2017
HOSPITALITY LAW
CONFERENCE

APRIL 24-26, 2017

CAUGHT ON CAMERA!

Defending Your Liability Claim Through Video Enhancement & Analysis

Presented by:

Barbara Worsham, PI
Rimkus Consulting Group, Inc.

HospitalityLawyer.com®
worldwide legal, safety and security solutions

PRESENTER

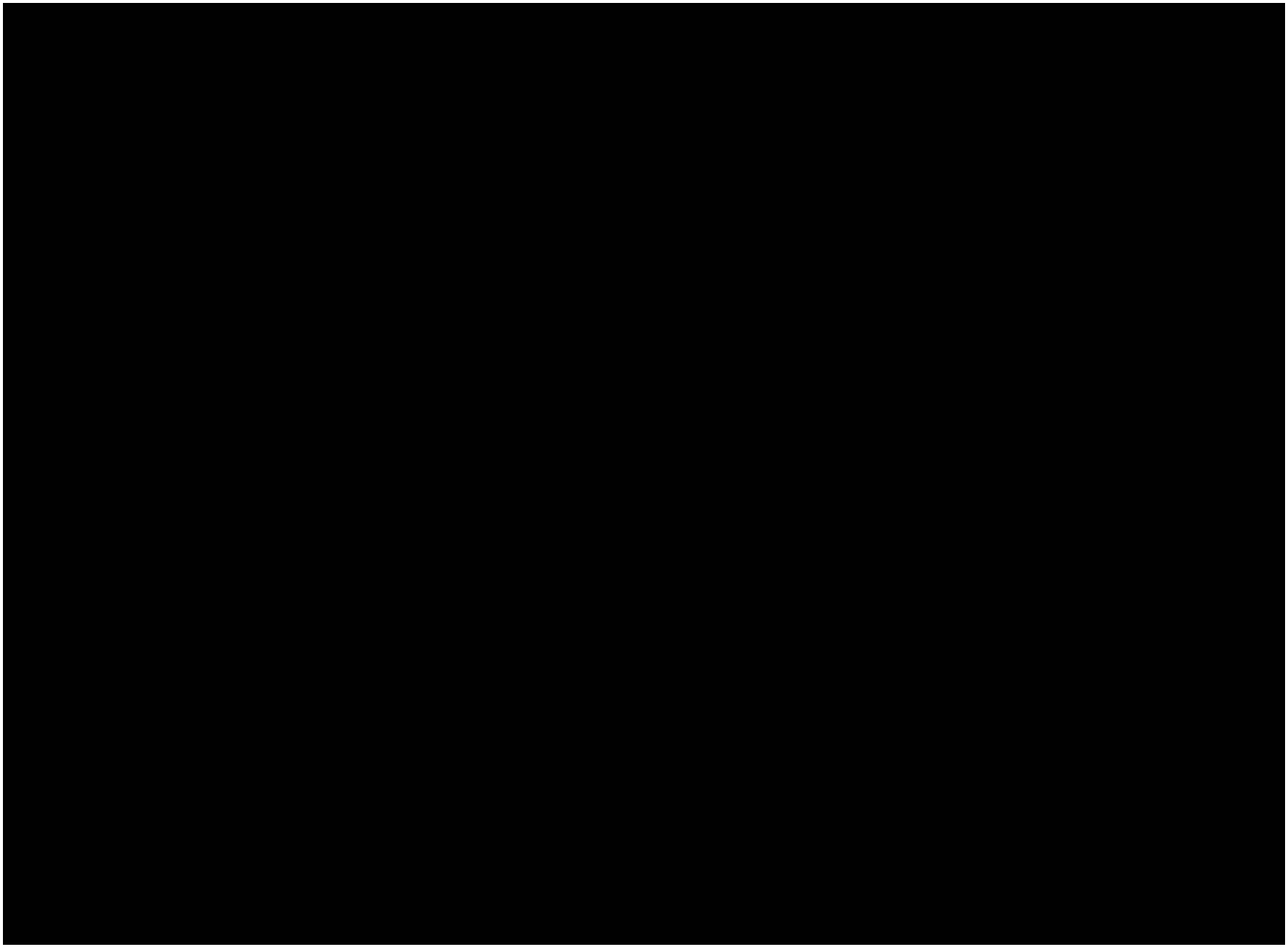
Barbara Worsham, PI

Vice President Animation, Graphics & Video

Rimkus Consulting Group, Inc.

- More than 25 years experience in animation, graphics, and video for litigation.
- Expertise includes enhancing video using state-of-the-art computer software.
- Has testified in depositions and trials at the state and federal levels regarding forensic animation or security video enhancement.

ENHANCEMENT IN MOVIES AND TELEVISION



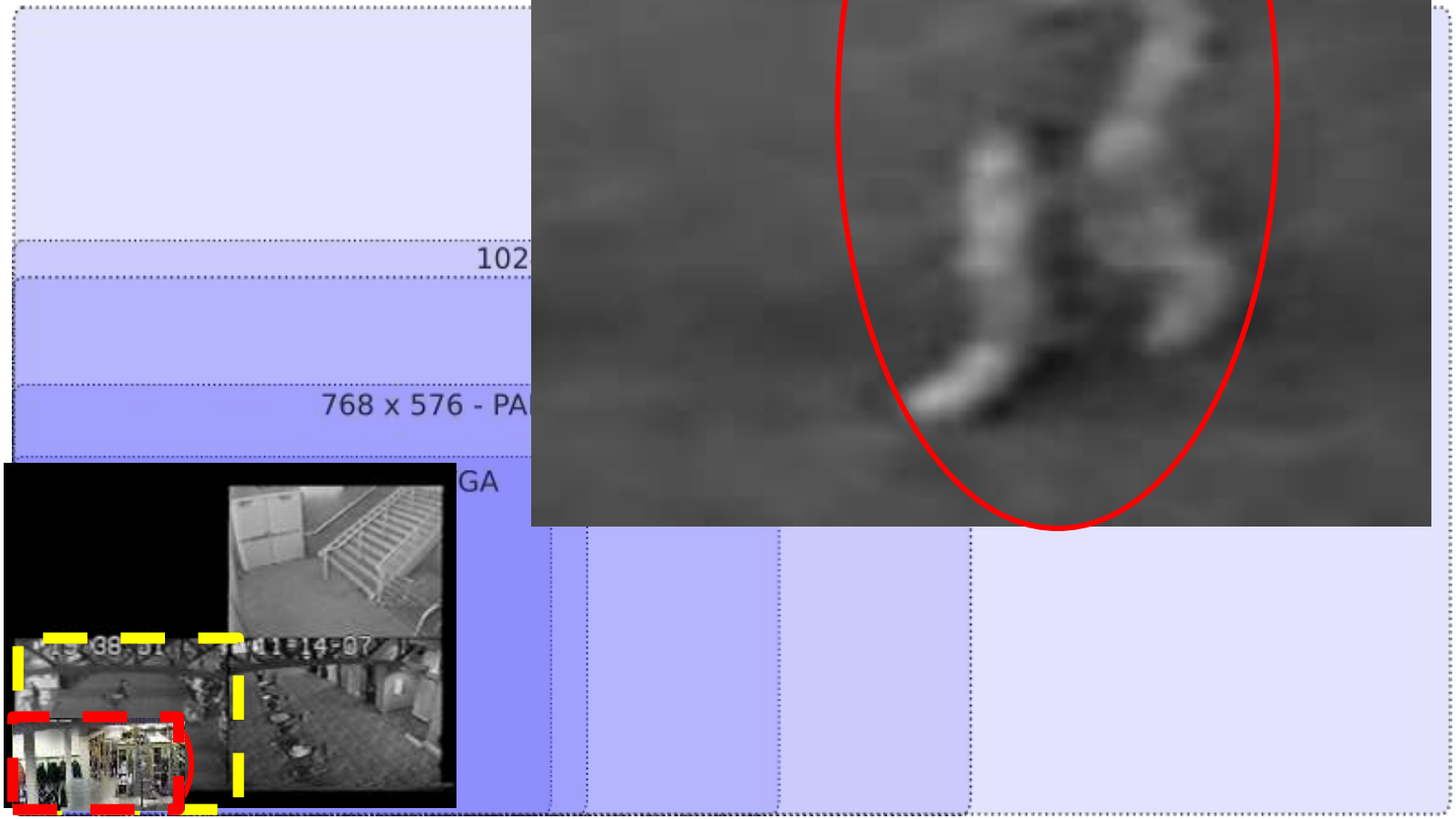
Why Doesn’t Enhanced Security Video show the detail that is in TV and Movies ?

HIGH QUALITY VIDEO COSTLY

VIDEO QUALITY vs. STORAGE COSTS

BUSINESSES TR

Record a Smalle



MORE PIXELS = MORE INFORMATION

324 pixels

223,104 pixels

BUSINESSES TRY TO SAVE COSTS

Compress the Video – Lossy Compression

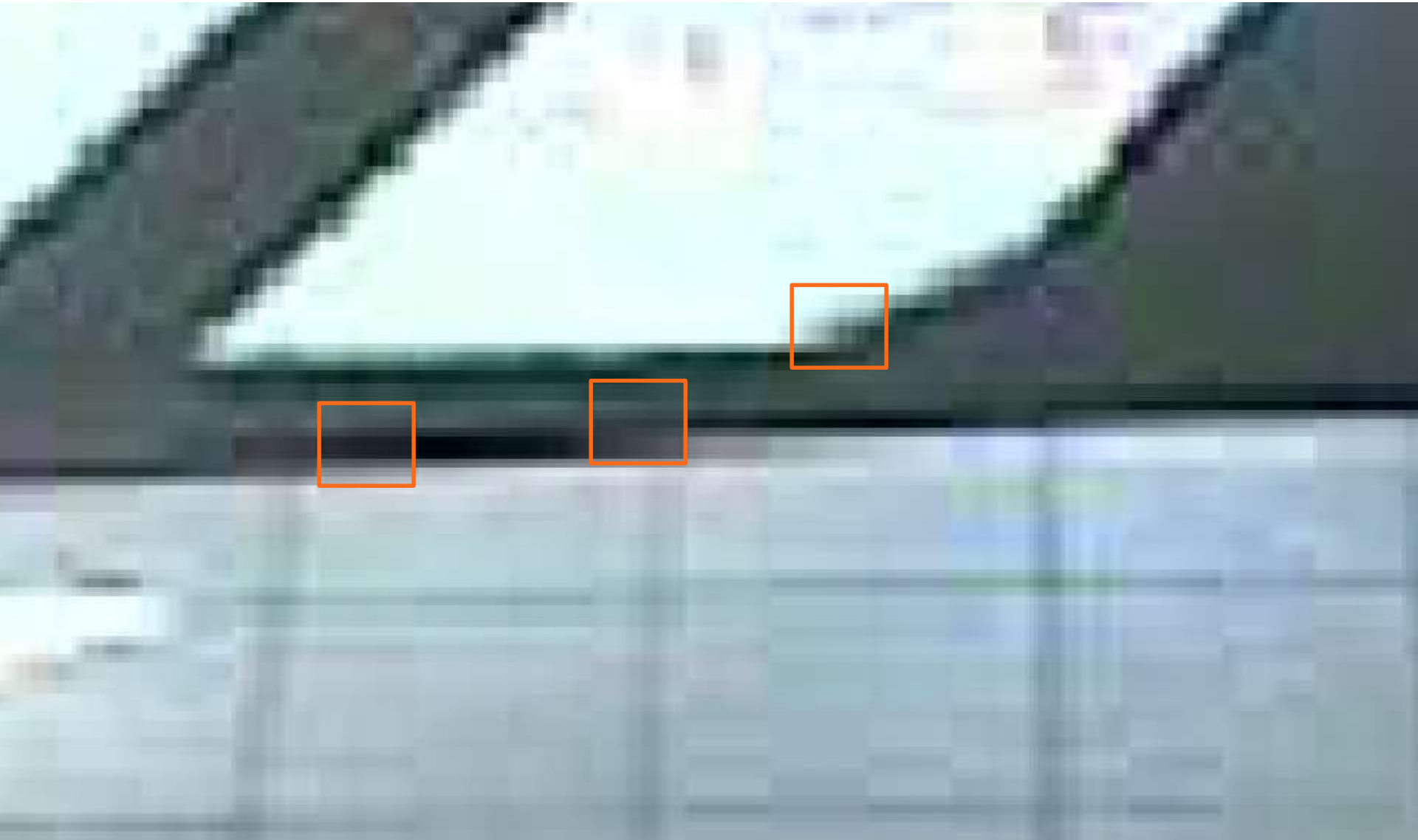
Details are lost

IPVM.com resolution vs compression tested

CASE EXAMPLE - COMPRESSED VIDEO

Compression artifacts can lead to incorrect conclusions

Close up of compression artifacts – “blocking” or “quilting”



BUSINESSES TRY TO SAVE COSTS

DVR discards half of the scan lines as it saves the video - Storage cut in half

BUSINESSES TRY TO SAVE COSTS

Lower the frame rate

Additional storage savings

Frame Rate

- Number of images that are displayed in 1 second of video.

BUSINESSES TRY TO SAVE COSTS

Lower the frame rate

Additional storage savings

Standard Video	Security Video
• 30 frames per second	• 5 frames per second to most common. • 1 frame per second or LESS.

DIFFERENT FRAME RATES ANALYZED

Slip/Trip or turned ankle?

1 frame per second
56 KB

5 frames per second
142 KB

10 frames per second
212 KB

30 frames per second
353 KB

10 frames per second is adequate to capture slip/fall
212 KB

FRAME RATE PROS/CONS

Low

- Low frame rate (1 fps) –
  - Will miss detail - slip/fall

High

- High frame rate (30 fps) – Costly Storage

OK

- 5-10 fps good for most scenes
- 15+ fps for best fast moving object (cars)

BUSINESSES TRY TO SAVE COSTS

Cameras set on Motion Detection

Camera records only when it detects movement

CAMERAS SET FOR MOTION DETECTION

Camera set to capture 1 frame per second **AFTER** motion is detected

1 hour of standard continuous video.
1 hour long.

1 hour recorded using motion detection
4 minutes long.

The Two Methods That Can Cost You Money Instead Of Saving You Money!

1. Low frame rate (1 frame per second)
2. Camera set to Motion Detection

If “CSI” enhancement is not real - What can I expect from Enhancement?

What types of video can be enhanced?

WHAT IS VIDEO ENHANCEMENT?

Unenhanced Video

- Low Resolution
- Poor Lighting
- Noise
- Shake

Resolution
De-blur
De-interlace
Contrast
Noise
Stabilization

Enhanced Video

- ✓ Sharpen - Adjusted Resolution
- ✓ Corrected Lighting
- ✓ Reduced Noise
- ✓ Stabilized

ENHANCEMENT

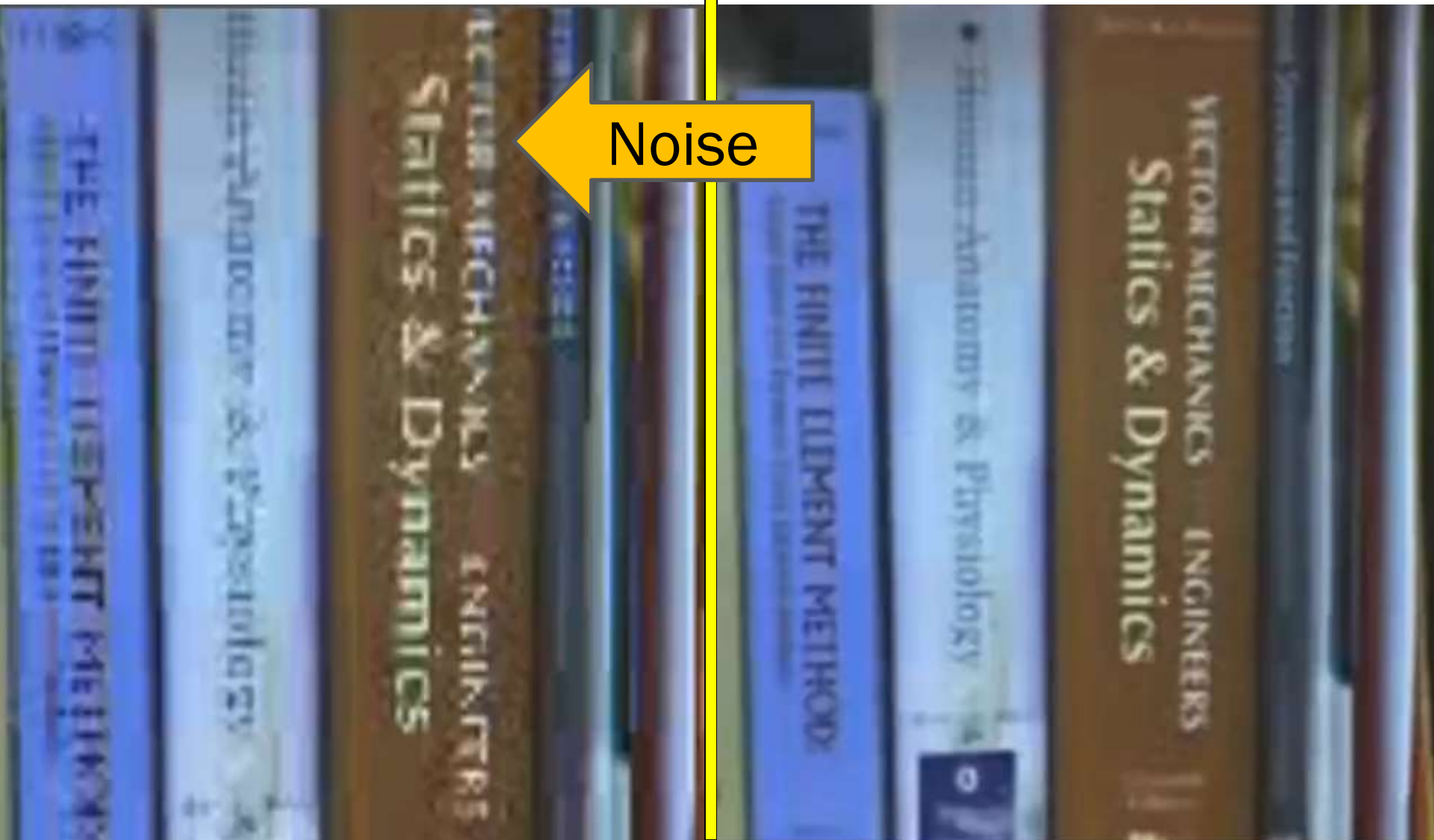
If the information is in the photo or video, then enhancement can make detail more clear

Enhancement - Does NOT create information

BASIC ENHANCEMENT EXAMPLES

Low Resolution
and Noise
Unenhanced

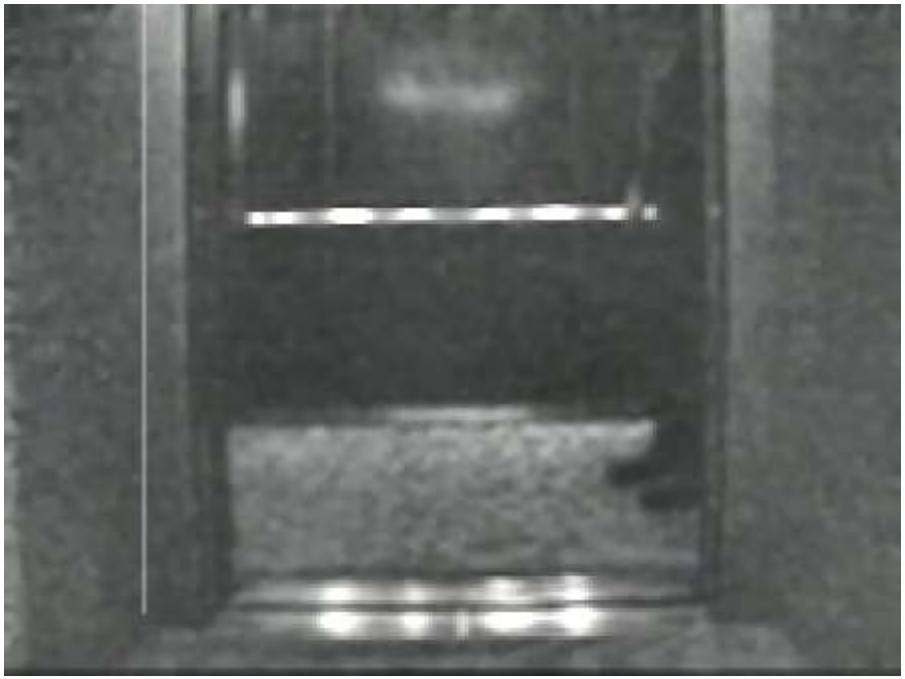
Low Resolution
and Noise
Enhanced



Unenhanced Image from Video

Enhanced Image from Video

Low Light



Unenhanced
Image from Video

Enhanced
Image from Video

Stabilization

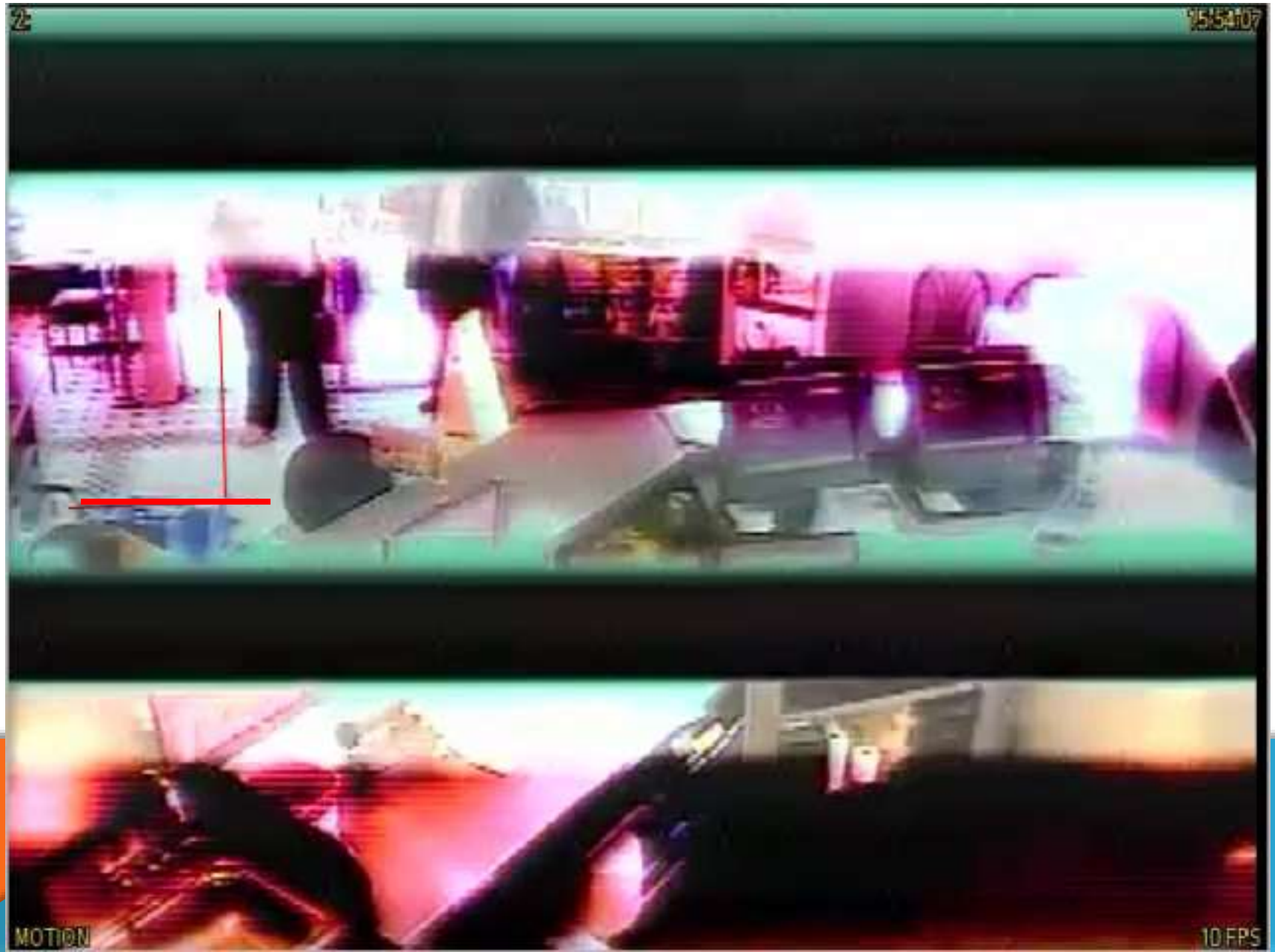
Unenhanced

Enhanced

Original Unenhanced Video With BAD Signal

FALL OCCURS

LOCATION OF CANE TIP ON FLOOR



EMPLOYEE MOPPED AREA TOWARDS DOOR

EMPLOYEE MOPPED AREA TOWARDS COUNTER

How surveillance video can aid the engineer's analysis

Speed and Location of vehicles	Did Slip and fall Occur?	What caused the slip/fall?

VIDEO – VIEW LOOKING SOUTH

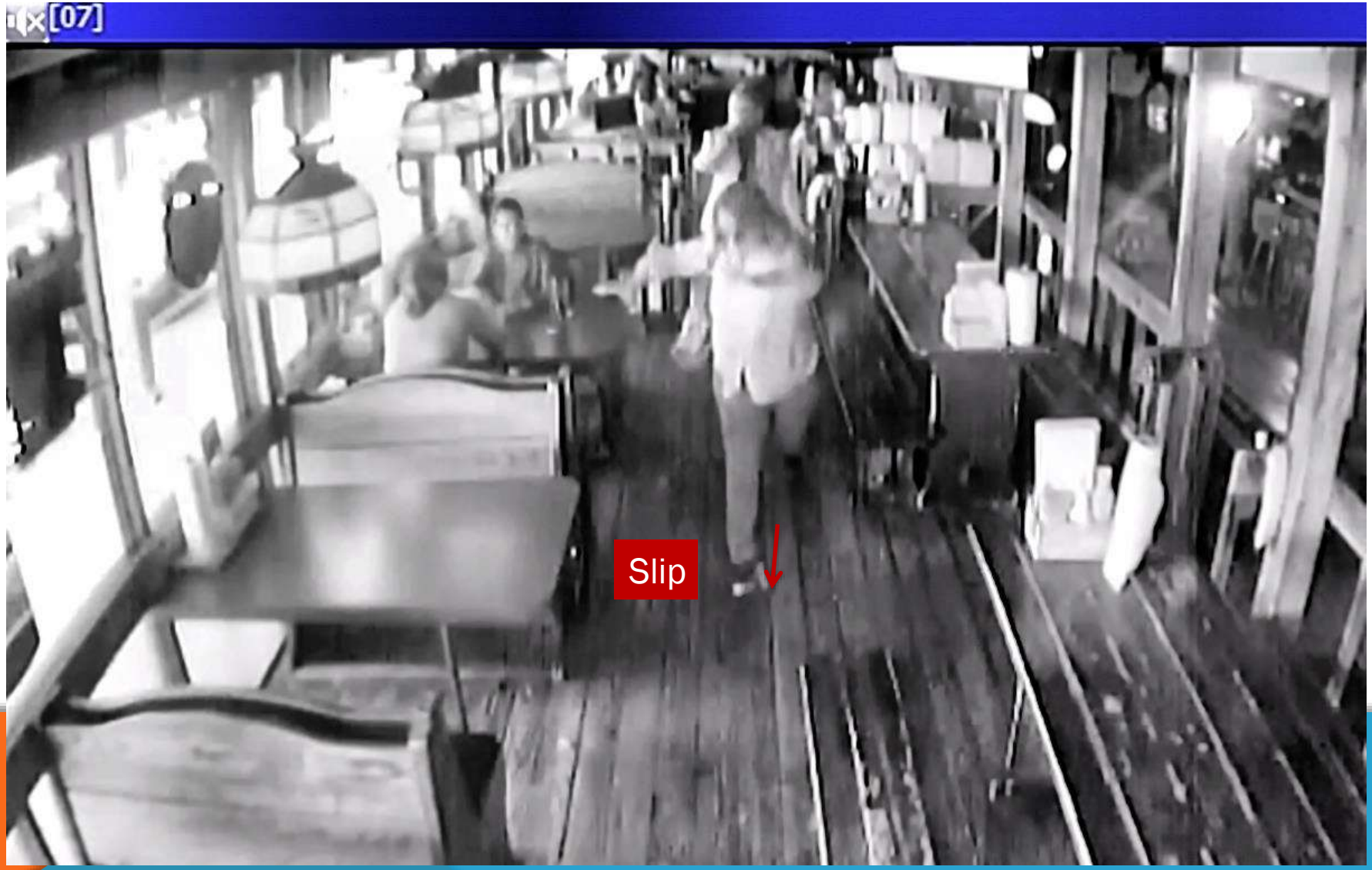
VIDEO – VIEW LOOKING NORTH

- Frames per second
- Distance traveled

Locations and Speeds of Vehicles When light Turned RED


[07]
11/03/2014 14:21:51

DID SUBJECT SLIP OR ROLL ANKLE FIRST?



DID SUBJECT SLIP OR ROLL ANKLE?

LICENSE PLATES RULE OF THUMB -

Cameras that aren't designed to capture license plates will rarely capture license plates.

Exception to the Rule - Cell phone video – camera held on license plate for several seconds

Unenhanced Video Image

Enhanced Video Image

SECURITY VIDEO CAPTURED FALL

Plaintiff Claimed that she was reaching for railing
Planter blocked her access to railing

WAS SHE REACHING FOR THE HANDRAIL WHEN SHE FELL?

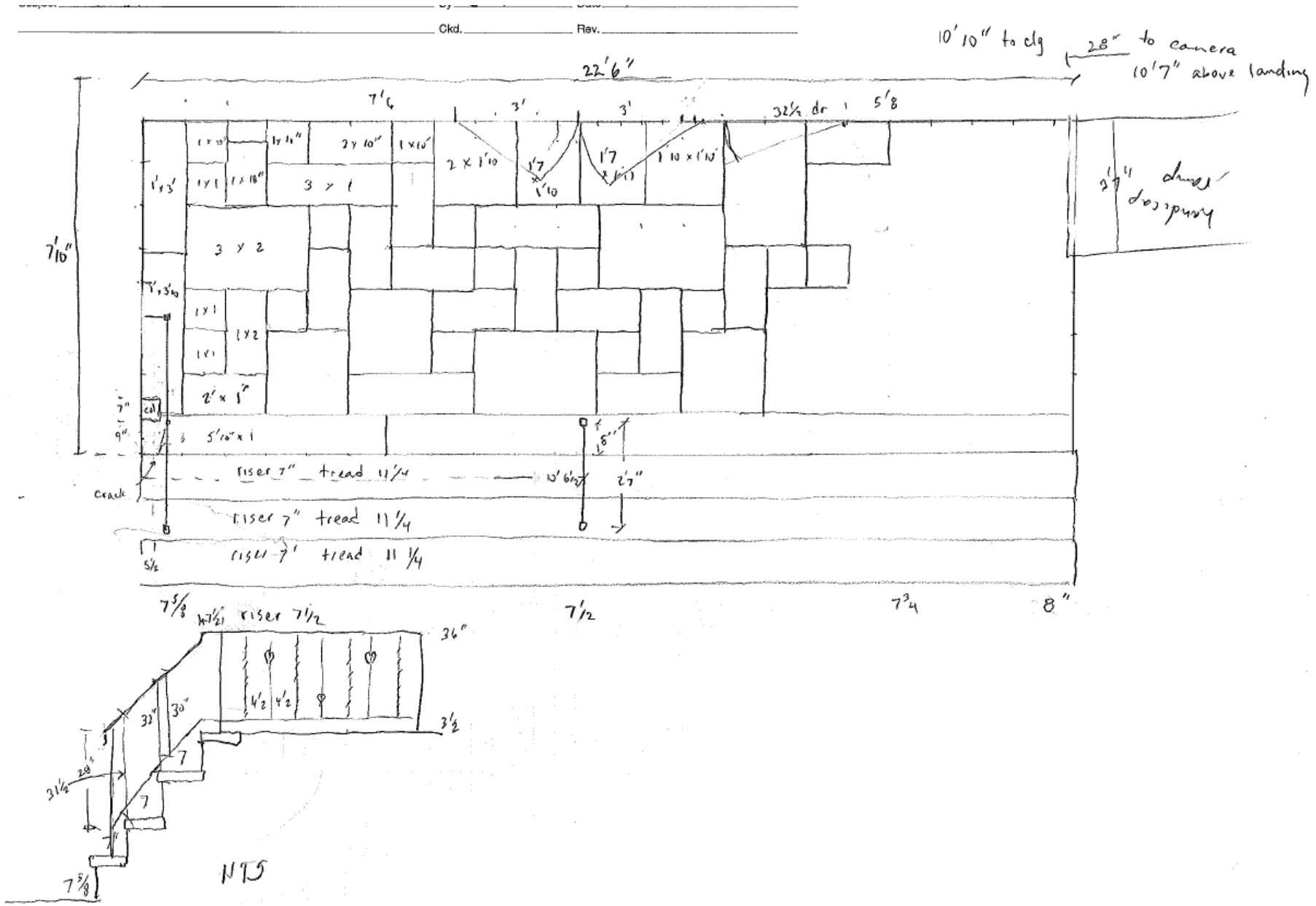
Position foot on top step.

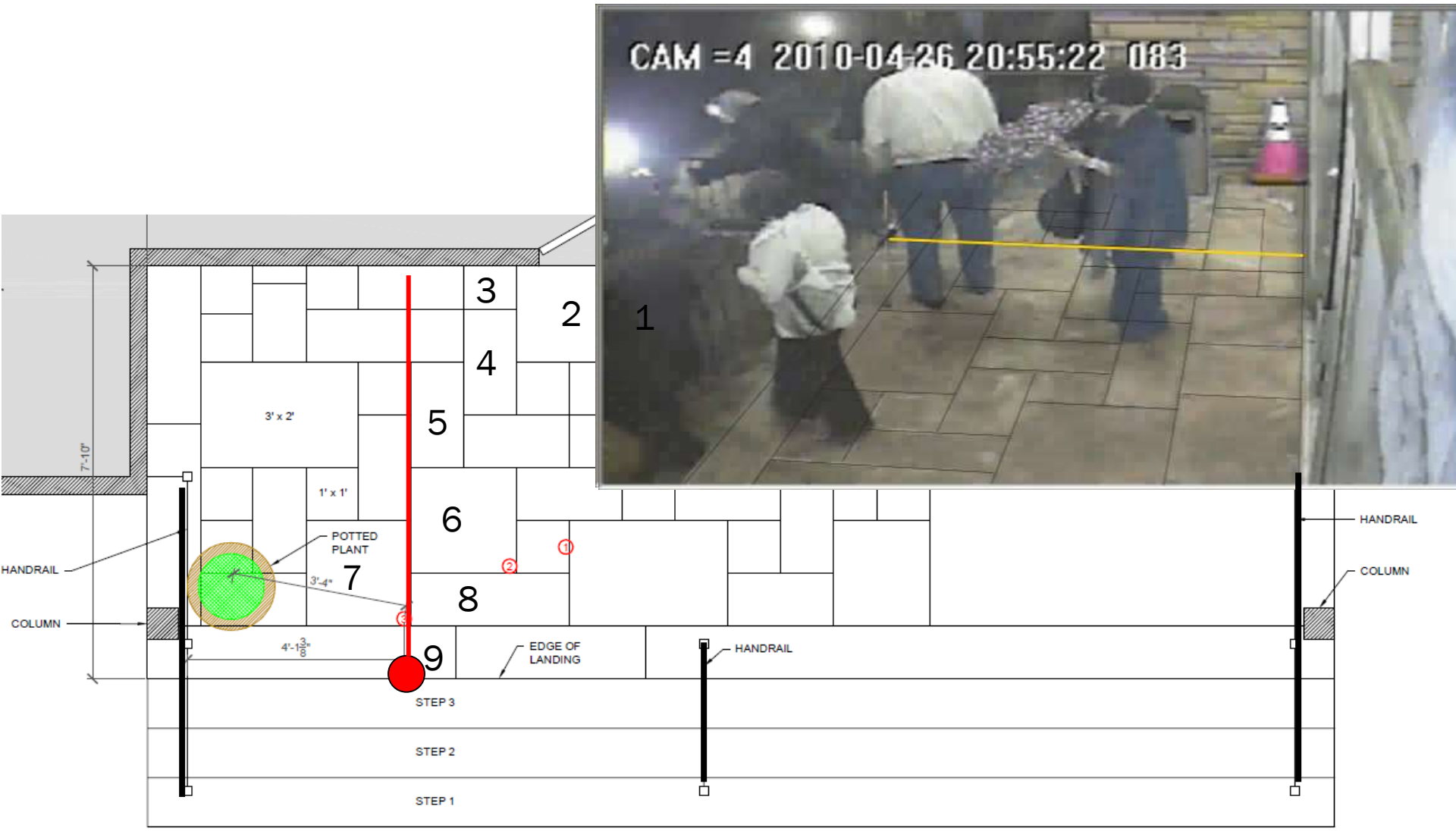
UNIQUE STONE PATTERN

OUTLINE OF STONE PATTERN OVER VIDEO


CAM =4 2010-04-26 20:54:49 458

FIELD SKETCH WITH DIMENSIONS

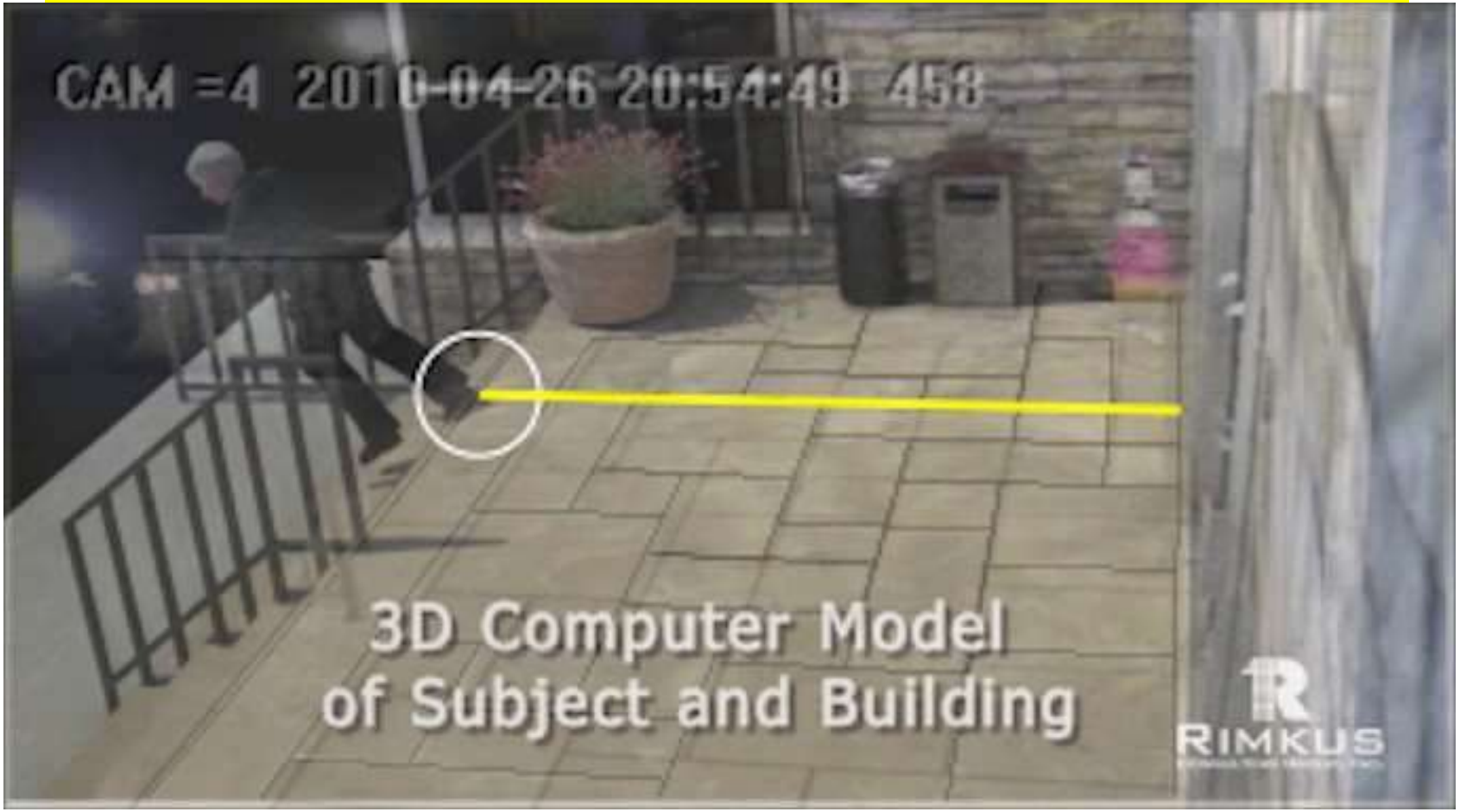




49 ½ " from railing

RESULT – SUMMARY JUDGMENT

IF CASE WOULD HAVE BEEN BEFORE JURY.



The Same Accident
IF Video had been Recorded at
1 Frame per Second

What Data Is Available From
Video?

The Same Accident If Recorded At 1 Frame Per Second

The Same Accident If Recorded At 1 Frame Per Second

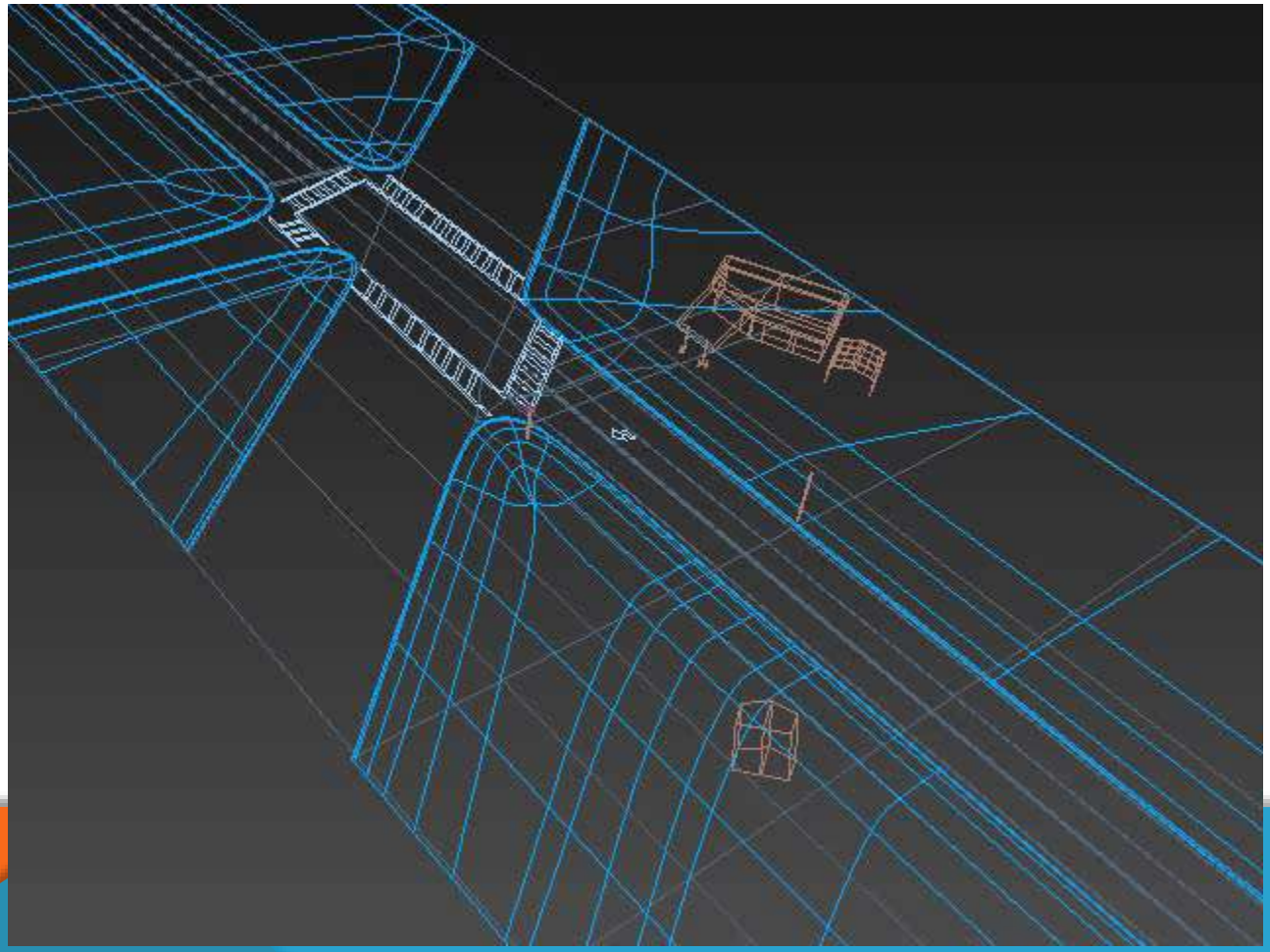
The security video would have had NO information regarding her location be the fall!
NO Summary Judgment!

SECURITY CAMERA VIDEO OF ACCIDENT

Tanker Truck Ran Over Pedestrian

Pedestrian – claimed she was in the crosswalk.
Driver - claimed he did not see pedestrians before pulling forward.

The intersection was modeled in 3D.
The computer's camera was placed in the same location as the security video camera



The 3D computer model matched the exact location and timing of the pedestrians in the security video.

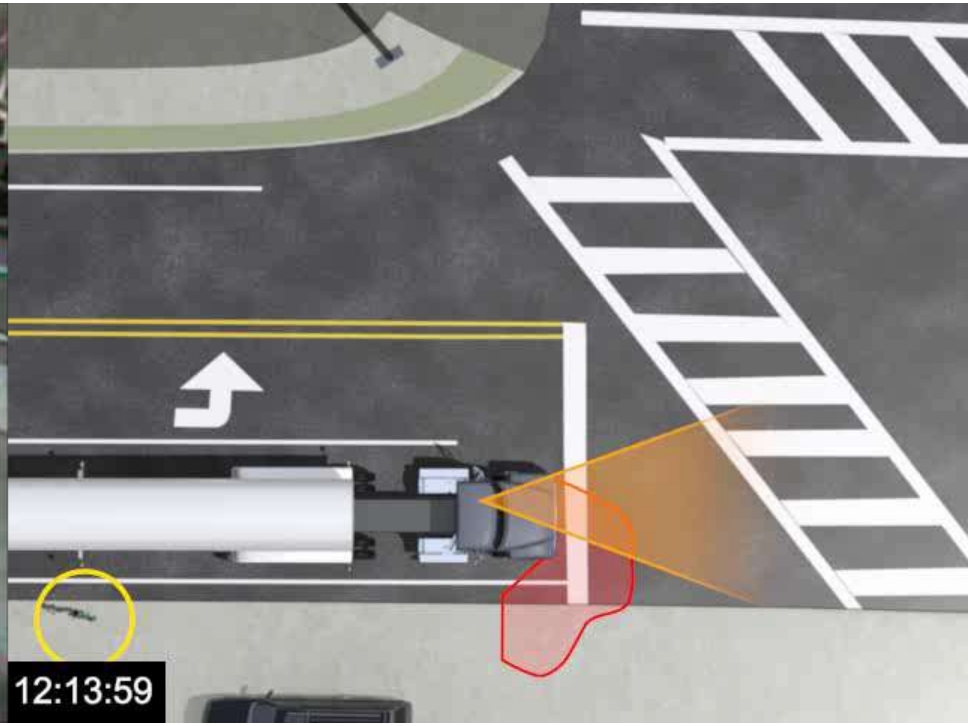
Security Video View

3D Model View

Computer camera matched to security camera's view rotates to overhead view

3D Model View

Security Video View

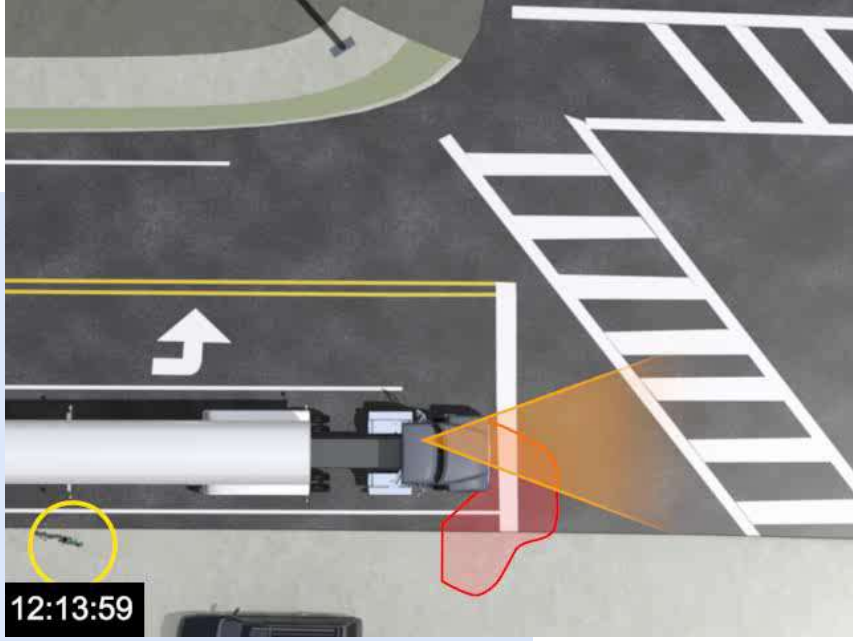


3D Model View

RED ZONE = AREA WHERE 4’9” PEDESTRIAN NOT VISIBLE TO TRUCK DRIVER

TRUCK DRIVER'S VIEW

TRUCK DRIVER'S VIEW



Security Video

Pedestrians feet/lower legs were visible in front of truck

3D Model

Pedestrians Feet/Lower Legs Were Visible In Front Of Truck

Scenario According To Plaintiff Testimony

Best Practices

Figure 1(a). A CCTV image likely to be suitable for personal identification.

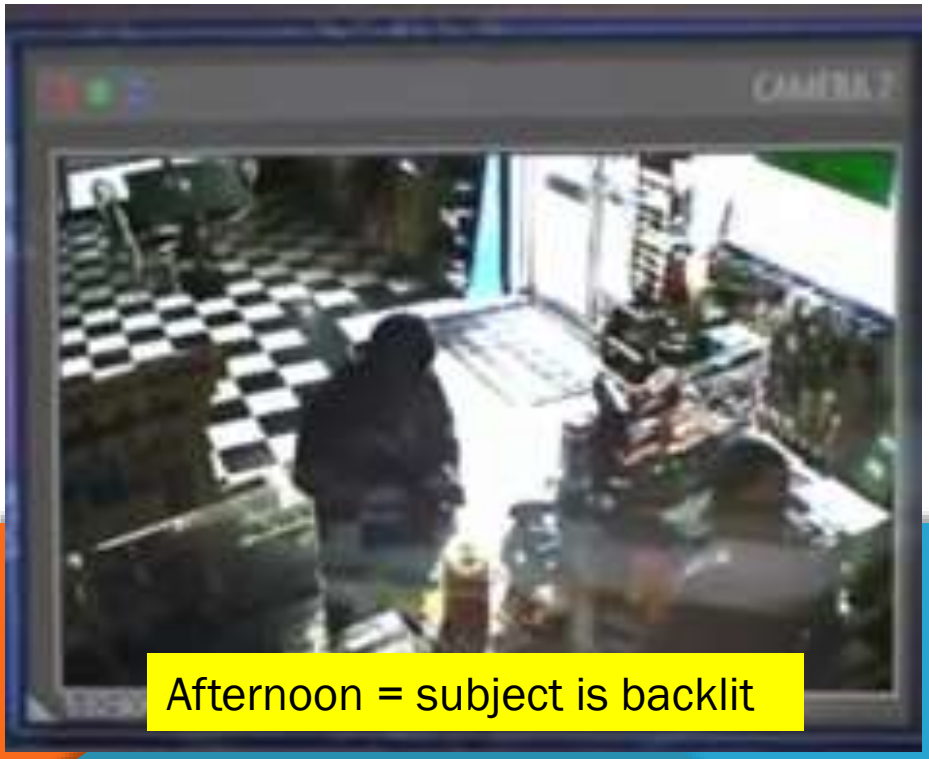
Figure 1(b). A CCTV image not likely to be suitable for personal identification.

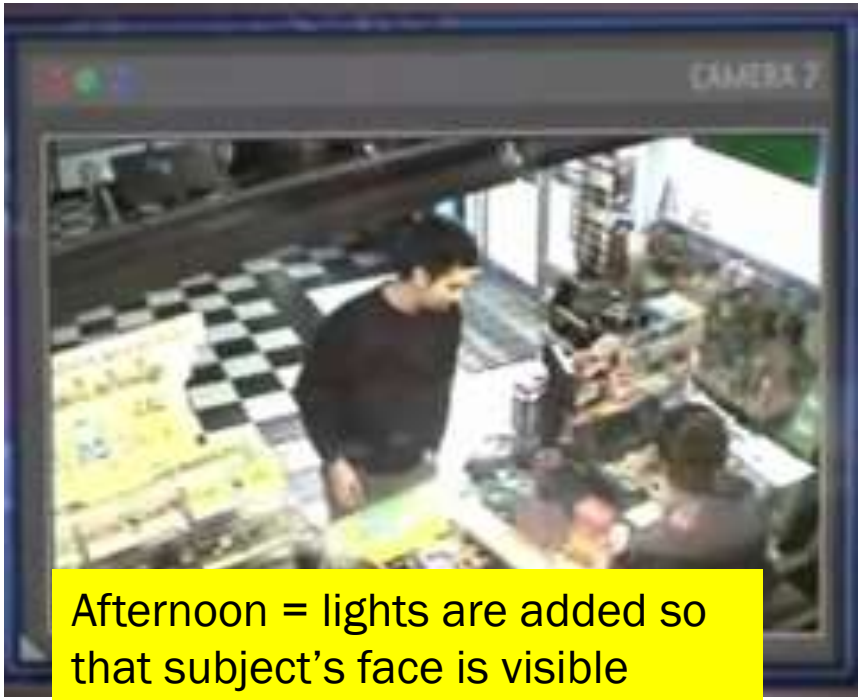
Figure 1(c). Cropped, enlarged, and enhanced image processed from Figure 1(a).

Figure 1(d). Cropped, enlarged, and enhanced image processed from Figure 1(b).

SWGIT - Scientific Working Group Imaging Technology, Recommendations and Guidelines for Using Closed-Circuit Television Security Systems in Commercial Institutions

LIGHTING ISSUES





from https://www.fbi.gov/news/videos/caught-on-camera

Lights that are on timers must be checked. Are lights coming on at correct time?

from https://www.fbi.gov/news/videos/caught-on-camera

Best Practices for Video Enhancement

Review recordings

- Verify time and camera of the incident.
- Verify that incident is in exported video file. Verify DVR time set correctly.

NOTE:

- IF you have to video the computer screen with your cell phone, do NOT zoom in and out. Keep as still as possible.

Collect native file with proprietary player

- Typically native file will give the best detail available

Best Practices for Video Enhancement

Get ALL camera views available

- ½ hr. to 2 hrs. before through ½ hr. to 2 hrs. after the incident. If incident occurred at night, retrieve daytime video from the same camera.

Operator may be Untrained

- Exports low quality video
- If operator unsure, suggest calling the supplier to retrieve best quality.

Original video

Video Was Exported At Size Intended for Email

Enhanced video shown side by side with original

Documenting Video Enhancement

Document Enhancement	• Type of video, codec, player, MD5 Hash (digital signature)
Enhancement Software Report	• Replicate the results 100% of the time

Start Time:	0:00:00.00
Resolution:	368x148
Duration:	0:00:12.17
Frame Rate:	29.97 fps
File Size:	62473216 bytes
File Date:	Wednesday, February 02, 2011
MD5 Hash:	68C03FF6FF362282C8BB00983B184FC1
Aspect Ratio:	Default

Settings:	
Resolution:	
Matching level:	15
Super resolution:	2
Fusion level:	0
Stabilization:	off
Debluring:	
Level:	114
Focus:	1.32
Motion debluring:	off
Denoise:	0.50
Camera type:	Gauss
Contrast:	
Level:	92
Sensitivity:	3
Light & Color:	
Auto Levels:	on
Gamma:	1
Saturation:	1
Color:	0.146
Deinterlacing:	
Fast:	off
Masking:	off
ROI:	off

Processed Videos:

Start Time:	0:00:00.00
Resolution:	640x480
Duration:	0:20:51.78
Frame Rate:	0.00 fps
File Size:	9149992448 bytes
File Date:	Friday, May 20, 2011
MD5 Hash:	B0BA74CCF6EE3BA5F23E974CE030090A
Aspect Ratio:	Default

Settings:

Resolution:	
Matching level:	7
Super resolution:	1
Fusion level:	0
Stabilization:	off
Debluring:	
Level:	40
Focus:	2.00
Motion debluring:	off
Denoise:	0.50
Camera type:	Gauss
Contrast:	
Level:	127
Sensitivity:	3
Light & Color:	
Auto Levels:	on
Gamma:	1
Saturation:	1
Color:	0.146
Deinterlacing:	
Fast:	off
Masking:	
Type:	None
Meta data:	keep
ROI:	off

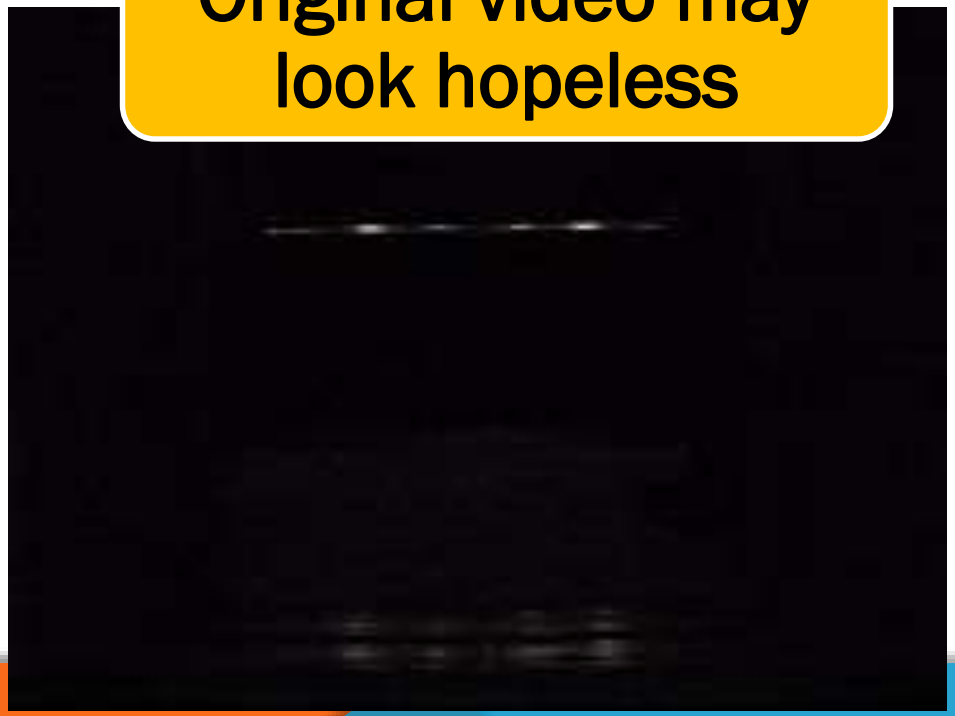
Summary

Good chance your incident might be Caught on Camera

Summary

Bad Camera settings – Enhancement needed

Original video may look hopeless



After Enhancement

Summary

Enhancement & Analysis

2017 HOSPITALITY LAW CONFERENCE

April 24-26, 2017

Caught On Camera! Defending Your Liability Claim through Video Enhancement and Analysis

Barbara Worsham, PI

Rimkus Consulting Group, Inc.

bmw@rimkus.com

800-580-3228.

RIMKUS CONSULTING GROUP, INC.

Forensic Engineers and Consultants