CRIME SCENE PROCESSING

Crime Scene Diagramming

Policy Statement

A crime scene diagram will be made for homicide and suspicious death scenes. *At the direction of a Forensic Services Supervisor or Detective, a diagram may be required for other types of investigations.* Diagrams are normally requested by Internal Affairs for Use of Deadly Force Review Boards.

A crime scene sketch will be completed at the crime scene. The sketch and accompanying notes will contain **accurate and complete** measurements and descriptions for all elements within the sketch. Crime scene sketches and measurements will be recorded in a neat and orderly manner. A crime scene diagram, drawn to scale and based upon the measurements contained in the crime scene sketch, will be completed using the Section's Computer Aided Design (CAD) software[1], **within 4 weeks**, unless otherwise directed by a Forensic Services Supervisor. The scale used to print the final crime scene diagram will be handwritten on the back of the diagram and a copy will be forwarded to LESA records for inclusion in the case file. *Crime scene sketches and/or notes will not be substituted for a scale diagram, but **will** be retained as part of the discovery process.*

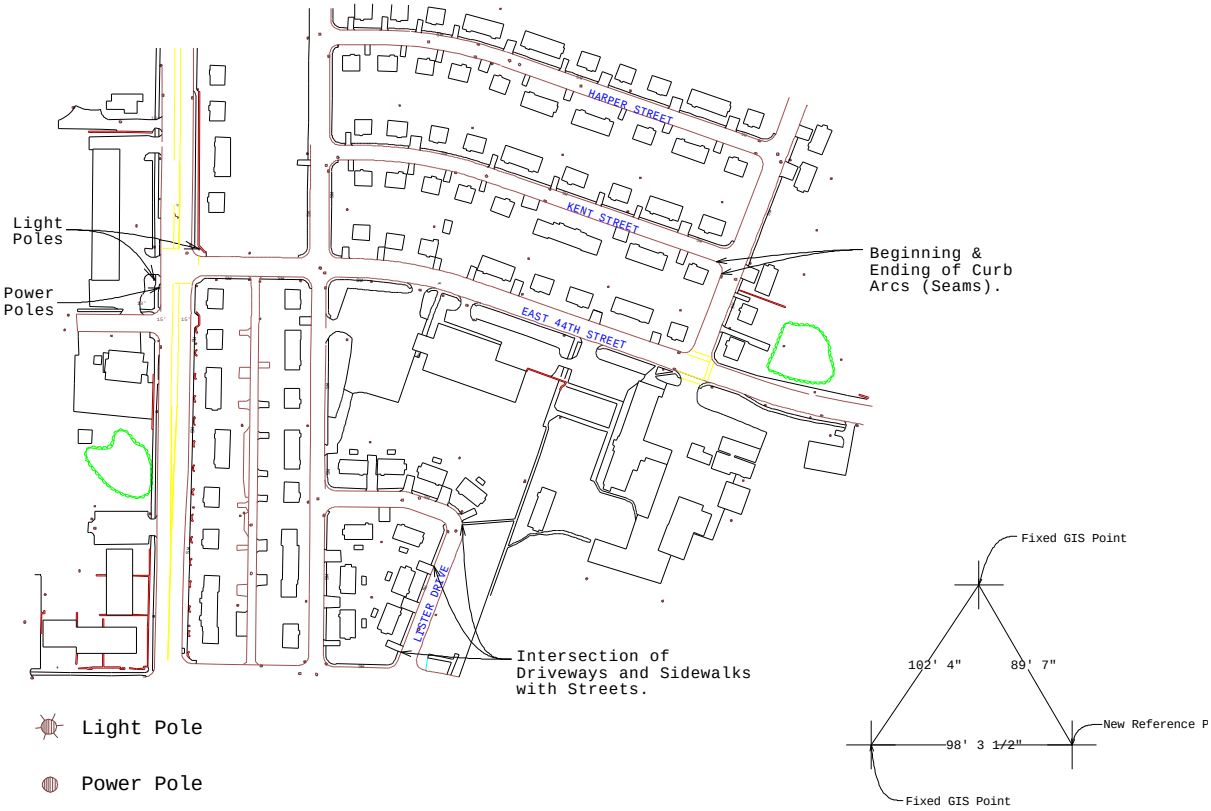
Procedure – Measuring Effectively

The most critical step in the process of creating a crime scene diagram is accurately measuring the position of every item depicted in the rough sketch. Every item included in the rough sketch *should* be measured from one or more reference points. The number will depend upon the method used to measure the scene. Before any measurements are taken, the measurement method must be determined and reference points must be established.

The choice of a reference point should be considered carefully. ***Figure 1***, on the next page, illustrates several different reference points that can be used anywhere within the City of Tacoma. They are based upon known points that appear in the Geographic Information System. Other points can be used, as long as they are permanent and are established in the crime scene diagram based upon measurements taken from another, known point, that also appears in the GIS. By ensuring reference points are in the GIS, it is always possible to combine scene measurements with details found in the GIS to produce diagrams that include area maps and other important information that would not otherwise available to the viewer of the final crime scene diagram.

[1] The Forensic Services Section currently utilizes Visual Cadd 4.0 to complete crime scene diagrams.

Choosing a Valid Reference Point



Anything that is not going to move can be used as a Reference Point as long as you can establish its location by Triangulation, using one of the Points shown above.

Figure 1

When a crime scene is restricted to the interior of a building, the choice of a reference point is left to the wisdom and training of the Forensic Specialist. GIS data is not available for the interior of buildings, however, the exterior of buildings constructed within the City of Tacoma prior to 1995 are documented by the GIS. The measurements of buildings are based upon aerial photographs, so actual measurements tend to be rooflines, and unless the building has a flat roof, with no overhang, the actual measurements will not be an accurate footprint. When measuring the interior of a residence or other structure, the Forensic Specialist should ensure measurements are available to establish the amount of roof overhang. Additional measurements that include the distance from the front door to the street and structures, such as fences (fences are not documented consistently in the GIS) will help to check the specific accuracy of the GIS data when it is combined with crime scene measurements. In general, GIS measurements are accurate to plus or minus 2 feet. Experience has shown the GIS to be within 6 inches of actual measurements taken at the scene.

When measuring an outdoor scene, recommended reference points includes: power poles, light poles, the point where a sidewalk or driveway intersects with a street, or the seams in a curb, as it turns a corner from one street to another (intersection). When measuring an indoor scene, reference points become a little fuzzier, though the concept is the same as for

outdoor scenes. Common reference points include the corners of a room or the point where a doorway intersects with the floor.

The Forensic Services Section currently utilizes two different methods for measuring crime scenes; the Linear Coordinate (or Baseline Method) and Triangulation. A variation of the Baseline Method, which is known as the 90 Degree Method, is typically used for indoor scenes. The method chosen will depend upon the specific geography of the scene and the availability of reference points. Weather can also have an affect upon the decision to choose one method over another. Other factors include the availability of personnel and the overall size of the crime scene, the number and types of obstructions between potential reference points and the objects being measured.

Linear Coordinate or Baseline Method

One of the most common methods used to measure a crime scene is known as the baseline measurement system. The baseline method generally begins by the establishment of a single reference point. A tape measure is then extended (parallel to the scene) from the reference point to an end point, which then becomes a second reference point. A baseline is most often established along a curb or sidewalk in order to simplify the measurement process. Measurements are then made from a point on the tape to an object in the scene. Measurements are always made at a 90-degree angle to the tape (***see Figure 2 on next page***). Measurements are then recorded according to their geographic location, relative to the tape. To better illustrate the measurement process; we have positioned a car in the center of a crime scene. A baseline has been established in the center of the crime scene with the zero point of the tape set at a reference point on the north end of the scene (reference point 1). The other end of the tape has been set to a reference point at the south end of the scene (reference point 2, 100 feet away). To locate the front tire of the car we move south along the tape to a position directly east of the front tire. The reading on the tape is 34 feet 4 inches. We then measure to the west of the baseline until we reach the front tire, 12 feet 6 inches away. This last measurement must be taken with the tape held at a 90 degree (perpendicular) to the baseline. Figure 2 shows the potential for error if the tape is not held perpendicular to the baseline. In this example, the relative position of the front tire to reference point 1 is 34 feet 4 inches south, and 12 feet 6 inches west.

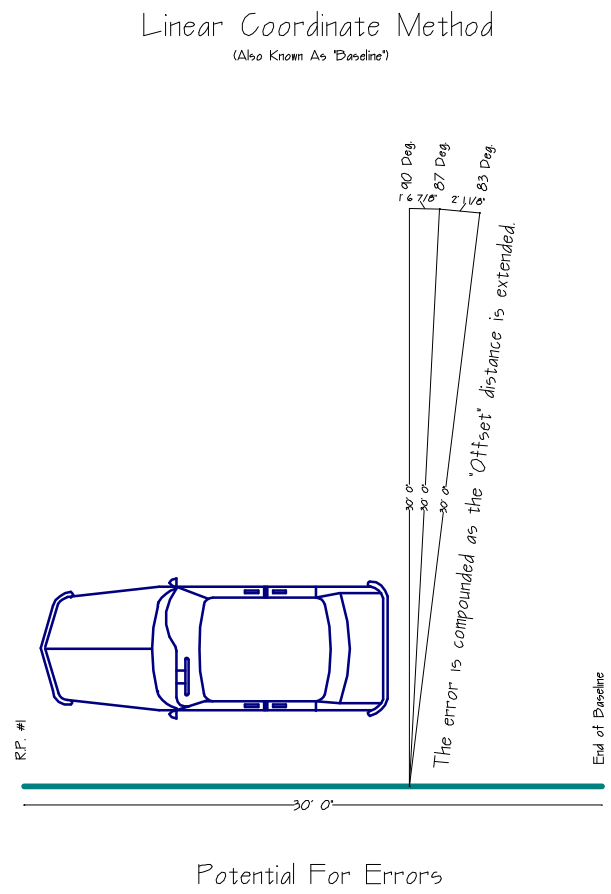


Figure 2

The baseline method is generally the simplest method to set up, but it is also the least accurate method. As the distance between the baseline and the objects being measured increases, so does the potential for error. This method is only recommended when the distance between the baseline and the objects to be measured is less than 30 feet. As distances increase and the complexity of an outdoor scene increases, consideration should be given to switching to the Triangulation Method. Switching from one method to another and even back again is perfectly acceptable as long as the reference point utilized and the method employed is clearly documented as part of the measurements.

Triangulation

Absent the availability of a transit and the trained personnel to use it, triangulation is generally considered the most accurate method for measuring the relative position of an object within a scene. Triangulation utilizes two or more reference points to establish the position of an object. By drawing a line that connects the two reference points and extending a line from each of the reference points to the object being measured, a triangle is formed. Ideally, the distance between both reference points and the object being measured would be the same. This, however, is rarely the case. Figure 3 shows how even a relatively large error in measurement using the triangulation method still produces a fairly accurate recording of a specific position. The one drawback inherent with the use of triangulation is that it is more

manpower intensive than the baseline method. Triangulation generally requires a minimum of two people to record the necessary measurements. However this is a minor drawback since the baseline method also requires two people to ensure accuracy over longer distances; even though one person can measure a small scene. Additionally, there are a number of electronic devices available that will enable one person to measure even a large scene utilizing the triangulation method.

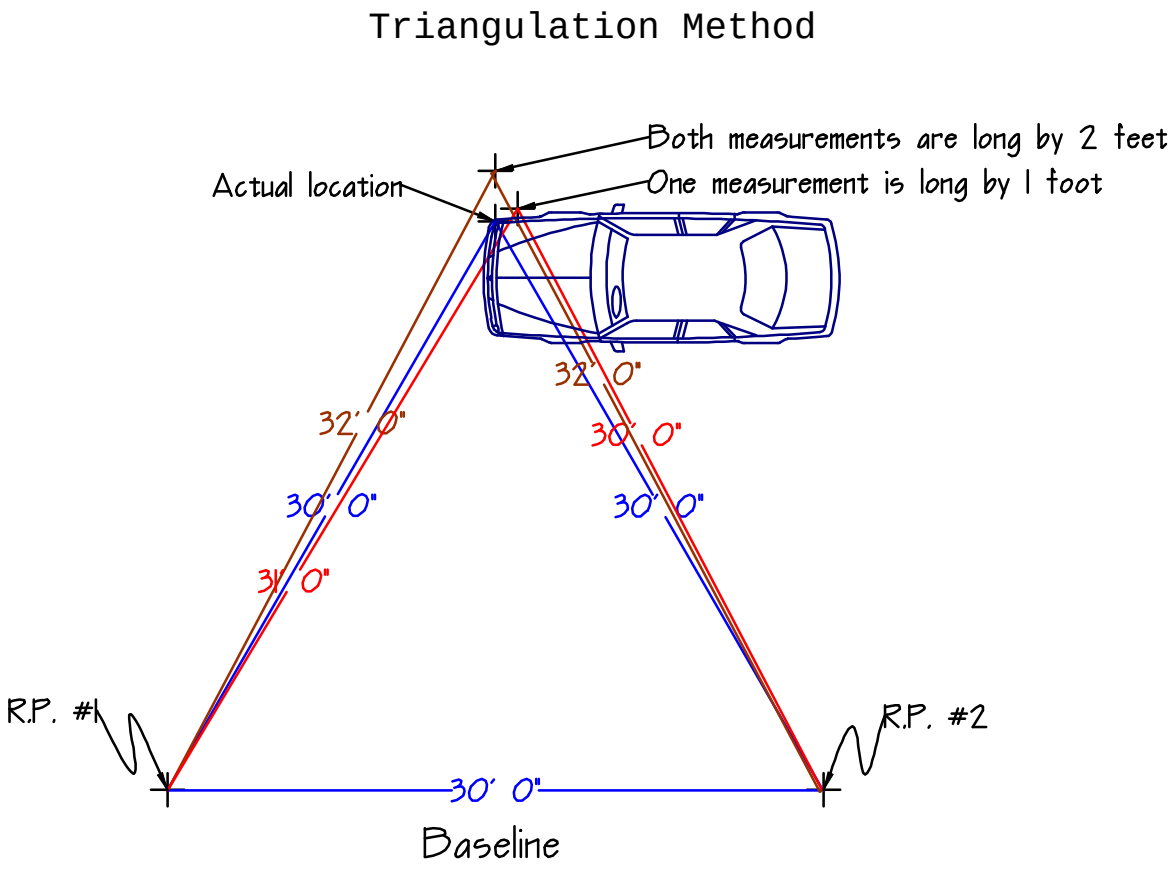


Figure 3

When utilizing the triangulation method, a minimum of two reference points must be established. Normally, it is best to have the reference points in a direct line at opposite ends of the scene. Both reference points should be visible at the same time from all points within the scene. If not, it will be necessary to establish additional reference points to cover those areas not visible to one or both of the first two reference points. Once the reference points are established, the first measurement taken will be the distance between the two reference points. If additional reference points are used, the distance between those additional reference points and the first two will also need to be recorded.

90 Degree Method (A variation of the Baseline Method)

This method is typically used for measuring an indoor crime scene. To establish the position of an object in a room, measurements are taken from two different walls within the room that are perpendicular to one another. The tape measure is held perpendicular to the wall when the measurement is taken to ensure 90 degree angles from the wall to the object being measured.

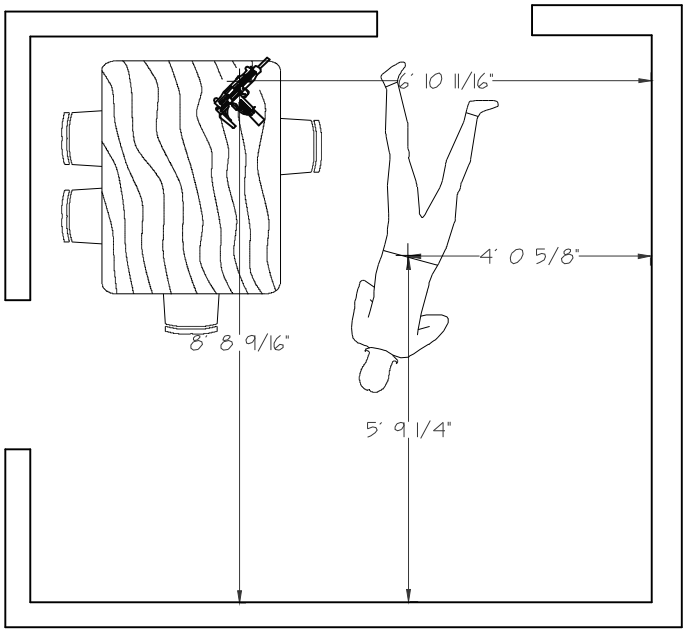


Figure 4

Figure 4, above, is an example of how the 90 degree method is used to measure the position of objects in a room.

Important

Regardless of which method is chosen, when measuring a crime scene, the most important thing to remember is: ***Every object depicted in the crime scene sketch must have a sufficient number of recorded measurements to enable anyone looking at the field sketch to determine both the size and the location of each object depicted.*** The person who prepared the rough field sketch is responsible for the accurate collection and recording of all measurements. This same person should control which method is used to gather measurements, as well as what is and is not included in the sketch.

Figure 5, below, shows a typical rough sketch, prepared on a *Supplementary Diagram Report form Z-2391*. Illustrations on the next page show a typical page of measurements utilized with the 90 Degree Method and the final diagram prepared from those measurements. The person, who is preparing the final drawing in Visual Cadd, may or may not be the same person who prepared the field sketch. *All the information necessary to complete the diagram must be recorded by the Specialist responsible for the rough sketch, before leaving the scene.* Rough sketches and notes must be safeguarded in event defense attorneys demand discovery, and as a reference when changes need to be made during trial preparation.

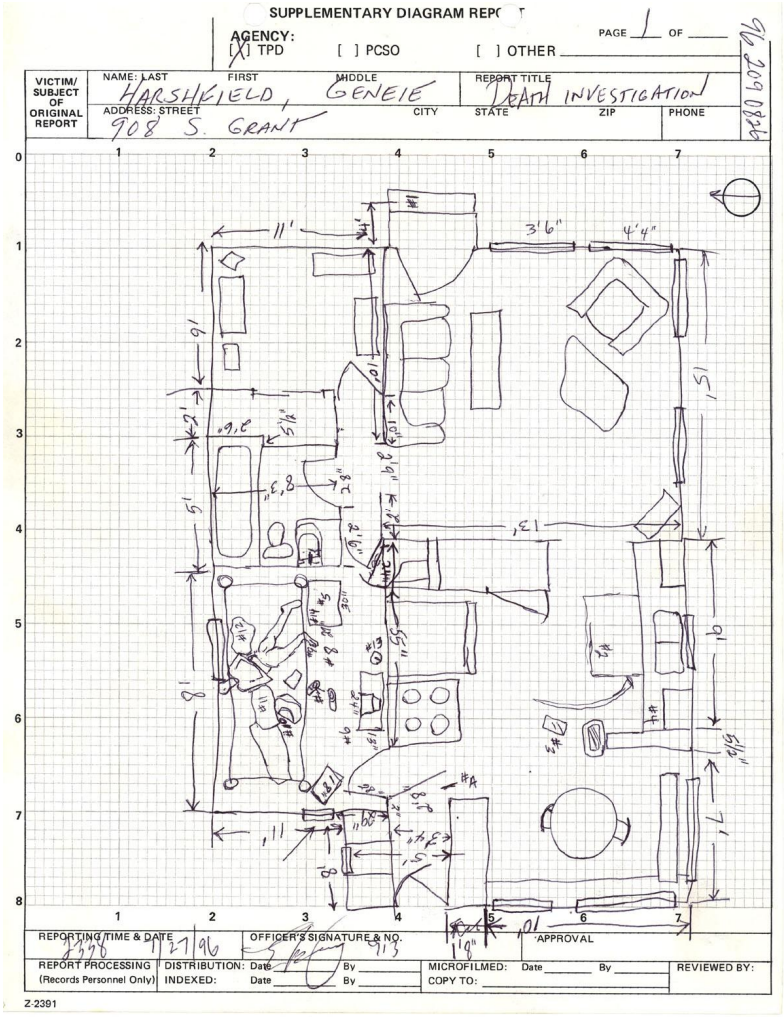
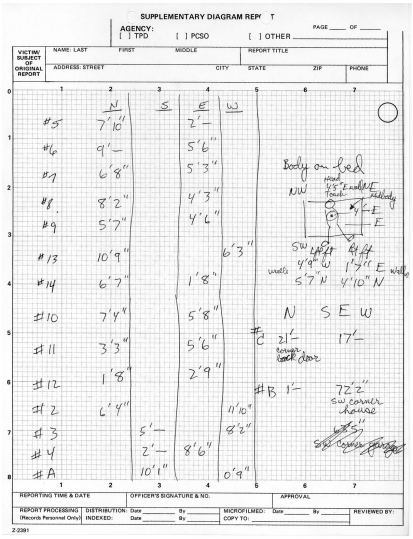
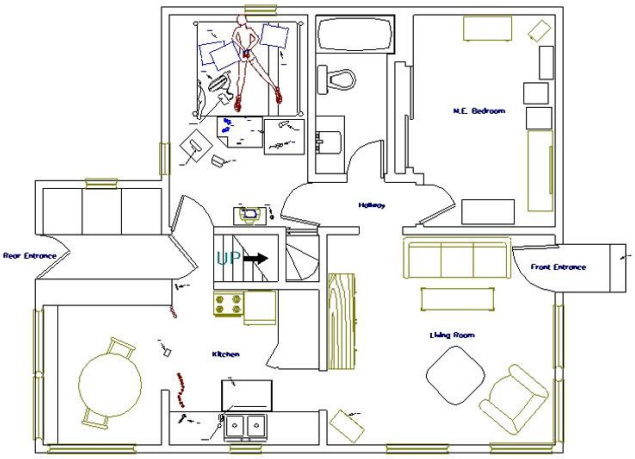


Figure 5

All sketches as well as related notes and measurements must be secured in the Section file cabinet so they can be accessed in case the Specialist involved is not available. A copy of all notes and sketches should also be maintained in the Specialist's file cabinet to insure against the possibility of loss.



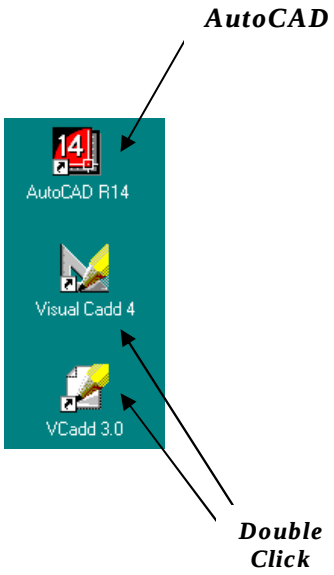
Measurements recorded at the scene, using 90 degree Method.

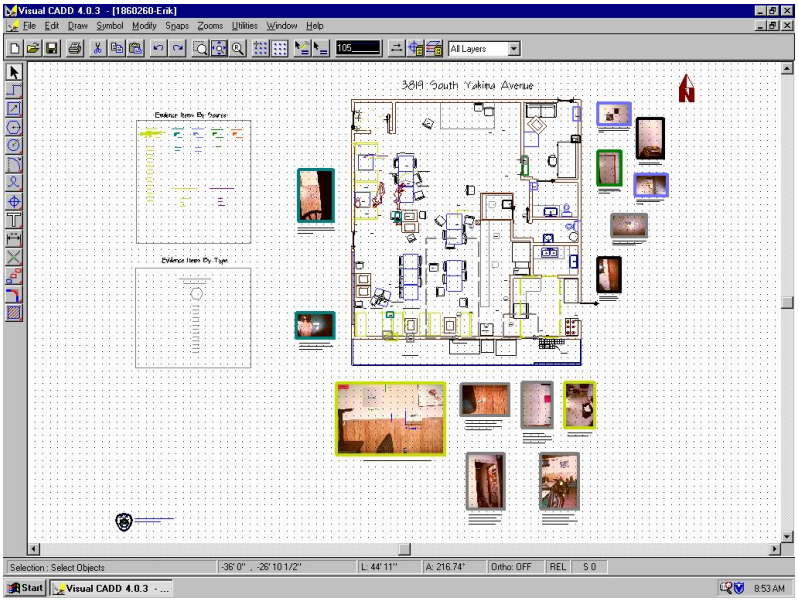


Final Diagram

Procedure – Using Visual Cadd

To open Visual Cadd, find the Visual Cadd icon (either version 3 or 4) on the Windows desktop and double click with the left mouse button.





Visual Cadd 4.03 Interface

Two and Three Letter Commands

The Visual Cadd interface might seem intimidating at first, but with a little practice, the user will find that it is well organized and easy to learn. The most powerful and time saving feature offered by Visual Cadd is the ability to use two and three letter shortcut commands. By using these letter driven commands, the mouse doesn't need to move out of the drawing area to access menus. Instead, it can move smoothly from a drawing mode to an editing mode without leaving the line that is being drawn or edited. A list of these commands is kept next to the CAD workstation as a reference. Most two and three letter commands also have an equivalent menu choice to aid the user who is unfamiliar with the program or prefers to use menus rather than command shortcuts.

Some of the more common two letter commands are provided in the table below:

TWO Letter Command	*Operation*	*TWO Letter Command*	*Operation*
A3	*Three Point Arc*	**OR**	*Ortho Mode – Toggles ortho mode on and off.*
BR	*Break an object, such as one line segment into two line segments.*	**PO**	*Point – Allows the user to insert a point (+) at a specific location in the diagram.*
C2	*Two Point Circle*	**RD**	*Redraw – Refreshes the current drawing.*
CG	*Change the properties, such as line color, width and/or layer of a selected object.*	**SE**	*Select – Use to turn on selection so one or more objects can be selected.*
CO	*Copy an object(s)*	**SM**	*Snap Midpoint – Snaps the cursor to the center of a line.*
ER	*Erase an object(s)*	**SP**	*Snap Perpendicular – Snaps the beginning of a line perpendicular to another line.*
EX	*Explode a symbol into the original lines that were used to create it – allows a symbol to be edited.*	**TK**	*Tracking – Used to place an object based upon its distance from another object already in the drawing.*
LE	*Add a leader – text with an arrow.*	**WE**	*Window Erase – Erase objects inside window.*
MD	*Measure Distance from one object to another.*	**ZA**	*Zoom All – Zoom drawing extents.*
OA	*Ortho Angle – Set ortho mode to a specific angle.*	**ZW**	*Zoom Window – Zoom in based upon a window.*
OO	*OOPS – Undo last operation.*		

Layers

When creating a diagram, it is ***very important to utilize layers to organize objects within the drawing***. Layers can be analogized to tracing paper placed over the base drawing. Anything drawn on a tracing paper layer can be taken away or changed without affecting the underlying drawing. To put this into practice within this section, the following guidelines should be used:

1. As much as possible, group like items on a single layer - unlike items should be separated onto separate layers.

    A. Walls should be placed on a layer named walls.
    B. Windows should be separated on a layer named windows.
    C. Doors should be separated on a layer named windows.
    D. Evidence should be placed on a separate layer. In some cases, different types of evidence, such as bullets, blood, clothing, etc. should all be placed on separate layers.

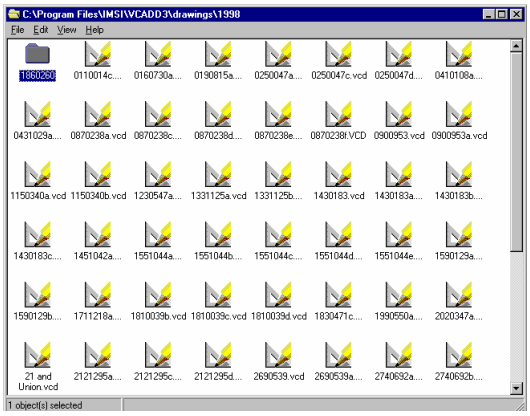
2. GIS maps are separated into layers. When integrating maps into a crime scene diagram, do not mistakenly add evidence to one of the GIS layers. This will cause confusion later and will make editing very difficult.

3. Color should be used to further separate specific types of objects, but color is NOT a substitute for layer placement of objects.

The consistent use of layers to separate objects into logical groupings will pay back dividends when a Detective or Prosecutor wants something changed and/or highlighted for presentation in court. If the entire drawing was completed on one or two layers, with no logical thought given to the placement of specific drawing objects on a particular layer, the user will pay a heavy price in both time and aggravation when changes become necessary. Instead of having to delete all the blood evidence scattered throughout a diagram, if all blood evidence had been placed on a single layer, the layer could be turned off instead. Need to change the color of spent casings in a drawing? Change the layer color.

Inserting Images into Drawings

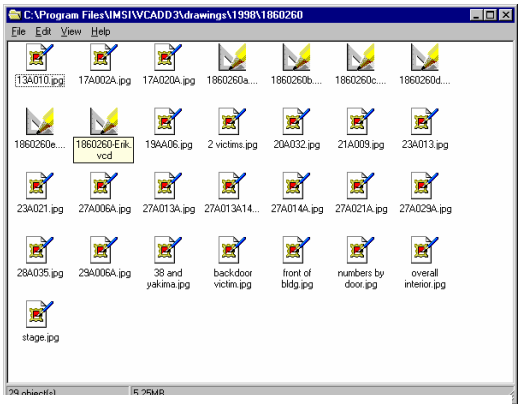
A new feature recently added to Visual Cadd is the ability to insert images, as an object, into a drawing. This feature should not be over used, but in some cases, one or more images added to a crime scene diagram can make an otherwise confusing or overly complex diagram more understandable to a jury.



Creating a Case Folder in the current year Folder.

The first step in adding an image to a diagram begins BEFORE Visual Cadd is started. Open the My Computer icon on the Windows desktop and then double click the C drive icon. Double click the Program Files icon. Double click the IMSI icon. Double click the VCADD3 icon. Double click the Drawings icon and then double click the year this crime occurred.

With the XXXX year folder open:



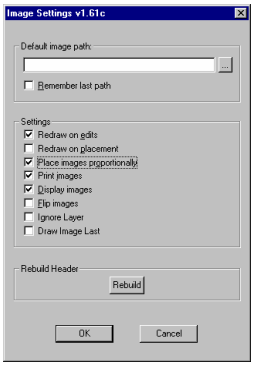
Adding existing drawings and images to the Case Folder.

1. Create a new folder and name it the case number of the case being diagrammed (with the cursor inside the open folder, right click, select New, then Folder).

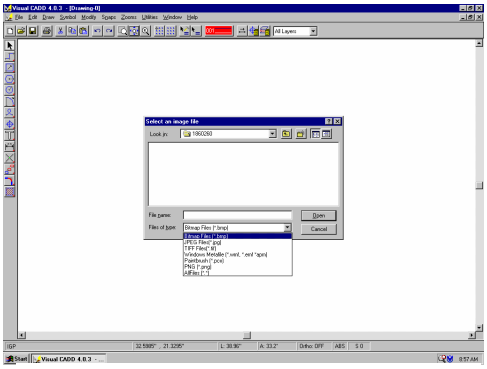
2. Next, move any existing diagrams from this case into the newly created case folder.

3. Next, copy the image files, which will be used in this diagram, into the open case folder. To move images from the Scanning Workstation to the CAD Workstation, copy the desired image files to the Network (M:) drive. Next move the image files from the M: drive to the open case folder.

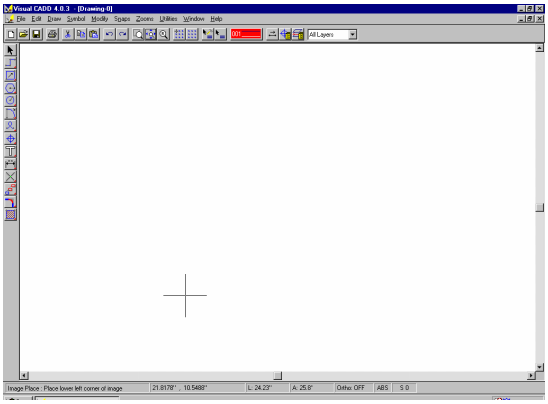
4. With Visual Cadd 4 open, and the desired diagram loaded, type IGS to open the image settings dialog (***see illustration on next page***). Check the box labeled place images proportionally. Then click OK. The IGS command only needs to be executed once during a Visual Cadd session, but it must be executed each time Visual Cadd is opened for the first time, even if a drawing that already contains images is opened.



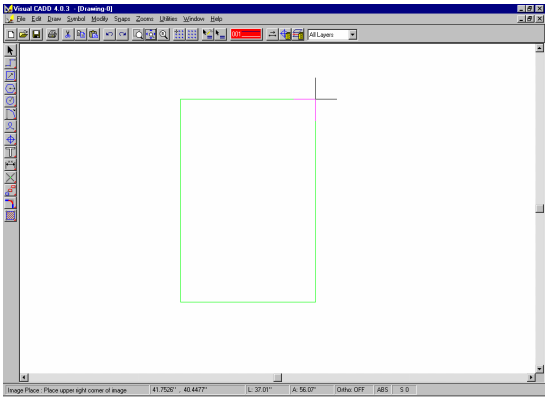
IGS Dialog



IGP Command – Selecting an image file to insert.



Setting the lower left corner of the image.



Setting the upper right corner of the image.

5. To place an image in the current drawing, type IGP at the command prompt. When the + cursor reappears, the command line will prompt to click a point in the drawing where the lower left corner of the image will be anchored.
6. Move the cursor to the upper right to define the opposite corner of the image. When the image appears to be sized correctly, click to anchor the corner.
7. At this point, the rectangle will be displayed using the current layer properties. To force the image to display, it may be necessary to execute a RD command at the command prompt.

IMPORTANT

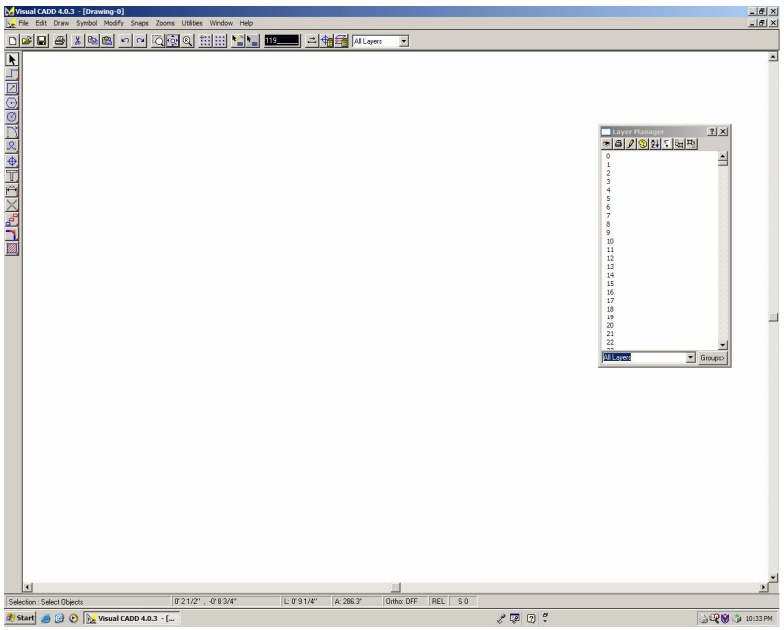
Images should ***NOT*** be used as a substitute for accurate measurements and careful field sketching methods. Images simply clarify and fill in details for specific portions of the diagram that would otherwise be confusing to the viewer.

Procedure – Creating a Visual Cadd Drawing

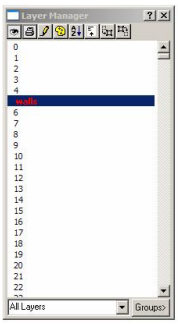
This procedure is not meant to be a stand alone training document. For more specific information on creating diagrams using Visual Cadd, see the Visual Cadd manual and department training material. Specific questions should be directed to a Supervisor.

- **Step 1** – Open Visual Cadd, as illustrated in the previous section.

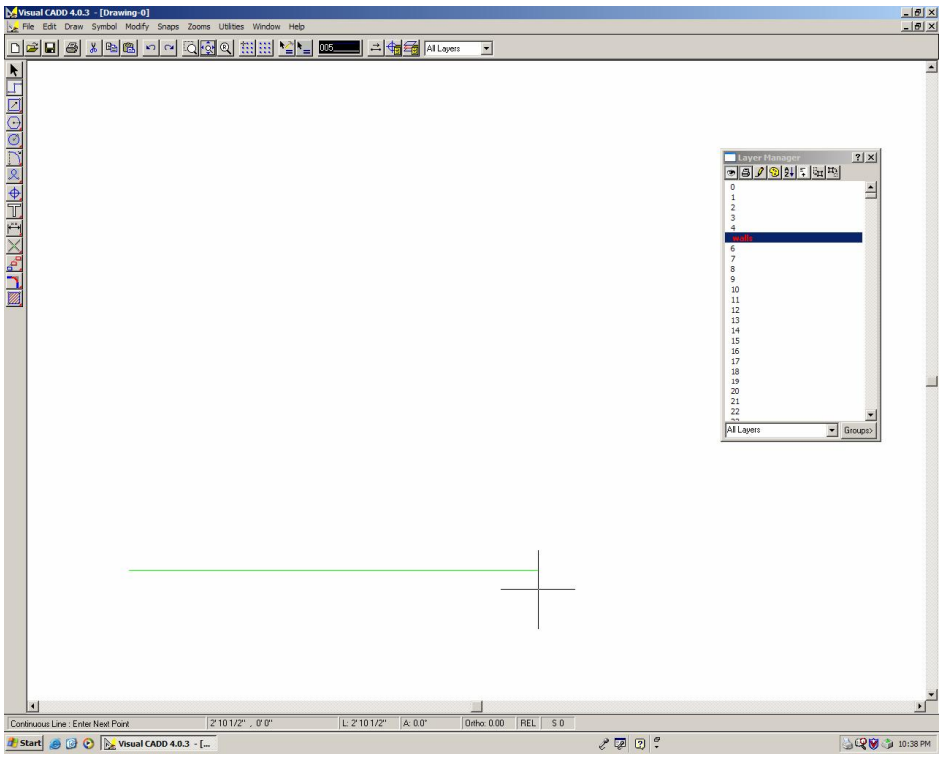
- **Step 2** – Make sure the Layer Manager is open as shown below.



- **Step 3** – Before drawing any lines, set the current layer to something other than the default, which is zero. The illustration below shows the Layer Manager. Layer 5 has been named “walls”. To name a layer, click on the layer (5 in this case), then click again to activate the cursor. Then type in the name desired and finish by clicking somewhere within the Layer Manager pallet. Do this for each type of entity in the drawing. Leave five unnamed layers in between in case an unanticipated layer needs to be created at a later time.



Step 4 – Once the layers have been named, it's time to set the screen scale to match the dimensions of the drawing to be created. Set the current layer by double clicking on the desired name. The name will turn red to indicate everything that is drawn from this point forward will be placed on that layer. The illustration on the previous page shows the "walls" layer as having been selected as the current layer.



Start a horizontal line and type in the width of your entire crime scene, using the key board, and then press the enter key on the key board to finish the line. As an example, if your scene consists of a house and the yard outside the house, and the width of the yard is 125 feet, type in 125' and press enter. The cursor will go off the screen. Type ZA, for Zoom All, to move the screen back so the entire line is visible. Next, type in the distance representing the depth of the drawing. Using the same example, if the yard is 200 feet, 6 inches deep, type in 200' 6" and press enter. The line will again go off the screen. Type ZA to bring it back onto the screen. Now select both lines and press the Delete key. The lines will be gone, but the boarders of the screen will now be set to the correct magnification. It's now time to begin drawing the elements of this diagram.

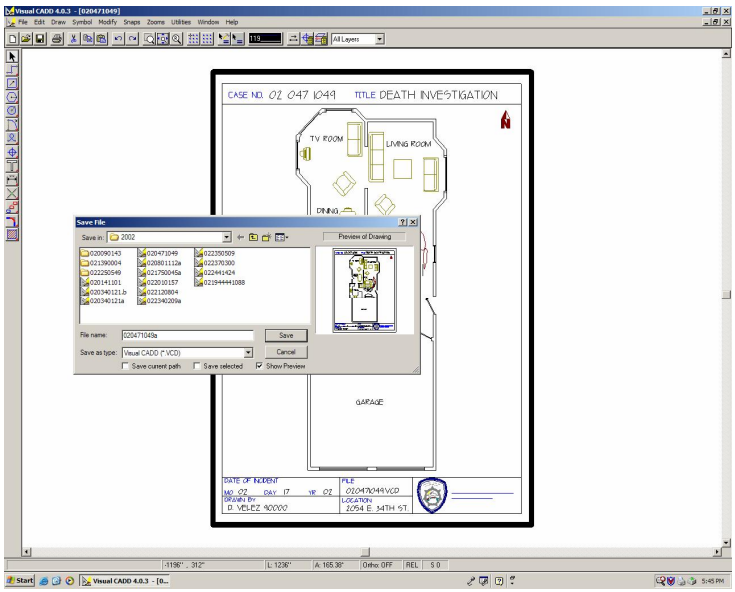
Step 5 – Click on the line tool (either single or double, depending upon the element to be added) and start adding the first element. A double line set to a width of 6" is used to represent a wall. Starting in the lower left corner, click the left button and type in the length of the wall using the key board and the enter key. Once all the walls are completed, change layers and continue adding entities such as doors, windows and furniture.

Once the structure has been completed, add the evidence.

Note: *If a GIS map is going to be used, it is best to import the map first, and then set up the layer names. The reason being that GIS uses the first 100 or so layers. Adding a GIS map to an existing Visual Cadd drawing can cause any existing layer names and their entities to be changed.*

Step 6 – Once the diagram has been completed it should be saved according to the case number (frequent intermediate saving is also strongly recommended to prevent the irretrievable loss of data in the case of a computer crash). Assuming there are no images inserted in the drawing (if so, see the section on previous pages that explain how to save a drawing with images), click on File, then Save As, and name the drawing according to the following formula: Case Number + a single letter, indicating the number of the drawing in the case. The drawing is saved into the appropriate year folder.

As an example, the illustration below shows a diagram that was completed in connection with Case Number 020471049. Since this is the first diagram completed for this case the name of this diagram would be 020471049a.vcd and would be saved into the 2002 folder as shown.



Once the diagram has been saved, two copies should be printed using the Section laser printer. One copy goes to LESA as part of the case file. The other goes to the 4th floor. A third copy could be printed for inclusion with the rough sketch and crime scene notes kept by the Forensic Specialist. Whenever a diagram is completed, the Forensic Specialist must maintain all sketches, notes and measurements in the event they are required as part of Discovery.