

Safety Guidelines for Lightwave Transmission Systems

Verizon Safety Management
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National Manager / LASER Safety Officer



LASER

Light Amplification by Stimulated Emission of Radiation

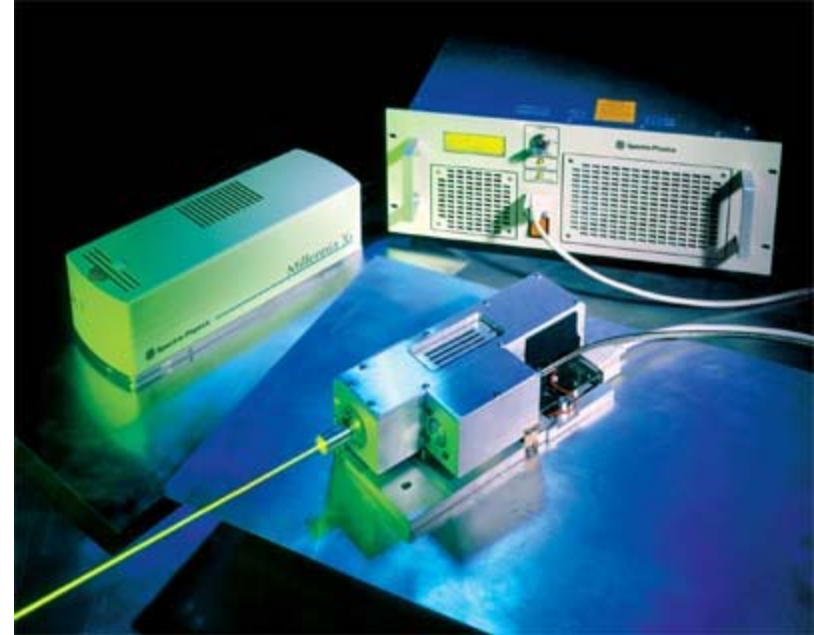
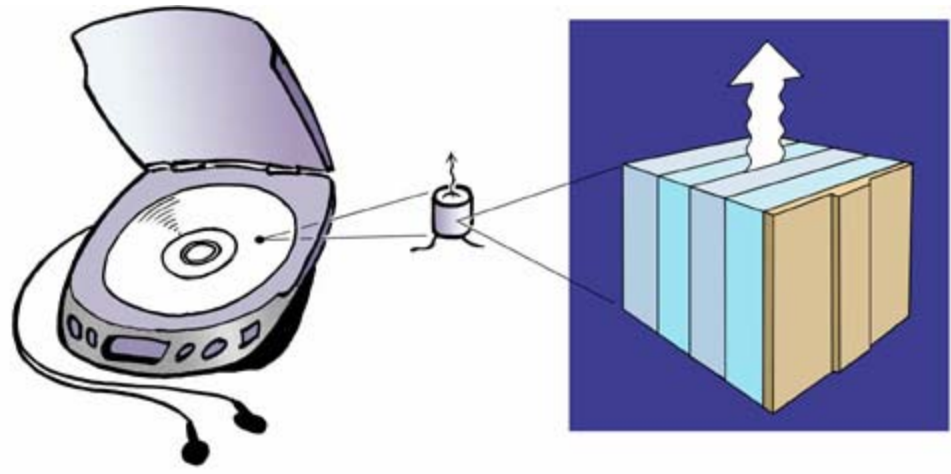


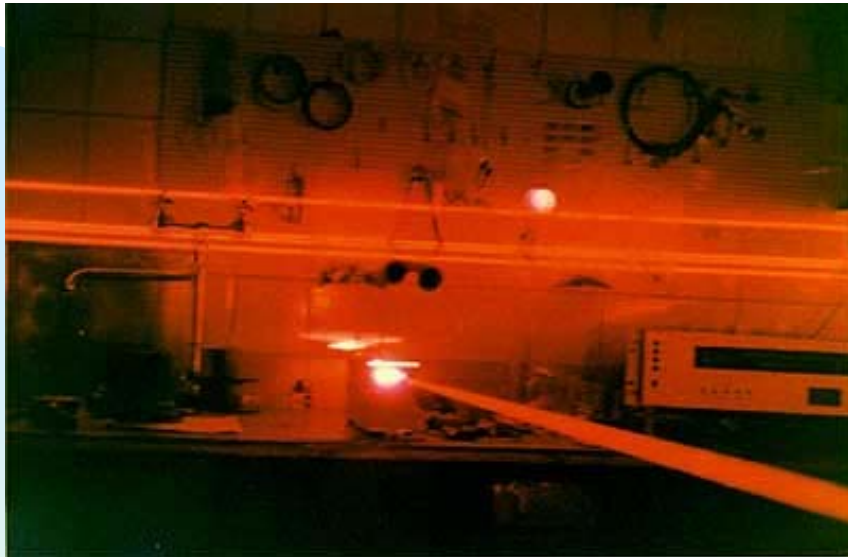
LASER Types

Argon fluoride (UV)
Krypton fluoride (UV)
Nitrogen (UV)
Argon (blue)
Argon (green)
Helium neon (green)
Helium neon (red)
Rhodamine 6G dye
(tunable)
Ruby (CrAlO₃) (red)
Nd:Yag (NIR)
Carbon dioxide (FIR)
Diode Tel-Com



Semi Conductor LASER





Gas LASERS

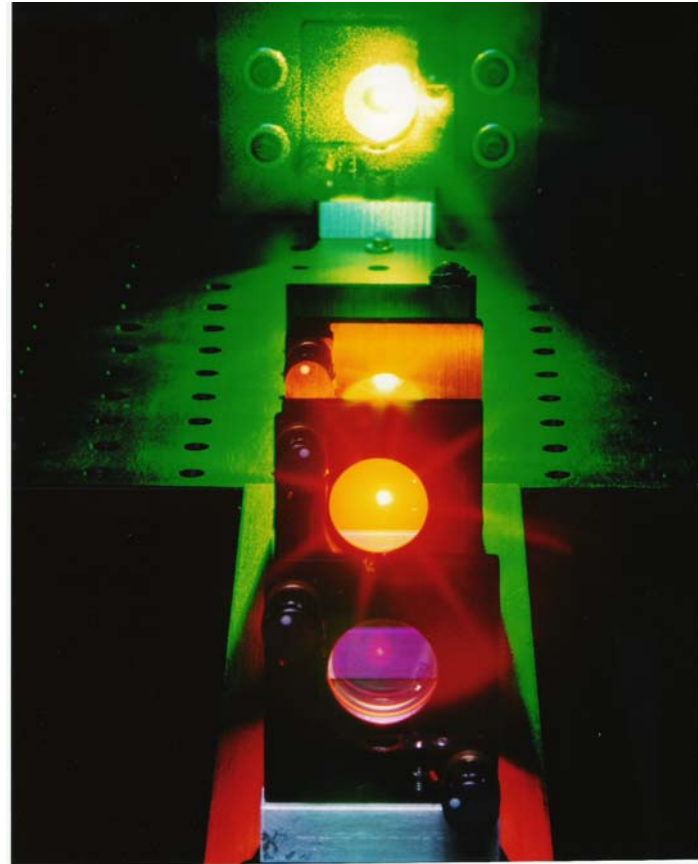




Excimer LASERs



Dye LASERS



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<http://www.cartoonbank.com>



"For God's sake, Edwards. Put the laser pointer away."

Characteristics of a LASER



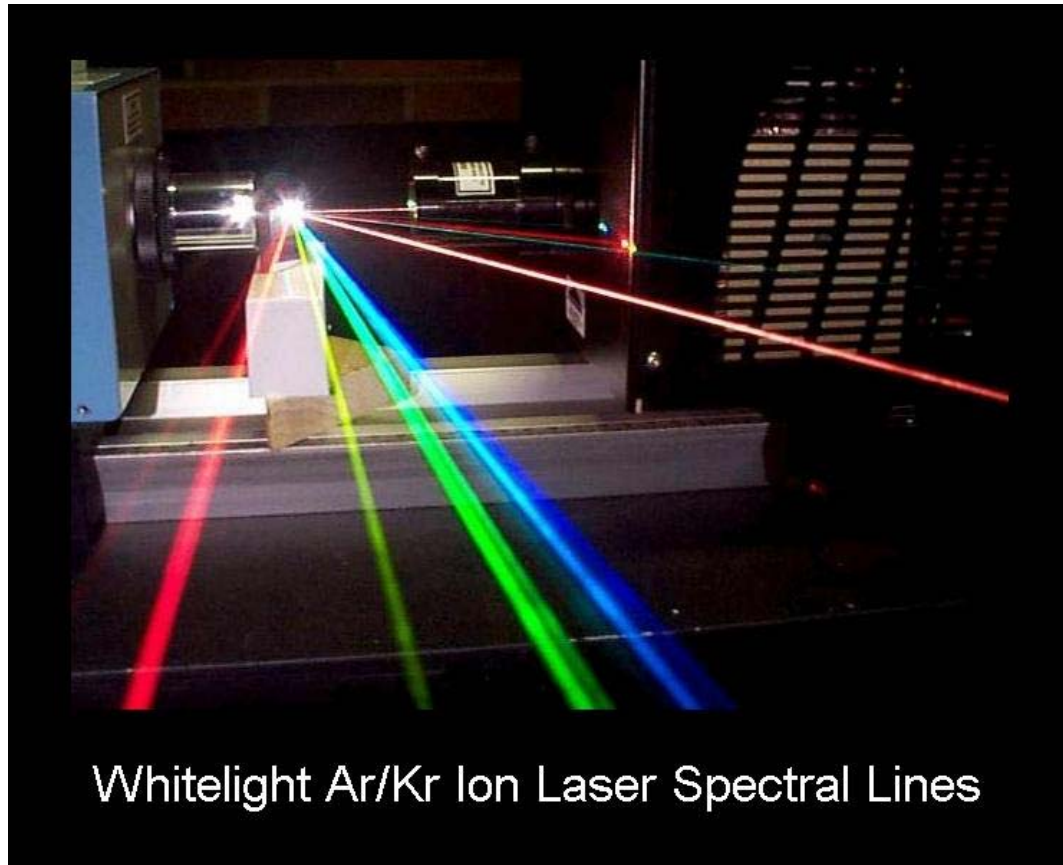
LASER Classifications

LASER Classification (American National Standards Institute – ANSI)

- LASERs are classified into four broad areas depending on the potential for causing injury (tissue burns). When you see a LASER, it should be labeled with one of these four class designations:
- **Class 1 (Closed System)**
- **Class 1A**
- **Class 2 (low power)**
- **Class 3A and 3B- (Medium Power)**
- **Class 4- (High Power)**



3 Characteristics of a LASER



Whitelight Ar/Kr Ion Laser Spectral Lines



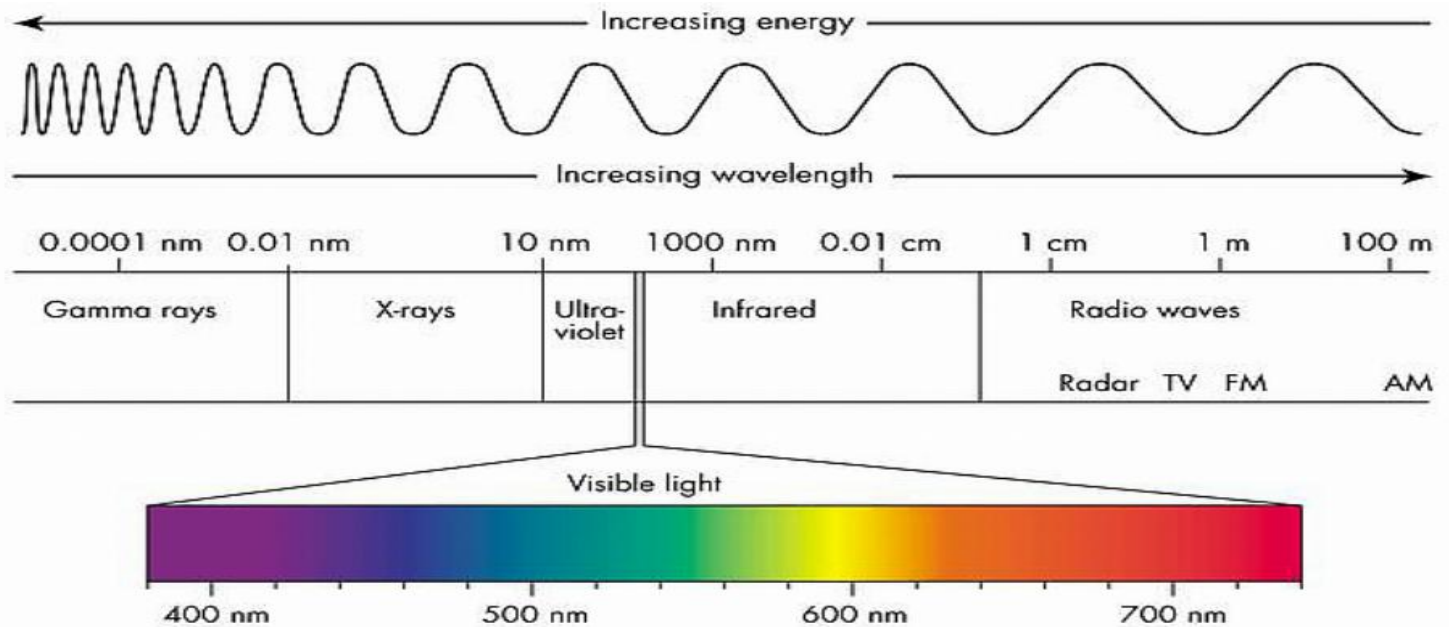
OPTICAL FIBER(LIGHT WAVE) COMMUNICATION SYSTEMS (OFCS)



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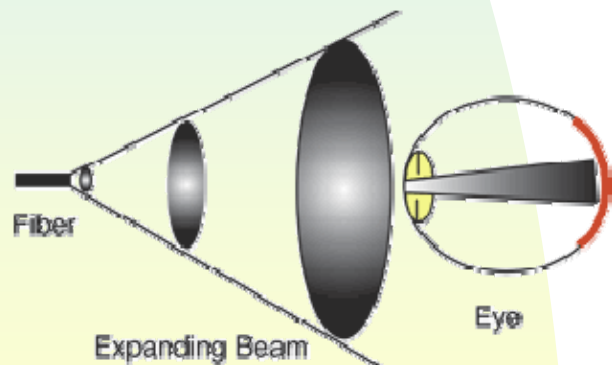


Spectrum

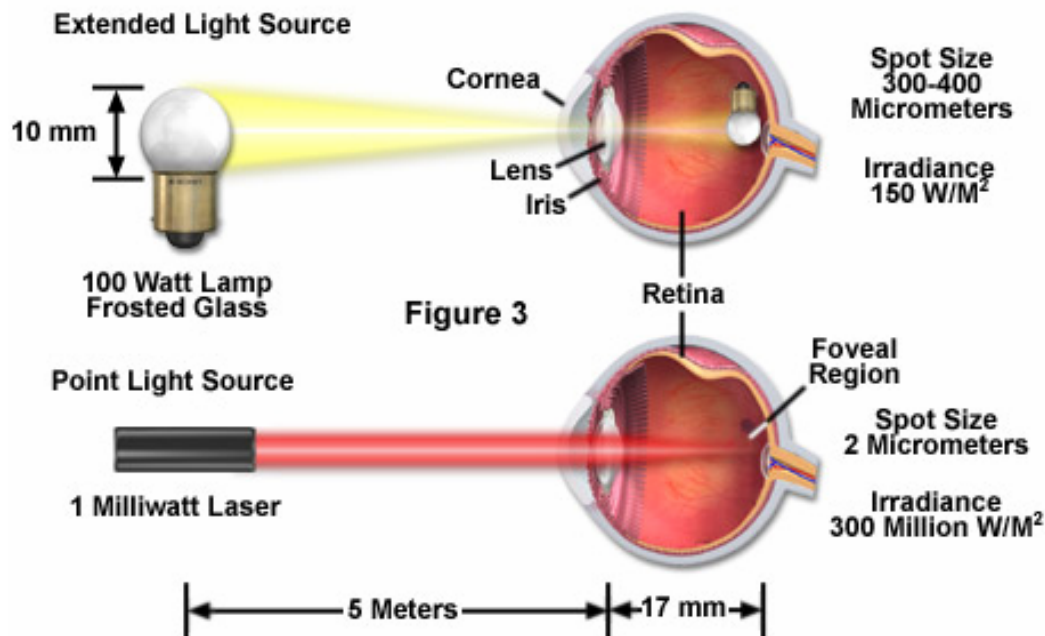


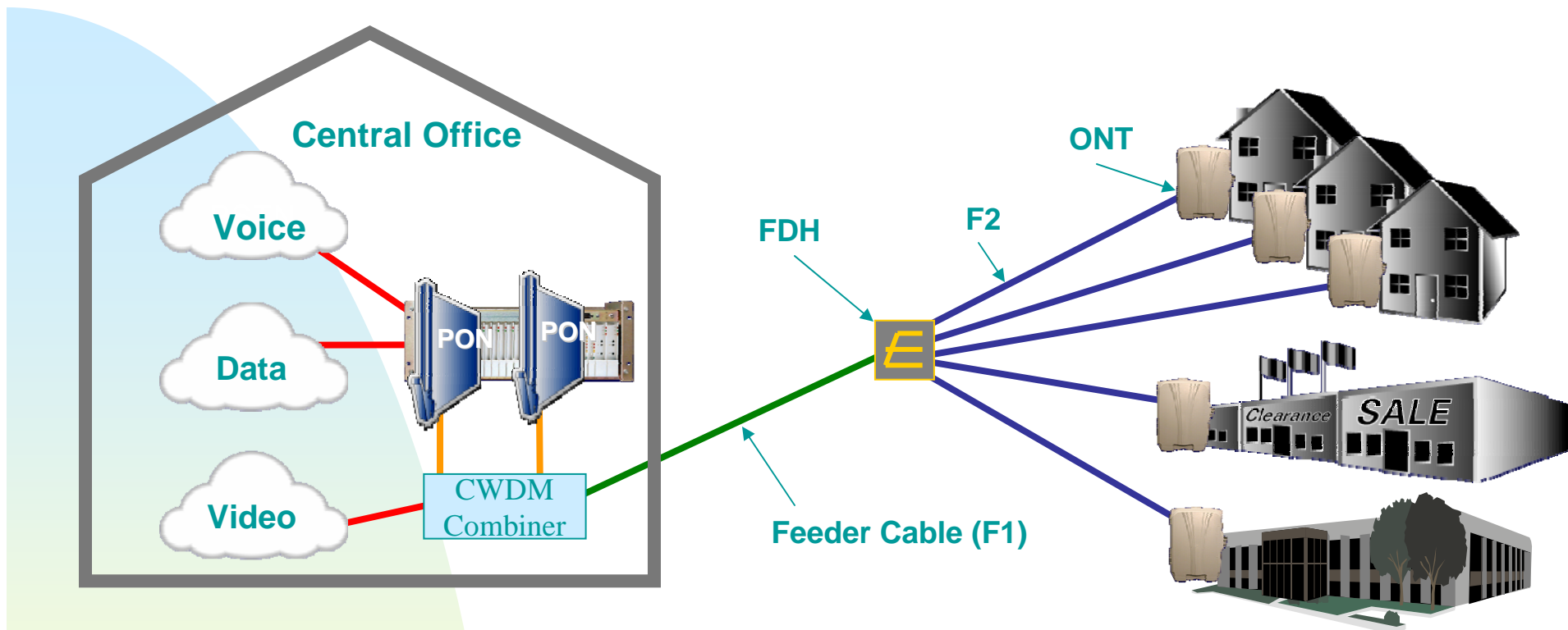
LASER Safety and the Eye

WARNING!!!!
NEVER LOOK
DIRECTLY INTO A
FIBER END, A
LASER SOURCE
OR POINT A
LASER IN YOUR
EYES OR AT
OTHERS!



Extended and Point Source Power Density at the Retina





Verizon's Fiber to the Premises FIOS



Non-Beam Hazards of LASERs



Glass Particles



Fusion Splicing

Chemical/Solvents



Safe Practices

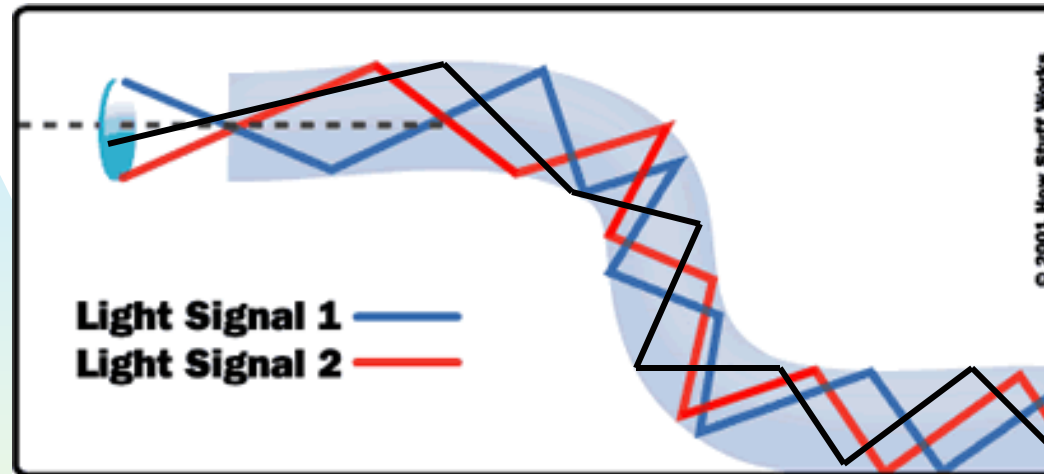
ANSI Standards					
Z136.1/Z136.2	Class 1 (SG1)	Class 2 (SG2)	Class 3A (SG3a)	Class 3B (SG3b)	Class 4 (SG4)
Power Level mW	Cannot emit LASER Radiation	$\leq 1\text{mW}$	1-5 mW	5 -500 mW	$> 500\text{ mW}$
Power Level dBm	Cannot emit LASER Radiation	$\leq 0.00\text{ dBm}$	0.01 - 7 dBm	7 - 27 dBm	$> 27\text{dBm}$
Eye Exam Req.	No	No	No	Yes	Yes
LASER Eyewear	No	No	No	Should	Shall

Class 1 (SG1) system for transmission during normal operations.

When being serviced it becomes a Class 3a or 3b depending on power level.



Multimode Fiber Optics



Downstream Video
Downstream Voice and Data
Upstream Voice and Data



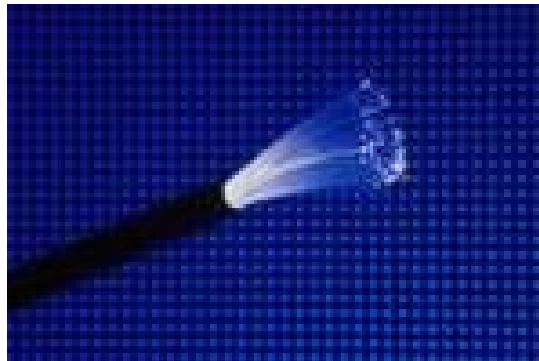
Safety Considerations



Class 3a



Class 3b



**SYSTEMS THAT ARE NOT ENCLOSED AND ENERGIZED ARE CLASSIFIED AS A 3A OR 3B LASER.
THE FOLLOWING SAFETY CONSIDERATIONS THEN APPLY:**

Only authorized-trained employees may:

- Install
- Service
- Maintain fiber-optic systems that are Not enclosed.



LASER Eye Protection

Diode Tel-Com
804-1755nm
Optical Density 3
Visible Light Transmission 30%
Lens Color - Green



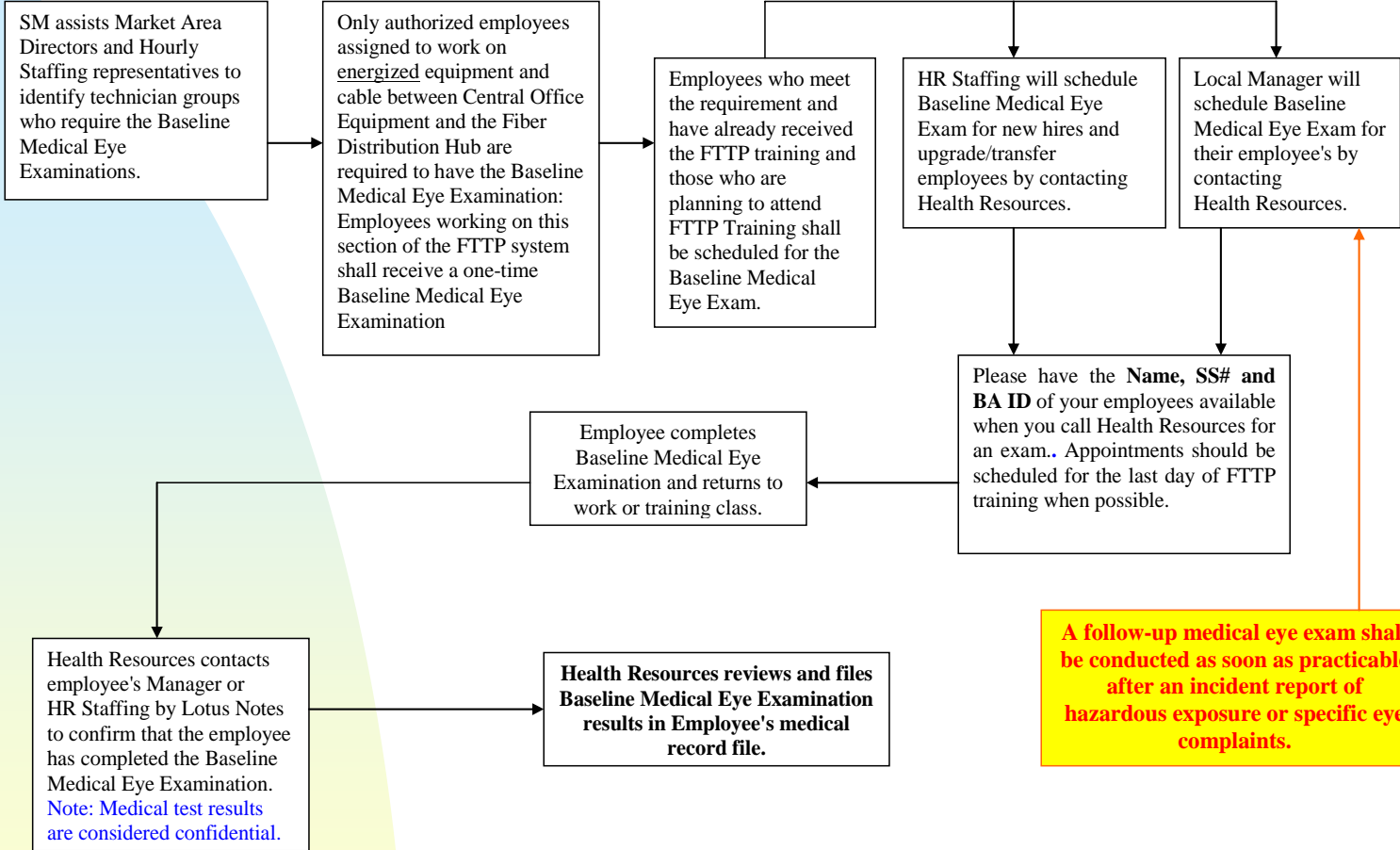


Medical Surveillance

– Baseline Eye Exam



Medical Surveillance



A follow-up medical eye exam shall be conducted as soon as practicable after an incident report of hazardous exposure or specific eye complaints.



FIOS Training Available

Title	Course Code	Classroom Enrollment Available	Other Delivery Options	Course Hours	Course Status	Development Site
FTTP: FIBER OPTIC FOR I&R TECHNICIANS	TT10332T	No	None	104.00	Active	Verizon (excluding 272's)
FTTP: FIBER OPTIC FOR I&R TECHNICIANS	TT10332	Yes	None	104.00	Active	Verizon (excluding 272's)
FTTP: FIBER OPTIC FOR I&R TECHNICIANS - NEW HIRE - WEST	TT10332NH-W	Yes	None	120.00	Active	Verizon (excluding 272's)
FTTP: I&M INSIDE PREMISES	TT10332B	No	None	32.00	Active	Verizon (excluding 272's)
FTTP: I&M INSIDE PREMISES - CONTINUING EDUCATION - MAR05 UPDATE	TT10332B-CE0305	No	None	24.00	In Dev.	Verizon (excluding 272's)
FTTP: I&M INSTALLATION	TT10332A	No	None	40.00	Active	Verizon (excluding 272's)
FTTP: I&M MAINTENANCE	TT10332C	No	None	24.00	Active	Verizon (excluding 272's)
FTTP: I&M VIDEO SERVICES	TT10332D	Yes	None	40.00	Active	Verizon (excluding 272's)

Questions?



Additional Contact Information

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