed. It gradually became apparent that LEDs were the most efficient lighting technology. LEDs ensure better visibility and clearer light for less power consumption. They soon became an elementary part of television, automobile, telecommunications, and transport systems.

Oleg V. Losev

THE GROTE CUSTOMER EXPERIENCE

The relationship between Grote and its customers extends beyond the warehouse, the store front, or a formal conference room. The Grote Customer Experience is an opportunity to connect one-on-one with our customer in a laid back professional manner, in an enjoyable environment. Grote values loyalty and building relationships with customers that go well beyond the business setting.

The Grote Customer Experience consists of several aspects that can be combined or used independently, based on the relationship that is being formed and the interests of the particular customer. Grote has always welcomed customers into our manufacturing facility for a meet and greet, plant tour, or business opportunity discussions that take place in our specially designed, customer "1901" Sales Conference Room. Visits are typically catered by one of the many Madison local restaurant favorites. Lunchtime promotes customer questions and open dialogue. Lunch can also be a time for one of the five Grote's to stop in for a quick conversation and introduction.

The Grote Customer Experience now goes beyond the halls of the corporate office in Madison. Grote offers an additional way to totally immerse yourself in to the world of lighting. A dedicated customer training facility is available for large or small groups to increase their knowledge at our remote facility.

Offered activities include: Swimming pool, hot tub, skeet shooting, seasonal hunting of deer and turkey, fishing, a put and take bird program, and a Cincinnati Reds baseball experience.

Key Points

Grote Customer Experience is all about increasing customer knowledge and build lasting relationships.

Amphibious six wheeler and a golf cart provides entertainment and transportation around property.

Corn Hole and Ladder Golf Toss provide great team building opportunities.

Illuminated with Grote Trilliants®, the automatic wobble machine provides shooting competitions throughout the day or night.

Deer are abundant.

Gorgeous deck with large six-burner grill and a relaxing Jacuzzi.

Access to creek teaming with Small Mouth Bass.

Business meeting room is equipped with projector and audio.

Grote field level seats view.

BUILDING RELATIONSHIPS IS THE NAME OF THE GAME

BASIC EQUIPMENT REQUIRED ON ALL TRAILERS

Area	Equipment	SAE Lens Code	Function	Quantity	Color	Location	Height from the Ground
1	Tail Lamps	T	Indicate vehicle's presence and width	Minimum 2	Red	On the rear - symmetrical as far apart as practicable	380 - 1,830 mm 15 - 72 inches
	Stop Lamps	S	Indicate braking	Minimum 2	Red	On the rear - symmetrical as far apart as practicable	380 - 1,830 mm 15 - 72 inches
	Rear Turn Signal Lamps	I	Indicate direction of turn	Minimum 2	Red or Yellow	On the rear - symmetrical as far apart as practicable	380 - 2,110 mm 15 - 83 inches
	Rear Reflex Reflectors	A	Indicate vehicle's presence and width	Minimum 2	Red	On the rear - symmetrical as far apart as practicable facing rearward	380 - 1,530 mm 15 - 60 inches
2	License Plate Lamp(s)	L	Illuminates license plate	Minimum 1	White	On the rear - above or at the sides of license plate	No requirement
3	Rear Side Marker Lamps	P2, PC* or P3, PC2*		Minimum 2	Red	Each side at rear as far back as practicable	380 - 1,530 mm 15 - 60 inches no max. for veh. under 2,032 mm (80 inches) wide
	Rear Side Reflex Reflectors	A	Front and rear side marker lamps / side reflex reflectors indicate vehicle's presence and length	Minimum 2	Red	Each side at rear as far back as practicable facing sideward	380 - 1,530 mm 15 - 60 inches
4a	Front Side Marker Lamps	P2, PC* or P3, PC2*		Minimum 2	Yellow	Each side at front as far forward as practicable	380 mm minimum 15 inches minimum
4b	Front Side Reflex Reflectors	A		Minimum 2	Yellow	Each side at front as far forward as practicable facing sideward	380 - 1,530 mm 15 - 60 inches

ADDITIONAL EQUIPMENT FOR TRAILERS EXCEEDING THE FOLLOWING PARAMETERS

Length 9.1 m (30 ft) or longer

Area	Equipment	SAE Lens Code	Function	Quantity	Color	Location	Height from the Ground
5a	Intermediate Side Marker Lamps	P2 or P3	Indicate presence of a long vehicle	Minimum 2	Yellow	Each side near center facing sideward	380 mm minimum 15 inches minimum
5b	Intermediate Side Reflex Reflectors	A	Indicate presence of a long vehicle	Minimum 2	Yellow	Each side near center facing sideward	380 - 1,530 mm 15 - 60 inches

Width 2,032 mm (80 inches) or wider

Area	Equipment	SAE Lens Code	Function	Quantity	Color	Location	Height from the Ground
6	Rear Clearance Lamps	P2, PC* or P3, PC2*	Show vehicle's width MAY NOT be combined with tail lamps	Minimum 2	Red	At widest point - symmetrical on the rear or near the rear facing rearward	As high as practicable may be lower only if ID lamps are at the top
7	Rear Identification (ID) Lamps	P2 or P3	Indicate presence of a wide vehicle	Exactly 3	Red	On the rear - center horizontally spaced 150 mm (6 in) to 300 mm (12 in) apart facing rearward	In Canada: at the top - may be lower if door header narrower than 25 mm In USA: as high as practicable
8	Front Clearance Lamps	P2, PC* or P3, PC2*	Show vehicle's width	Minimum 2	Yellow	At widest point - symmetrical on the front or near the front facing forward	As high as practicable

Width 2,032 mm (80 inches) or wider AND GVWR 4,536 kg (10,000 lbs) or more

Area	Conspicuity Treatment	DOT Code	Quantity	Color	Location	Height	Options
9	Rear Upper Body Markings		Exactly 2 pairs of 300 mm long strips	White	On the rear upper corners facing rearward	At the top	Reflex reflectors may not be required if they are replaced in their required location with conspicuity treatment.
10	Bumper Bar Marking		Continuous	Red/White	On the rear bumper bar's horizontal element full width - facing rearward	No requirement	
11	Rear Lower Body Marking	DOT-C DOT-C2 DOT-C3 DOT-C4 (See options)	Continuous	Red/White (See options)	On the rear full width of the vehicle facing rearward	As horizontal as practicable and as close as practicable to the range of 375 to 1,525 mm from the ground	Optional in Canada: Rear lower body and side conspicuity treatment may also be solid white, solid yellow, or white and yellow.
12	Side Marking		See Location	Red/White (See options)	Each side - facing sideward continuous, or evenly spaced over minimum of 50% of length starts and ends as close to the front and rear of the vehicle as practicable	As horizontal as practicable and as close as practicable to the range of 375 to 1,525 mm from the ground	

* Photometrically certified at installation angle
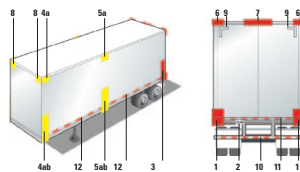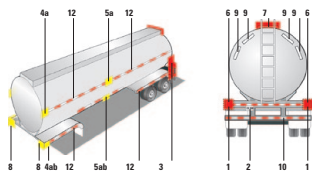** Not required on truck tractors
§ Vehicles less than 2,032 mm wide
†Vehicles 2,032 mm wide or wider
‡Vehicles less than 2,032 mm wide and 4,536 kg

IMPORTANT NOTE: Every lamp, reflex reflector, and conspicuity treatment must be permanently attached to the location specified and must comply with all applicable requirements prescribed for it by FMVSS/CMVSS 108. The face of any device on the front/rear and sides should be respectively perpendicular and parallel to the vehicle's centerline unless it is photometrically certified at installation angle. No part of the vehicle shall prevent any device from meeting its prescribed requirements unless an auxiliary device meeting all prescribed requirements is installed.
IN CANADA: Manufacturers and importers of vehicles must have the proper certification test records demonstrating compliance of lighting components with all prescribed requirements.


BASIC EQUIPMENT REQUIRED ON ALL TRUCKS, BUSSES & MPVs

Area	Equipment	SAE Lens Code	Function	Quantity	Color	Location	Height from the Ground
1	Headlamps - Lower Beam US requires DOT lettering on lens US & Canada - light source code required on lens	H, HR	Forward road illumination	Minimum 2	White	On the front - Symmetrical If 4 lamp system - outboard or above upper beams	560 - 1,370 mm 22 - 54 inches
	Headlamps - Upper Beam US requires DOT lettering on lens US & Canada - light source code required on lens	H, HR	Forward road illumination	Minimum 2	White	On the front - Symmetrical If 4 lamp system - inboard or below lower beams	560 - 1,370 mm 22 - 54 inches
	Parking Lamps	P	Indicate parked vehicle	Minimum 2	White or Yellow	On the front - Symmetrical As far apart as practicable	380 - 1,530 mm 15 - 60 inches
	Daytime Running Lamps (DRL) Canada - Required US - Optional (US requires "DRL" lettering on lens if not headlamp)	Y2	Indicate in use vehicle	Minimum 2	White or Yellow	On the front - Symmetrical As far apart as practicable	380 mm minimum 15 inches minimum Max. depends on type of DRL
	Front Turn Signal / Hazard Warning Lamps	I	Indicate direction of turn / identify disabled vehicle	Minimum 2	Yellow	On the front - Symmetrical As far apart as practicable	380 - 2,110 mm 15 - 83 inches
2	Front Clearance Lamps†	P2, PC* or P3, PC2*	Show vehicle's width	Minimum 2	Yellow	At widest point - symmetrical on the front or near the front facing forward	As high as practicable
3	Front Identification Lamps (ID)†	P2 or P3	Indicate presence of a wide vehicle	Exactly 3	Yellow	On the front - center horizontally spaced 150 mm (6 in) to 300 mm (12 in) apart	As high as practicable or on top of the cab
4a	Front Side Marker Lamps	P2, PC*, P3, PC2*		Minimum 2	Yellow	Each side at front as far forward as practicable	380 mm minimum 15 inches minimum
4b	Front Side Reflex Reflectors	A	Front and rear side marker lamps / side reflex reflector indicate vehicle's presence and length	Minimum 2	Yellow	At front - symmetrical as practicable facing sideward	380 - 1,530 mm 15 - 60 inches
5a	Rear Side Marker Lamps**	P2, PC* or P3, PC2*		Minimum 2	Red	Each side at rear as far back as practicable	380 mm minimum 15 inches minimum
5b	Rear Side Reflex Reflectors**	A		Minimum 2	Red	Each side at rear as far back as practicable facing sideward	380-1,530 mm 15 - 60 inches
6	Rear Clearance Lamps** †	P2, PC* or P3, PC2*	Show vehicle's width, MAY NOT be combined with tail lamps	Minimum 2	Red	At widest point - symmetrical on the rear or near the rear facing rearward	As high as practicable May be lower only if rear ID lamps are at the top
7	Rear Identification (ID) Lamps** †	P2 or P3	Indicate presence of a wide vehicle	Exactly 3	Red	On the rear - center Horizontally spaced 150 mm (6 in) to 300 mm (12 in) apart facing rearward	In Canada: at the top - lower if door header narrower than 25 mm In US: as high as practicable
8	Tail Lamps	T	Indicate vehicle's presence and width	Minimum 2	Red	On the rear - symmetrical As far apart as practicable	380 - 1,830 mm 15 - 72 inches
	Stop Lamps	S	Indicate braking	Minimum 2	Red	On the rear - symmetrical As far apart as practicable	380 - 1,830 mm 15 - 72 inches
	Rear Turn Signal/ Hazard Warning Lamps	I	Indicate direction of turn / identify disabled vehicle	Minimum 2	Red or yellow	On the rear - symmetrical As far apart as practicable	380 - 2,110 mm 15 - 83 inches
	Rear Reflex Reflectors	A	Show vehicle's presence and width	Minimum 2	Red	On the rear - symmetrical As far apart as practicable	380 - 1,1530 mm 15 - 60 inches
9	Backup Lamp	R	Illuminates ground behind the vehicle and alert road users	Minimum 1	White	Rear	No requirement
10	License Plate Lamp(s)	L	Illuminates license plate	Minimum 1	White	On the rear - above or at the sides of license plate	No requirement
11	Center High Mounted Stop Lamp ‡	U3	Indicates braking	Minimum 1	Red	On the rear - centerline of the vehicle	860 mm minimum 34 inches minimum

ADDITIONAL EQUIPMENT FOR SPECIFIC VEHICLES - VEHICLES 9.1 m (30 ft.) LONG OR LONGER

Area	Equipment	SAE Lens Code	Function	Quantity	Color	Location	Height from the Ground
12a	Intermediate Side Marker Lamps	P2 or P3	Indicate presence of a long vehicle	Minimum 2	Yellow	Each side near center	380 mm minimum 15 inches minimum
12b	Intermediate Side Reflex Reflectors	A	Indicate presence of a long vehicle	Minimum 2	Yellow	Each side near center facing sideward	380 - 1,1530 mm 15 - 60 inches

TRUCK TRACTORS

Area	Conspicuity Treatment	DOT Code	Quantity	Color	Location	Height	Options
13	Rear Upper Body Markings	DOT-C DOT-C2 DOT-C3 DOT-C4	Exactly 2 pairs of 300 mm long strips	White	Rear upper corners of cab facing rearward	As high as practicable excluding fairings	
14	Rear Marking	DOT-C DOT-C2 DOT-C3 DOT-C4	Exactly 2 sections of min. 600 mm each	Red/White	Rear - facing rearward - on fenders, on mud flap brackets, or within 300 mm below the top of mud flaps	As horizontal as practicable and not higher than 1,525 mm from the ground	If mud flaps not used - on the cab or frame mounted brackets

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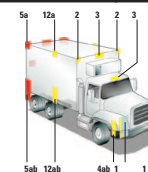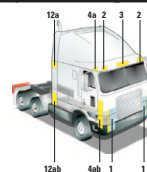
GROTE PRODUCT NUMBERING SYSTEM

Grote uses a meaningful product numbering system that makes it possible to quickly locate the correct product and verify the correct product has been selected. The typical Grote part number contains five digits, followed by a hyphen, followed be a single digit. Here's what it all means.

The first two digits or alpha characters (00000-0) indicate the product category.

G Hi Count™ LED Lamps
01-09 Per-Lux® Lamps and Accessories
10 Mirror Arms
11 Brackets
12 Small Mirrors
13 Junior West Coast Mirrors
16 Large West Coast Mirrors
18 Automotive Mirrors
20-24 Junior West Coast Bracketry and Assemblies
22 Large West Coast Mirrors
26 Large West Coast Mirror Assemblies
28 Mirror Specialties
40, 41 Reflectors and Conspicuity Tape
43 Guards Mounting Brackets and Permit Holders
44 Flashers
45-47, 49 Clearance / Marker and Identification Lamps
48 Turn Signal Switches
50-59 Multi-Function Stop / Tail / Turn Lamps, Rear Lamp Modules, & Center High Mount Stop Lamps
60 License, Courtesy
62 Back Up Lamps
63 Flood Lamps

64 Tractor & Head Lamps, Quartz and Halogen
65 Boat Trailer Kits
66-69 Wire Harnesses and Pigtails
70, 71 Triangle Flares, Driving Cones, Warning
72 Automotive Horns
73 Back Up Alarms
76-77 Roto Beacon Strobes
78 Warning Lamps
82-83 Military
85 OE Type Replacement Lamps / Lenses
87 Ultra Link Power Cords
90-92 Lenses and Lamp Components
99 Miscellaneous

The second two digits or alpha characters (00000-0) indicate the product number.

The second two digits or alpha characters are unique to a specific product in any single category. When the first two digits [category] are combined with the second two digits [product] they form a base product number.

The fifth digit (00000-0) indicates product variations.

LAMPS PRODUCTS	MIRROR
0 Split Color	
1 Clear	1 White
2 Red	2 Black
3 Yellow	3 Chrome or
Stainless	
4 Green	4 Aluminum
5 Blue	5 Zinc

The sixth digit (00000-0) indicates packaging.

1 Indicates Bulk Display Packaging
4 Indicates Pair Pack
5 Indicates Bubble Pack, Display Pack, Clam Shell or Retail Pack (Crystal-Pack or Slide Lock)

The absence of the sixth digit indicates product is in standard shelf packaging, e.g., individual pack or polybag, and in the case of lenses a standard shelf pack will have 6 to 12 to a container. Refer to your price sheet for exact quantity and other pack types.

ADDITIONAL RESOURCES

These resources can be acquired online or through the marketing department.