

## **Diseño del Sistema de Iluminación de la Estación de Río Piedras**

El propósito de esta investigación es diseñar un sistema de iluminación para la estación de Río Piedras. Entre todas las estaciones escogí la de Río Piedras porque es la única estación que será subterránea, por lo menos durante la primera fase del proyecto. El problema de iluminación puede ser resumido en proveer suficiente luz en el lugar que se desea y cómo se desea. Al hacer un diseño de iluminación se toman en cuenta diversos factores, por ejemplo, el costo inicial, el costo de operación, la eficiencia de la instalación y apariencia del equipo y la seguridad que provee al usuario. También debemos pensar en el tipo de edificio, qué trabajo se realizará en él, cuáles son las especificaciones que se desean, el área, el color de las paredes, los techos y los pisos, qué tipo de iluminación se desea, qué cantidad de dinero hay disponible, cuánta cantidad de luz natural recibe, cuáles serán los servicios que se prestarán, entre otros.

Durante el desarrollo de esta investigación he buscado información sobre iluminación, para qué se hace éste diseño y cuál es su importancia. He leído sobre las diferentes formas de iluminación y cuáles son sus características. También he buscado información sobre las especificaciones que son requeridas por el GMAEC para los sistemas de iluminación de las estaciones en especial, la estación de Río Piedras. Gracias a la Sra. Lydia Mercado, pude obtener los planos de la estación, una copia en papel y una en disco. Con la ayuda de mi consejero, Prof. Julio A. Santiago, escogí un área de muestra, y utilizando el programa AUTO-CAD calculé su área y altura. También estoy aprendiendo a usar un programa llamado LUXICON, que se utiliza para el análisis de iluminación.

Delmarie Ayala Román (802-93-0561)

## Definition and Concepts

- Lighting
- Basic Lighting Concepts
- Light Sources
  - Natural Light
  - Artificial Light
- Guidelines Questions



## Basic Lighting Concepts



- Light
- Illumination
- Brightness
- Color
- Adaptation
- Glare

# Light Sources

## ■ Natural Light

## ■ Artificial Light

Incandescent Lamp

Fluorescent Lamp

High Intensity Discharge Lamp



# Incandescent Lamp

Basically the incandescent lamp is a very simple device, just a wire sealed in a glass enclosure. Electric current, passing through the wire, heats it to incandescence and the wire emits light.

Filament lighting is indicated:

- where a warm character is demanded;
- where running costs are low or are of secondary importance;
- where color rendering is unimportant provided it is familiar;
- where simplicity and cheapness in installation are paramount;
- where lamps must be changed by unskilled persons;
- where bright point source sparkle is desired;
- where detailed control over modeling and directional character of the lighting is necessary;
- where easily controlled local lighting on the work, a desk lamp, is indicated.

# Fluorescent Lamp

The fluorescent lamp is one member of a family of electric discharge sources. Its bulb contains mercury-supported arc and is filled with an inert gas, kept at low pressure, which produces light by activating the thin film of phosphors (fluorescent material) that coat the glass tube.

Fluorescent lighting is indicated:

- where running costs over a long period must be minimized;
- where high levels of illumination must be provided with the least addition to the total electrical loading in the building;
- where uniformity of illumination over large area is needed;
- where a cool and hygienic appearance is demanded;
- where the lighting is to be used as a supplement to daylight.

# High Intensity Discharge Lamp

High intensity discharge (HID) lamps are members of the electric discharge family of light sources. Three types are now commercially available: mercury vapor, metal halide, and high-pressure sodium. Light is produced in all three when a high-pressure electric arc is passed through a gas vapor, rather than by a low-pressure arc as in fluorescent lamps.

## Guidelines Questions

- Ⓐ What type of building is it?
- Ⓑ What type of work will be done?
- Ⓒ Where is it to be located: is there available service?
- Ⓓ What is the utility supply voltage?
- Ⓔ What are the code requirements?
- Ⓕ What is the square footage?
- Ⓖ Are there different work related zones?
- Ⓗ What type of equipment is to be used: what task power is required?
- Ⓘ Are computers to be used?
- Ⓚ What is the design electrical load?
- Ⓛ What transportation is required: elevators, escalators?
- Ⓜ How much room is available on each floor for electrical equipment?
- Ⓝ Are there offices or cubicals or large open spaces?



## Guidelines Questions

- Ⓐ Are there conference rooms?
- Ⓑ What is the means of circulation in terms of the emergency exits?
- Ⓒ How many convenience outlets are required?
- Ⓓ How high are the ceilings?
- Ⓔ What is the average work surface height?
- Ⓕ What will be the color of the walls, ceilings, and floors?
- Ⓖ What kind of lighting will be used?
- Ⓗ What are the color rendering index requirements?
- Ⓘ What is the budget for electrical bills?
- Ⓚ What are the hours of operation of the building?
- Ⓛ Will there be any additional buildings associated with this structure: a parking garage or a lot that must have lighting?
- Ⓜ What natural lighting is available?

# Tren Urbano Design Criteria

## ■ General

Lighting system shall be:

- Functional
- Relative simple
- Economical
- Energy-Efficient
- Vandal-Resistant
- Control glare

## ■ Lamps

- Incandescent Lamps
- Hot Cathode Fluorescent Lamps
- Metal Halide Lamps
- High Pressure Sodium Lamps

\* Lamps shall comply the National Energy Policy Act of October 1992

## ■ Calculation Procedures

- Calculation Assumptions
- Calculation Methods

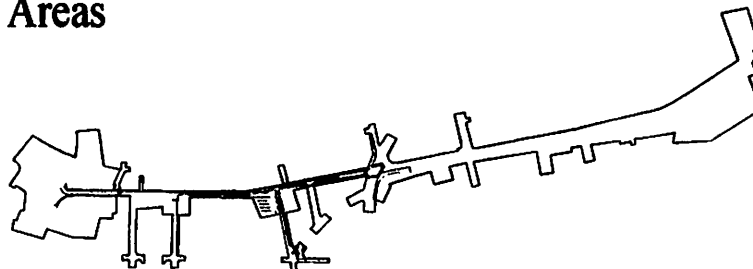


# Río Piedras Station

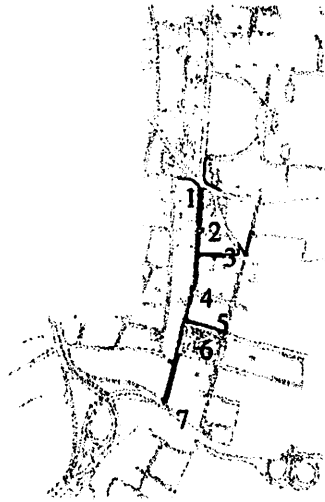
## ■ Location

## ■ Station Layout

## ■ Areas



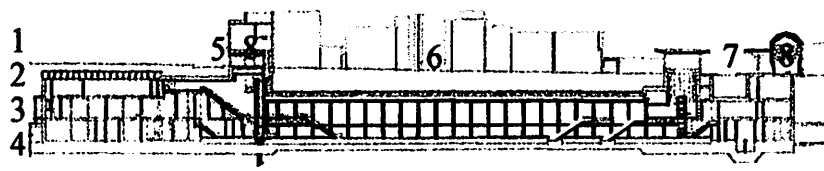
## Location



### Legend

- 1 Ponce de León Ave..
- 2 Saldaña Street
- 3 Robles Street
- 4 Paseo de Diego
- 5 Arzuaga Street
- 6 Río Piedras Plaza and Church
- 7 PR 3

## Station Layout



### Legend

- |                   |                  |
|-------------------|------------------|
| 1 Street Level    | 5 Arzuaga Street |
| 2 Concourse Level | 6 Paseo de Diego |
| 3 Mezzanine Level | 7 Robles Street  |
| 4 Platform Level  | 8 Station        |

## Areas

|                            |                                       |
|----------------------------|---------------------------------------|
| Tunnel Valve Room          | Electrical Room                       |
| Cable Room                 | UPE and TPSS Fan Room                 |
| Custodial Room             | Storage Room                          |
| Pumping Room               | Emergency Equipment Room              |
| Battery Room               | Mechanical Room                       |
| Emergency Fan Room         | Train and Control Communications Room |
| Air Supply Room            | Elevator Equipment Room               |
| Trash Room                 | Ejector Room                          |
| Staff Security Room        | Sprinkler Valve Room                  |
| Fire Pump Room             | Chiller Room                          |
| Equipment Room             | Platform and Train Room               |
| Emergency Stairs Corridor  | Emergency Exit Corridor               |
| Service Corridor           | Elevator Areas                        |
| Station and Staff Entrance | Staff Toilet                          |

Plaza, Platform, Mezzanine, Paid Area, Map Case Area, Passageways Area, and others.



## Conclusion / Recommendations

- Lighting is a design element which can greatly enhance the overall impression of a building. Station lighting system can reinforce safety and spaciousness resulting in a more user friendly environment.

