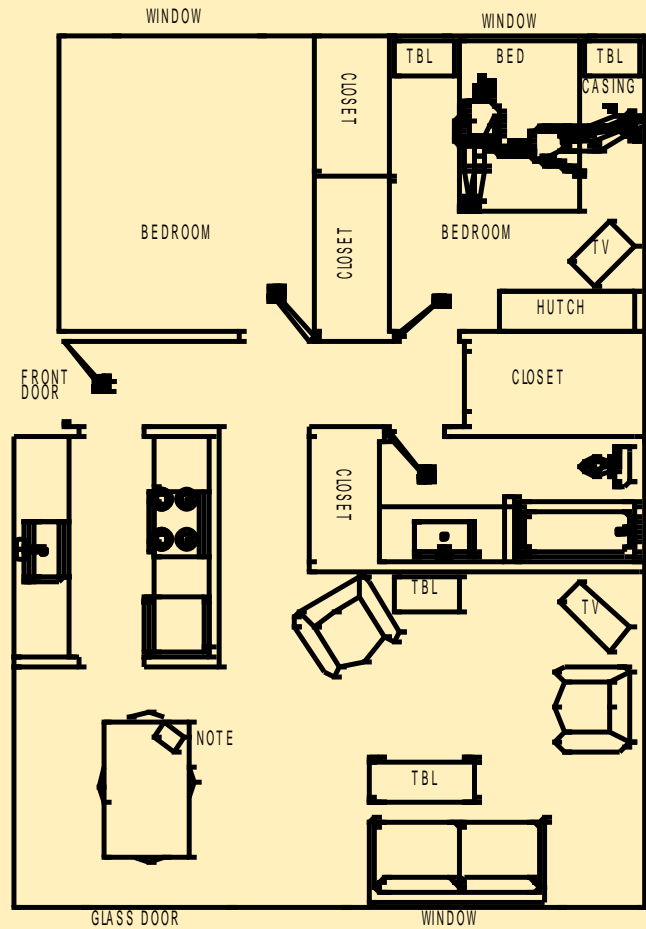


DIAGRAMMING





Purpose

- To standardize the way crime scenes are documented through sketching & measurements by all officers of the state.
- To permanently document a crime scene and location of evidence
- To produce an illustrative view of the scene
 - is an excellent visual aid which allows for the removal of unnecessary detail & the inclusion of significant items



Definition of a Crime Scene Diagram

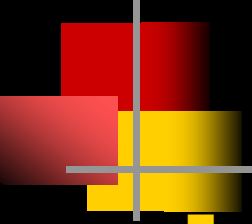
- A simple line drawing which shows where “things” are in relation to each other and to fixed objects within the scene
 - supplements written reports & photographs
 - photos, because of distortion or perspective, do not always represent the exact location in which objects are situated in relationship to one another



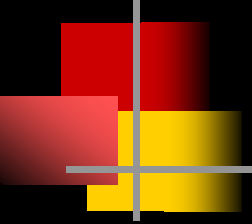
The Diagram

- Simplest & most effective way to represent the crime scene
 - location of the body
 - location of physical evidence
 - position of witnesses
 - position of lighting, windows, obstructions, etc.
 - relationship of all items to each other

Use the Diagram to:

- 
- Refresh the memory of witnesses & officers
 - Assist in developing a clearer understanding of what occurred
 - To reconstruct the crime scene if need be
 - Assist in developing different scenarios
 - witnesses & suspects can show their movements and/or locations
 - clarifies verbal testimony of complex movements
 - If small enough, lay it out in the courtroom
 - Excellent visual aid for the jury
 - Shows the defendant's actions at the scene
 - impeach the defendant's testimony or story

The Preliminary Sketch

- 
- Completed at the scene
 - Not drawn to scale
 - roughly lays out the scene and evidence
 - includes measurements of room dimensions and evidence locations
 - can consist of several pages
 - Use one or more pages for each room in a building
 - If need be, use several pages for one room
 - Used to produce the final diagram
 - You need to be able to decipher your measurements



Admissibility of the Diagram into Court

- Diagram the scene as you found it
 - Must be a complete & accurate representation of the scene
 - Must be able to describe the methodology used
- Prosecutors may have you produce additional diagrams
- Measurements are permanently documented
 - Usually not on the diagram-Use measurement logs
 - Unless you want to show specific dimensions relevant to the case/investigation



Mistakes

- Errors can cause the judge to refuse admittance of the diagram into the trial
 - This is a loss of a valuable piece of evidence
- Errors and or mistakes can cause loss of credibility
 - This could effect the remainder of your case
 - Could also effect future trials or contacts with the judge
- Proof read diagram(s), notes, & logs for accuracy
 - verify your measurements are correct/accurate
 - verify scale is correct
 - verify case number & date is correct
 - verify labels are correct



The Completed Diagram

- Most problems with crime scene diagrams is cluttering
 - good diagrams are as simple and uncluttered as possible
 - may have to utilize a legend with a numbering system for your evidence items
- Must be prepared to testify in court
- If not drawn to scale
 - there is no obligation to prepare a scaled diagram
 - Somewhere on the diagram write:

"NOT DRAWN TO SCALE"



Scaled Diagrams Used For Courtroom Presentation

- Scaled diagrams lend credibility and professionalism
 - Drawn to scale and often in color
 - prepared by trained police officers, graphic experts, artists, illustrators or engineers
 - scaled diagrams eliminate the need for measurements on the diagram itself
 - measured distances can actually be done on a large scaled diagram in the court room
 - Make certain that you know what scale your diagram is
 - That your measuring device matches that scale



The Crime Scene

- Evaluate your scene
 - Inside or Outside Scene?
 - How large is the scene?
 - How much time & manpower is needed?
- Materials Needed
 - Total Station and/or measuring devices
 - Paper
 - straight edge for sketching

Measurements

Much Easier
To Read

0.32'

OR

$3\frac{13}{16}$ "



sed

n, etc)

ools

ns on the

object



Reference Points

- Definition: a fixed & significant object from which measurements are made
 - Types of reference points
 - *Tangible*: room/building corners, door frames, power poles, fire hydrants, PK nails, etc.
 - *Intangible*: Not permanent. Extended curb lines, a temporary mark in the gravel or on the ground, etc. (triangulate to more permanent points (2) if possible)
 - Identify & locate on the diagram by using RP1, RP2, etc.
 - May use multiple reference points on a scene
 - depends on the complexity and/or size of the scene
 - may make measuring the scene easier
 - identify any change in reference points



MEASUREMENT METHODS

- Total Station
 - The current standard
- Baseline-Coordinate Grid System
 - Most common method used when T.S. not available
- Triangulation
 - Reliable and easy
- Photogrammetry
 - Able to obtain 3D points from photographs
 - Specific camera settings and equipment required
 - Diagram completed in Cad Program; similar to a Total Station
 - Not a photograph
- GPS Devices
 - Can be used with On-Line Satellite Mapping Software
 - Google Earth for example

Total Station

- Is an electronic/optical instrument used in modern surveying
 - Captures 3D points to produce a scaled diagram
 - Able to capture larger scenes
 - Works best on outdoor scenes
 - Cumbersome on indoor scenes
 - Requires numerous moves
 - Line of sight problems

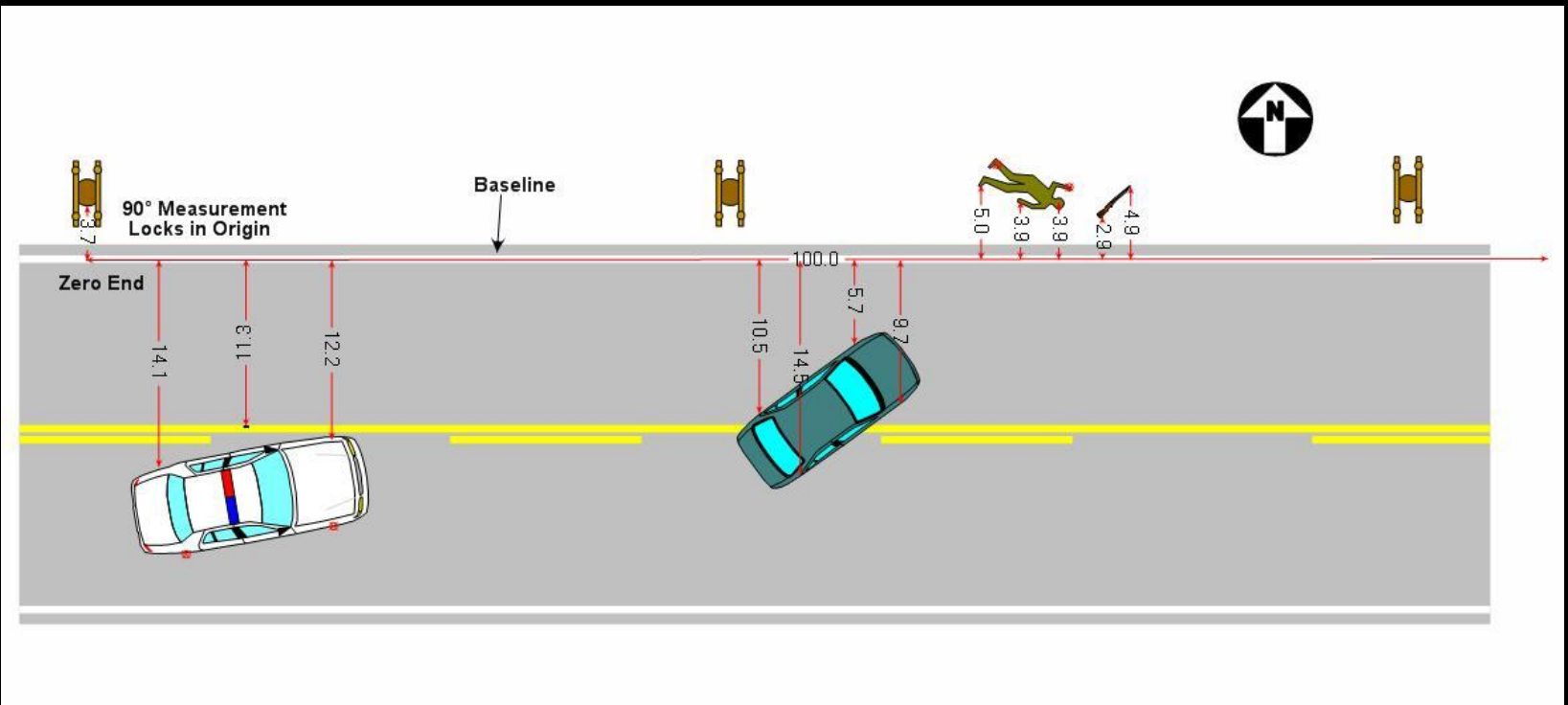




Baseline Coordinates

- Requires two tape measures
 - Baseline
 - tape established on the ground in a straight line
 - Remains in place throughout the process
 - Longer the better: 100/300 foot tape
 - The Origin is the zero end of the tape
 - Set the Origin to a fixed point (RP)
 - Extend the tape in a direction (N,S,W,E)
 - Measurement tape
 - Dynamic tape used to measure perpendicular (90°) off the baseline to the object
 - 25/50/100 foot tape depending on scene size
 - Measurement taken from the baseline to the object
 - Record measurement & direction from baseline to object
 - Record measurement & direction along the baseline

Baseline Measurements



Baseline Measurements
(This Example)

Baseline Measurement Log

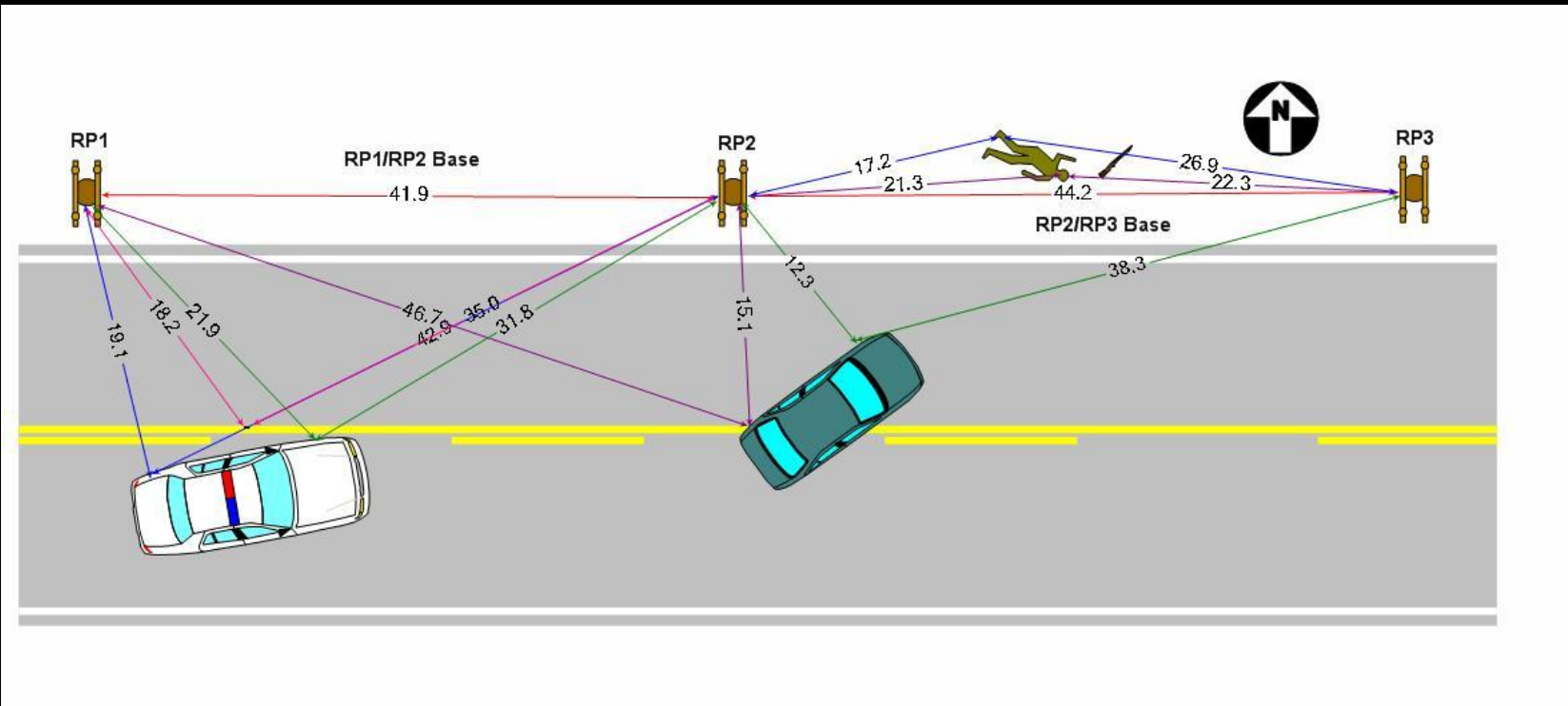
POINT	DESCRIPTION	N	S	E	W
RP	Power Pole #12245/556432	3.7		0	
1	LR Patrol Car		14.1	4.9	
2	LF Patrol Car		12.2	16.4	
3	Shell Casing		11.3	10.2	
4	Right Foot	5.0		61.1	
5	Right Hand	3.9		64.9	



Triangulation

- **triangulation** is the process of determining the location of a point by measuring *angles* to it from known points at either end of a fixed baseline
 - Requires *two* reference points (RP)
 - You *must* measure the distance between the RP's
 - this is the base of your triangle
 - Measure from each RP to the item you want to locate
 - this makes *three* measurements for each item
 - Making a triangle for each point you are measuring to
 - Identify & record reference points as well as their locations
 - Record measurements
 - Can use multiple RP's, again depending on the scene
- Requires a compass to plot the measurements on paper for your diagram

Triangulation Measurements





Triangulation Measurement Log

RP #	POINT #	DISTANCE	DESCRIPTION
1	RP2	41.9	RP1/RP2 Baseline
2	RP3	44.2	RP2/RP3 Baseline
RP1	1	19.1	LR Patrol Car
RP2	1	42.9	LR Patrol Car
RP1	2	18.2	Shell Casing
RP2	2	35.0	Shell Casing
RP1	3	21.9	LF Patrol Car
RP2	3	31.8	LF Patrol Car
RP2	4	21.3	Body-Head
RP3	4	22.3	Body-Head



Inside Scenes

- Hand Measurements are a good method
 - 90 Degree Modified Baseline
 - Perfect for inside scenes
 - Baseline Coordinate Method
 - Triangulation
- Total Station is not practical
 - Multiple rooms
 - Can't reach around corners
 - Must make numerous moves
 - Tight quarters
 - Can be used in conjunction with hand measurements



Measurements

- The physical measurements are the easy part
 - Recording the measurements not so much
 - Need to be able to read & understand them
 - Need to use a system that works for you
 - Room dimensions
 - Furniture locations
 - Evidence locations
 - Need to develop a labeling system that works for you
 - Need to use multiple pages for recording
 - One page (or more) for each room
 - Overall sketch so you can connect the rooms



Measurement Problems

- Most inside crime scenes aren't like "classroom" conditions
 - Cannot always get tapes into the corners
 - furniture in the way
 - blood splattered all over the place
 - bodies in the way
 - garbage & clutter all over the place
 - Use common sense when taking measurements
 - sometimes you have to improvise
 - especially when dealing with *non-square* rooms
 - cannot always take measurements at floor level
 - plumb bob can assist if needed



Locating Items

- Make enough measurements to place the item back at the scene the way it was found
 - make measurements to all extremities of the body
 - locate head, hands, feet, mid section
 - allows you to place the body as it was found
 - Unless body has been moved by Rescue Personnel
 - make multiple measurements to locate items
 - both ends of a rifle, knife, crow bar, etc
 - corners of a table, chair, sofa, etc
 - Again, depends on the situation



Evidence

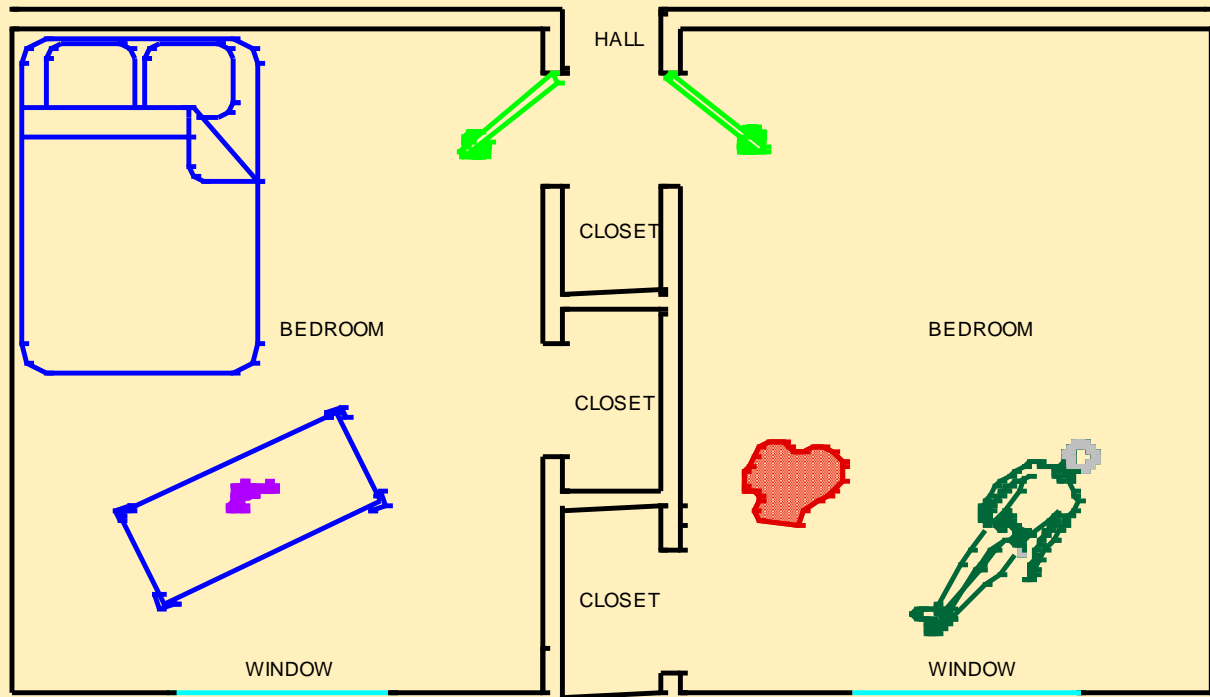
- Communicate with the lead detective
 - Scene by scene basis
 - Some items need more measurements than others
 - Blood & fluid pools
 - If the pattern isn't important, a single measurement to the center and obtain dimensions on the object
 - Same is true for round objects like furniture or other items
 - Bodies
 - Determine how many measurements are actually needed to accurately place it.
 - Do you really need both ends of a shell casing?
 - Shell casings bounce around before final rest



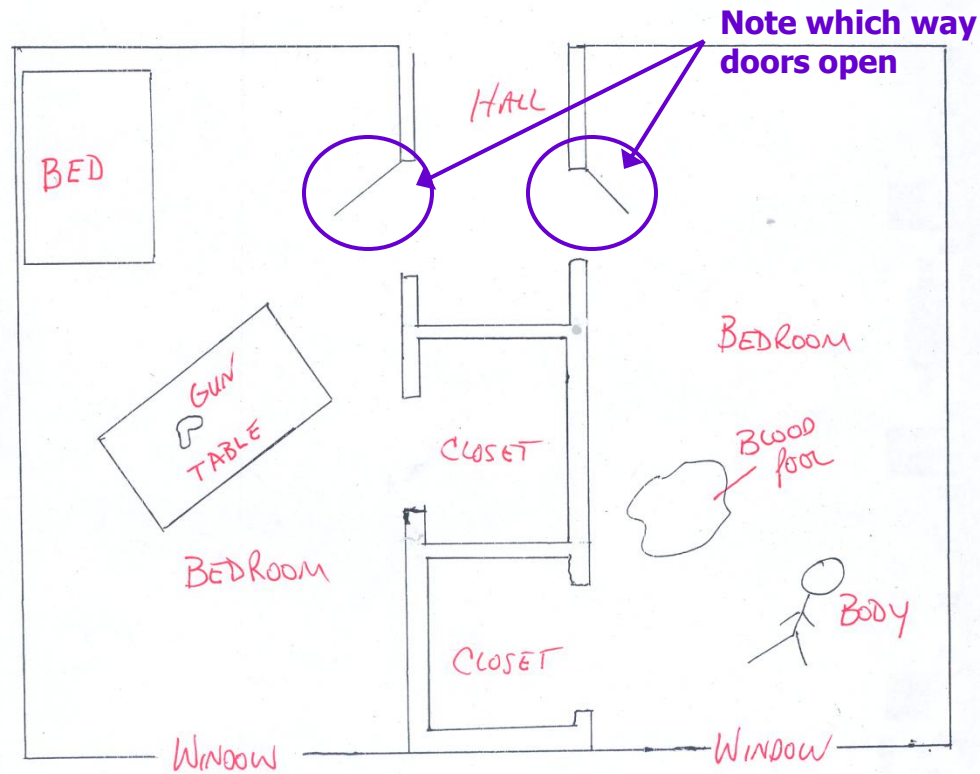
Furniture

- Determine if items (furniture) are *square* to the room
 - need to locate fewer points
 - example: square table or bed positioned against both walls in a corner
 - only measurement needed is the dimensions on the object and then place it into the corner.
 - Or a piece of furniture parallel to the wall
 - need measurements on the dimensions of the object and then locate one corner.
 - Some furniture is not evenly shaped
 - Such as chairs, sofas, play toys, etc.
 - Causes additional problems when evidence is located on it
 - Need to determine how to measure it
 - To locate and diagram it accurately

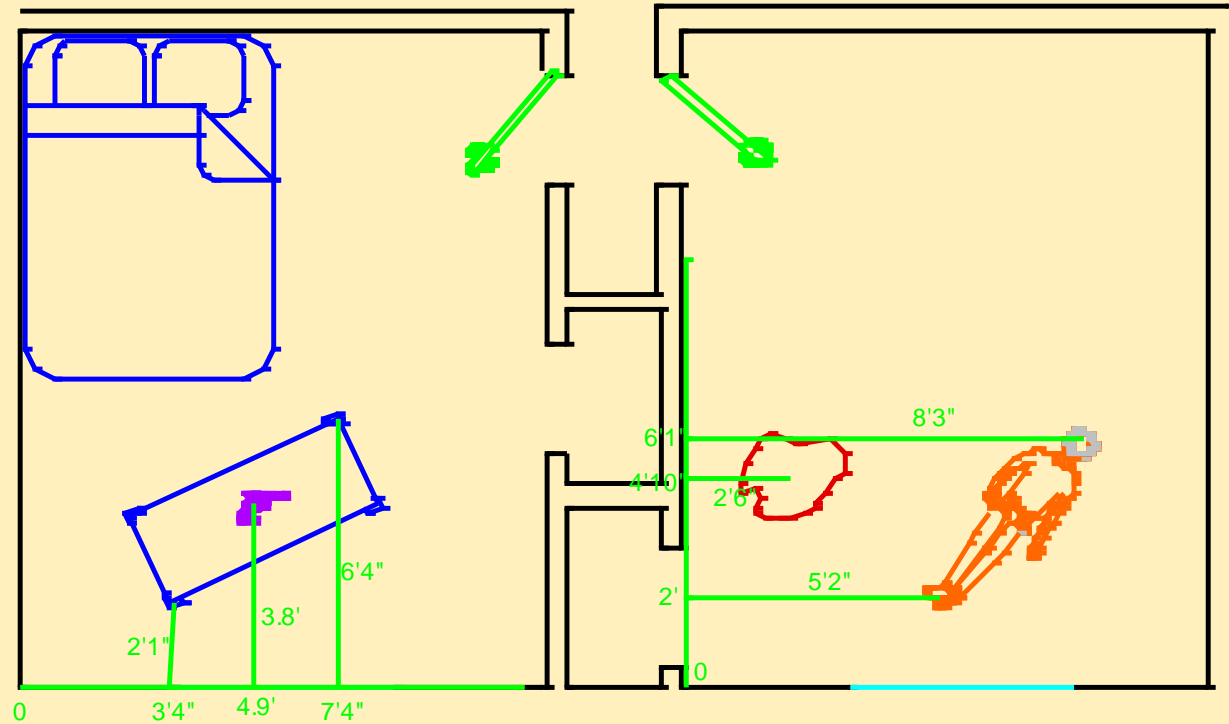
Example Crime Scene



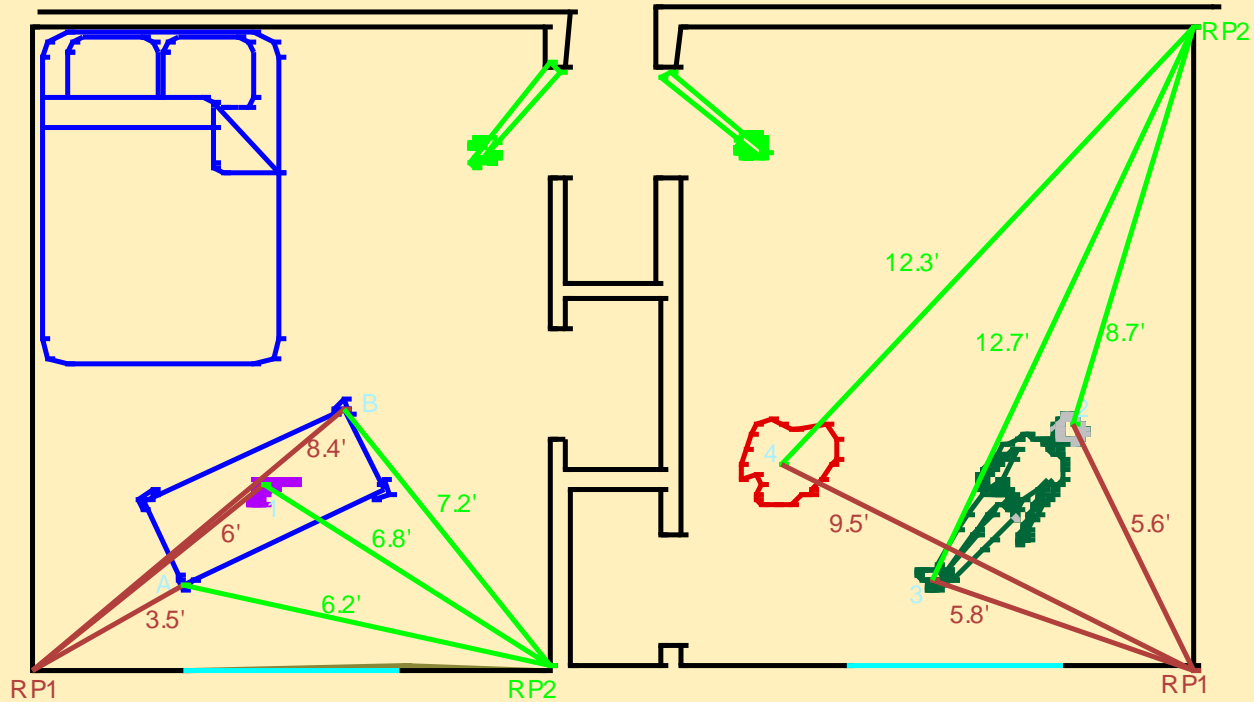
Make A Rough Sketch



Baseline Example

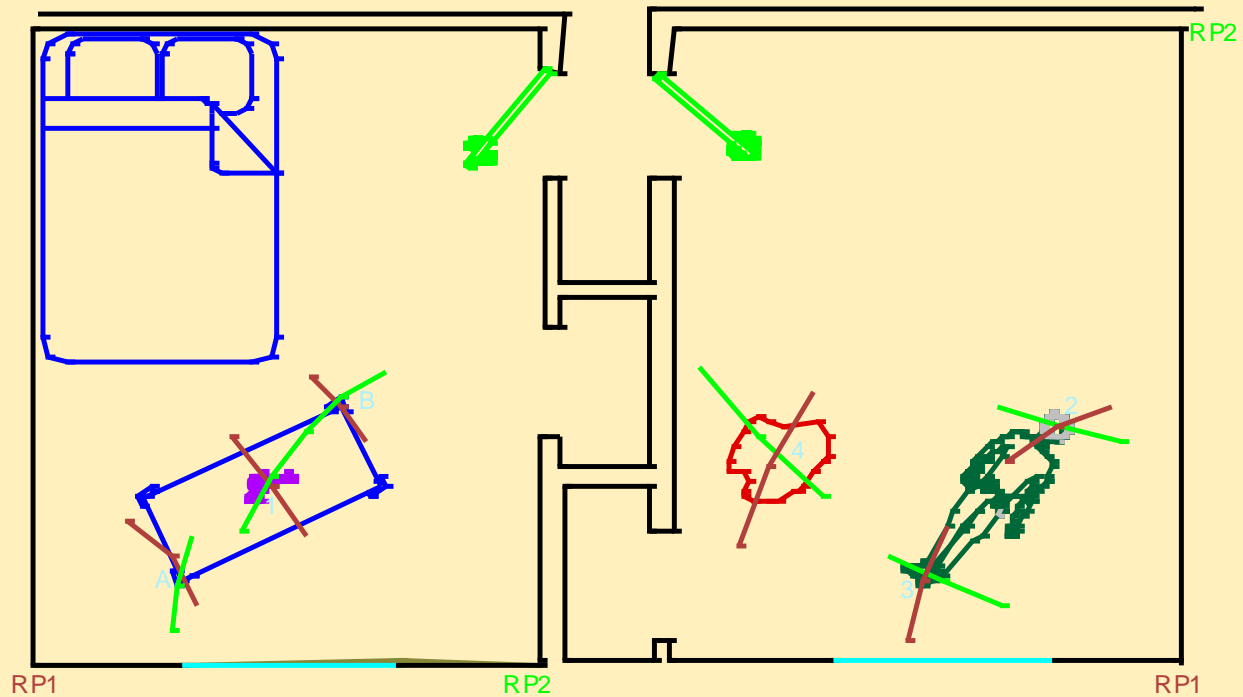


Triangulation Measurements at the scene



Triangulation

*Plotting points for your diagram
A compass is needed to accomplish this*



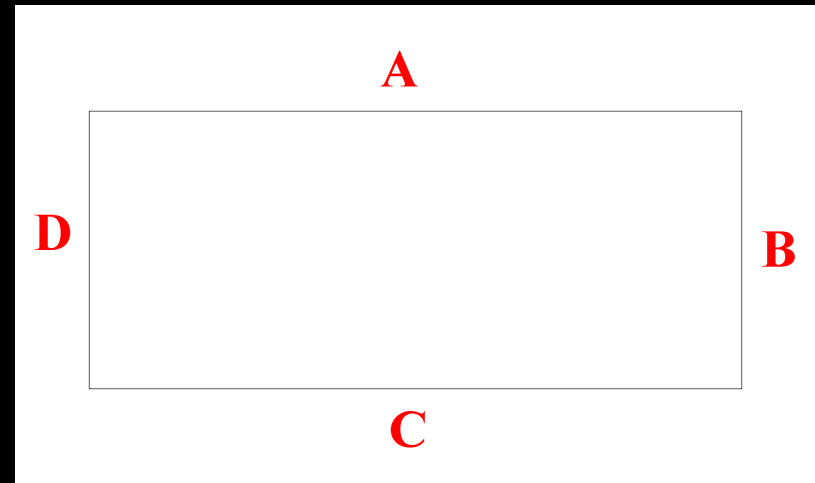


90 Degree Modified Baseline

- Only need one tape measure
 - Do not need to lay a tape on the floor
 - Choose two walls (perpendicular) to each other inside a room
 - Use the walls as your base lines
 - Measure at 90 degree angles from each wall to your object
 - Record the measurements on your log
- Cluttered rooms not as much of a problem

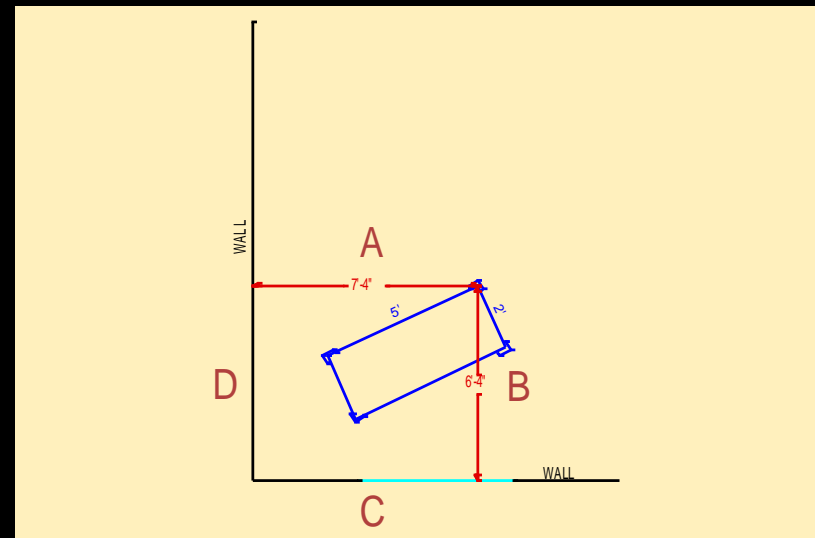
Rectangles

- Rectangle Rules
 - Opposite sides are equal to each other
 - $A=C$
 - $B=D$
 - Adjacent sides are perpendicular
 - 90 degree angle



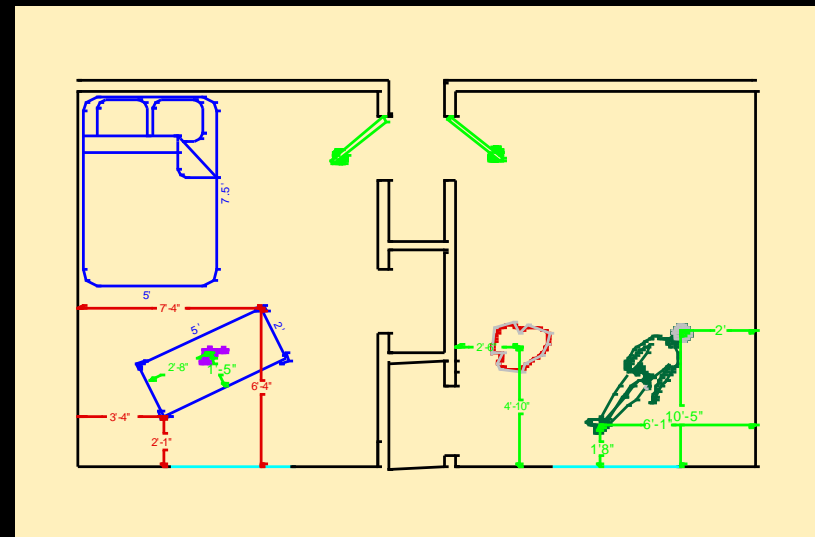
Applies to 90 degree walls in a room

- At scene it is very difficult to lay a baseline along a wall ("C" or "D")
- Easier to make your measurement at a 90 degree angle from the wall ("A" and "B")
- When drawing the diagram at the office
 - Start at the corner and go the "A" distance up the "C" wall then the "B" distance out to the point location. Or visa versa.

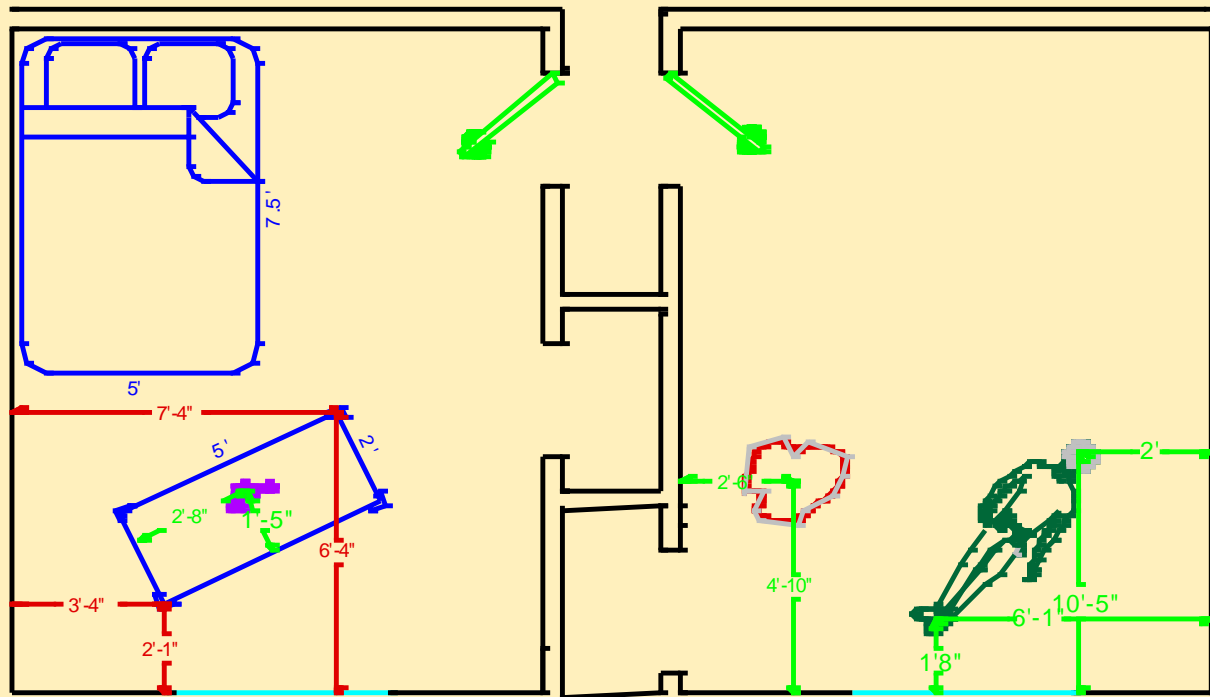


Locate Furniture & Evidence

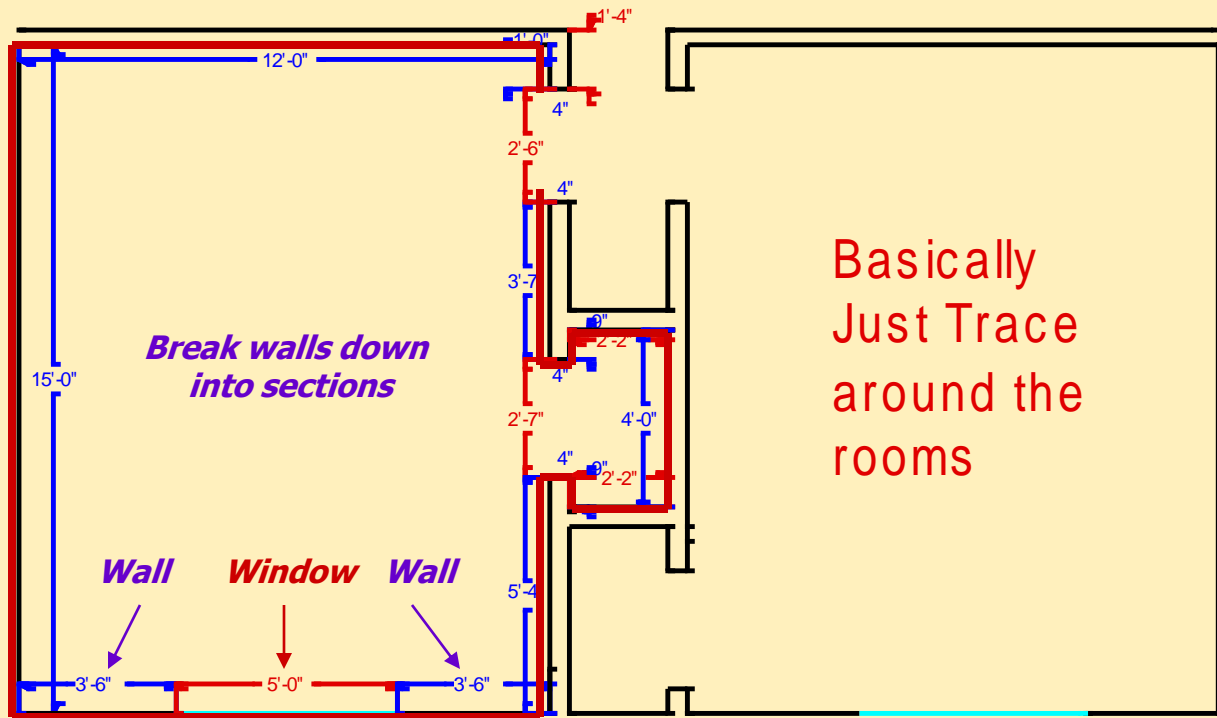
- The bed is a rectangle
 - Placed against both walls in the corner
 - "Square" to the room
 - Only need dimensions of the bed
- The Table is a rectangle
 - Need dimensions as well as locate at least 2 points
- Table becomes the base lines for gun
 - Use table edges at 90 degree angles
- Center of blood pool + dimensions
 - May want to measure perimeter points
- Determine how many points needed for the body



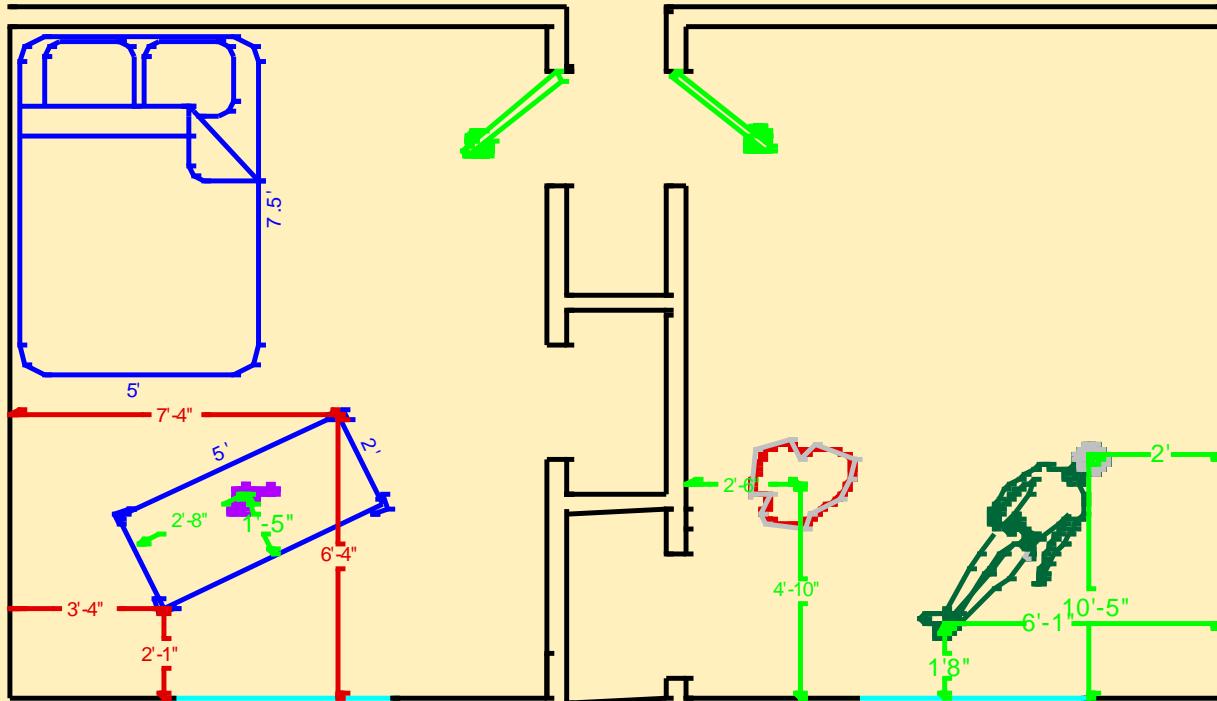
90 Degree Modified Baseline Example



Room Measurements

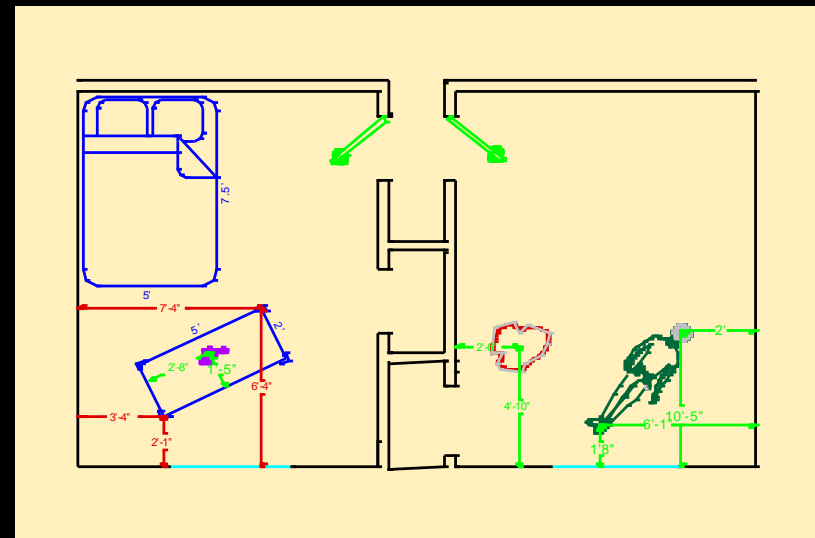


Locate Furniture & Evidence



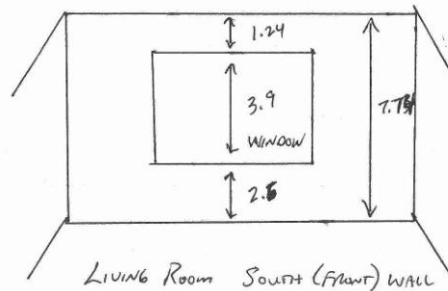
Inside Diagrams – 2D

- Additional 3D Measurements to Consider
 - Furniture Heights
 - Window Heights
 - Header & Footer
 - Door Heights
 - Wall Evidence Height
 - Stair Heights

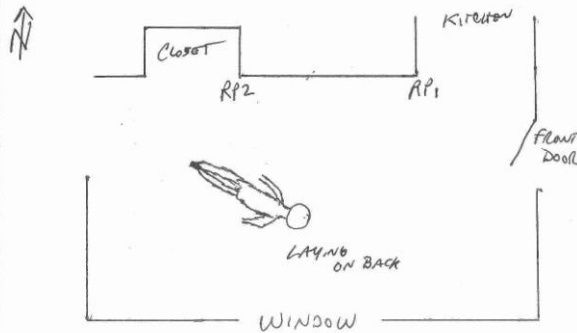


Measurement Examples

Living Room



LIVING ROOM SOUTH (FRONT) WALL

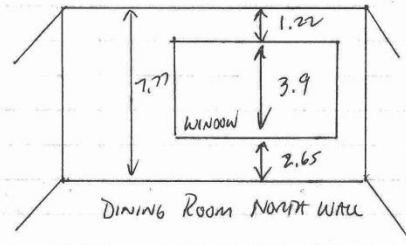


TRANSECTION	RP1	RP2
HEAD	7.3	7.6
FEET	8.6	4.2
BODY LENGTH	5.8	

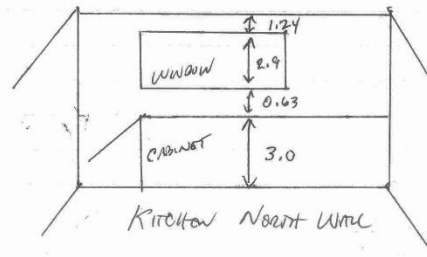
ORIGINAL
PAGE 1

Measurement Examples

DINING ROOM



KITCHEN

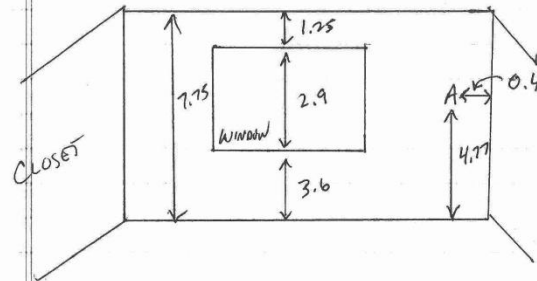


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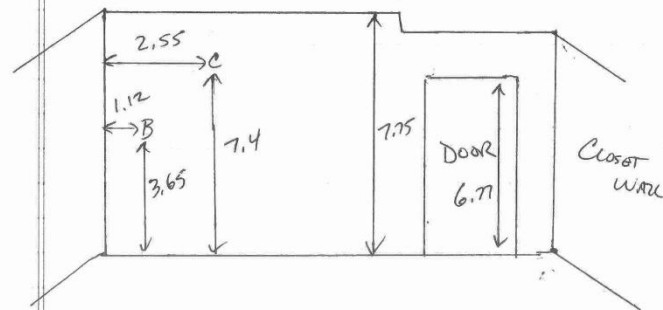
Page 2

Wall Evidence

South (Front) Bedroom South Wall



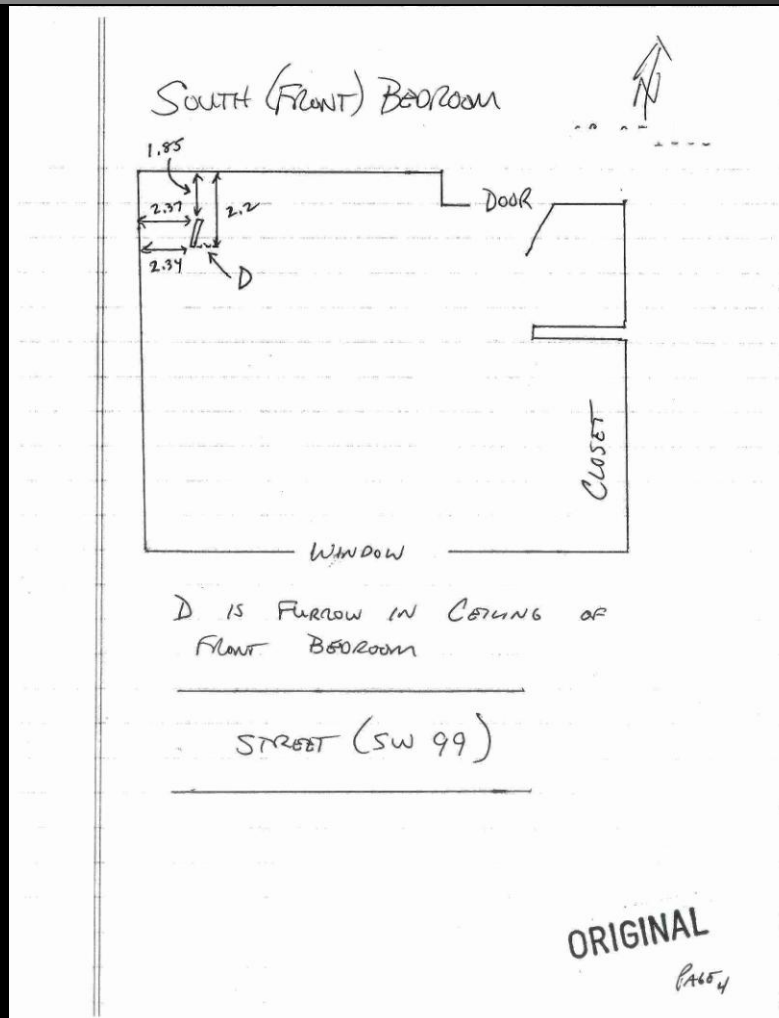
South (Front) Bedroom North Wall



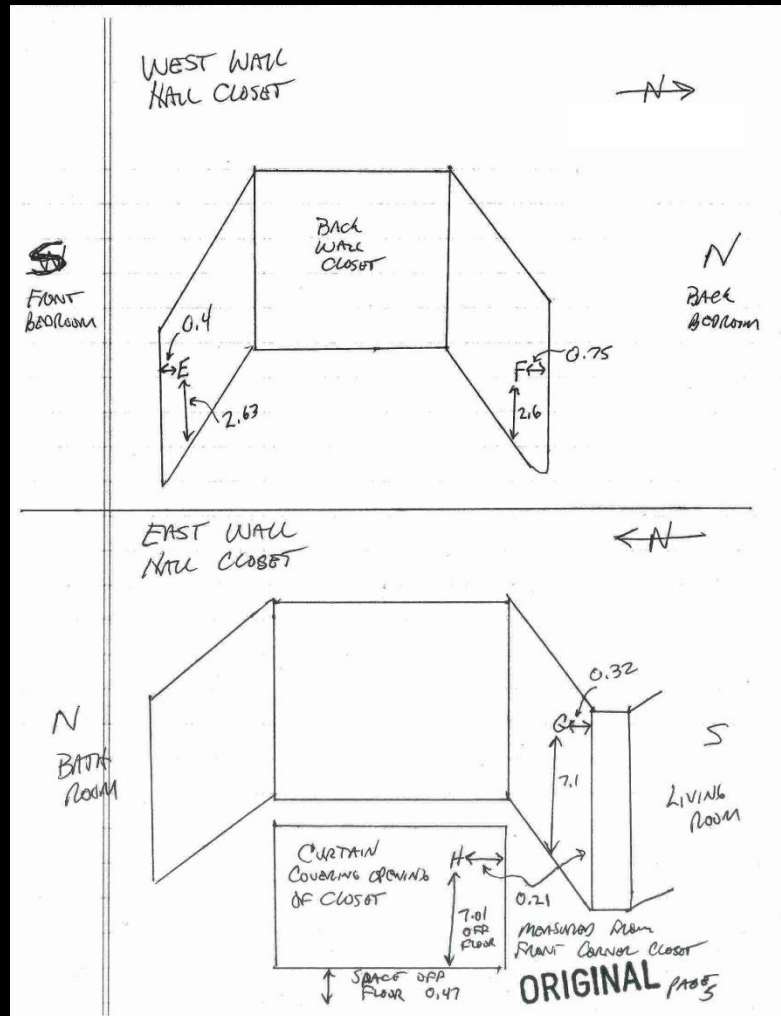
ORIGINAL

Page 3

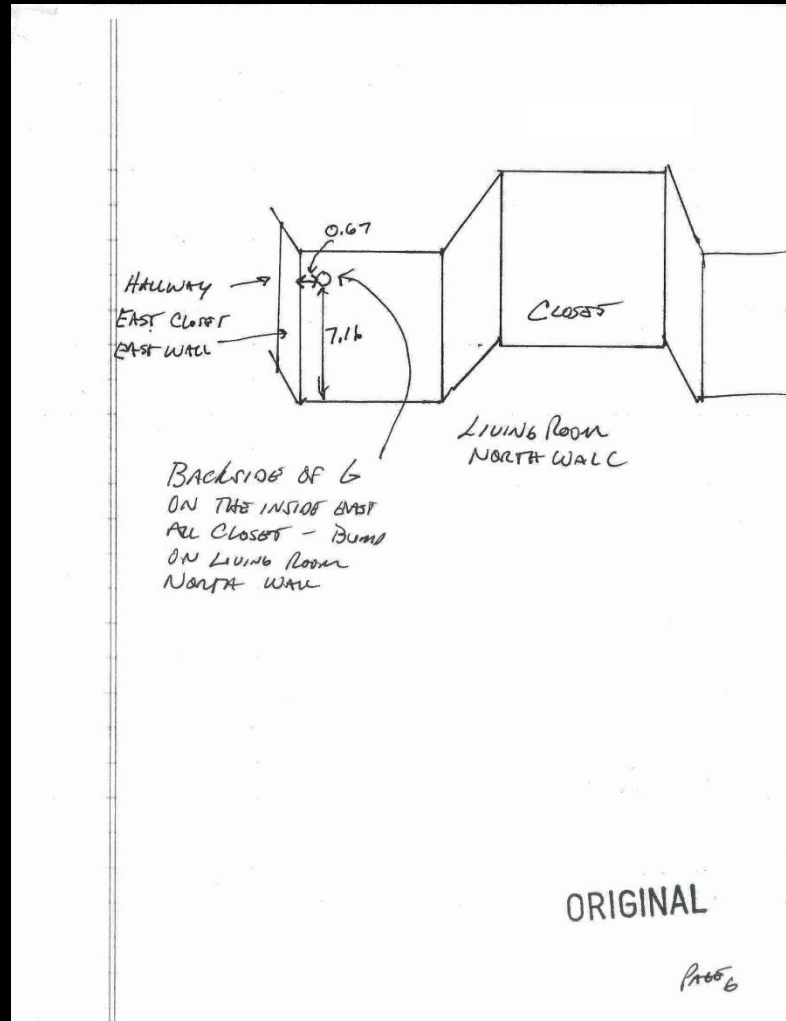
Ceiling Evidence



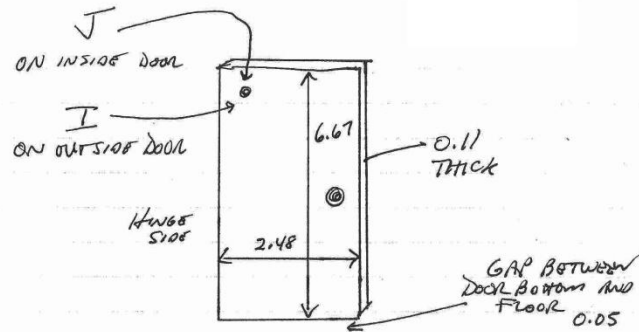
Measurement Examples



Other Side of Wall - "G"



Door Evidence



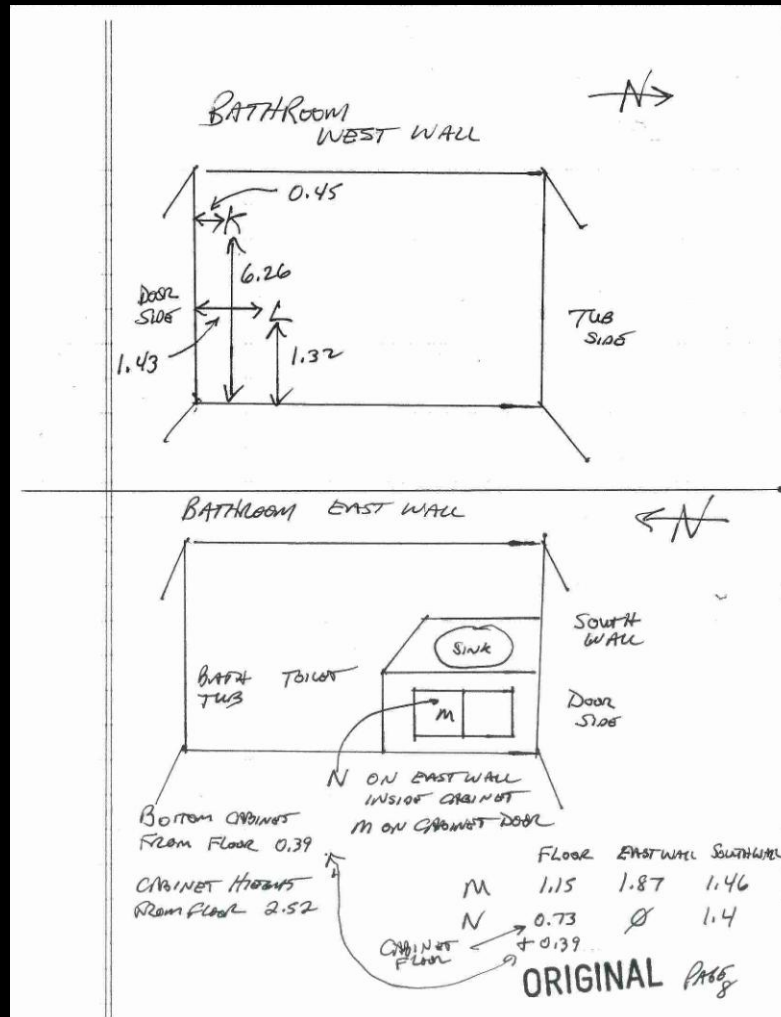
BATHROOM DOOR
OUTSIDE VIEW

	Vertical From Door Bottom	Horizontal From Hinge Side
I	6.33	0.14
J	6.26	0.03

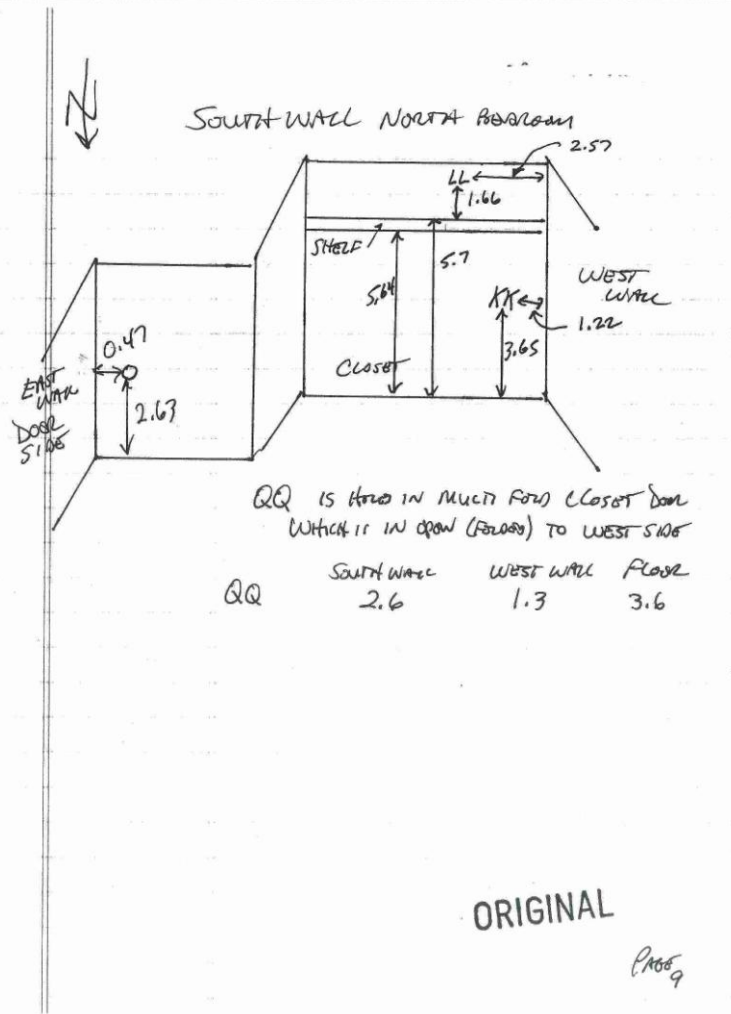
ORIGINAL

Photo

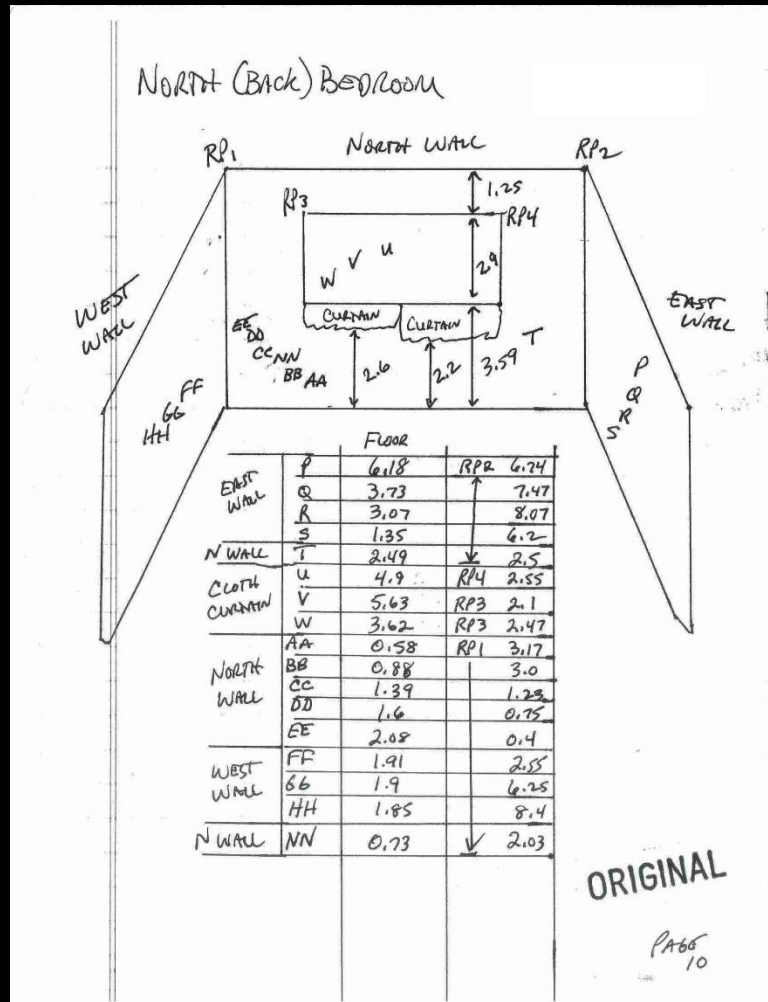
Measurement Examples



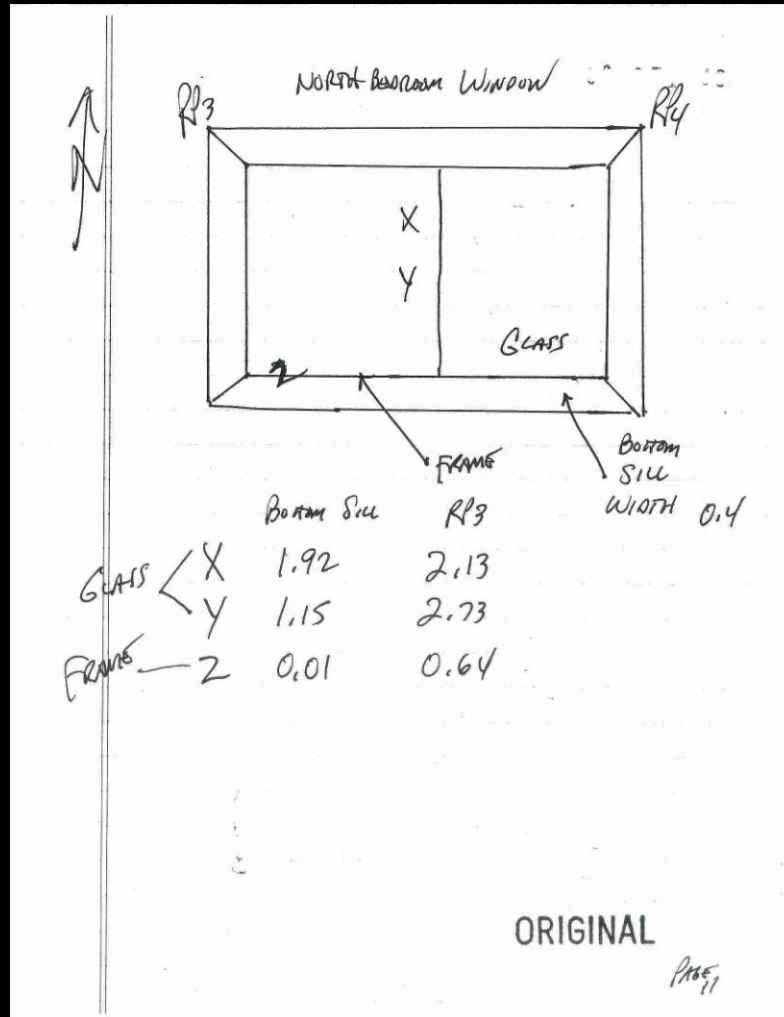
Measurement Examples



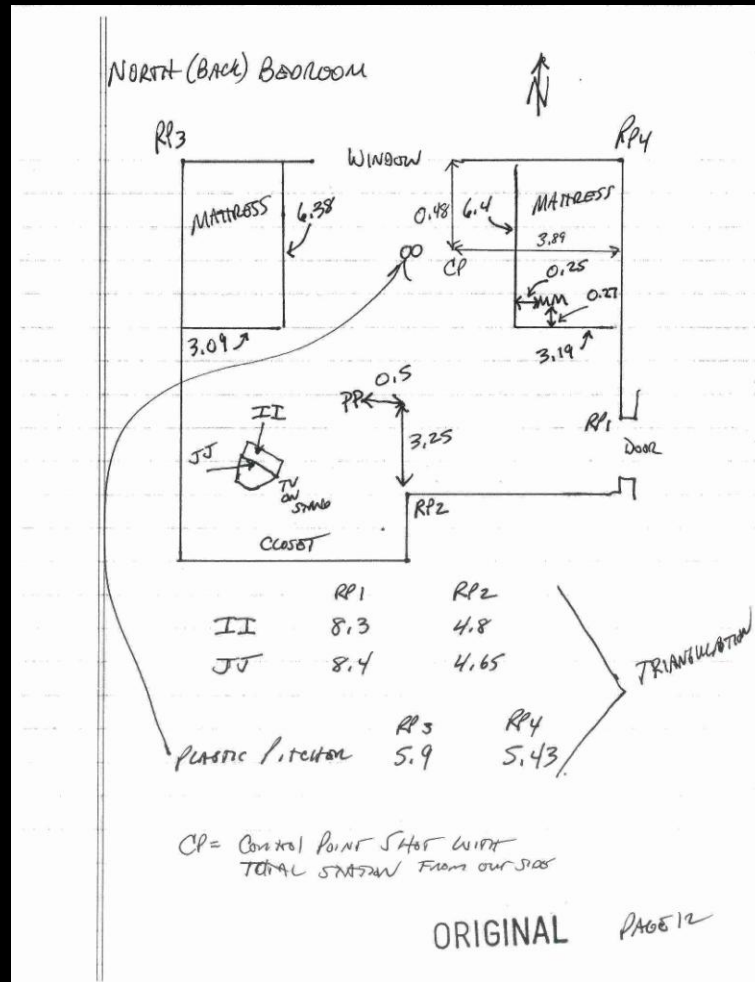
Measurement Examples



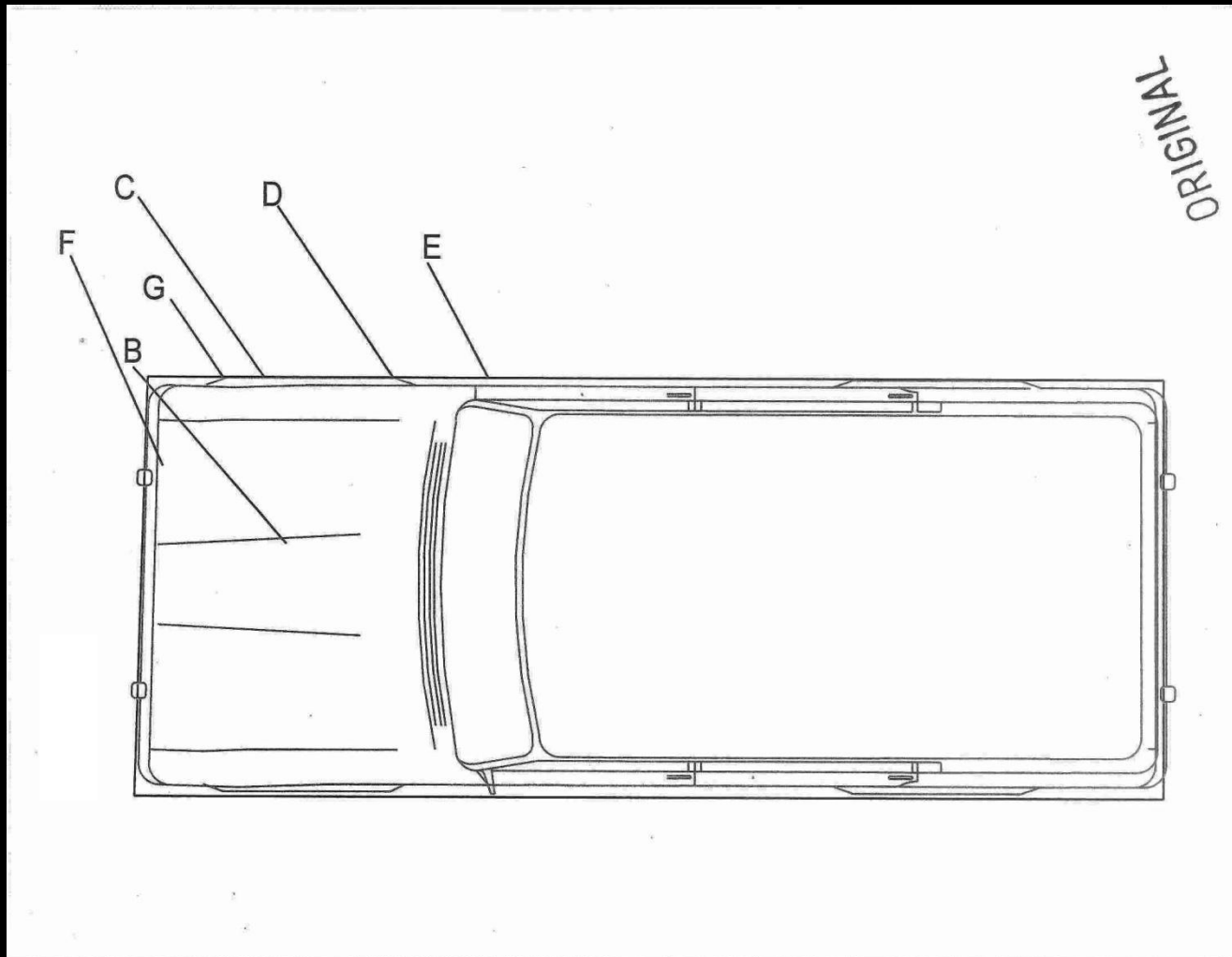
Window Evidence



Measurement Examples

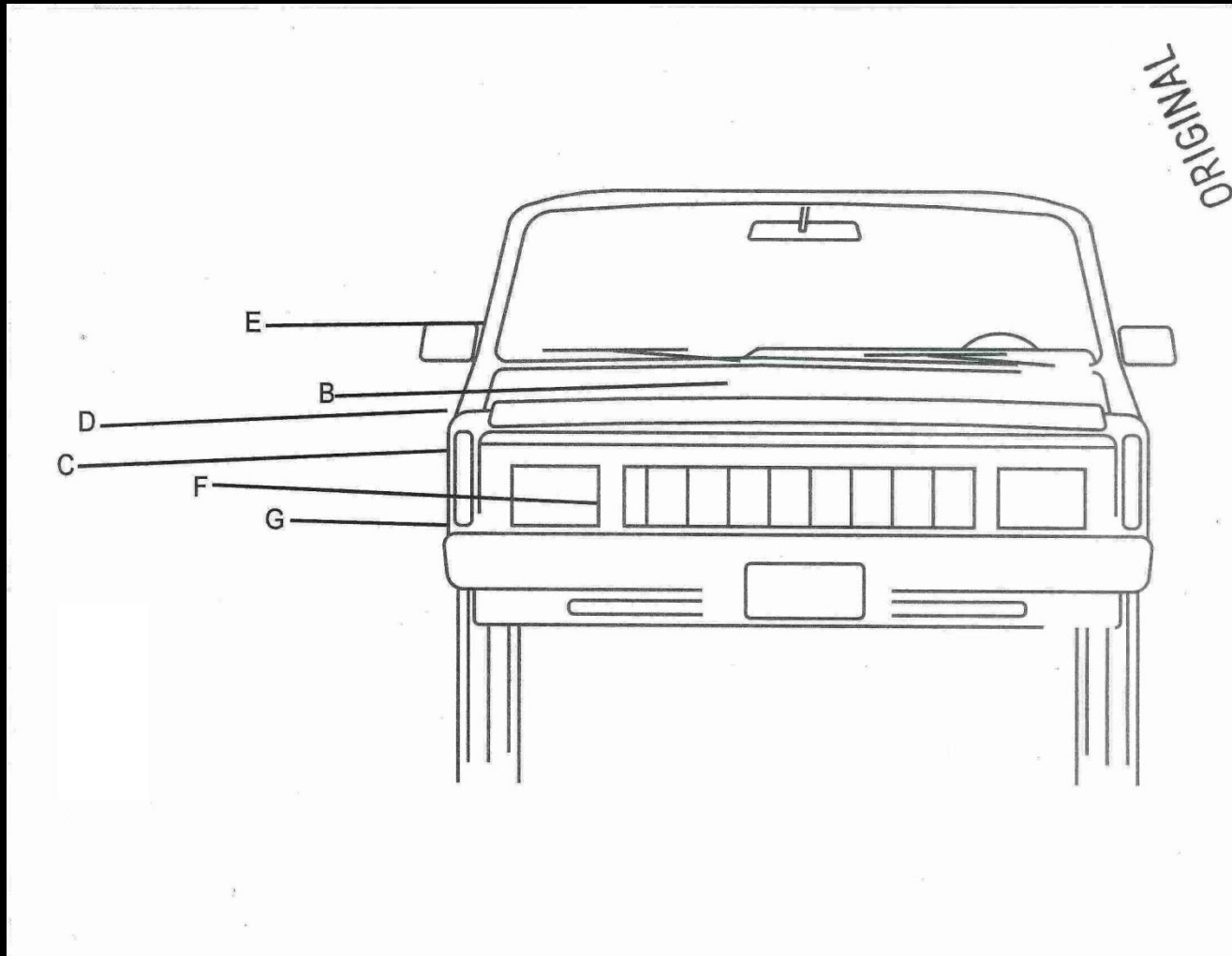


Trajectory Example Top View

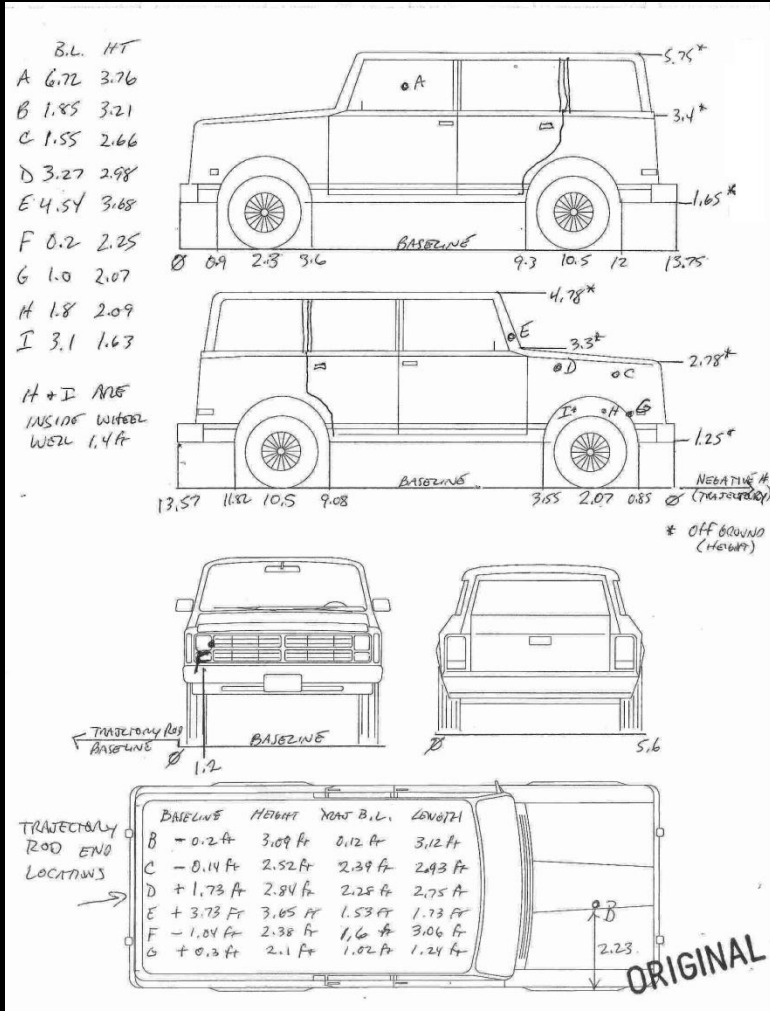


Trajectory Example

Front View



Trajectory Example Measurements



Clean & Easy



Not So Clean-



Not So Easy





Finishing the Diagram

- Place the compass direction on the diagram
- Place a title block on the diagram
 - Case number
 - Date & time
 - Type of investigation
 - Drawn & measured by
- Place a legend on the diagram
 - Identifies evidence items in the diagram
- Place a scale on the diagram
 - Computer drawn diagrams the scale is accurate and precise
 - Actual measurement is typed in and drawn to that scale.
 - Hand Drawn diagrams could be labeled “approximate scale”
 - Accounts for the problems encountered with the engineer ruler & pencil width applications



Hand Drawn vs. Computer Drawn

- Paper diagrams drawn by hand
 - Using an engineer's rule to draw to scale.
 - Your pencil lead is thick enough to account for six inches or more, depending on your scale.
 - You can probably get by with measurements to the nearest inch
 - However, if someone took your measurements and reproduced the diagram on a computer, a discrepancy might be revealed.
 - A paper diagram drawn by hand to scale is an accurate representation of the crime scene.
 - It is just as accurate as a computer generated diagram
 - A computer generated diagram is able to use more precise measurements.



11 X 8.5 Paper

Maximum Scene Sizes

- 1"=1' (1:12)
 - Maximum scene size 10' X 8'
- 1"=5' (1:60)
 - Maximum scene size 50' X 40'
- 1"=10' (1:120)
 - Maximum scene size 100' X 80'
- 1"=20' (1:240)
 - Maximum scene size 200' X 160'
- 1"=30' (1:360)
 - Maximum scene size 300' X 240'



Tools Needed

- Ruler
 - Engineer ruler preferred
 - Set up to do six different scales
 - 1"=10'; 1"=20'; 1"=30'; 1"=40'; 1"=50'; 1"=60'
- Paper
 - Choose a size that best fits your needs
- Compass if you chose triangulation
- Pen
- Flex curve for curved lines



"THE REAL WORLD"

- ***The MAIN Goal:***
 - Is to produce a scaled diagram that accurately represents the crime scene as it was found.
 - To give accurate testimony in court
 - Not to look like an idiot in front of the judge, prosecutor & jury
 - Not to have your co-workers cringe when your name is mentioned in connection with the crime scene diagram.
 - To be able to understand it years later
 - Common sense. Any system you choose will work as long as you can justify and explain it.