

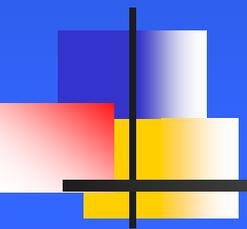
A nighttime photograph of a highway construction site. The scene is illuminated by streetlights and work lights. In the foreground, a worker in a high-visibility vest stands near a piece of equipment. A large truck is positioned in the middle ground, and a forklift is visible on the right. Orange traffic barrels line the road, and a line of cars is visible in the distance. The overall atmosphere is busy and focused on the construction work.

Working Safely at Night

2004 ARTBA WZ Conference

James E. Bryden, PE
Jbryden@nycap.rr.com

NCHRP 17-17



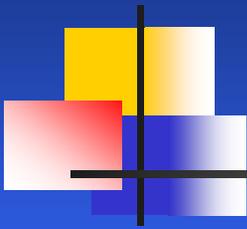
GUIDELINES FOR NIGHTTIME TRAFFIC CONTROL

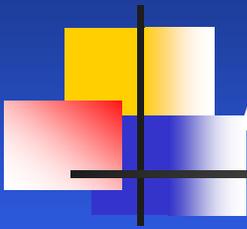
THE LAST RESOURCE

Jim Bryden

Doug Mace

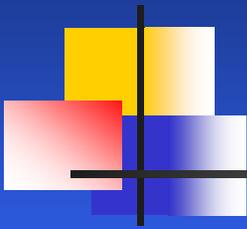






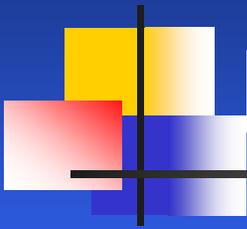
Advantages

- Reduced traffic volume
- Better access to work site
- Longer work shifts – maybe
- Cooler temperatures
- Reduced business impact



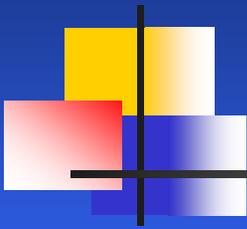
Concerns

- Visibility
- Work quality
- Staffing issues
- Noise & glare
- Worker & driver alertness
- Impaired drivers
- Higher speeds
- Cost – labor, materials, traffic control
- Logistics, supervision



Nighttime Safety Concerns

- Irresponsible driver behavior
- High speed
- Driver confusion
- Work space intrusions
- Poor visibility
- Irresponsible worker behavior



Concerns

Worker
Safety





EDOHRNE

2



Roadway Worker Deaths During Night Operations: What Do the Data Show?

Stephanie Pratt

National Institute for
Occupational Safety
and Health

Centers for Disease
Control and Prevention

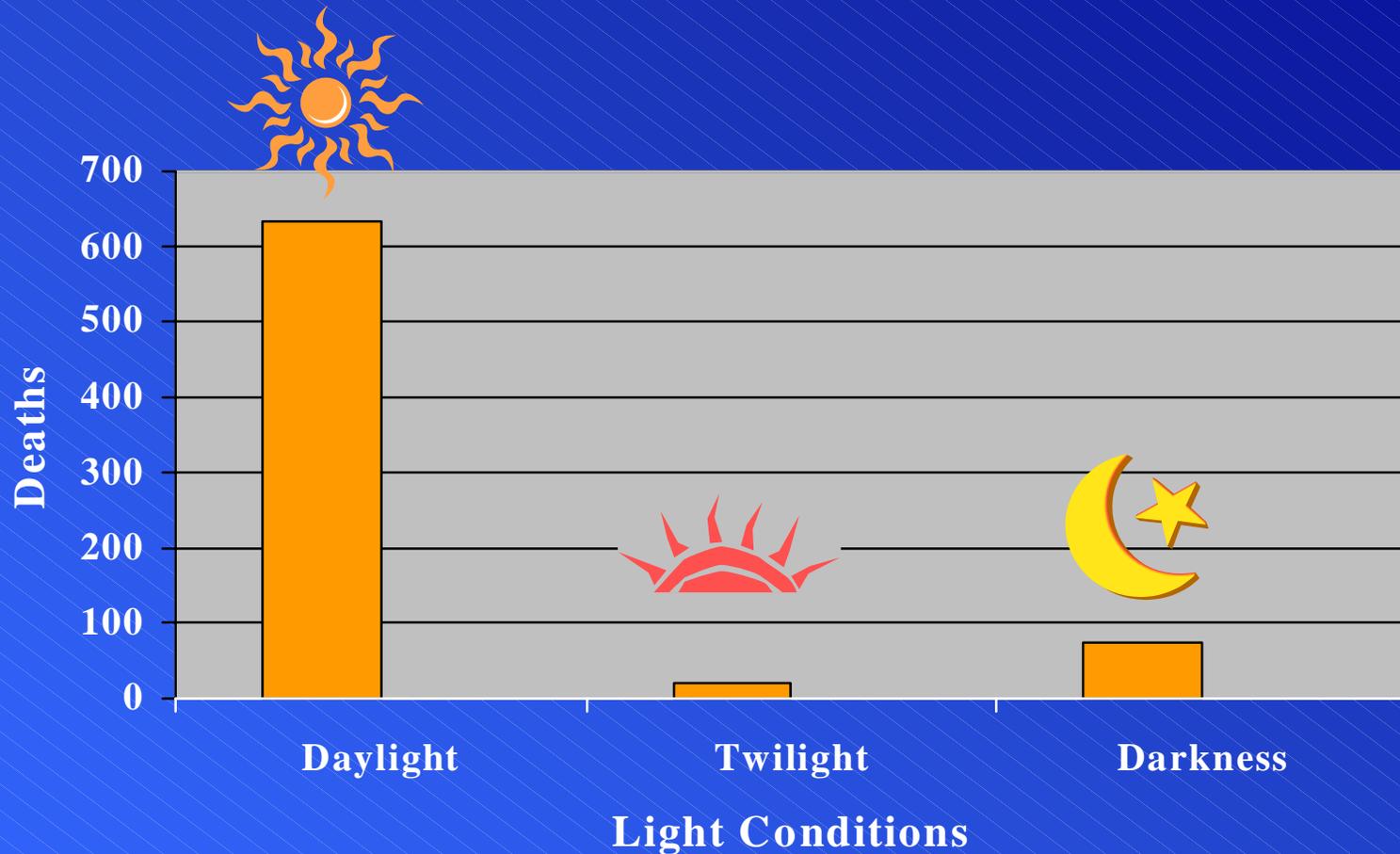


Worker Deaths in Work Zones



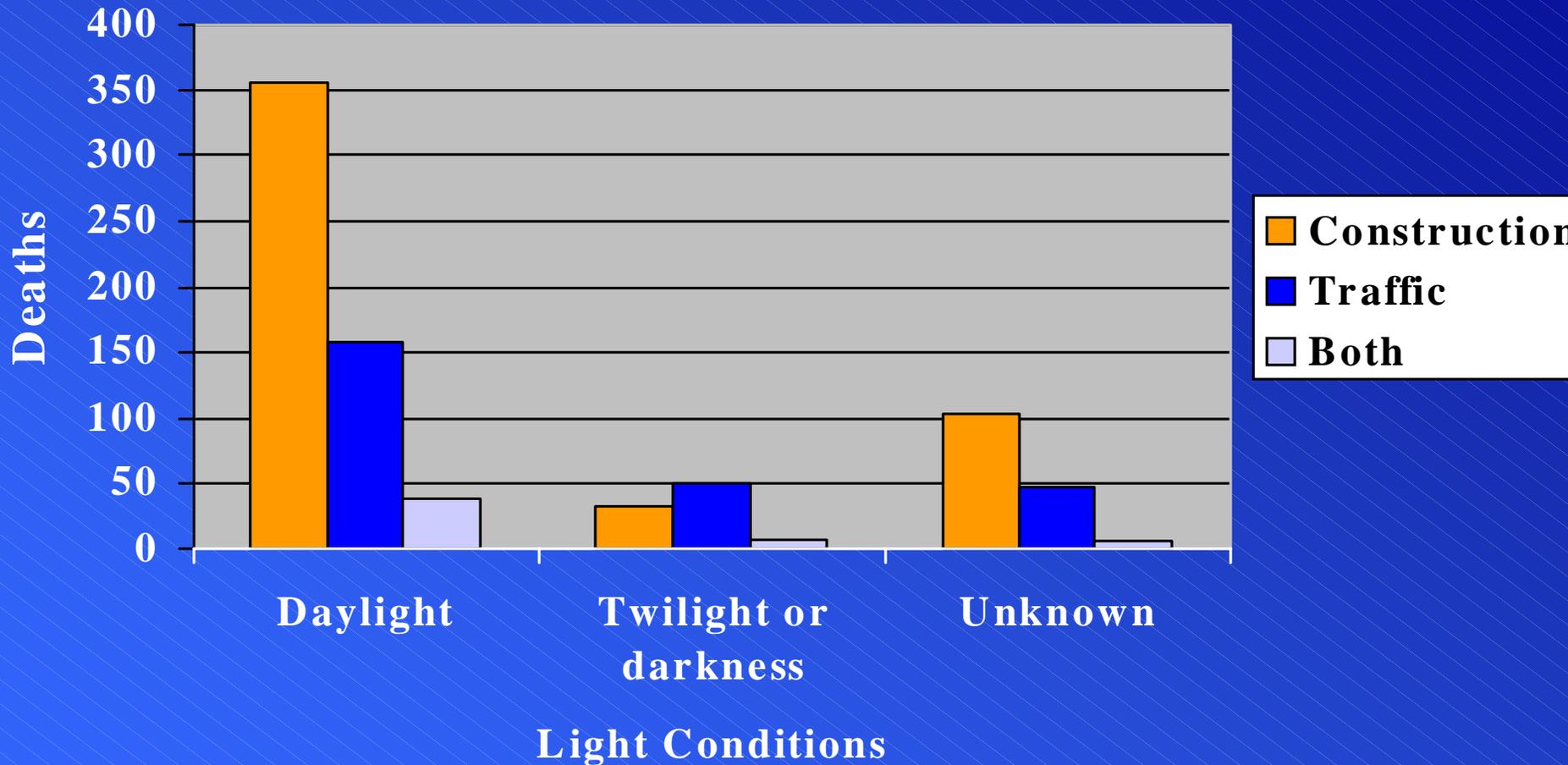
- ☀ 910 worker deaths 1992-2000
- ☀ 826 (91%) were vehicle or equipment-related (traffic vehicle, construction vehicle, or both)

Worker Fatalities in Highway Work Zones, by Light Conditions, 1992-2000 (n=729*)



* Excludes 181 cases for which light conditions could not be determined.
Source: Census of Fatal Occupational Injuries, special research file (excl. NYC)

Worker Fatalities in Highway Work Zones, by Light Conditions and Vehicle Type, 1992-2000 (n=910)



Source: Census of Fatal Occupational Injuries, special research file (excl. NYC)

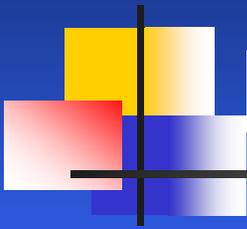
Worker Deaths in Work Zones During Twilight and Darkness (n=95) What Factors Contributed?

- ☀ Traffic vehicle entered work area (37)**
- ☀ Impaired driver (9)**
- ☀ Worker stepped into path of traffic vehicle (7)**
- ☀ Safety equipment not in use (7)**
- ☀ Worker struck by machine part (5)**
- ☀ Backing (5)**

Take-Home Messages

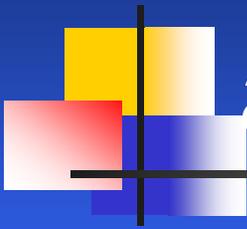


- ☀️ **Work at night is not responsible for the overall increase in worker deaths**
- ☀️ **Planning for safe night operations should address both construction vehicles and traffic vehicles**



Enhancements to Address Night Concerns

- Temporary illumination
- Brighter signs and TCDs
- Larger signs and TCDs
- More signs and TCDs
- Positive guidance
- More safety devices
- Driver information
- Police enforcement



Other Traffic Control Devices and Safety Features

- **Changeable message signs**
- **Flashing arrow panels**
- **Temporary signals**
- **Rumble strips**
- **Crash cushion**
- **Shadow vehicles with TMA**
- **Traffic barriers**
- **Arrestor nets and intrusion alarms**



Clear Driver guidance



DETOUR



INTERSTATE

80

EAST



EXIT

EXIT
13S ↗

EXIT
3
MP

NIGHT

WDRK



SUN
MARKET

City of Citrus

Population
10,000

STOP

GREENBK

AND

SUNRISE

SU
MAR

STOP

EXPECT

5 MIN.

DELAYS



GREENBK
AND
SUNRISE

SUN
MARKET

RISE
PLACE

SPEED
LIMIT
40

City of Oliver Heights

EX-SCENE
SUNRISE PLACE
SUNRISE PLACE



EAST BND
ONRAMP
CLOSED



DETOUR
W/ B50 TO
MADISON

RAMP
CLOSED
AHEAD



NO STOPPING
ANY TIME



ETOU
/B86
MADISON



HOW WILL THIS PROJECT IMPACT TRAFFIC?

Traffic delays will be kept to a minimum, whenever possible, during the project. Most of the roadwork is scheduled to take place at night, when there is less traffic. Between May and early June, there will be three weekends when northbound Highway 99 will be reduced to two lanes at the Florin Road over crossing. The northbound Highway 99 off-ramp to westbound Florin Road and the eastbound Florin Road on-ramp to northbound Highway 99 will also be closed. These lane closures will begin Saturday evening at 6:00 p.m. and continue until Monday morning at 5:00 a.m. Caltrans' Highway Advisory Radio (530AM or 1610AM) will be activated and changeable message signs, which will be placed at key locations on the highway, will advise motorists of alternative routes and the expected time of delay.

WHY WORK ON THE WEEKEND?

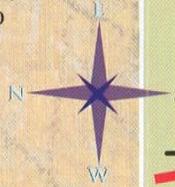
Traffic is lighter on the weekend. Caltrans and its contractors will be able to operate more efficiently and get the job done quicker by working continuously on the weekends. *These methods will:*

- ◆ Minimize the impact on traffic
- ◆ Cost less

If we did not work continuously on the three weekends previously mentioned, this project would take longer, cost more and the quality of the work would suffer. Work crews would have to set up and take down their equipment each night, leaving only a couple of hours to actually work on the project.

WHAT'S HAPPENING

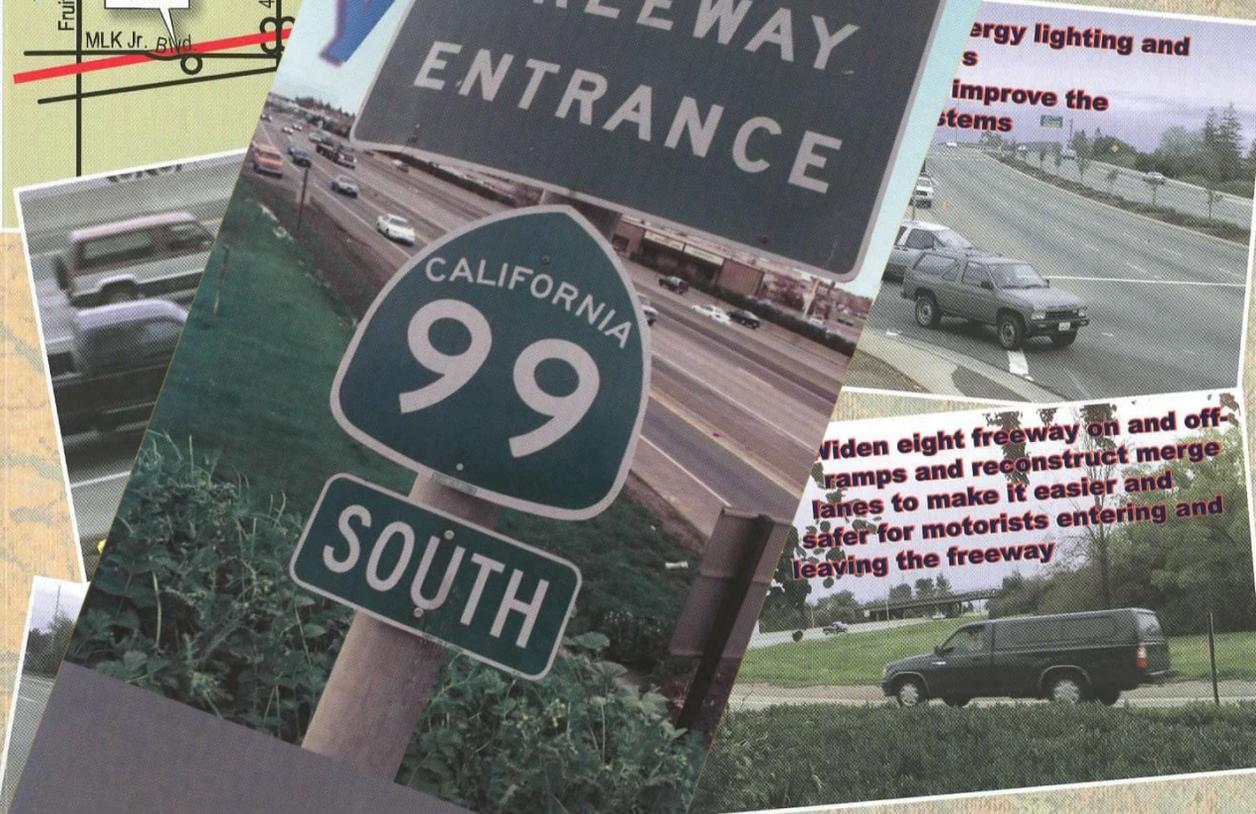
Caltrans is improving and Martin Luther King Jr. Blvd. includes these improvements:



Highway 99 and Safety Enhancement Project



Between Mack and King Jr. Blvd.

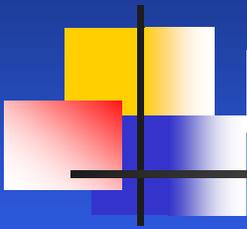


WHEN WILL THE HIGHWAY IMPROVEMENTS BEGIN AND END?

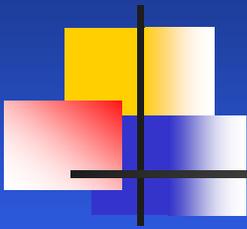
This project will begin in May 2001 and end in December 2001. Weather is always a factor, so we will do our best to keep you informed of any changes to the schedule.



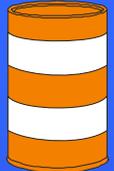
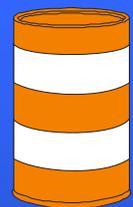
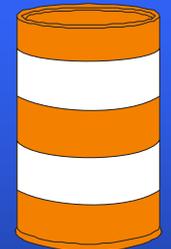
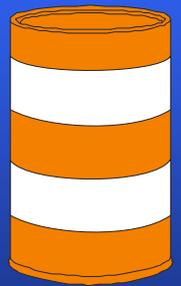
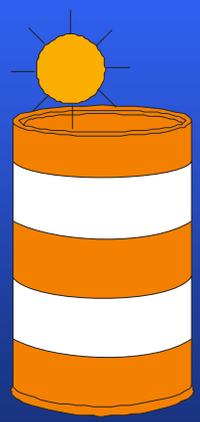
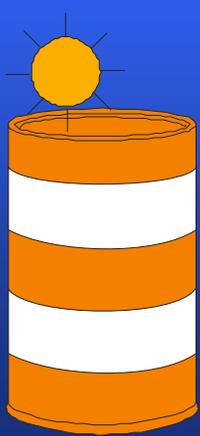
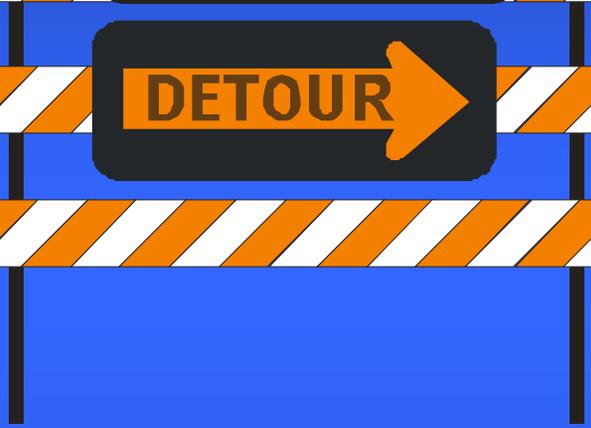
Channelizing and Guiding Devices

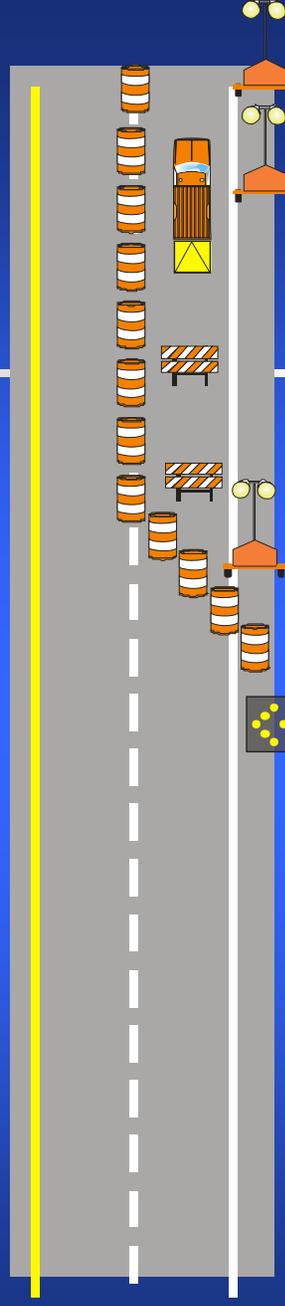
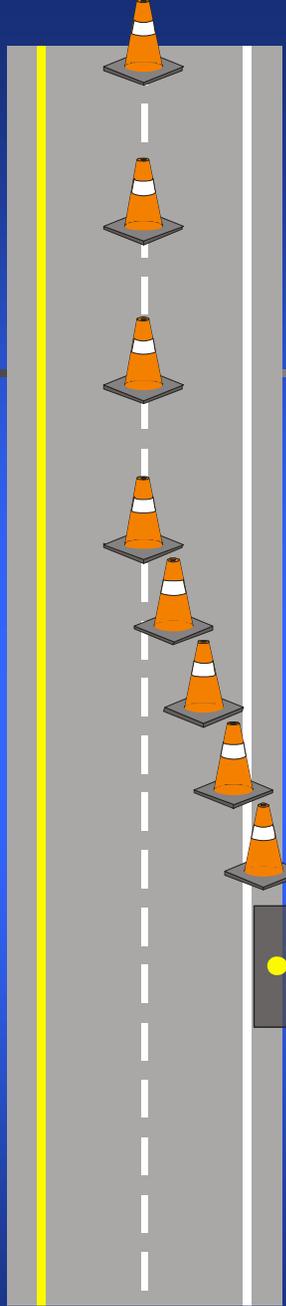
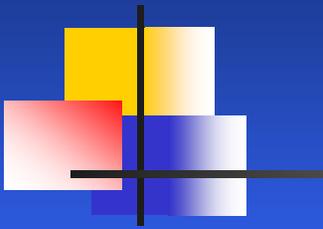


- Channelizing device types
- Device spacing
- Retroreflectivity
- Condition
- Impact performance and ballast
- Warning lights
- Pavement markings
- Delineation



**ROAD
CLOSED**





**NIGHT
WORK
AHEAD**











EXIT
1 ↗

ROAD WORK AHEAD

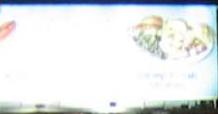


2 SCHEENECTADY
9 ALBANY
9 SARATOGA

NO LEFT TURN

YIELD

ACURA



1111 1111







Police Enforcement





10/25/17
16:23:01

EXIT 14
Downbound Albany
Exit 14

Peak Avenue
Exit 3 & 4
Downbound Albany
Exit 4

EXIT 14
Downbound Albany
Exit 14

EXIT 14
Downbound Albany
Exit 14

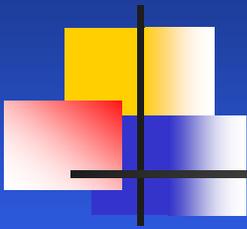
EXIT
Port of
Albany

EXIT

SOUTH









High Visibility Apparel

ONE WAY

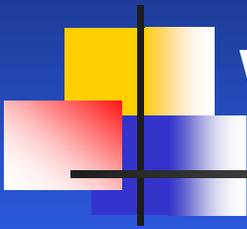


SPEED
LIMIT
35









Work Vehicle Protection

- Warning lights – 360 deg. Visibility
- Two lights = better depth perception
- Amber is preferred color
- Rotating/flashing incandescent best
- Strobe lights not as good
- Supplement with 4-way flashers
- Retroreflective markings
- Identifying signs





CONSTRUCTION
VEHICLE
DO NOT FOLLOW

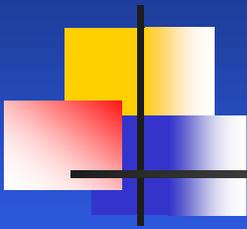
TRUCKS ARE BEAUTIFUL





 BENSON

FITZGERALD
CATINA, NJ







**HIGH
VOLTAGE**



LANE
CLOSED
WET
PAINT

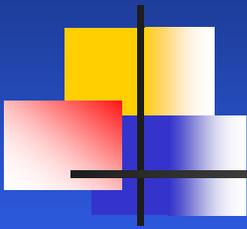
Accent
Stripe
Inc.
Orchard Park, N.Y.
Salisbury, Md.





Effective Lighting





Lighting Requirements

- Illumination requirements by task
- Illumination criteria
- Paving and milling operations
- Uniformity and glare
- Equipment and systems
- Lighting plan

Illumination Requirements

by Task

- **Level I – 54 lux (5 fc)** General illumination
- all activity areas
- **Level II – 108 lux (10 fc)** – paving,
milling, equipment work areas
- **Level III – 215 lux (20 fc)** – mechanical,
electrical, other detail work
- **Fixed Roadway Lighting typically less
than 20 lux (<2fc).**





VOLVO

amida











COMPLIANT TOUCH
PAVEMENT

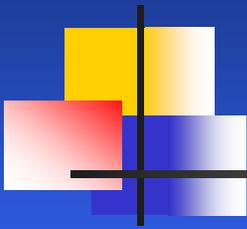
WORLD RUSH.





amida

AL4000



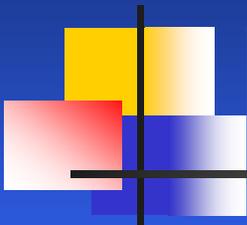












Night Flagging

- Avoid if possible
- Provide adequate illumination
- Good setup and procedures



STOP

UNEVEN
LANE



SLOW

STAY OFF THE ROAD

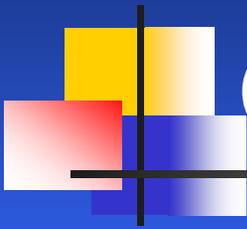


STOP

VALLEY
Hillside





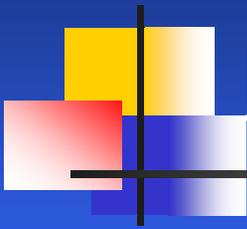


Overview of Night work Concerns

- Night work entails additional risks
- Night work can be safe for workers and travelers
- Enhanced traffic controls reduce risks
- Planning is critical for safe, efficient operations



Take Home Messages
For
Safe Night Work



5 Practical Solutions

- Effective signs
- Effective channelization
- Visible workers
- Visible work vehicles/equipment
- Temporary lighting

DETOUR

WEST

INTERSTATE
694

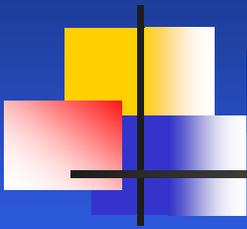












Key References for Night Work

- MUTCD Part 6
- NCHRP Report 475 - Procedure
- NCHRP Report 476 - Guidelines
- NCHRP Report 498 – Illumination Guidelines
- Traffic Control Handbook for Mobile Operations at Night

www.trb.org

<http://mutcd.fhwa.dot.gov>