

RMACES
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NIGHT TIME PAVING LIGHTING AND EQUIPMENT SETUP



MY BACKGROUND – GRANT CRUSETURNER

- ◉ Estimator/PM for Brannan Sand and Gravel
- ◉ Involved with CAPA/CDOT's committee on Nighttime Illumination

MY BACKGROUND – NEAL RETZER

- Current Construction Project Engineer for CDOT
- Former Roadway Designer/Project Manager for Design

CDOT HAS DEVELOPED A NEWER NIGHTTIME ILLUMINATION SPECIFICATION OVER THE LAST COUPLE YEARS

- This specification gives minimum lighting requirements for night time construction.
- To understand this specification and how to properly setup your operation for night work, you need a basic understanding of how light is dispersed and how it is measured.

BACKGROUND

- The National Cooperative Highway Research Program (NCHRP) published their NCHRP Report 726: A Guidebook for Nighttime Construction: Impacts on Safety, Quality, and Productivity
- In this report, the NCHRP identified the problem area and proposed solutions for those problems

PROBLEM AREAS IDENTIFIED BY NCHRP

- Safety of Personnel
- Safety of Traveling Public
- Reduction in Quality
- Increased Construction Nuisances

WHAT ARE WE TRYING TO ACCOMPLISH WITH NIGHTTIME ILLUMINATION?

- Two Parts – Must be balanced.
 - Provide the proper amount of light with minimal glare for our workers so that they can safely, effectively, and efficiently perform their work.
 - Properly illuminate the work area in order to increase awareness and visibility of the work zone and the construction worker to the travelling public

CDOT NIGHT WORK LIGHTING SPECIFICATION REQUIREMENTS

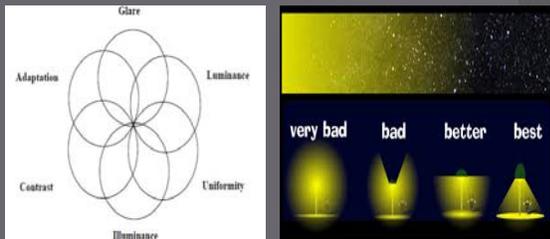
- For paving operations, minimum of 5 foot candles 25 feet in front of and behind and 5 feet each side of each piece of moving equipment.
- Light sources shall be positioned not to interfere with or impede traffic in any direction and not cause glare for motorists.
- Must maintain a uniformity ratio of 5:1 over work space.

HIGHLIGHTS AND LOWLIGHTS OF CDOT LIGHTING SPECIFICATION

- Highlights
 - Clearly states amount of illumination and where
 - Clearly states who and what must be illuminated
 - Mentions glare and other safety issues
- Lowlights
 - Vague and contradictory on which direction the lights should point (one part says perpendicular and parallel)
 - Requires project to be shut down if any of the lights are shutoff or burned out

CDOT LIGHTING DESIGN GUIDE AND PRINCIPLES

- Glare vs Contrast vs Luminance



LIGHTING PRINCIPLES APPLIED

- High Mast vs Cobra Head Cutoff Lenses



DIFFERENT TYPES OF LIGHTS

- Light Towers



DIFFERENT TYPES OF LIGHTS

- Flood/Spot Lights



DIFFERENT TYPES OF LIGHTS

- Overhead Lights – Balloon Lights



DIFFERENT TYPES OF LIGHTS

- Overhead Lights – LED Overhead Light



SO NOW THAT YOU KNOW THE BASICS, HOW TO YOU ACHIEVE THESE REQUIREMENTS?

- Planning and Preparation
- Executing and Maintaining

PLANNING AND PREPARATION

- Planning needs to begin before the bid.
- Visit the worksite at night
- What is the topography of the roadway? Is it hilly and curvy?
- What type of lighting do you currently have on your equipment?
 - How many foot-candles are you currently at 25 feet?
 - How about at 5 feet?

PLANNING AND PREPARATION

- Based on your current situation, get prices for different types of lights.
 - If you are struggling to meet the minimums at 25 feet, you may need to spot lights.
 - If you are struggling to meet the minimums at 5-10 feet, you may need to overhead lights.
- Prepare a detailed estimate of your cost to both purchase new lighting and install. No one wants to get a huge bill after you get the job that you didn't have budgeted.

SO YOU GOT THE JOB, NOW WHAT?

- Use the estimate that you developed pre-bid as a starting point.
- Get a few different types of lights and begin testing. Track and record reading with a light meter.
 - Very Important – Think about the energy that will be required to power these lights.
- Test in real world situations. This will give you a better idea of the additional time required in daily setup. Identify any hazards that need to be mitigated.
 - Ideally, test systems on a project that does not have an illumination specification.

SO YOU GOT THE JOB, NOW WHAT?

- Based on your tests and trial, develop your lighting plan.
 - Include diagrams showing placement of lights
 - Describe the types of lights being used
 - Describe how you will minimize glare

EXECUTING AND MAINTAINING

- Using your lighting plan as a guide, set each piece of equipment with the lights required.
- Test your lights during the day to ensure you have adequate power and that all the lights work. It is easier to get replacement during normal business hours
- Keep extra bulbs accessible in case of problems at night. Bulbs depending on the type can be fragile.

BEST PRACTICES

- Ensure that lights are not positioned directly towards traffic.
 - Elevate lights as much as possible and point lights down
 - Point lights perpendicular to traffic
- Take into account the power needed for the lights
 - LEDs may be more expensive but they use less energy, thus not requiring supplemental power.

BEST PRACTICES

- Be careful of overhead obstructions and power lines when elevating lights
- Try to make additional lights user-friendly.
 - Cumbersome systems will go underutilized by crews
- Make sure to use GFCI
- Use outriggers on light plants.

BEST PRACTICES



WHAT'S A PROJECT ENGINEER TO DO?

- This situation fulfills the specification but is not necessarily a safe or ideal solution according lighting design standards



WHAT'S A PROJECT ENGINEER TO DO?

- This situation doesn't fulfill the specification completely but seems to work well and is more practical



CONCLUSION

- Proper lighting at night will increase the safety and the quality of your nighttime construction activities.
- The "Specification" world and the "Real" world don't always coincide so try and use common sense
- Questions?