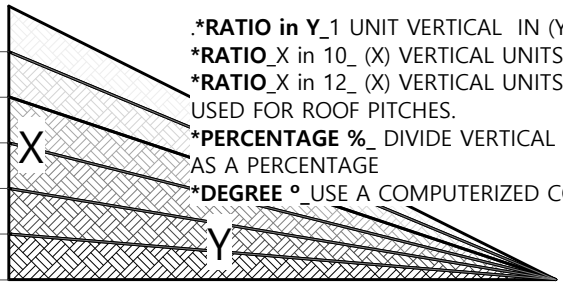
'LANGUAGE' FOR SLOPES

***GENERAL**_SLOPE, GRADIENT, GRADE, INCLINE, PITCH ALL MEAN THE SAME THING. ALL MEASUREMENT TERMINOLOGY IS BASED ON THE RELATIONSHIP OF VERTICAL TO HORIZONTAL UNITS.

***PICK ONE & STICK WITH IT:** THE DIYer MAY WANT TO SELECT ONE OF THESE MEASUREMENT LANGUAGES & STICK WITH. THE RATIO LANGUAGE IS ARGUABLY THE EASIER ONE TO MENTALLY VISUALIZE.

RATIOS EXPRESSED IN 'X' AND 'Y'
PERCENTAGE
DEGREES

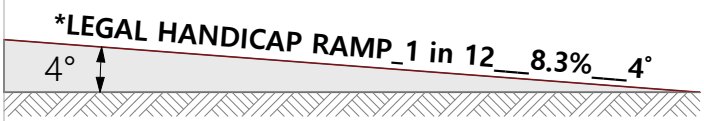
1:2	5in10	6in12	50.0%	26˚
1:2.4	4.8in10	5in12	41.6%	22˚
1:3	3.3in10	4in12	33.3%	18˚
1:4	2.5in10	3in12	25.0%	14˚
1:6	1.66in10	2in12	16.6%	9˚
1:12	.83in10	1in12	8.3%	4˚

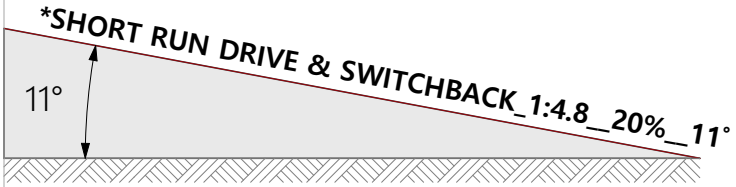


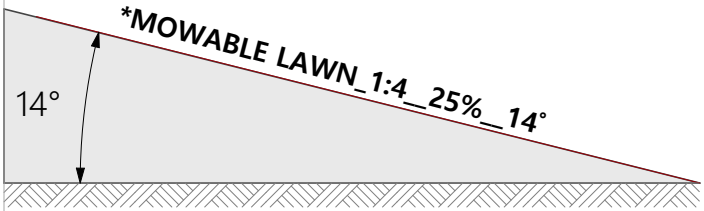
.***RATIO in Y**_1 UNIT VERTICAL IN (Y) UNITS HORIZONTAL
***RATIO**_X in 10_ (X) VERTICAL UNITS IN 10 UNITS HORIZONTAL.
***RATIO**_X in 12_ (X) VERTICAL UNITS IN 12 UNITS HORIZONTAL. COMMON LANGUAGE USED FOR ROOF PITCHES.
***PERCENTAGE %**_ DIVIDE VERTICAL DIMENSION BY HORIZONTAL DIMENSION. EXPRESSED AS A PERCENTAGE
***DEGREE °**_USE A COMPUTERIZED CONVERSION TABLE-(OR A TRIG TABLE IF SO INCLINED)

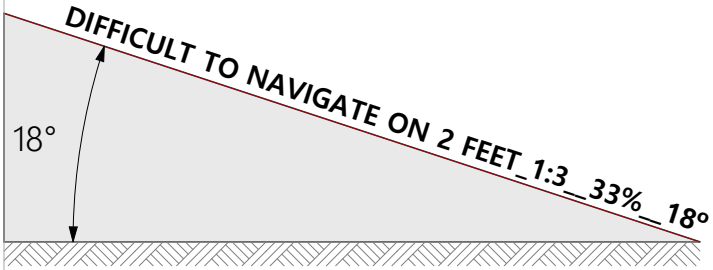
***HARD SURFACE DRAINING_1/8" TO 1/2" IN 12"__.20%__1˚**

***MIN SLOPE AWAY FROM HOUSE_MIN 6" IN 10'__5%__2˚**





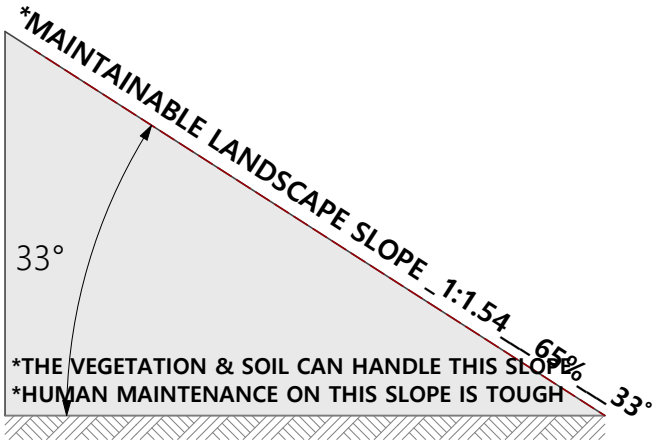


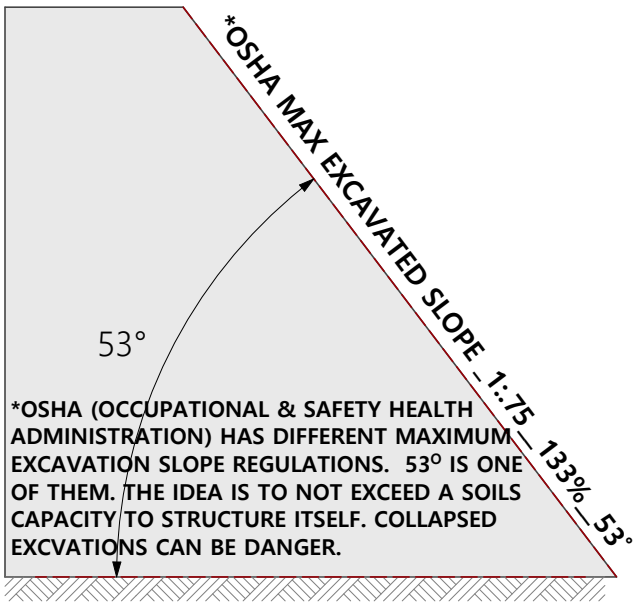


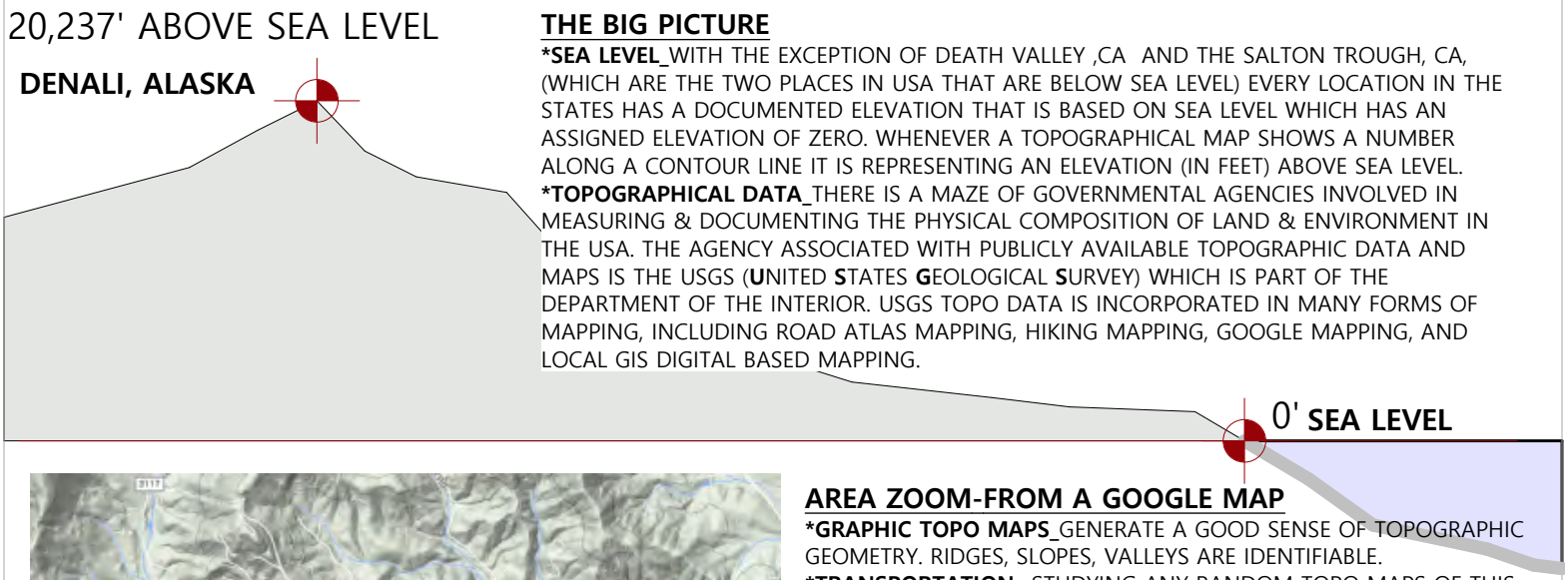
GENERALLY ACCEPTED SLOPE PARAMETERS

***GENERAL**_THESE ILLUSTRATIONS ARE A SNAPSHOT OF SOME OF THE ACCEPTED SLOPE PARAMETERS FOR A VARIETY OF CONDITIONS & ACTIVITIES.

***OBSERVATION FOR STEEPER SLOPE SITES:**_GRADIENTS ON SITE CAN VISUALLY BE DECEPTIVE. READ AHEAD AND SOME TECHNIQUES FOR CHECKING AND MEASURING ARE EXPLAINED. WALK THE SITE IN ALL DIRECTIONS. LOOKING UPSLOPE AND DOWNSLOPE CAN GIVE DIFFERENT IMPRESSIONS.

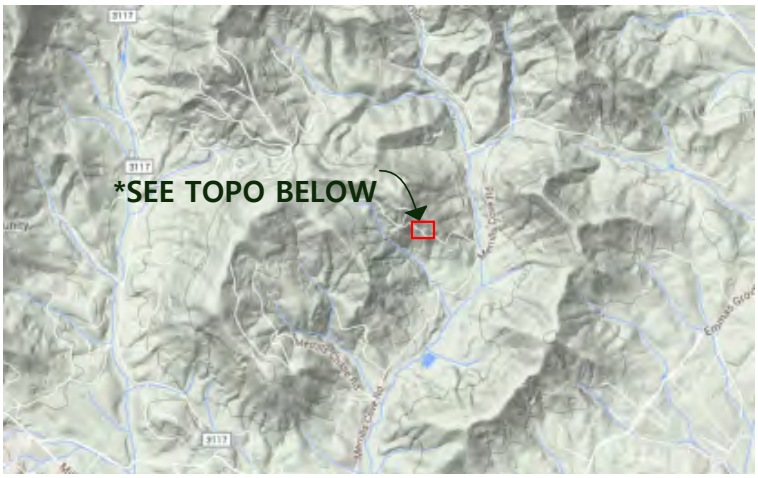






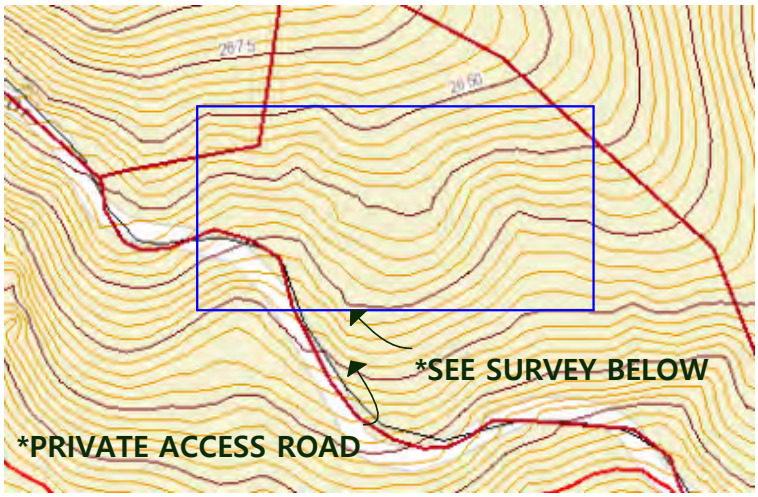
THE BIG PICTURE

***SEA LEVEL_**WITH THE EXCEPTION OF DEATH VALLEY ,CA AND THE SALTON TROUGH, CA, (WHICH ARE THE TWO PLACES IN USA THAT ARE BELOW SEA LEVEL) EVERY LOCATION IN THE STATES HAS A DOCUMENTED ELEVATION THAT IS BASED ON SEA LEVEL WHICH HAS AN ASSIGNED ELEVATION OF ZERO. WHENEVER A TOPOGRAPHICAL MAP SHOWS A NUMBER ALONG A CONTOUR LINE IT IS REPRESENTING AN ELEVATION (IN FEET) ABOVE SEA LEVEL.
***TOPOGRAPHICAL DATA_**THERE IS A MAZE OF GOVERNMENTAL AGENCIES INVOLVED IN MEASURING & DOCUMENTING THE PHYSICAL COMPOSITION OF LAND & ENVIRONMENT IN THE USA. THE AGENCY ASSOCIATED WITH PUBLICLY AVAILABLE TOPOGRAPHIC DATA AND MAPS IS THE USGS (**U**NITED **S**TATES **G**EOLOGICAL **S**URVEY) WHICH IS PART OF THE DEPARTMENT OF THE INTERIOR. USGS TOPO DATA IS INCORPORATED IN MANY FORMS OF MAPPING, INCLUDING ROAD ATLAS MAPPING, HIKING MAPPING, GOOGLE MAPPING, AND LOCAL GIS DIGITAL BASED MAPPING.



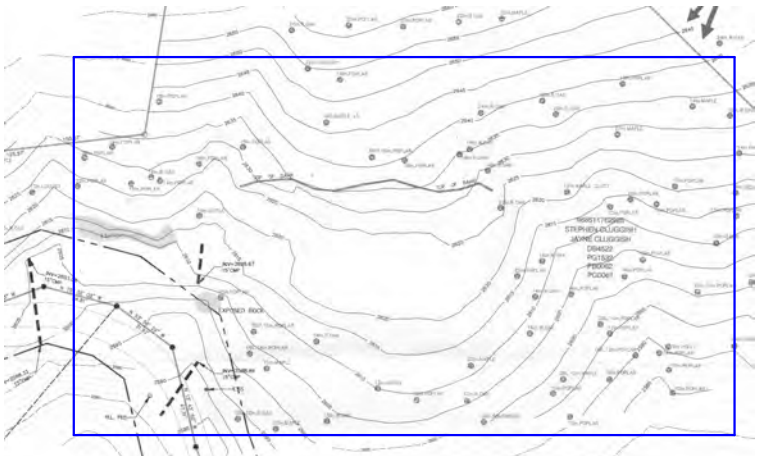
AREA ZOOM-FROM A GOOGLE MAP

***GRAPHIC TOPO MAPS_**GENERATE A GOOD SENSE OF TOPOGRAPHIC GEOMETRY. RIDGES, SLOPES, VALLEYS ARE IDENTIFIABLE.
***TRANSPORTATION_** STUDYING ANY RANDOM TOPO MAPS OF THIS TYPE WILL ILLUSTRATE THAT RIVERS, RAILROAD TRACKS, AND PRIMARY MOTORWAYS ALL GLIDE GRACEFULLY THRU THE LOWER TO LOWEST ELEVATIONS.. HISTORY AND COMMON SENSE CORROBORATE THIS. RIVERS BEING HISTORICALLY THE FIRST PRIMARY MEANS OF TRANSPORTATION, RAIL BEDS FOLLOWING THOSE LOW LYING AND (MORE OR LESS) LEVEL RIVER PATHWAYS, WITH SUBSEQUENT ROADWAYS FOLLOWING SUIT.
***ACCESS OBSERVATION_**ROADWAYS AT ALL SCALES ARE MORE EASILY CONSTRUCTED, AND ULTIMATELY PROVIDE BETTER ACCESS TO 'LAND' WHEN CONSTRUCTED IN THOSE LOWER ELEVATIONS. IN FACT MOST ACCESS ROADS SIT BELOW THE LAND THEY PROVIDE ACCESS TO. THIS IS USUALLY A GOOD THING.



LOT ZOOM-FROM A COUNTY GIS MAP

***'DOWNLOADING' TOPO MAPS_**THE ORIGINALLY HAND DAWN USGS TOPOGRAPHICAL MAPS HAVE BEEN GOING THRU A TRANSITION INTO A DIGITAL FORMAT. US TOPO, THE NATIONAL MAP IS A PLACE TO INVESTIGATE THIS. A TOPO CAN BE FOUND FOR ANYPLACE IN THE USA. HAVING SAID THAT THERE ARE OTHER SOURCES. A FAVORITE IS THE LOCAL GIS SITE, IF ONE EXISTS, BECAUSE THE DATA ASSEMBLED DEALS WITH A SPECIFIC PROPERTY. SEE (d1.1). THE GOAL IS TO FIND THE CLEAREST AND MOST DETAILED TOPO MAP AVAILABLE FOR A TARGET PROPERTY.
***THE INTERVALS_**ALL TOPOGRAPHIC MAPS HAVE ELEVATION INTERVALS BETWEEN THE CONTOUR LINES. THAT INTERVAL MAY BE CLEARLY STATED, ALONG WITH THE SCALE OF THE MAP, IN A LEGEND. OR THE ELEVATION NUMBERS ON A MAP WILL REVEAL THAT INTERVAL. BIG MAPS COVERING LARGE AREAS WILL TEND TO HAVE LARGER CONTOUR INTERVALS, AS HIGH AS 50', OR 100'. DETAILED MAPS COVERING SMALLER AREAS MAY HAVE INTERVALS OF 2' OR 5'.



SITE SPECIFIC SURVEY

***A LEVEL OF ACCURACY_** THE TOPO MAPS AVAILABLE ON THE WEB (FOR FREE) MAY BE ADEQUATE IN SOME PROJECT/CONSTRUCTION SITUATIONS, AND NOT IN OTHERS. THE BALANCE OF THIS CHAPTER WILL OVERVIEW THE RELATIONSHIP BETWEEN TOPOGRAPHY, DESIGN AND CONSTRUCTION. THE IMPORTANCE/NECESSITY OF A SITE SPECIFIC SURVEY MAY BECOME CLEAR.
***TOPO_** A TOPOGRAPHICAL SURVEY CAN BE DONE TO A SPECIFIED INTERVAL. IN THIS SITE SAMPLE THE REQUESTED INTERVAL WAS 1'. THE SURVEYOR USED A USGS TOPO AS A STARTING PLACE, AND FIELD VERIFIED AND INCREASED THE DETAIL FOR THAT AREA OF THE SITE THAT WOULD BE BUILT ON. ON VERY STEEP SITES THIS LEVEL OF DETAIL MIGHT BE DESIRABLE TO FULLY COMPREHEND FOUNDATION REALITIES BEFORE THE CONSTRUCTION PROCESS. TOPO MAPS DO NOT LIE. VISUAL IMPRESSIONS CAN EASILY MISLEAD.

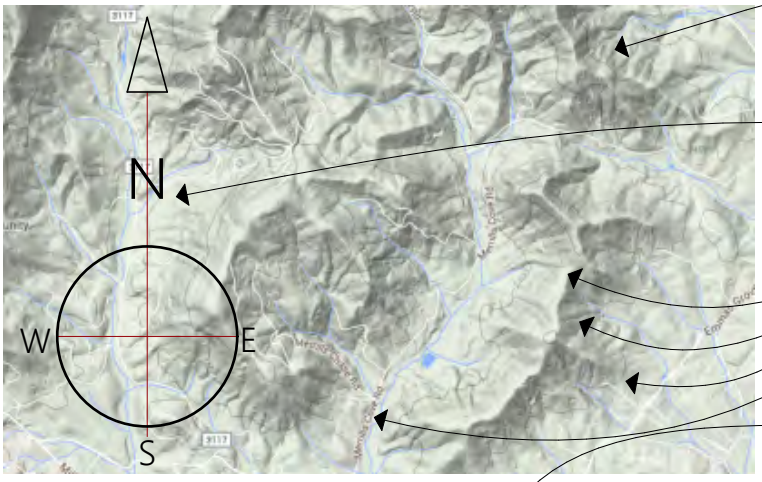
TOPOGRAPHIC SITE PLAN CONVENTIONS

***TOPOGRAPHIC (CONTOUR) LINES**_ARE USUALLY NUMERICALY NOTED WITH THEIR ACTUAL HEIGHT ABOVE SEA LEVEL. SURVEYS ARE KEYED BACK INTO USGS MONUMENTS THAT HAVE RECORDED AND "OFFICIAL" ELEVATIONS ABOVE SEA LEVEL.

***ELEVATIONS/INTERVALS**_ EACH CONTOUR LINE REPRESENTS A CONSISTENT ELEVATION (ABOVE SEA LEVEL) . IF YOU WALK ALONG A CONTOUR LINE YOUR PATH WILL BE DEAD LEVEL. IF YOU WALK PERPENDICULAR TO THE TOPO LINES YOU WILL BE HEADING UPHILL OR DOWNHILL. WHEN TOPO LINES ARE CLOSER TOGETHER IT INDICATES A STEEPER GRADE. WHEN TOPO LINES ARE FARTHER APART IT INDICATES A MORE GENTLE GRADE.

***SCALE**_HOW STEEP OR GENTLE IS REALIZED WITH THE USE OF A SCALE. PLANS ARE DRAWN TO A SCALE, USUALLY AN "ENGINEERS" SCALE WHICH IS A HORIZONTAL DISTANCE BASED ON A PLAN MEASUREMENT OF 1 INCH. 1 IN =10 FT, 1 IN = 20 FT, 1 IN = 50', 1 IN = 500 FT. THE SCALE CONCEPT NEEDS TO BE FLEXIBLE TO ACCOMMODATE LAND PARCEL SIZE AND THE ACTUAL SIZE OF A MAP OR PLAN. A LARGE PARCEL PRINTED IN A LETTER SIZE SHEETS NEEDS TO HAVE A "SMALL" SCALE (SAY 1"=200') . A SMALL PARCEL PRINTED ON AN ARCHITECTURAL D SIZE SHEET (24" X 36") CAN HAVE A "LARGE SCALE" (SAY 1 IN = 10')

***GET AN ENGINEERS SCALE**_A SCALE IS BASICALLY A RULER THAT TRANSLATES INCHES MEASURED ON A MAP OR PLAN INTO FEET OR FEET AND INCHES. THERE ARE ARCHITECTS SCALES AND ENGINEERS SCALES. AN ENGINEERS SCALE IS GENERALLY MORE USEFUL WHEN DEALING WITH MAPS AND SITE PLANS. AN ARCHITECTECTS SCALE MORE USEFUL WHEN DEALING WITH ARCHITECTURAL PLANS.

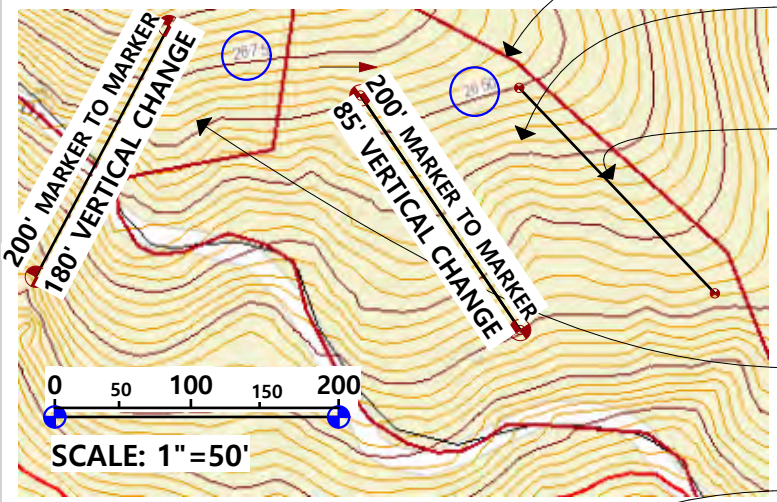


***TOPO & SCALE**
*ON THESE 'GRAPHIC' TOPO MAPS ATTEMPTING TO DETERMINE EXACT SLOPE CONDITIONS IS TOUGH. A GENERAL SENSE OF TOPOGRAPHY IS WHAT ONE IS AFTER.

***KNOW THE SUN ORIENTATION**
*KEEP TRACK OF THE SUN ORIENTATION. IT IS ONE OF A SITES NATURAL CHARACTERISTICS THAT WILL DETERMINE CERTAIN DECISIONS

***'READING' TOPOGRAPHIC GEOMETRY**
*RIDGES
*STEEP SLOPES
*GENTLE SOPES
*VALLEY ROAD AND CREEK

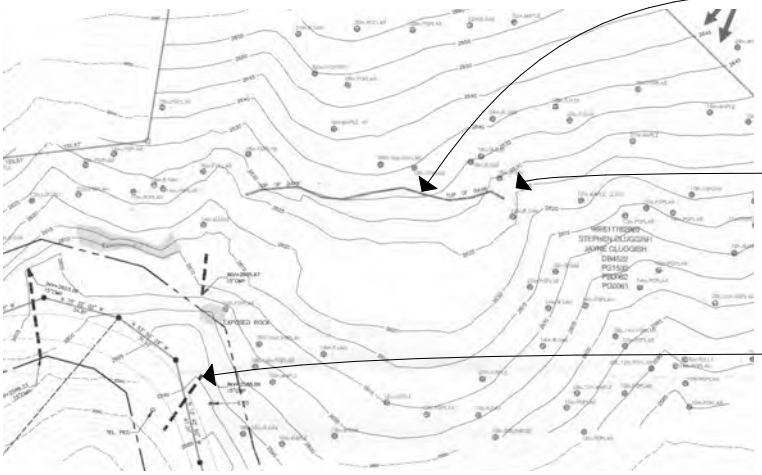
***PROPERTY BOUNDARIES**
*WILL SHOW IN A GIS MAP.



***INTERVALS**
*THE LARGER (DARKER) INTERVALS ON THIS MAP ARE 25'
*THERE ARE 5 (LIGHTER LINES) BETWEEN THAT ARE THEREFORE AT 5' INTERVALS

KNOW THE MAP SCALE
*A MAP SCALE MAY BE GRAPHIC, OR A MAP SCALE MAY BE IN INCHES AND FEET. IF A MAP HAS BEEN REPRODUCED/SCANNED/PRINTED IT IS VERY POSSIBLE THE REAL DIMENSIONED SCALE HAS BEEN ALTERED. THIS SAMPLE HAS BEEN PINGED OFF THE NET SO THE 'ENGINEERS SCALE' IS NOT GOING TO BE ACCURATE. THE GRAPHIC SCALE IS BEING USED (CAN BE USED) BUT REQUIRES STRAIGHTFORWARD INTERPOLATION.

GET A QUICK SENSE OF SLOPE
*ONCE THE MAP SCALE IS UNDERSTOOD A SIMPLE HORIZONTAL DIMENSION AND COUNT THE TOPO INTERVALS. THE RESULT IS THE 'GRADIENT' (OR INCLINE, GRADE, SLOPE, PITCH) SEE (d3.1)



REAL CHANGES
*THIS SHOWS THAT TOPOGRAPHY WAS ALTERED FROM THE "NATURAL/ORIGINAL' TOPOGRAPHY. IN THIS INSTANCE A PIECE OF EXCAVATION EQUIPMENT ACCESSED THIS SITE AND BOTH ROUGH GRADED AN ACCESS DRIVE AND LEVELED AN AREA AS AN INTENDED BUILDING PAD

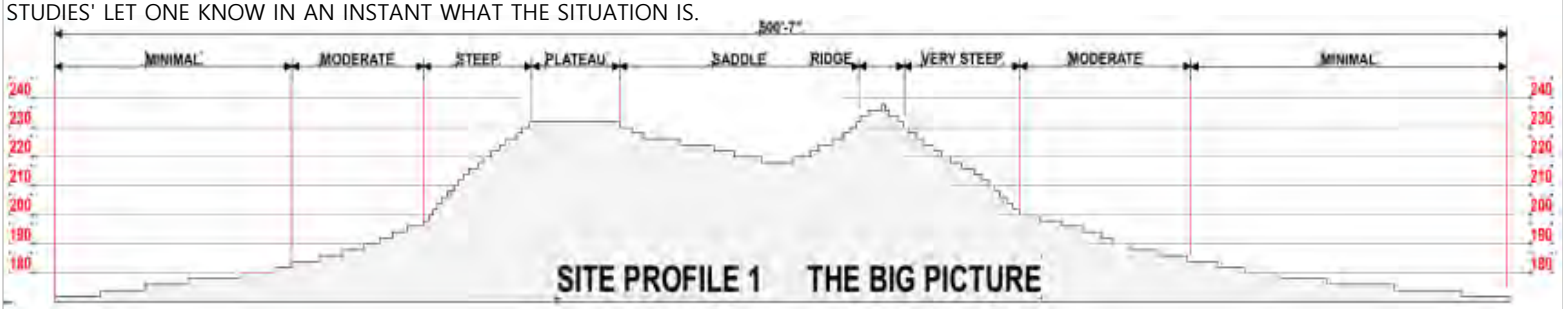
TREE SURVEY
*ALSO REQUESTED ON THIS SURVEY WERE SPECIFIC TREES IN THE CONSTRUCTION VICINITY. DIAMETER OF THE TRUNK (CALIPER) AND THE SPECIES ARE INDICATED. THE TREES SURVEY SERVES BOTH AS A REFERENCE TO AN EXACT POSITION ON THE SITE AND AN OVERVIEW GOVERNING TREE REMOVAL.

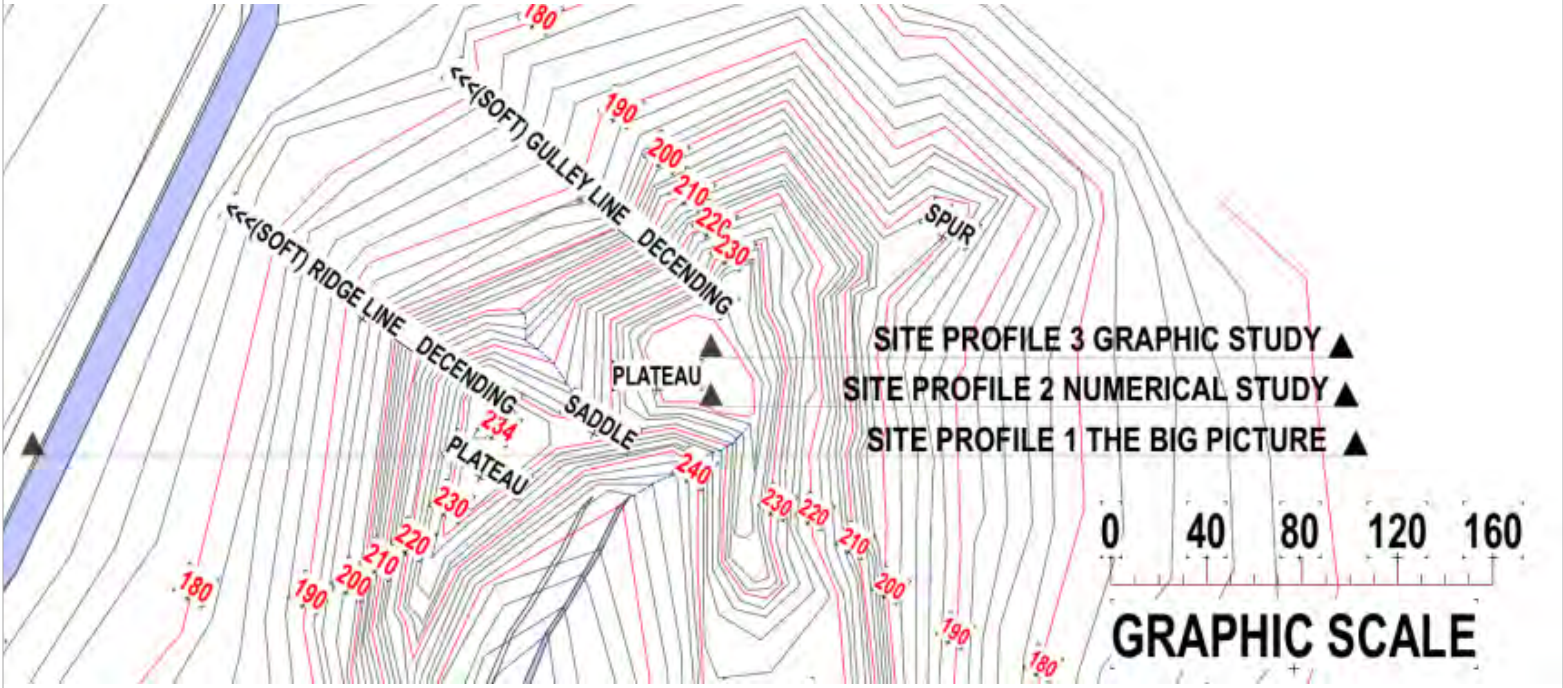
REAL ROAD & DRAINAGE CULVERTS
*THE ACTUAL ROAD CONSTRUCTION (ALTERED) TOPOGRAPHY & DRAINAGE CULVERTS WERE SURVEYED IN CONTEXT WITH PROPERTY LINES AND ROAD RIGHT OF WAY.

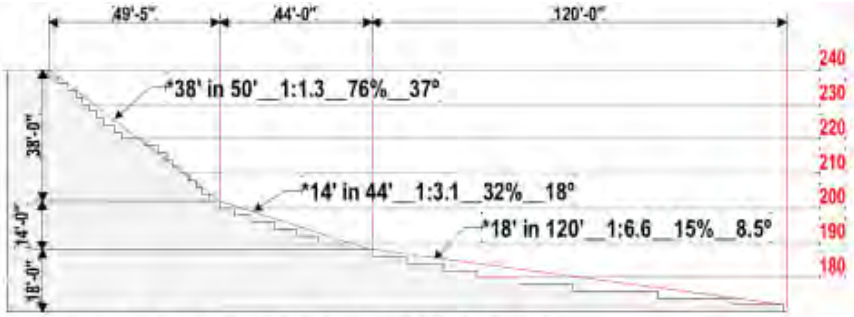
THE SITE PROFILE

***SCALE**_WITH AN ACCURATE TOPO MAP AND AN UNDERSTOOD SCALE A SITE PROFILE CAN BE CUT ANYWHERE AND IN ANY DIRECTION. SEE 3.6 FOR A QUICK HOW TO.

***QUICK STUDY**_ PROFILES ARE A HIGHLY RECOMMENDED CHECK SYSTEM. A PROFILE CAN QUICKLY INFORM ONE OF A CONDITION. 'GRAPHIC STUDIES' LET ONE KNOW IN AN INSTANT WHAT THE SITUATION IS.







TOPO SLOPE NUMBERS

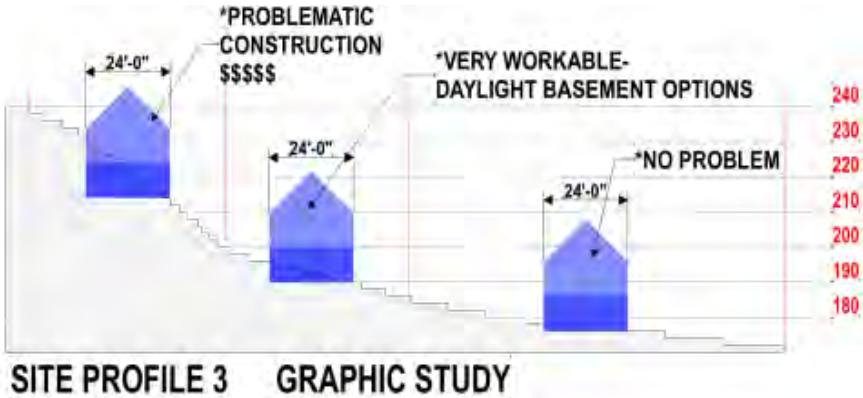
***CALCS**_CALCULATING SLOPES IS SIMPLE MATH.

***RATIO OF SCALED NUMBERS**_ X VERTICAL UNITS IN Y HORIZONTAL UNITS

***RATIO_1 in Y**_1 UNIT VERTICAL IN (Y) UNITS HORIZONTAL

***PERCENTAGE %**_ DIVIDE VERTICAL DIMENSION BY HORIZONTAL DIMENSION. EXPRESSED AS A PERCENTAGE

***DEGREE °**_ A TRIG TABLE (TANGENT) WILL TRANSLATE A % (IN HUNDREDTHS) DIRECTLY TO DEGREES_OR USE A FREE INTERNET CONVERSION TABLE (MUCH EASIER).



GRAPHIC SLOPE ANALYSIS

***SET THE GRAPHIC SLOPE FIRST**_WHICH IS JUST A LINE REPRESENTING THE CUT LINE DESCRIBED BELOW

***THE HOUSE PROFILE**_ SET A SCALED GRAPHIC PROFILE ON THE GRAPHIC SLOPE AND SOME QUICK CONCLUSIONS CAN BE DRAWN.

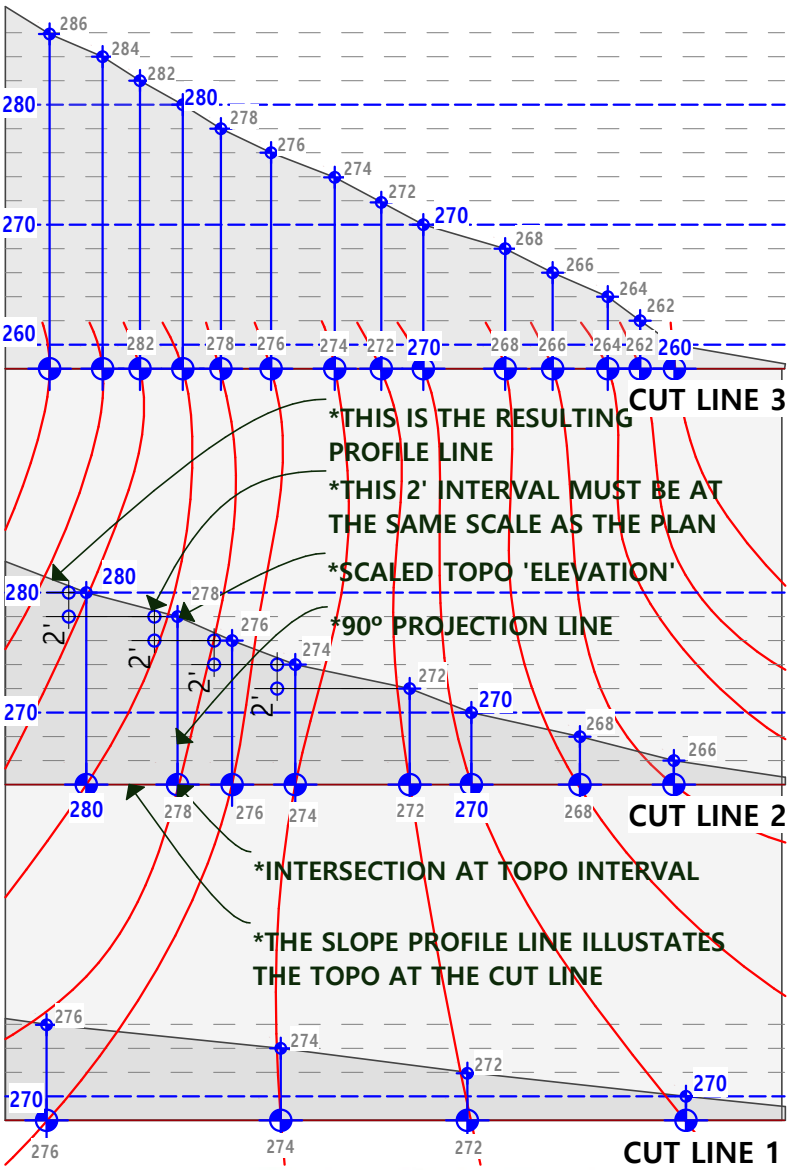
***A GENERAL NOTE**_TECHNOLOGY ALLOWS TO BUILD ON VIRTUALLY ANY SLOPE. STEEPER SLOPES DO BECOME MORE COSTLY TO BUILD ON. SO STEEP SLOPE CONSTRUCTION IS TYPICALLY LIMITED BY BUDGETS.

ACCURACY FOR PLANNING

***SITE TOPO OVERVIEW**_THESE PROFILES CAN HELP MAKE DECISIONS ABOUT A SITE'S SUITABILITY, OR HELP MAKE DECISIONS ON THE MORE SUITABLE LOCATION(S) ON A SITE. AT THIS POINT IN THE PROCESS ABSOLUTE ACCURACY IS NOT DEMANDED. THESE TOOLS/TECHNIQUES ON 3.5/3.6 CAN DO THE JOB.

ACCURACY FOR CONSTRUCTION

***CONSTRUCTION TOPOGRAPHICAL ACCURACY**_MORE EXACTING KNOWLEDGE OF A TOPOGRAPHY FOR CONSTRUCTION PLANNING IS CERTAINLY HELPFUL. IF THERE IS A RULE OF THUMB IT MIGHT BE THAT THE STEEPER THE SLOPE THE MORE IMPORTANT THAT ACCURACY IS.



SITE PROFILES-2D

***TOPO/CONTOUR**_A TOPO/CONTOUR MAP IS NECESSARY. CHECK BACK 3.2 FOR SOURCES

***TOOLS NEEDED**_ TRACING PAPER TO OVERLAY THE TOPO MAP. A SMALL DRAFTING TRIANGLE WITH 1-90º CORNER, AND AN ENGINEERS SCALE.

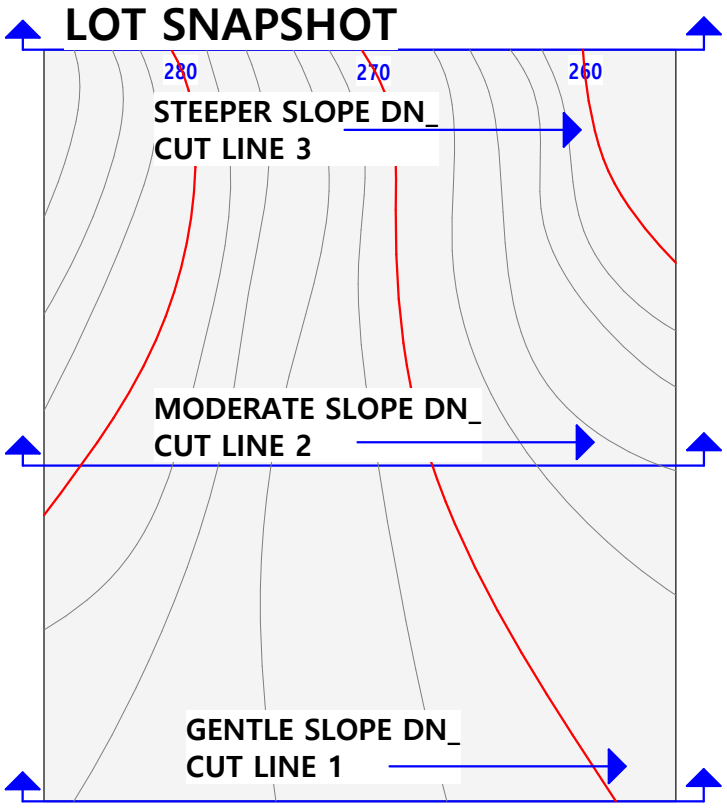
***PROCESS**_THE CUT LINE CAN BE ANYWHERE THAT A SLOPE PROFILE HAS BENEFIT.

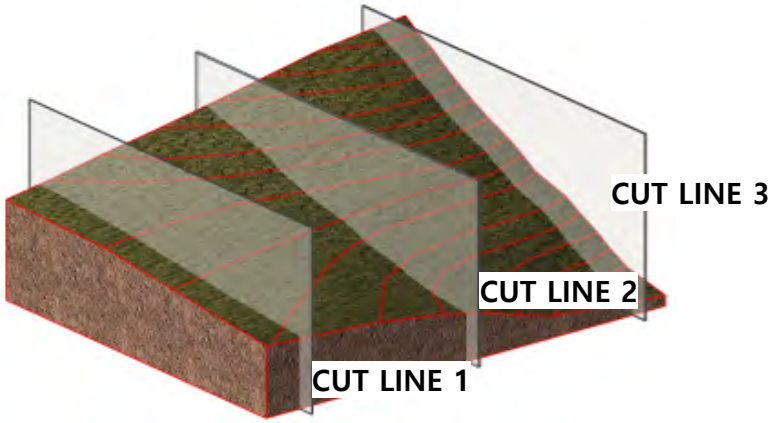
1.WHERE THE CUT LINE CROSSES THE MAPS TOPOGRAPHICAL INTERVAL LINES MAKE A MARK AND PROJECT THAT LINE AT 90º (WITH THAT LITTLE TRIANGLE) A SCALED DISTANCE BASED ON THE TOPO.

2. THE VERTICAL PROJECTIONS CAN ACTUALLY BE ANY TOTAL LENGTH BUT MUST REFLECT THE DIFFERENTIAL OR INTERVAL OF THE TOPO MAP. IN THIS CASE IT IS 2 FEET. THE 2 FT INTERVAL MUST BE DRAWN TO THE SAME SCALE AS THE MAP ITSELF.

3. THE HORIZONTAL GUIDE LINE ARE NOT REQUIRED BUT MAY BE GRAPHICALLY HELPFUL. THE GUIDE LINES MUST BE DRAWN TO SCALE AT THAT SAME 2FT INTERVAL.

THIS TOPO SAMPLE SITE HAS BEEN ROTATED 90ºTO FACILITATE 'DRAWING' THE 90º PROJECTION LINES



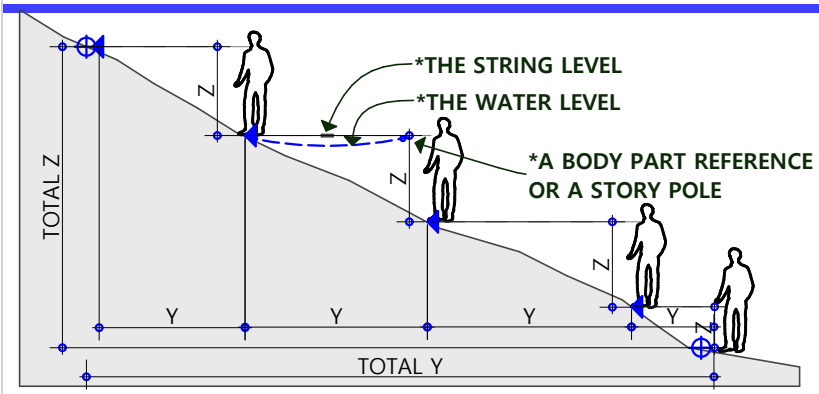


COMPUTER MODELING

***THIS ILLUSTRATION**_THIS IMAGE IS A 3D TOPOGRAPHICAL MODEL OF THE 2D EXERCISE ABOVE. THESE TRANSLUCENT CUT PLANES REPLICATE (MORE OR LESS) THE CUT LINES IN THE 2D EXERCISES ABOVE.

***3D FOR THE DIYer**_THERE EXIST APPROPRIATELY AFFORDABLE 3D SOFTWARE PROGRAMS THAT WILL ALLOW THE DIYer TO REPLICATE A SITE SITUATION IN A 3D MODEL FORMAT. RECOMMENDATIONS UNFORTUNATELY CANNOT BE MADE AT THIS TIME. THERE IS A TIME INVESTMENT IN MOST SOFTWARE OFFERINGS. A RULE OF THUMB MIGHT BE THAT THE MORE 'POWERFUL' (FLEXIBLE AND DETAILED) A SOFTWARE THE LONGER THE LEARNING CURVE. CLEARLY SOME FOLKS ARE WELL SUITED TO UTILIZE A COMPUTER TOOL LIKE THIS, AND OTHERS NOT. FYI THE SOFTWARE PACKAGE USED FOR THIS WHOLE PRESENTATION IS EXPENSIVE, PROFESSIONAL, AND NOT REALLY RECOMMENDED FOR THE DIYer.

CHECKING TOPOGRAPHY WITHOUT A TOPO MAP

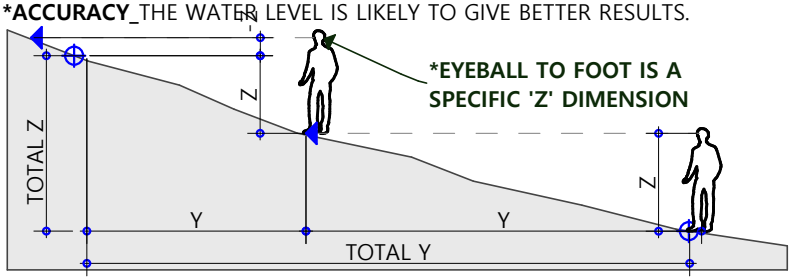


DIY#1-WATER LEVEL or STRING LEVEL(a couple bucks)

***MEASURING Z**_A REFERENCE ON THE BODY OR A HOME MADE STORY POLE WITH WATER OR STING LEVEL (AND 2 PEOPLE) CAN GENERATE SOME REASONABLE ELEVATION DIFFERENTIALS

***MEASURING Y**_STRETCH A PARALLEL MEASURING TAPE TO GET THE HORIZONTAL DISTANCE

***ACCURACY**_THE WATER LEVEL IS LIKELY TO GIVE BETTER RESULTS.

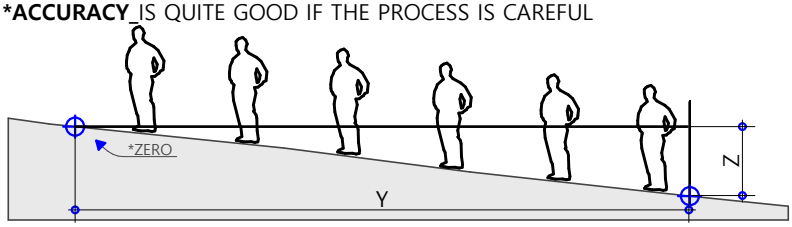


DIY#2-HAND HELD LEVEL/HAND HELD LASER W/ LEVEL($60 & UP)

***FROM THE BOTTOM**_THE LEVEL SETS/READS A SPOT ON THE TOPO AHEAD/ABOVE. SOMEONE NEEDS TO MARK THE SPOT. THEN THE HORIZONTAL MEASUREMENT IS TAKEN (Y), WITH MEASURING TAPE OR LASER DEVICE.

***Z**_ IS THE MEASURED DISTANCE FROM THE LEVEL OPERATOR'S EYEBALL (OR HIP) TO THE GROUND. THAT Z DIMENSION WILL REMAIN CONSISTENT UNTIL THE FINAL VERTICAL MEASUREMENT

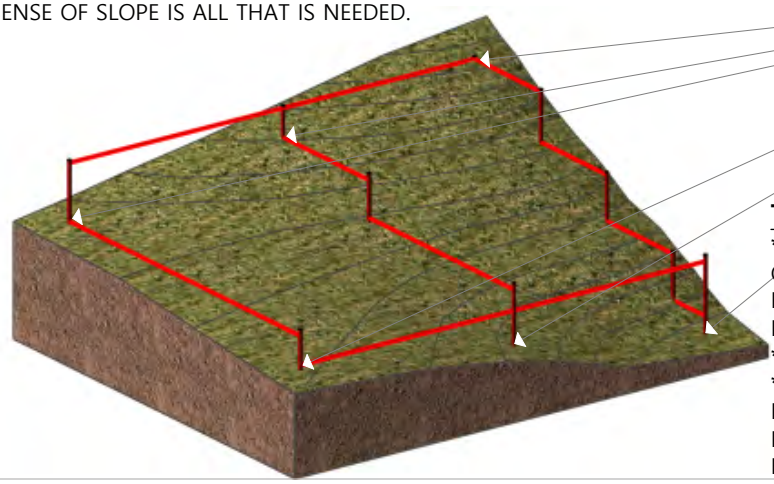
***ACCURACY**_IS QUITE GOOD IF THE PROCESS IS CAREFUL



DIY#3-STEP OFF WITH ALTIMETER DEVICE

***IDEA**_STEPPING OFF A DISTANCE WITH A CALCULATED 3' STEP WHILE RECORDING THE ELEVATION CHANGE WITH AN ALTIMETER DEVICE IS TEMPTING DUE TO ITS SIMPLICITY. THIS TECHNIQUE APPLIES TO GENTLE SLOPES ONLY.

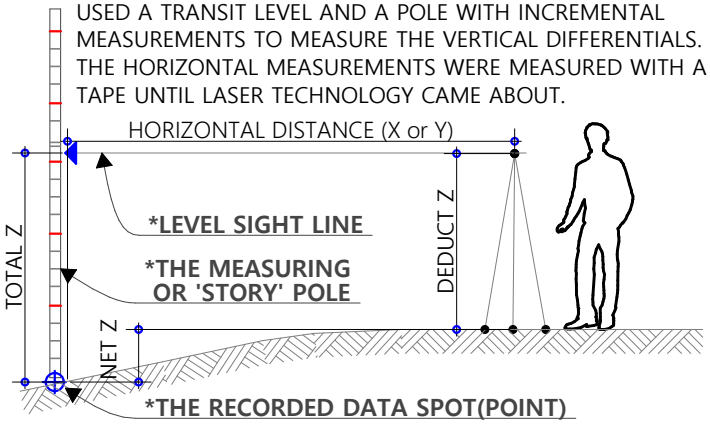
***ACCURACY**_CHECK THE CONSISTENCY & ACCURACY OF THE ALTIMETER DEVICE FIRST**.** THE ACCURACY OF THE STEP AND ALLOWANCE FOR THE SLOPE, AND THE ACCURACY OF THE ALTIMETER DEVICE MAKE THIS TECHNIQUE OK IF A GENERAL SENSE OF SLOPE IS ALL THAT IS NEEDED.

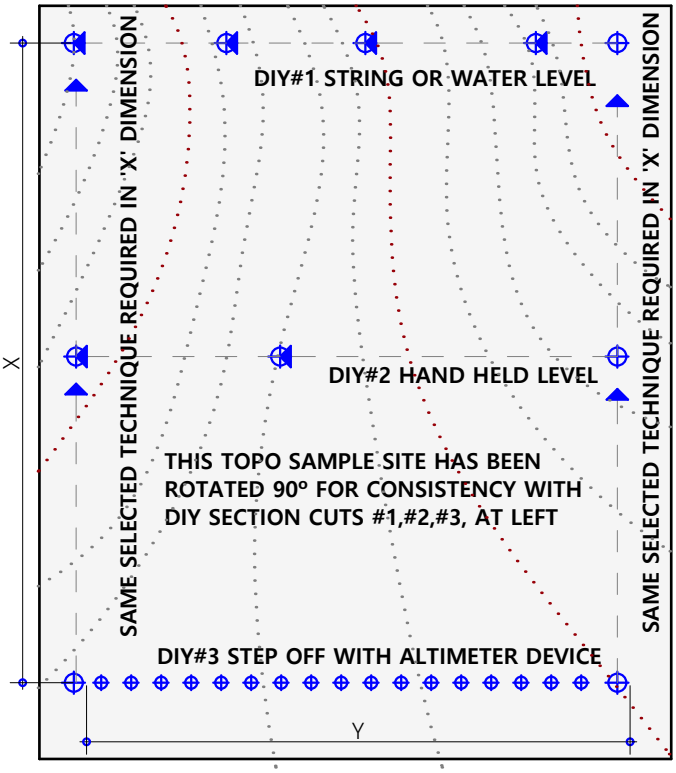


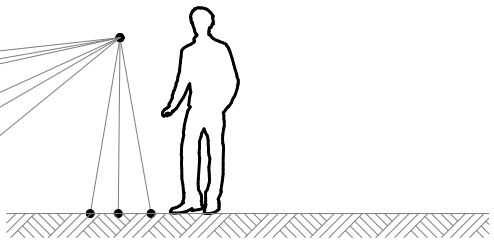
THE IDEA

***HORIZONTAL DIMENSIONS**_X AND Y DIMENSIONS NEED TO MEASURED LEVEL TO THE HORIZON. A LEVEL TOOL MUST BE USED. A CONTROL POINT MUST BE SET (A ZERO POINT), SO THE VARIOUS VERTICAL DIFFERENTIALS CAN BE RECORDED & MADE SENSE OF.

***TRANSIT LEVEL & STORY POLE**_THE TRADITIONAL SURVEY USED A TRANSIT LEVEL AND A POLE WITH INCREMENTAL MEASUREMENTS TO MEASURE THE VERTICAL DIFFERENTIALS. THE HORIZONTAL MEASUREMENTS WERE MEASURED WITH A TAPE UNTIL LASER TECHNOLOGY CAME ABOUT.







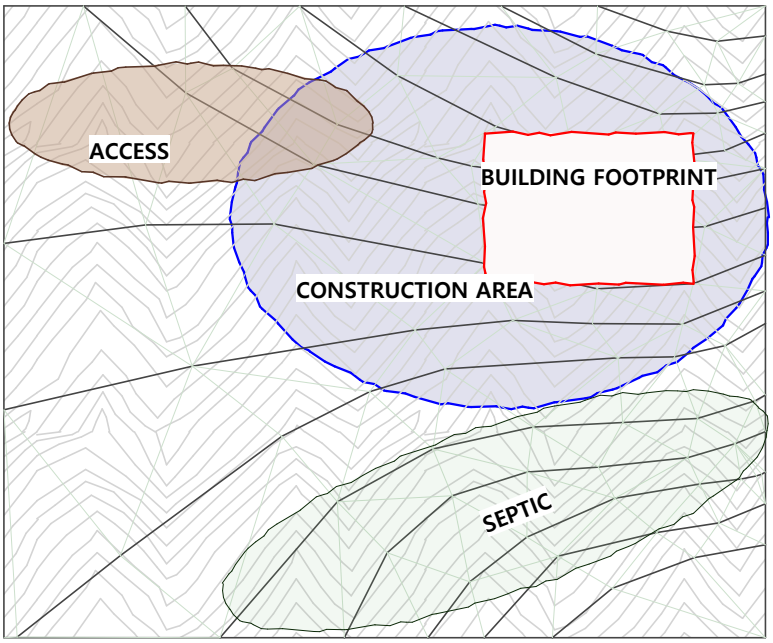
THE COMPUTERIZED SURVEYOR

***TOTAL SYSTEM**_TOTAL SYSTEM IS THE ADOPTED GENERAL TERM FOR A COMPUTERIZED SURVEYING SYSTEM THAT PERMITS MULTIPLE POINT READS FROM 1 STATION. RESEARCH 'TOTAL SYSTEM' FOR AN EXPLANATION IF DESIRED.

***ACCURACY**_ACCURACY IS SPOT ON.

***LONG TERM THOUGHT**_A SURVEYOR BECOMES REQUIRED ONCE A PROJECT IS READY FOR CONSTRUCTION TO LAYOUT/SPOT ALL CORNERS FOR EXCAVATION & FOUNDATION WORK. GETTING A SURVEYOR ON BOARD FOR SOME EARLY TOPO WORK IS NEVER A BAD IDEA.

CONSIDERING PRIMARY SITE FUNCTIONS

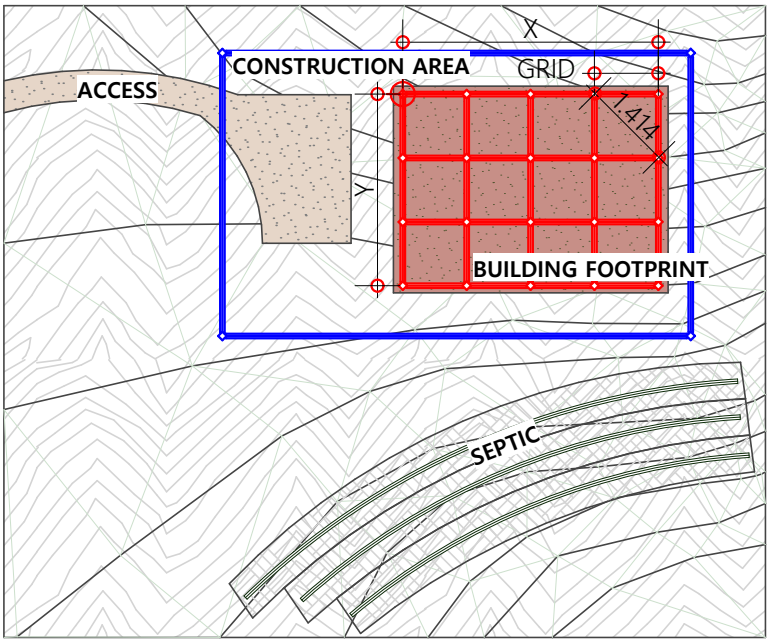


THE PROCESS

***ALL THE PARTS NEED CONSIDERATION**_THIS EXERCISE IS SUMMARIZING THE INCLUSION OF THE 4 MAJOR SITE REQUIREMENTS THAT ALL TAKE SUBSTANTIAL PHYSICAL SPACE. LOGIC SAYS THAT EACH OF THESE NEED SITE SPECIFIC INVESTIGATION AND SIZE DETERMINATION. THIS EXERCISE MIMICKS THE PROCESS.

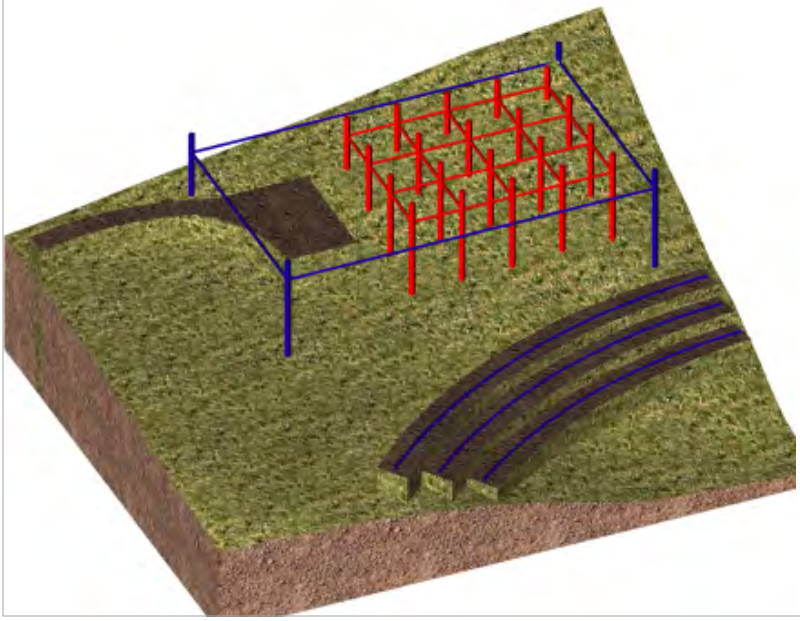
LOCATING THE PHYSICAL SITE PARTS

***ACCESS (BROWN)**_FROM ACCESS ROAD TO BUILDING SITE. LENGTH AS REQ'D PER SITE. . ARRIVAL & PARKING PER VEHICULAR NEEDS
***SEPTIC (GREEN)**_ (IF REQUIRED) SIGNIFICANT VARIANCE ON POSSIBLE AREA NEEDED FOR SEPTIC FIELD & REPAIR. CHECK EARLY WITH AUTHORITIES, AND OR INSTALLER. THIS IS NOT A DIY EVENT.
***CONSTRUCTION AREA (BLUE)**_AREA SURROUNDING THE BUILDING FOOTPRINT REQUIRED FOR VEHICULAR PARKING & MOVEMENT, FOR PERIMETER HOUSE DRAINAGE REQUIREMENTS, FOR YARD & OUTSIDE ACTIVITIES AS DESIRED
***BUILDING FOOTPRINT (RED)**_THE AREA OF THE 'FOOTPRINT" OF THE HOUSE CONSTRUCTION. BECAUSE AT THIS POINT THE BETTER/BEST LOCATION ON A SITE FOR THE HOME IS UNDER CONSIDERATION AN EXACT UNDERSTANDING OF A FOUNDATION GEOMETRY IS NOT NEEDED. WE ARE TRYING TO DEFINE AN AREA THAT WILL NEED TOPOGRAPHICAL INVESTIGATION



SIZE & SHAPE THE PHYSICAL SITE PARTS

***ACCESS (BROWN)**_SCALE IN A 11' WIDE DRIVEWAY & A PARKING TURNAROUND AREA OF 24' X 40', IDEALLY ON LEVEL GRADE
***SEPTIC (GREEN)**_ ASSUMING SATISFACTORY SOIL, A 3 BEDROOM HOME (IN THIS HYPOTHETICAL SAMPLE) REQUIRES 250 LIN FT OF DRAIN FIELD THIS EXAMPLE SHOWS 3 LINES,10' APART, AND 80' +LONG. THIS ALSO SATISFIES TYPICAL GRAVITY FIELD REQUIREMENTS WITH THE FIELD BEING BELOW THE HOUSE (GRAVITY) AND THE DRAIN LINES FOLLOWING THE NATURAL TOPOGRAPHY (REQUIRED).
***CONSTRUCTION AREA (BLUE)**_16' IS BEING APPORTIONED FOR CONSTRUCTION AND DRAINAGE ON THE UPHILL SIDE. 10' IS BEING APPORTIONED FOR CONSTRUCTION AND DRAINAGE ON THE SLOPING RIGHT SIDE.30' IS BEING APPORTIONED FOR THE VEHICULAR AND ENTRY REQUIREMENTS ON THE LEFT SIDE. 16' IS BEING APPORTIONED FOR THE DOWNHILL SIDE. A LITTLE EXTRA IS INCLUDED HERE TO ALLOW FOR POSSIBLE DECK OR PATIO.
***BUILDING FOOTPRINT (RED)**_A FOOTPRINT DIMENSION (X AND Y) MIGHT BE ASSUMED PREPRESENTING A TARGETED MAIN FLOOR HOME SIZE. EXAMPLE 28' X 40' WILL RESULT IN A FOOTPRINT OF 1120 SQ FT.



USING A BUILDING FOOTPRINT GRID

***THE GRID**_SET UP A GRID REPRESENTING THE APPROXIMATE BUILDING FOOTPRINT AREA. SELECT A GRID DIMENSION AND KNOW ITS HYPOTENEUSE BY MULTIPLYING THE GRID DIMENSION TIMES 1.414. LAY OUT STAKES IN THE GRID KEEPING IT ALL (CLOSE TO) SQUARE USING THE HYPOTENEUSE DIMENSION AS A WORKING CHECK.
***THE STAKES**_WOOD, OR GALV ELECT CONDUIT, SMALL DIAMETER PLASTIC PIPE, REBAR, FENCING STAKES ARE MATERIAL OPTIONS. THEY NEED TO BE HAMMERED OR DRILLED INTO THE EARTH AND NEED TO STICK UP ABOVE THE REFERENCE ELEVATION.
***REFERENCE ELEVATION**_USING A LEVEL TECHNIQUE PREVIOUSLY NOTED, MARK EACH STAKE CLEARLY REPRESENTING A LEVEL PLANE. THE BETTER IF THAT LEVEL PLANE REPRESENTS A FINISH FLOOR PLANE.
***STEEP SLOPES OR ROCKY TERRAIN**_JUST MAKE THIS HARD PHYSICALLY, BUT WORTH NOTING THAT THIS EFFORT PAYS OFF MORE WITH STEEPER SITES.
***VISUALIZATION**_THIS GRID IDEA ALLOW ONE TO ENVISON A FLOOR PLANE AND DETERMINE FOUNDATION HT REQUIREMENTS AROUND/ACROSS THE BUILDING FOOTPRINT.

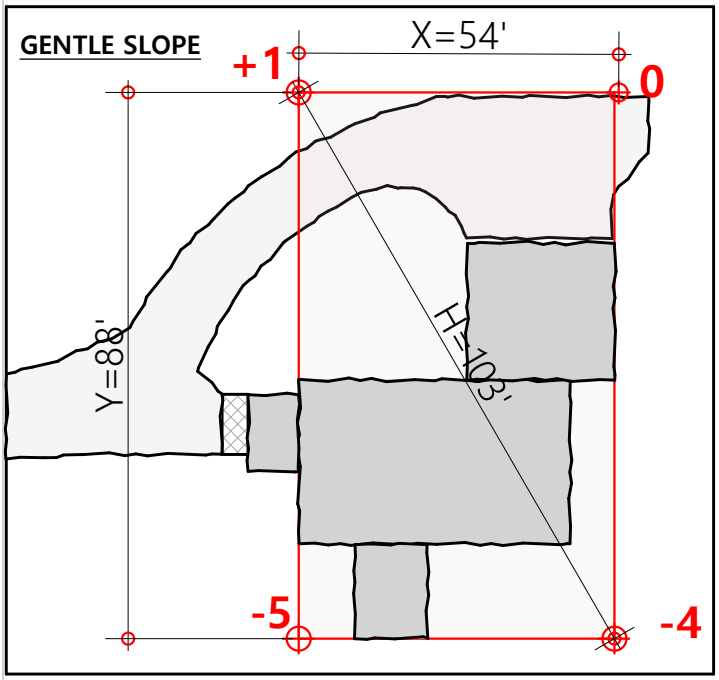
MAPPING THE BUILDING FOOTPRINT+CONSTRUCTION AREA

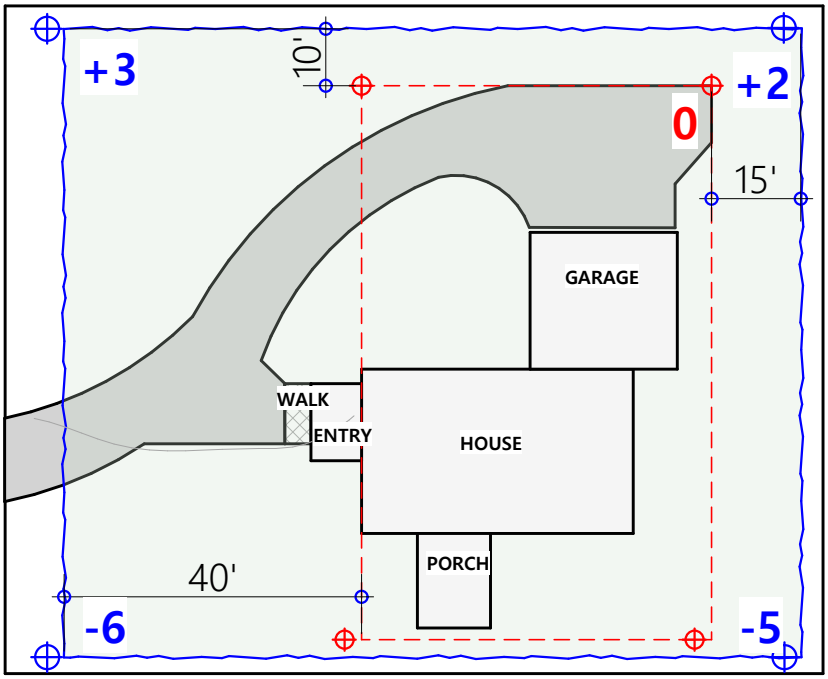
BUILDING FOOTPRINT

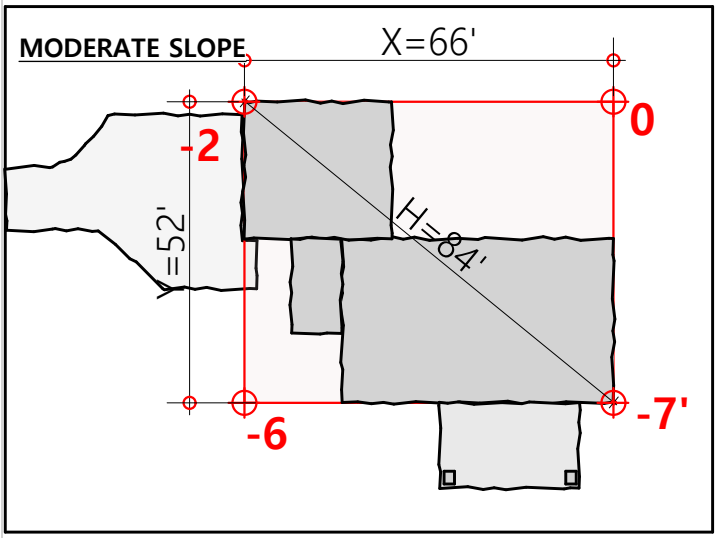
***PLANS**_REPRESENTS A MORE DETAILED PLAN, INCLUDING GARAGE, ENTRY & PORCH COMPONENTS, IN SCALE. THEN CIRCUMSCRIBE THAT PLAN INTO A SIMPLE RECTANGLE. THE HYPOTENUSE DIMENSION IS TO CHECK SQUARE IN A FIELD LAYOUT.
***TOPO CHECK**_THE ELEVATION DIFFERENTIAL AT THE 4 PRIMARY CORNERS IS THE INITIAL PRIMARY FIELD DATA DESIRED. 3.6 OVERVIEWS SOME DIY TECHNIQUES TO GET THAT DATA.

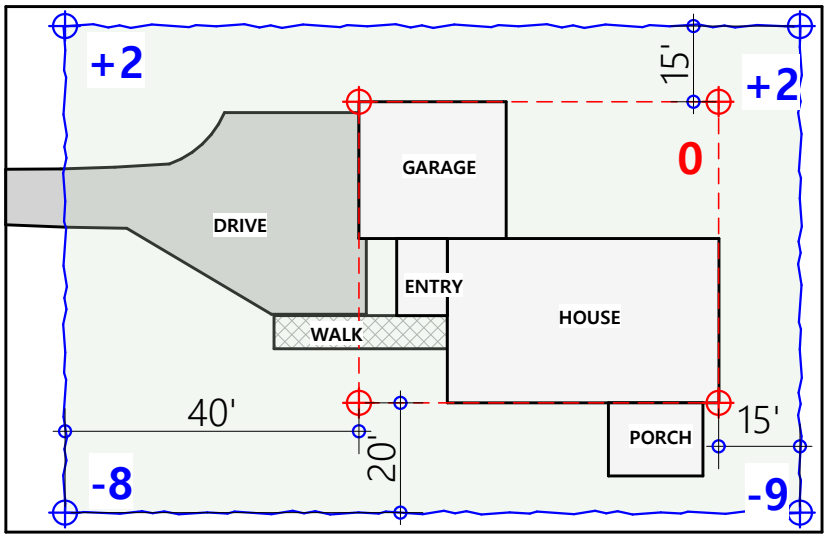
CONSTRUCTION AREA

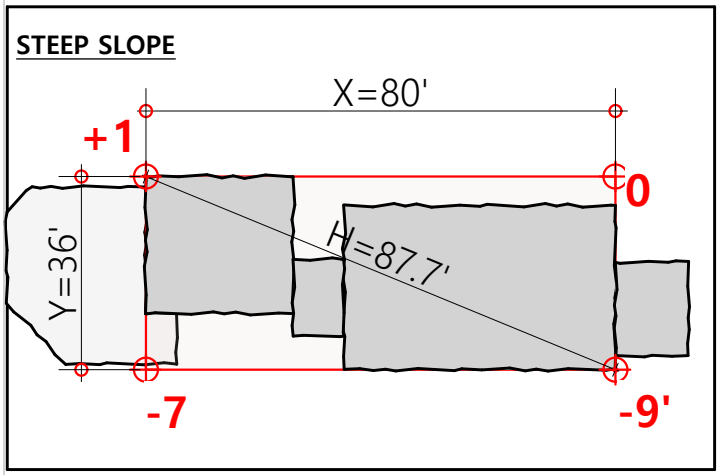
***PLANS**_SETCH PLAN IS REFINED A BIT AND PARKING AND DRAINAGE CONSIDERED SO A CONSTRUCTION AREA CAN BE DIMENSIONED
***OFFSETS**_IF THE BUILDING FOOTPRINT IS SQUARED UP & FIELD STAKED AND RIBBONED, USING OFFSET NUMBERS TO OUTLINE THE CONSTRUCTION AREA IS STRAIGHTFORWARD.
***ZERO REFERENCE**_THE ZERO REFERENCE FOR THE BUILDING FOOTPRINT CAN REMAIN THE REFERENCE FOR THE CONSTRUCTION AREA.

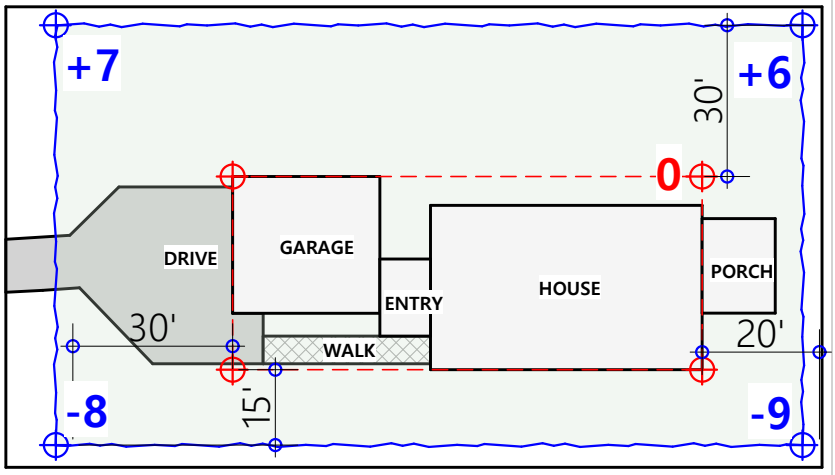








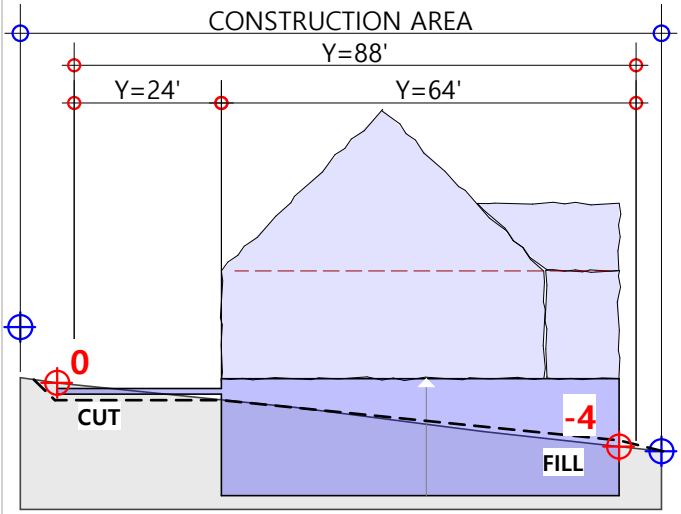


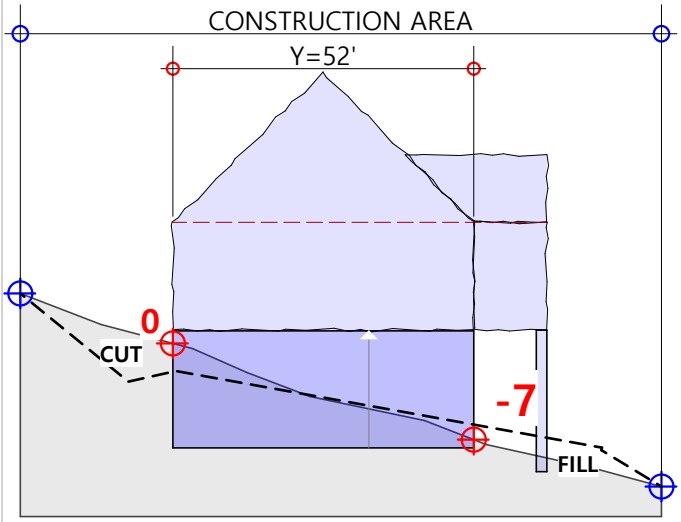


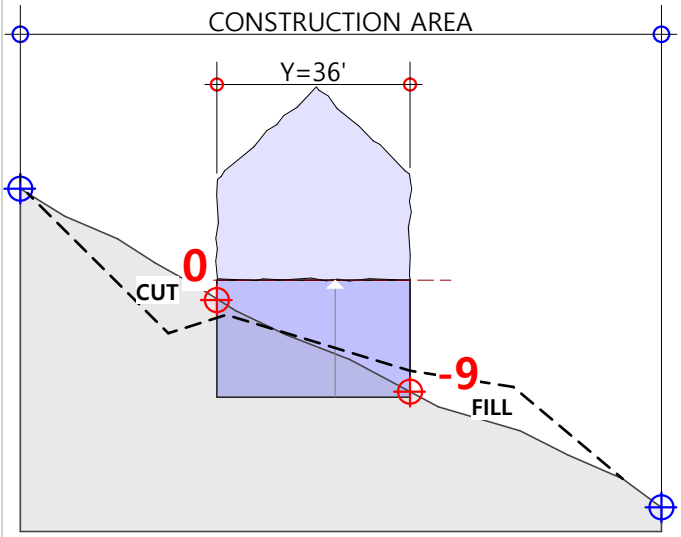
SITE PROFILING THE BUILDING FOOTPRINT+CONSTRUCTION AREA

PROFILE THE GRADE DIFFERENTIAL

***THE GRADE**_IN SCALE, DRAW THAT SITE PROFILE.
***BUILDING FOORPRINT**_IN SCALE, SUPERIMPOSE THE BUILDING FOOTPRINT, REPRESENTED IN BLUE HERE.
***TOPOGRAPHICAL MANIPULATION**_SELDOM, IF EVER, WILL A FOOTPRINT SIT PERFECTLY ON A SITE SUCH THAT NO MANIPULATION OF THE TOPOGRAPHY IS REQUIRED. A RULE OF THUMB MIGHT BE THAT THE STEEPER A SLOPE THE MORE MAINIPULATION IS REQUIRED. **CUT** (DIGGING OUT) AND **FILL** (PURPOSEFULLY REPLACING) IS THE PRIMARY MANIPULATION. SEE 3.10







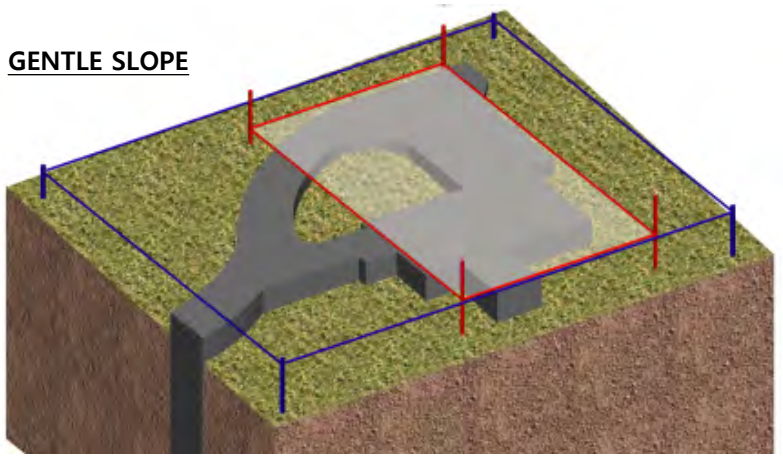
SLOPE BASED 3D ILLUSTRATIONS

THESE GENTLE SLOPE, MODERATE SLOPE, AND STEEP SLOPE VIGNETTES ARE CONSISTENT WITH THE PLAN AND PROFILE 2D DRAWINGS REPRESENTING THESE 3 SLOPE CONDITIONS

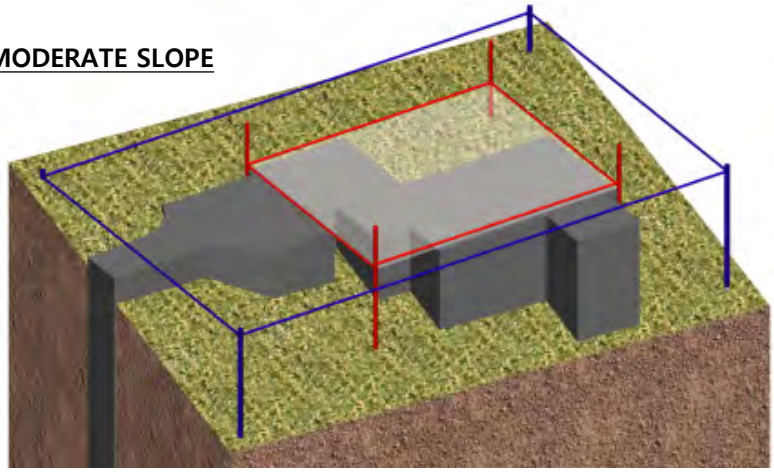
GRADE DIFFERENTIAL OBSERVATIONS_

***STEEPNESS OF SLOPE**_AS A BUILDING SITE SLOPE INCREASES ADDITIONAL CARE IN PLANNING IS REQUIRED. STEEPER SLOPES REQUIRE MORE ATTENTION TO LAYOUT & POSITIONING SO THE BUILDING FOOTPRINT AND CONSTRUCTION AREA DO NOT CONSUME A TOPO DIFFERENTIAL THAT IS DIFFICULT AND COSTLY TO HANDLE. IN THESE ILLUSTRATIONS THE BUILDING FOOTPRINT DESIGN IS SHAPED TO BETTER FIT THE SITE SLOPE.

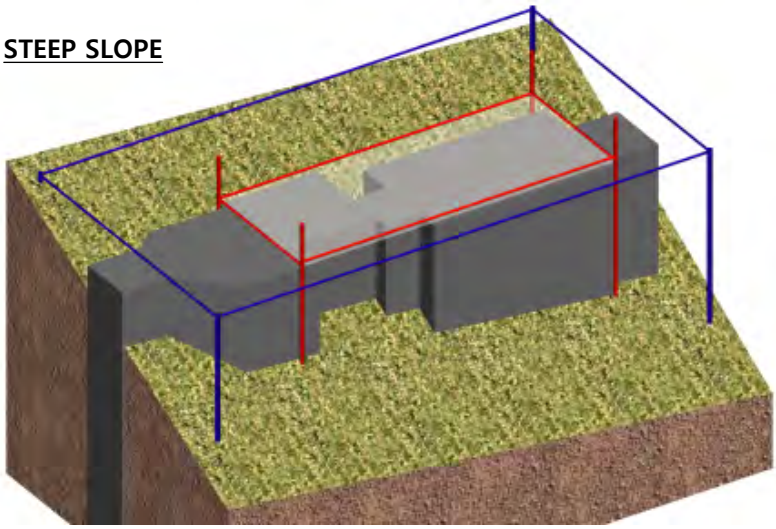
GENTLE SLOPE



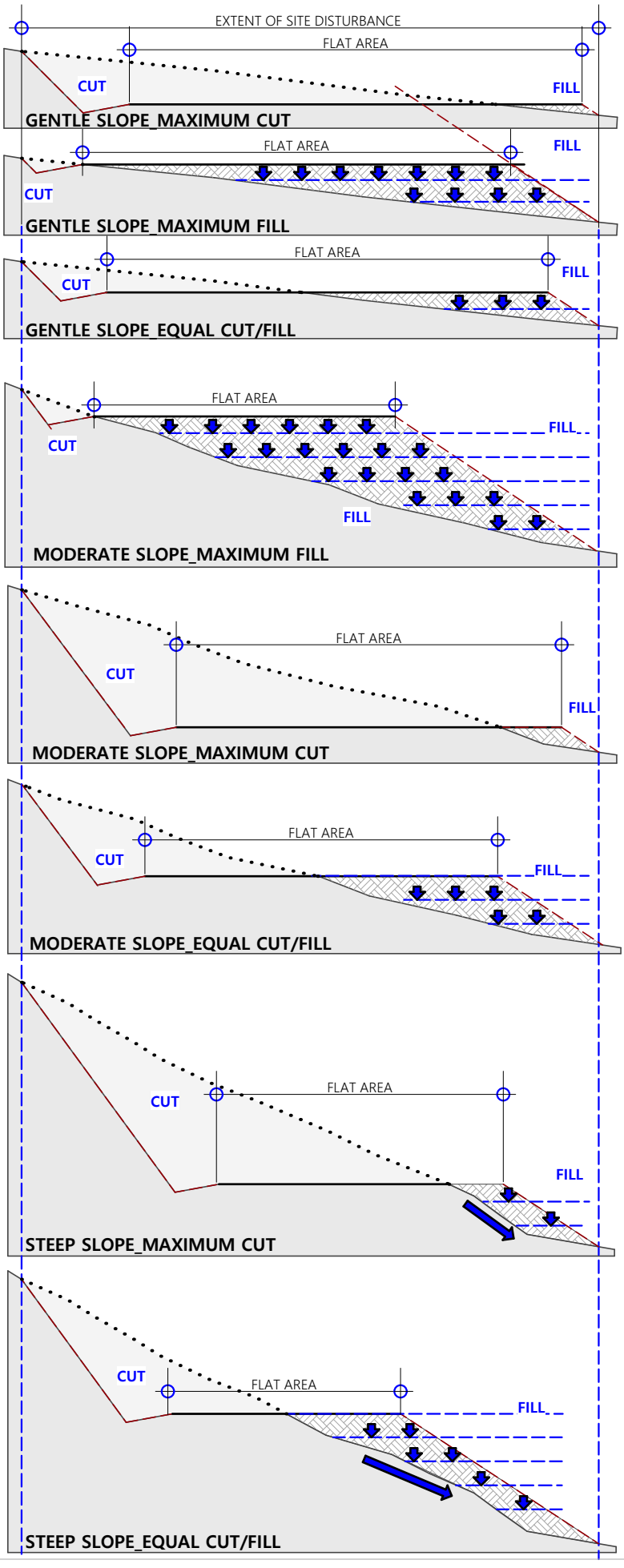
MODERATE SLOPE



STEEP SLOPE



CUT AND FILL AWARENESS



THIS ILLUSTRATION

*THIS ILLUSTRATION IS A COMPARATIVE GRAPHIC THINKING TOOL BASED ON A SET **EXTENT OF SITE DISTURBANCE** LIMIT, A CONSISTENT CUT ANGLE, AND A CONSISTENT FILL ANGLE.
*THE CUT ANGLE IS 53º, WHICH IS AN OSHA RECOGNIZED MAX EXCAVATED SLOPE ANGLE FOR TYPE A SOIL BEFORE SHORING IS REQUIRED. SEE (d3.1)
*EACH PROFILE ALSO SHARES A CONSISTENT 'SLOPE BACK' ON THE CUT SIDE REPRESENTING AN AREA NEEDED FOR HUMAN BODIES TO WORK, AND FOR A DRAINAGE METHOD TO BE INSTALLED.
*THE FILL ON THE HORIZONTAL PLANE IS INCLUDED IN THE BUILDING PAD AREA AND THEREFORE IS ASSUMED TO BE COMPACTED.
*THE FILL ANGLE ON THE SLOPE SIDE IS CONSISTENT AT 33º WHICH IS CONSIDERED THE LIMIT FOR MANAGED PLANTING. SEE (d3.1)
*THE RESULT IS A BUILDING PAD WIDTH, LABELLED **FLAT AREA**, WHICH VARIES DEPENDING ON THE SLOPE AND THE EXTENT OF THE CUT

CUT AND FILL BASICS

***THE CUT**_ EARTH IS REMOVED
***FILL**_ EARTH IS (CONDITIONALLY) REPLACED
***CUT/FILL BALANCE**_IDEALLY IF THE VOUME OF CUT (REMOVED) EARTH IS THE SAME AS THE VOLUME OF FILL (REPLACED) EARTH, THEN EARTH DOES NOT HAVE TO BE REMOVED FROM A SITE, OR BROUGHT ONTO A SITE. SO, IN PRINCIPLE A BALANCED CUT/ FILL IS A GOOD THING.
***DIRT**_THE ABOVE ASSUMES THE DIRT BEING CUT AND REUSED IS 'GOOD' DIRT. 'GOOD' DIRT MEANS YOU CAN BUILD ON IT. WHERE IT IS CUT THE DIRT MUST BE "UNDISTURBED", OR "VIRGIN" MEANING IT HAS BEEN SITTING THERE FOR A VERY LONG TIME, AND INHERENTLY FIRM ENOUGH TO BUILD ON. AND ABSOLUTELY DEVOID OF ANY ORGANIC MATTER.
***FILL DIRT**_IF THAT DIRT IS GOOD COMING OUT, IT CAN BE USED AS FILL WITH SOME CAVEATS. BECAUSE IT HAS NECESSARILY BEEN LOOSENED & BROKEN ALL UP DURING THE EXCAVATION PROCESS IT NEEDS TO BE RE-COMPACTED WHEN REINSTALLED. COMPACTION IN 'LIFTS' IS THE COMMOM METHOD. AFTER COMPACTION THE DIRT IS ONCE AGAIN FIRM ENOUGH TO BUILD ON.
***'ENGINEERED' FILL**_FILL THAT HAS BEEN REPLACED, SUCH AS IN LIFTS DESCRIBED ABOVE IS REFERRED TO AS ENGINEERED FILL. IT IS PREPARED TO MEET A STRUCTURAL REQUIREMENT. THAT REQUIREMENT CAN DIFFER, DEPENDING ON THE JOB AND ACTUAL BEARING LOAD IT IS CALLED ON TO MANAGE. GRAVEL IS A VERY VIABLE AND FREQUENT SUBSTITUTE FOR 'DIRT' AS A FILL MATERIAL AS THE CORRECT GRAVEL SELECTION IS COMPACTS READILY AND DOES NOT SUFFER FROM THE CONTINGENCIES OF WATER CONTENT. WHEN DIRT IS (TOO) WET IT WON'T COMPACT PROPERLY. SOME DIRT WON'T COMPACT IF IT IS (TOO) DRY ALSO.
***SOILS**_GOOD OLD DIRT IS ACTUALLY A BIT COMPLICATED WHEN WE ATTACH THE STRUCTURAL IMPORTANCE OF IT SUPPORTING STRUCTURES. SEE (d2.2, c2.3-c2.6)

CUT AND FILL IMBALANCES

***THE CUT**_ MOVING EARTH IS USUALLY PRETTY CHEAP. A DECENT PIECE OF EQUIPMENT CAN PUSH A LOT OF EARTH IN A SHORT AMOUNT OF TIME. SERIOUS ROCK ON A SITE IS ANOTHER MATTER.
* **FILL**_THE FILL PROCESS FOR STRUCTURAL PUPOSES CAN BE A SMOOTH PROCESS IF DIRT AND WEATHER COMPLY. IT ALSO CAN BE PESKY AND EXPENSIVE.
* **LANDSCAPE FILL**_IF CUT EXCEEDS FILL THEN DIRT NEEDS TO EITHER BE USED UP, OR TRUCKED AWAY. BACKFILL, DRAINAGE CONTOURING, LANDSCAPE FEATURES ARE NONSTRUCTURAL WAYS TO USE DIRT UP TO A PROJECTS ADVANTAGE.

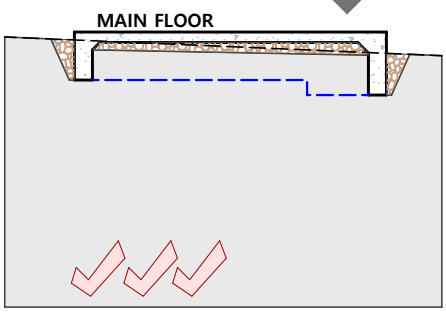
HARDSCAPE & LANDSCAPE RAMIFICATIONS

*THIS CUT AND FILL EXERCISE IS APPLICABLE IN CREATING ANY FLAT SURFACE REQUIRED, INCLUDING YARD AREA, DRIVEWAYS AND PARKING AREAS, AND BUILDING PADS.
*THE IMPORTANCE OF COMPACTION AND ACHIEVING A UNIFORM BEARING CAPACITY IS RELATIVE TO THE FINAL USE. A 'PAD' UNDER A HOUSE AN A 'PAD' UNDER A YARD HAVE 2 DIFFERENT CRITERION.

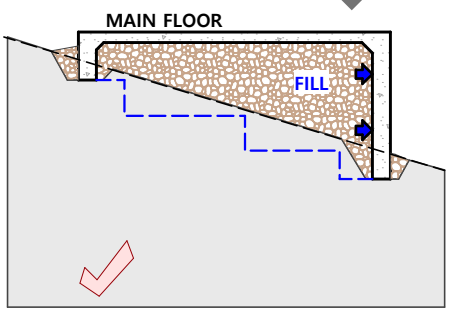
TOPO AND FOUNDATION TYPE OVERVIEW

SNAP SHOT VIEW-LINKING A SLOPE CONDITION TO A FOUNDATION CONFIGURATION_

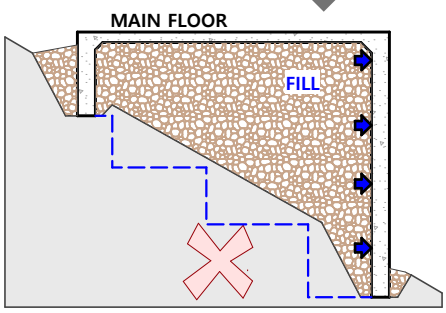
GENTLE SLOPE



MODERATE SLOPE

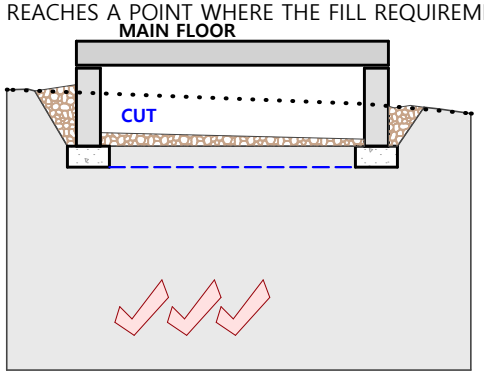


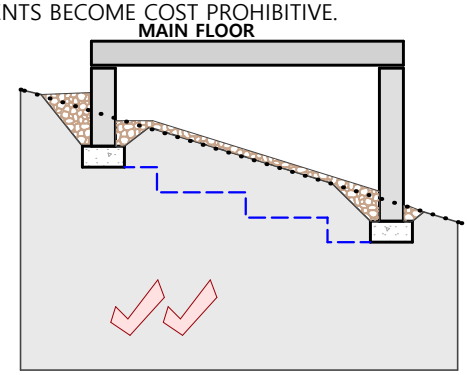
STEEP SLOPE

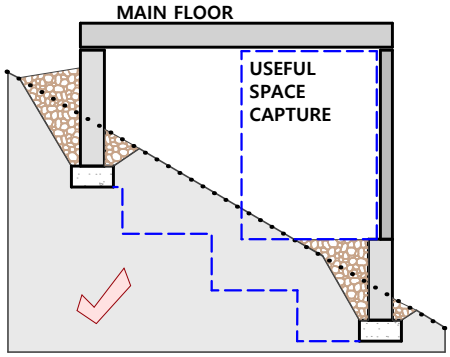


SLAB ON GRADE CONSTRUCTION_(FILL INTENSIVE)

*SIMPLE & COST EFFECTIVE ON FLAT GROUND. CONSTRUCTION COMPLICATION & COST INCREASE AS THE SLOPE INCREASES. THE SLOPE REACHES A POINT WHERE THE FILL REQUIREMENTS BECOME COST PROHIBITIVE.

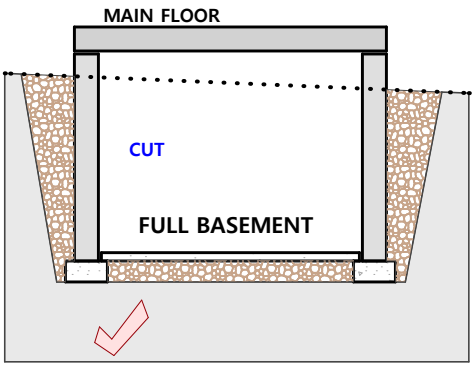


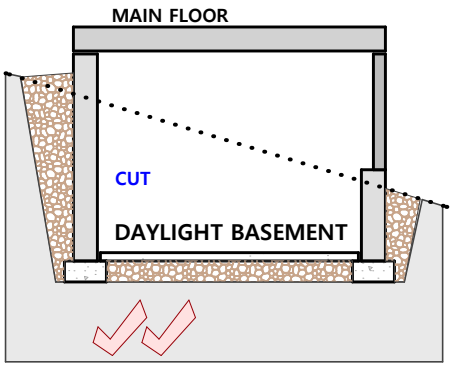


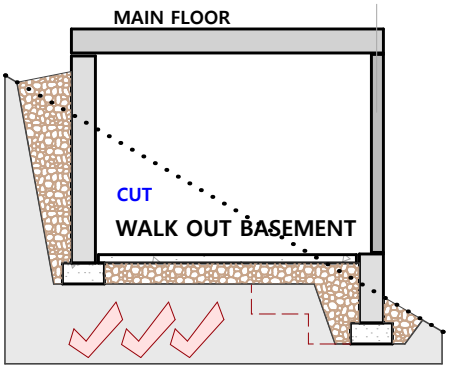


CRAWL SPACE CONSTRUCTION_(NEUTRAL+/-)

*CRAWL SPACE CONSTRUCTION COMPLICATION & COST ALSO INCREASE PRETTY DIRECTLY WITH AN INCREASE IN SLOPE. THAT COST INCREASE HAS VALUE WHEN USEFUL SPACE CAN BE CAPTURED UNDER THE MAIN FLOOR.

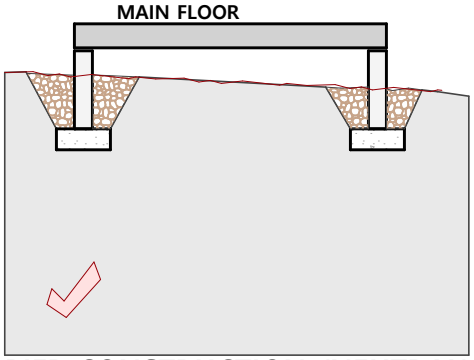


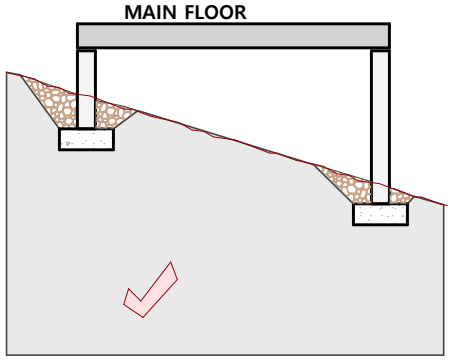


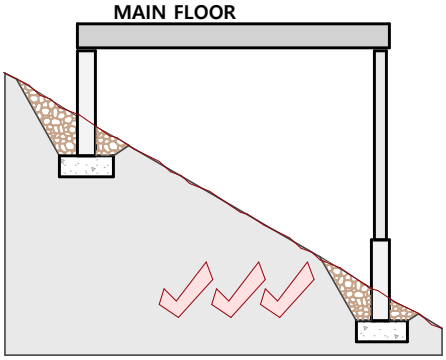


BASEMENT CONSTRUCTION_(CUT INTENSIVE)

*BASEMENTS CAN BECOME SLIGHTLY MORE COST EFFECTIVE AND DESIRABLE (AS MORE NATURAL DAYLIGHT BECOMES POSSIBLE) AS A SLOPE INCREASES. WHEN COMPARED WITH CRAWL CONSTRUCTION, THERE IS A POINT WHERE THE ADDITIONAL COST TO EXCAVATE COMPLETELY AND POUR A BASEMENT SLAB IS A SMART INVESTMENT. IN COLD CLIMATES, AND REGARDLESS OF SLOPE, BASEMENTS ARE COMMON.





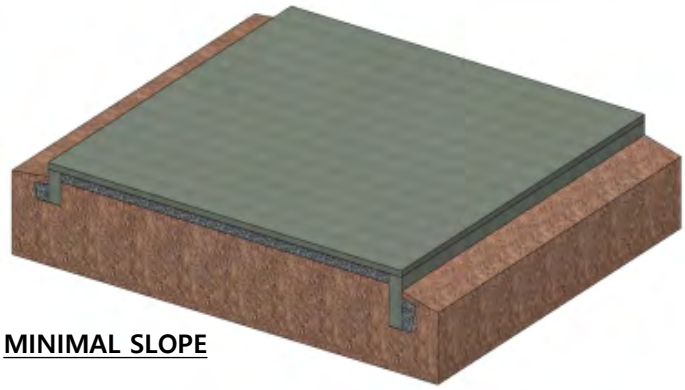


PIER CONSTRUCTION_(NEUTRAL)

*BELOW THE MAIN FLOOR IS "UNPROTECTED", SO FOR A HOUSE A CRAWL SPACE MAY BE A BETTER CHOICE IN MINIMAL & MODERATE SLOPE CONDITIONS. WITH SERIOUSLY STEEP SITE CONDITIONS BUILDING A PERIMETER FOUNDATION WALL MAY BE PROHIBITIVE IN WHICH CASE PIERS ARE AN OPTION. THERE ARE LOTS OF WAYS TO BUILD THEM. NOTE PIERS CAN BE A BEST OR ONLY SOLUTION WITH CERTAIN SOIL CONDITIONS AND IN CERTAIN COASTAL AREAS.

SLAB ON GRADE CONSTRUCTION_(FILL INTENSIVE)

*SIMPLE & COST EFFECTIVE ON FLAT GROUND. CONSTRUCTION COMPLICATION & COST INCREASE AS THE SLOPE INCREASES. THE SLOPE REACHES A POINT WHERE THE FILL REQUIREMENTS BECOME COST PROHIBITIVE.



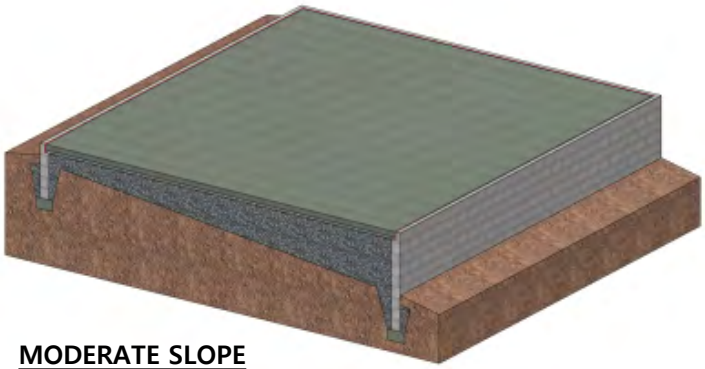
MINIMAL SLOPE

SLAB ON GRADE WITH INTEGRAL FOUNDATION

***DESCRIPTION_**A PERIMETER FOUNDATION "DITCH" IS DUG TO A DEPTH & WIDTH SPECIFIED, AND THE FLOOR AREA IS LEVELED AND PREPARED. A SINGLE CONCRETE POUR EVENT FILLS THE (FORMED) DITCHES AND THEN THE FLOOR AREA. THE FOUNDATION PERIMETER & FLOOR AREA ARE A SIMPLE AND SINGLE POUR

***SITE CONDITIONS_**MINIMAL SLOPE SITES AND SHALLOW FROST DEPTH BOTH REQUIRED. THE FINISH SLAB IS RARELY ELEVATED VERY HIGH ABOVE SURROUNDING GRADE WHICH IS A CONDITION OF THE SINGLE POUR EVENT. WHEN THE SLAB REQUIRES ELEVATION ABOVE GRADE THE STEM WALL TECHNIQUE BELOW IS A BETTER CHOICE.

***COMMENTS_**CONCRETE FLOORS ARE HARD. THEY TEND TO FEEL COOL TO COLD WHICH CAN BE A HOT CLIMATE ASSET AND A COLD CLIMATE LIABILITY. PLUMBING AND ELECTRIC REQUIRED IN THE FLOOR MUST BE LOCATED & INSTALLED PRIOR TO THE FLOOR BEING POURED. THERE IS NO FORGIVENESS ONCE THE FLOOR IS POURED.



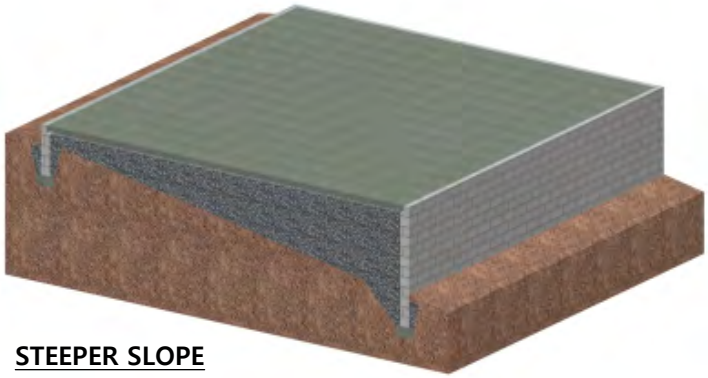
MODERATE SLOPE

SLAB ON GRADE WITH STEM WALL FOUNDATION

***DESCRIPTION_**A PERIMETER FOUNDATION IS CREATED FIRST WITH A FOOTING AND THEN A CONSTRUCTED PERIMETER FOUNDATION (STEM) WALL. THIS CONSTRUCTION IS A VARIATION OF SINGLE POUR INTEGRAL FOUNDATION AND IS REQUIRED WHEN WHEN THE SITE HAS A MORE AGGRESSIVE SLOPE OR THE FROST LINE IS DEEPER NECESSITATING A DEEPER FOOTING AND TALLER FOUNDATION WALLS.

***SITE CONDITIONS_**MINIMAL TO MODERATE SLOPE SITES AND SHALLOW TO AVERAGE FROST DEPTH. BECAUSE THE PERIMETER STEM WALLS BECOME A CONTAINER, THE FINISH SLAB CAN BE HIGHER ABOVE THE SURROUNDING GRADE AND THEREFORE MORE SITE FLEXIBLE.SEE BELOW REGARDING FILL LIMITATIONS.

***COMMENTS_**SAME AS ABOVE. THERE IS A SLAB EDGE INSULATION ADVANTAGE TO THIS 2 PHASE CONSTRUCTION.



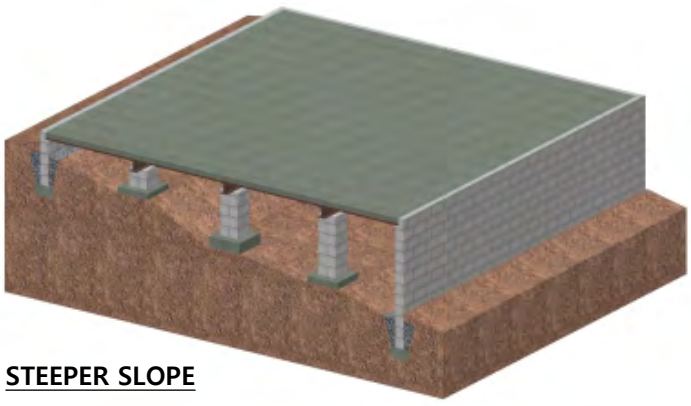
STEEPER SLOPE

SLAB ON GRADE REQUIRING SIGNIFICANT FILL

***DESCRIPTION_**SAME AS ABOVE

***SITE CONDITIONS_**WHEN A SITE GETS BEYOND A MODERATE SLOPE THIS CONSTRUCTION METHOD LOOSES ALL ITS INHERENT EFFICIENCIES.

***THE LIMITING ISSUE_**IS THE VOLUME OF FILL REQUIRED AND ITS COST. MORE FILL REQUIRES A TALLER AND STONGER FOUNDATION WALL, MORE ENGINEERED, COMPACTED LIFTS. A BIGGER FOOTPRINT CLEARLY INCREASES THIS WHOLE VOLUME CALCULATION.THERE IS A COST BREAK POINT WHERE THE STRUCTURED SLAB SHOWN BELOW OR THE CRAWL SPACE WITH FRAME FLOOR BECOMES MORE COST EFFECTIVE..



STEEPER SLOPE

STRUCTURED SLABS

***DESCRIPTION_**THIS CONSTRUCTION IS A STEEL AND CONCRETE VERSION OF A CRAWL SPACE. A PERIMETER FOOTING AND FOUNDATION WALL WITH PIERS SUPPORTS IS CONSTRUCTED. STEEL BEAMS AND A STEEL DECK IS INSTALLED AND FILLED WITH A POURED CONCRETE FLOOR.

***FILL_**IS ELIMINATED. THE COST OF THE FLOOR SUBSTRUCTURE THEN MUST BE CONSIDERED IN RELATION TO THE COST OF FILL (ABOVE)

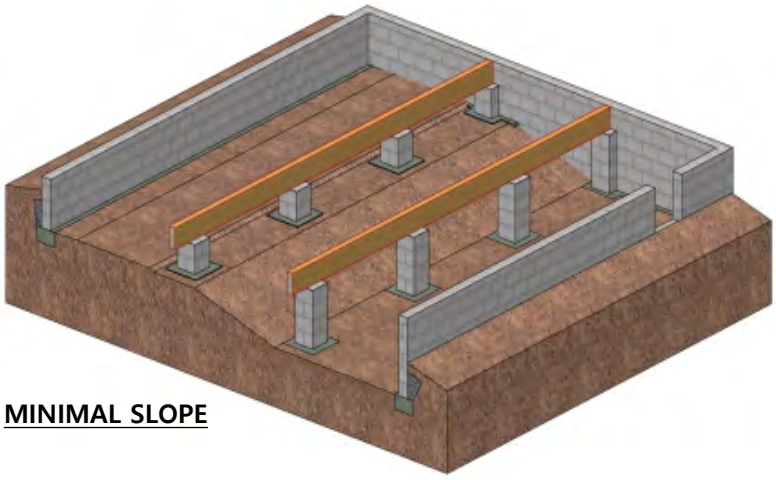
***APPLICATIONS_**THIS FOUNDATION CONSTRUCTION IS MORE LIKELY FOUND UNDER ENTRY PORCHES AND EXTERIOR LIVING PORCHES. THE CONSTRUCTION IS TOTALLY 'NON ROT' SO IN WET CONDITIONS THIS IS GOOD. IT ALSO CAN SUPPORT HEAVIER STONE FLOORING. USED IN SUPPORTING GARAGE FLOORS ON STEEPER SLOPED SITES. (NOTE CONDENSATION MAY REQUIRE ATTENTION)

***NOT A VIABLE 'MAIN FLOOR'_**FOR INTERIOR HEATED AND COOLED SPACE THIS STRUCTURED SLAB CONSTRUCTION HAS SOME PRACTICAL LIABILITIES AND OFFERS NO ADVANTAGE OVER THE FRAME CRAWL SPACE.

TOPO AND THE CRAWL SPACE FOUNDATION

CRAWL SPACE CONSTRUCTION_(NEUTRAL+/-)

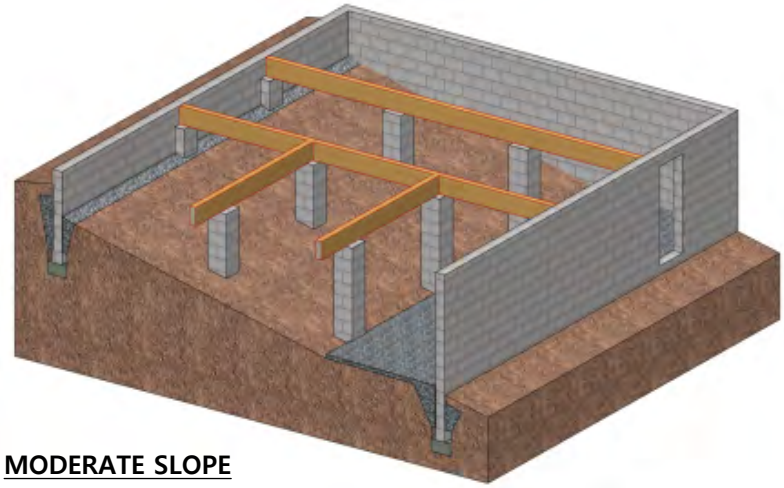
*CRAWL SPACE CONSTRUCTION COMPLICATION & COST ALSO INCREASE PRETTY DIRECTLY WITH AN INCREASE IN SLOPE. THAT COST INCREASE HAS VALUE WHEN USEFUL SPACE CAN BE CAPTURED UNDER THE MAIN FLOOR.



MINIMAL SLOPE

STANDARD CRAWL SPACE FOUNDATION

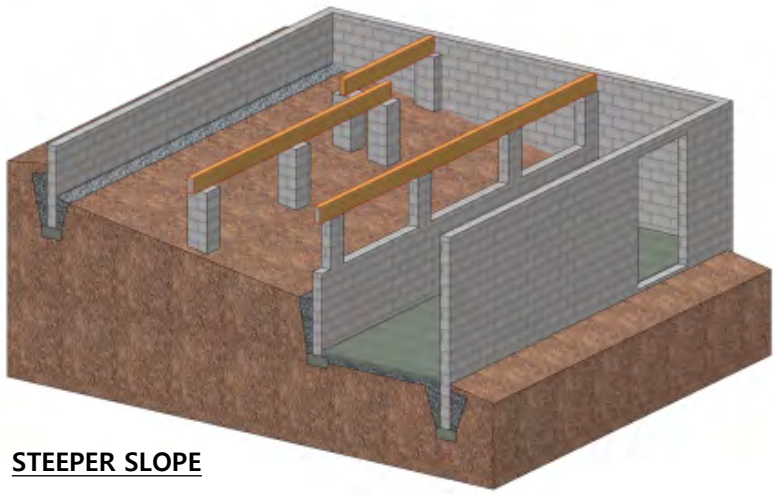
***GENERAL DESCRIPTION**_THE CRAWL SPACE FOUNDATION HAS A PERIMETER WALL USUALLY ON A CONCRETE FOOTING AND CONSTRUCTED OF A MASONRY PRODUCT. THE INTERIOR IS THEREFORE ENCLOSED AND PROTECTED FROM THE ELEMENTS AND ANIMALS (THEORETICALY). MORE RECENTLY THESE CRAWL SPACES ARE 'SEALED' AND PROTECTED THERMALLY AND FROM MOISTURE CHALLENGES.
***SITE CONDITIONS**_MINIMAL TO MODERATE SLOPE, BEST FOR SHALLOW TO AVERAGE FROST DEPTH. VIABLE IN MOST SOIL CONDITIONS.
***THIS ILLUSTRATION**_THIS ILLUSTRATION IS A VERY STANDARD CONSTRUCTION SHOWING A PERIMETER FOOTING AND WALL THAT STEPS WITH THE NATURAL PERIMETER GRADE. THE PERIMETER FOOTING IS ALWAYS BELOW FROST DEPTH. THE INTERIOR CONSISTS OF MASONRY SUPPORT PIERS (WITH FOOTINGS) AND BEAMS (USUALY REFERRED TO AS GIRDERS IN THIS APPLICATION) UPON WHICH SIT THE FRAME FLOOR. AN ACCESS DOOR IS REQUIRED.



MODERATE SLOPE

CRAWL WITH LIMITED STORAGE

***GENERAL DESCRIPTION**_SEE ABOVE
***SITE CONDITIONS**_MODERATE SLOPE REQUIRED, BEST FOR SHALLOW TO AVERAGE FROST DEPTH.
***THIS ILLUSTRATION**_SHOWS VARIATIONS TO THE STANDARD CRAWL ILLUSTRATED ABOVE.
***PIERS AND GIRDERS**_BECAUSE THERE ARE NO FINISHED SPACE REQUIREMENTS IN A CRAWL SPACE, THE PIERS AND CONSEQUENT GIRDERS CAN BE PLACED AS REQUIRED TO ALIGN AND MANAGE ALL THE BUILDING LOADS.
***SIMPLE UTILITY SPACE**_PERIMETER GRADE IS THE DETERMINANT OF HOW MUCH SPACE THERE IS IN THE CRAWL. IN THE TOP ILLUSTRATION THERE IS LITTLE,(TRUELY A 'CRAWL' SPACE). THIS ILLUSTRATION SHOWS HOW SIMPLE IT IS TO GENERATE SOME USEFUL ADDITIONAL SPACE IN CRAWL CONSTRUCTION IF THAT PERIMETER GRADE PERMITS. THIS CONSTRUCTION IS NO DIFFERENT EXCEPT THE FOUNDATION WALL ARE HIGHER. AND IN THIS ILLUSTRATION SOME GRAVEL HAS BEEN PLACED IN THAT LOW WALK AROUND SPACE, MAKING IT MORE STORAGE FRIENDLY.



STEEPER SLOPE

CRAWL WITH LIMITED FULL HEIGHT STORAGE

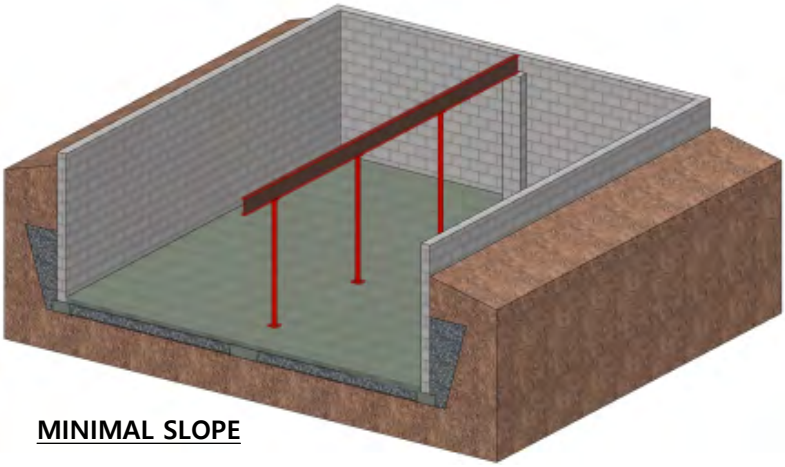
***GENERAL DESCRIPTION**_SEE ABOVE
***SITE CONDITIONS**_STEEPER SLOPE REQUIRED, BEST FOR SHALLOW TO AVERAGE FROST DEPTH.
***THIS ILLUSTRATION**_SHOWS VARIATIONS TO THE CRAWL WITH LIMITED STORAGE AS NOTED BELOW.
***CRAWL/UTILITY BASEMENT COMBO**_THIS GRADE IS A LITTLE STEEPER THAN THE ILLUSTRATION ABOVE AND DOES ALLOW FULL HEIGHT WALK-IN/WALK-OUT SPACE TO BE CREATED ON THIS LOWER SIDE. THE INTERMEDIATE FOUNDATION WALL IS HOLDING BACK THE EARTH (IF IT NEEDS RETAINING) OF THE HIGHER CRAWL AREA. THE LOCATION OF THAT INTERMEDIATE WALL DETERMINES THE AMOUNT OF UTILITY SPACE.
***FULL WALK IN**_A SINGLE MAN DOOR OPNG SHOWS HERE BUT IT IS POSSIBLE TO INCREASE THAT DOOR TO A DOUBLE, OR EVEN OVERHEAD TYPE, WHICH ALLOWS EQUIPMENT IN AND OUT IF SITE ACCESS TO THE DOOR IS REASONABLE .

MAKING THE CRAWL SPACE MORE EFFECTIVE

EVOLUTION_THE CRAWL EVOLVED FROM A FRONTIER/FARMHOUSE HAND DUG PIER AND BEAM FLOOR SUPPORT. A PERIMETER 'SKIRT' WAS ADDED TO HELP KEEP OUT THE COLD (WINDS) AND VARMINTS. THAT SKIRT WALL SUBSEQUENTLY BECAME A PERIMETER STRUCTURAL WALL.
NEXT EVOLUTION_IS THE 'SEALING' OR 'CLOSING' OF THE CRAWL SPACE. THE PERIMETER WALLS ARE INSULATED, THE WALLS AND CRAWL SPACE FLOOR (DIRT, GRAVEL AND OR CONCRETE) ARE AIR AND MOISTURE 'SEALED' AND TEMPERED. HVAC SYSTEMS CAN FUNCTION EFFICIENTLY WHEN SITUATED IN THE CRAWL. THESE 'SEALED' OR 'CLOSED' CRAWL SPACES ARE ON THE VERGE OF BECOMING CODE REQUIRED (AT LEAST IN SOME STATES). THE BASE CONSTRUCTION ONLY SHOWN ABOVE.

BASEMENT CONSTRUCTION_(CUT INTENSIVE)

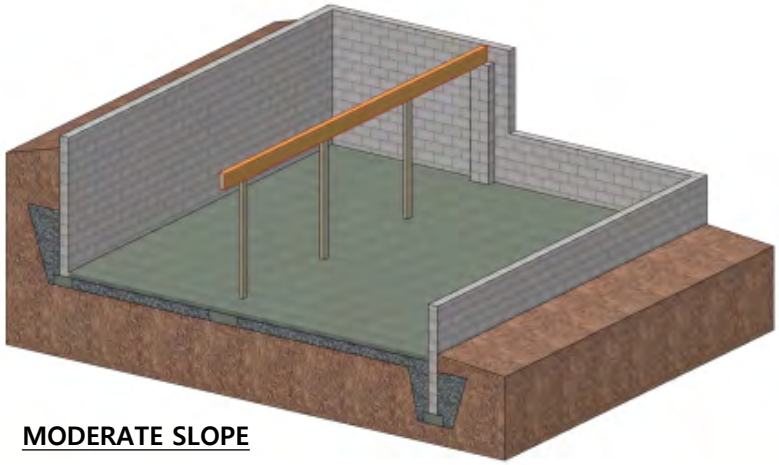
*BASEMENTS CAN BECOME SLIGHTLY MORE COST EFFECTIVE AND DESIRABLE (AS MORE NATURAL DAYLIGHT BECOMES POSSIBLE) AS A SLOPE INCREASES. WHEN COMPARED WITH CRAWL CONSTRUCTION THERE IS A POINT WHERE THE ADDITIONAL COST TO EXCAVATE COMPLETELY AND POUR A BASEMENT SLAB IS A SMART INVESTMENT. IN COLD CLIMATES, AND REGARDLESS OF SLOPE, BASEMENT ARE COMMON.



MINIMAL SLOPE

FULL BASEMENT FOUNDATION

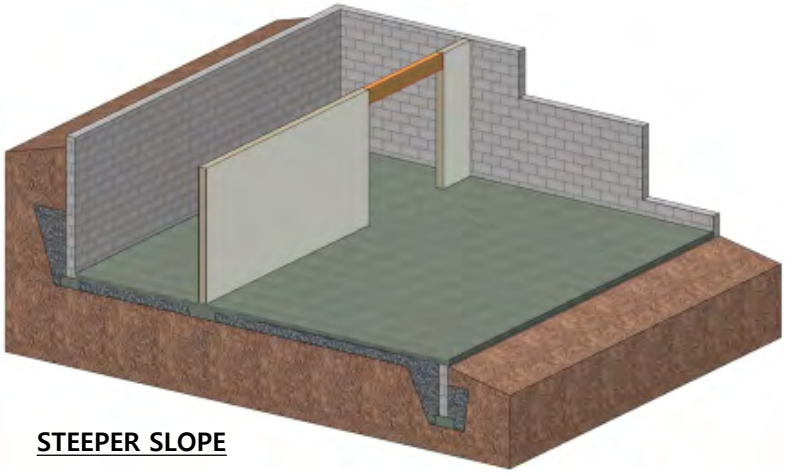
***GENERAL DESCRIPTION**_THE BASEMENT FOUNDATION HAS A PERIMETER WALL USUALLY ON A CONCRETE FOOTING AND CONSTRUCTED OF A MASONRY PRODUCT. THE FOOTINGS ARE SET AT A DEPTH THAT CREATES A FULL USEFUL AREA WITH A CONCRETE SLAB FLOOR. THIS CONSTRUCTION NECESSARILY GETS THE FOOTINGS BELOW FROST DEPTH EVEN IN THE COLDEST CLIMATE ZONES. THERE IS A VOLUME OF EARTH THAT NEEDS BE EXCAVATED AND REPURPOSED OR REMOVED FROM THE SITE.
***SITE CONDITIONS**_MINIMAL SLOPE, ANY FROST DEPTH.
***THIS ILLUSTRATION**_SHOWS A STANDARD CONSTRUCTION WITH PERIMETER FOOTING AND 8' TO 10' HIGH PERIMETER FOUNDATION WALL. THERE ARE CENTER LOCATED POSTS AND A BEAM THAT SUPPORTS THE FLOOR JOISTS ABOVE. POSTS AND BEAM METHOD TENDS TO BE REGIONAL. STEEL POSTS AND BEAMS ARE COMMON AND EFFICIENT (AS SHOWN). THE BASEMENT WALLS ARE SUPPORTING THE STRUCTURE ABOVE AND HOLDING BACK THE EARTH, AND NEED TO BE CONSTRUCTED ACCORDINGLY.
***COMMENTS**_BASEMENT SPACE ALWAYS HAS VALUE FOR STORAGE AND MECHANICAL EQUIPMENT. A PORTION OF THIS SPACE **MAY** BE FINISHED FOR OTHER USES AS LOCALLY PERMITTED.



MODERATE SLOPE

THE DAYLIGHT BASEMENT FOUNDATION

***GENERAL DESCRIPTION**_SEE ABOVE.
***SITE CONDITIONS**_MODERATE SLOPE REQUIRED, ANY FROST DEPTH.
***THIS ILLUSTRATION**_THIS ILLUSTRATION IS SHOWING A MODERATELY SLOPED SITE WITH FOOTINGS AND MASONRY FOUNDATION WALLS THAT 'STEP DOWN' WITH THE SITE.
***POSTS AND GIRDER**_THE GIRDER POSITIONING IS ULTIMATELY BASED ON THE BEARING WALL LOCATIONS REQUIRED ABOVE. WOOD POST AND GIRDERS (SHOWN HERE) REQUIRE A LITTLE MORE DEPTH AND BEEF THAN THE STEEL OPTION SHOWN ABOVE.
***FRAME EXTERIOR WALLS**_(NOT SHOWN) IT IS COMMON (NOT REQUIRED) FOR FRAME WALLS ON THE LOW SIDE TO RUN FROM FOUNDATION WALL TO MAIN LEVEL FLOOR. THE FRAME WALLS ARE A BIT MORE FLEXIBLE FOR WINDOW INSTALLATION, AND MORE SPACE EFFICIENT IN THE THICKNESS DIMENSION.
***COMMENTS**_FLEXIBILITY AND USEFULNESS OF THE BASEMENT SPACE IS INCREASED WITH WINDOWS OFFERING VIEW AND LIGHT.



STEEPER SLOPE

THE WALKOUT BASEMENT FOUNDATION

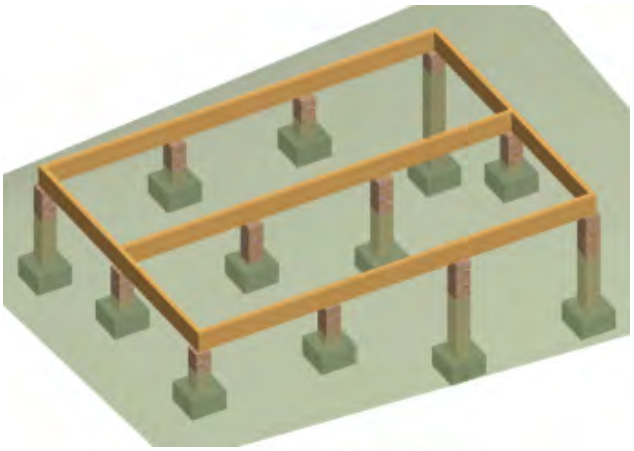
***GENERAL DESCRIPTION**_SEE ABOVE
***SITE CONDITIONS**_STEEPER SLOPE REQUIRED, ANY FROST CONDITION.
***THIS ILLUSTRATION**_SHOWING A STEEPER SLOPED SITE WITH MASONRY WALLS THAT STEP DOWN-AND ARE NOT REQUIRED ON THE LOW SIDE.
***WALL AND HEADER INTERNAL SUPPORTS**_IS ALWAYS AN OPTION TO POST AND GIRDER STRUCTURE. THIS REQUIRES THE BASEMENT SLAB FLOOR BE POURED BEFORE CONSTRUCTION CAN PROCEED WHICH IS A CONDITION/LIMITATION.
***FRAME EXTERIOR WALLS**_(NOT SHOWN) FRAME WALLS WILL BE FULL HEIGHT ON THIS LOW SIDE ALLOWING FULL GLASS DOORS- A COMMON ASSET ALLOWING FLUID ACCESS TO GRADE.
***COMMENTS**_QUALITY OF SPACE ON THIS DAYLIGHT SIDE IS INCREASED, AND THEREFORE MORE FLEXIBLE. THIS CONFIGURATION HAS THIS LEVEL CONSIDERED A STORY.(d6)

THE BASEMENT FOUNDATION

EVOLUTION_OUR FULL BASEMENT EVOLVED FROM THE DEEP FOUNDATION REQUIREMENT (NORTHERN CLIMATES WITH DEEP FROST) AND ADDED VALUE OF THE 'ROOT CELLAR'.
NEXT EVOLUTION_DIGGING A LITTLE DEEPER AND POURING A SLAB FLOOR ALLOWED THESE CELLARS MORE FLEXIBILITY OF USE. WITH AN INTERNAL STAIR, AND ADDITIONAL INSULATION AND MOISTURE PROTECTION, DECENT LIVING SPACE WAS MADE AVAILABLE. THE CELLAR BECOMES A 'BASEMENT'. ON SLOPED SITES MORE AREA FOR GLASS BECOMES AVAILABLE, SO A HIGHER QUALITY SPACE IS POSSIBLE. ON STILL STEEPER SITES FULL HT GLASS IS POSSIBLE ON THE LOWER GRADE SIDE(S) AND SPACE CREATED THERE BECOMES VALUABLE HIGH QUALITY LIVING SPACE.

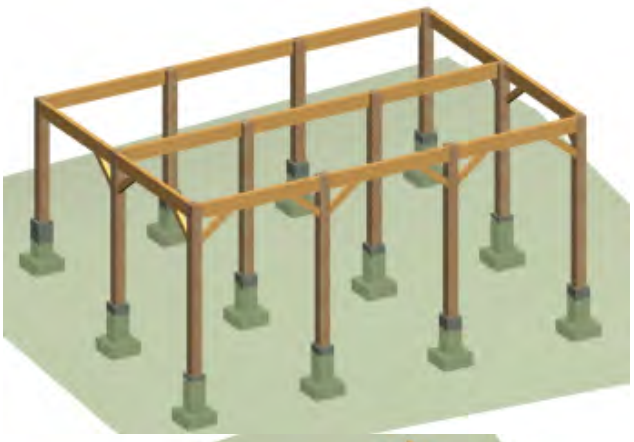
PIER+POST CONSTRUCTION_(NEUTRAL)

*BELOW THE MAIN FLOOR IS "UNPROTECTED", SO FOR A HOUSE A CRAWL SPACE MAY BE A BETTER CHOICE IN MINIMAL TO MODERATE SLOPE CONDITIONS. WITH SERIOUSLY STEEP SITE CONDITIONS, BUILDING A PERIMETER FOUNDATION WALL MAY BE PROHIBITIVE IN WHICH CASE PIERS+POST ARE AN OPTION. THERE ARE LOTS OF WAYS TO BUILD THEM. NOTE PIERS+POST CAN BE A BEST OR ONLY SOLUTION WITH CERTAIN SOIL CONDITIONS AND IN CERTAIN COASTAL AREAS WHERE PILE TYPE (POST) CONSTRUCTION IS MANDATORY.



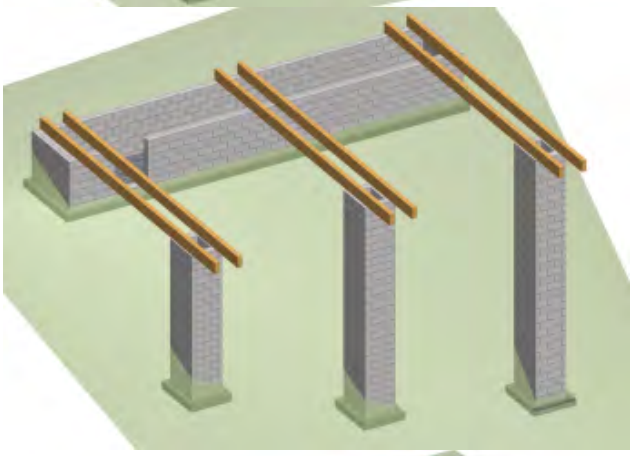
SHORT PIERS WITH FOOTINGS

***GENERAL DESCRIPTION_**THE TERM 'PIER' IS USED HERE TO SIMPLY DESCRIBE A VERTICAL SUPPORT. THEY COULD BE CONSTRUCTED OF CONCRETE, CONCRETE BLOCK, BRICK, OR STONE. THE PIER SUPPORTS THE GIRDERS (SHOWN) WHICH IN TURN SUPPORT THE FLOOR JOISTS (NOT SHOWN).
***THIS ILLUSTRATION_**SUGGESTS WHAT MAY HAVE BEEN A FARM OR PRAIRIE HOME FOUNDATION INVOLVING LIMITED (HAND) DIGGING FOR THE PIER/FOOTINGS, AND PRETTY SIMPLE CONSTRUCTION. THIS CONSTRUCTION IS STILL ABSOLUTELY VIABLE. POST AND BEAM.
***SITE CONDITIONS_** THE PIERS FOOTING ARE DUG TO A DEPTH REQUIRED TO REACH BEARING (AND FROST DEPTH). THE SUGGESTION IS THEY CAN BE WHATEVER HEIGHT NECESSARY TO ACHIEVE THAT CONSISTENT BEARING. THEREFORE THIS INDIVIDUAL PIER CONSTRUCTION IS RELEVANT TO SITES WITH INCONSISTENT GROUND CONDITIONS. IT IS ALSO POPULAR FOR SIMPLE ACCESSORY CONSTRUCTIONS LIKE PORCHES, DECKS+SHEDS.



TALL POSTS WITH PIER FOOTINGS

***GENERAL DESCRIPTION_**SAME POST AND BEAM IDEA AS ABOVE EXCEPT USING TALL WOOD POSTS FOR THE VERTICAL SUPPORT, INSTEAD OF SHORTER MASONRY PIERS. WOOD POSTS ALLOW A PRETTY SIGNIFICANT VERTICAL HT AS LONG AS THEY ARE BRACED SO THEY DON'T WOBBLE. BEAMS SIT ATOP THE POSTS, OR ARE NOTCHED INTO THE TOPS OF THE POSTS, AND THE FLOOR FRAMING (NOT SHOWN) RESTS ABOVE.
***THIS ILLUSTRATION_**SUGGESTS A 'STRUCTURAL GRID' OF POST AND BEAM SUPPORTING THE FLOOR ABOVE. IT IS ALSO SHOWING MASONRY PIERSTHAT EXTEND ABOVE GRADE. THESE ELEVATE THE ROT SUSCEPTIBLE WOOD POSTS ABOVE GRADE. PROPERLY TREATED OR SELECTED WOOD THAT IS GUARANTEED 'NON ROT' CAN EXTEND INTO THE EARTH AND SIT DIRECTLY ON THE FOOTINGS.
***POSSIBLE SITE CONDITIONS_**ANY SLOPED SITE IS A CANDIDATE, AS THE FOOTINGS CAN BE SET AT ANY HEIGHT, AND THE POSTS ANY HEIGHT. ONE MAY FIND HOMES SUPPORTED ON VERY STEEP SITES, AND IN SOME COASTAL AREAS WHERE LIVING SPACE NEEDS TO BE HIGHER OFF THE GOUND PLANE. THIS CONSTRUCTION IS ALSO COMMONLY SEEN IN DECK AND PORCH CONSTRUCTION CONTIGUOUS WITH CONVENTIONALLY CONSTRUCTED HOMES.



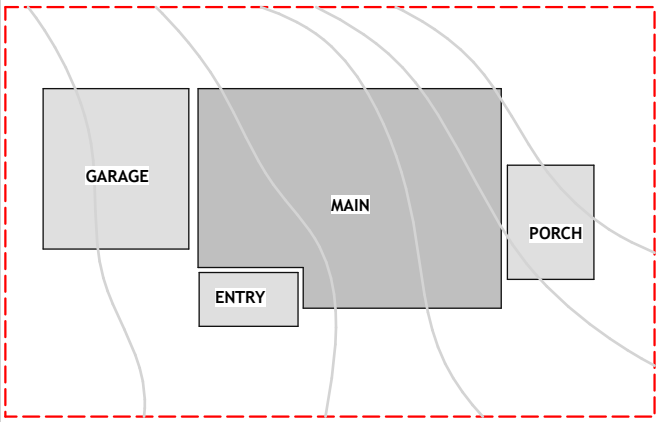
COMPOSITE PIER FOUNDATION

***GENERAL DESCRIPTION_**BECAUSE A VERTICAL SUPORT IS A VERTICAL SUPPORT- THEY DON'T HAVE TO ALL MATCH. THEY DO WANT TO OFFER CONSISTENT SUPPORT, SO A TOTAL BUILDING LOAD IS BEING 'EQUALLY' SUPPORTED.
***THIS ILLUSTRATION_**SUGGESTS A PARTIAL MASONRY CRAWL SPACE WITH TALL MASONRY PIERS. THE CRAWL SPACE CONSTRUCTION WOULD BE ON THE ENTRY SIDE WHERE GRADE IS CLOSER TO THE MAIN FLOOR ELEVATION, AND THE SUPPORT PIERS ON THE STEEP SIDE. THIS IS NOT A CONVENTIONAL SYSTEM, BUT ONE CREATED FOR A SITE CONDITION.
***SITE CONDITIONS_**STEEP SLOPE. THE IDEA IS RESTRICTING THE AMOUNT OF CONSTRUCTION ON THE LOW MORE DIFFICULT SIDE. IF COMPARING THIS APPROACH TO A FULL HT PERIMETER WALL, A SIGNIFICANT DIFFERENCE IN EXCAVATION AND MATERIALS IS REQUIRED.

FRICTION PILES

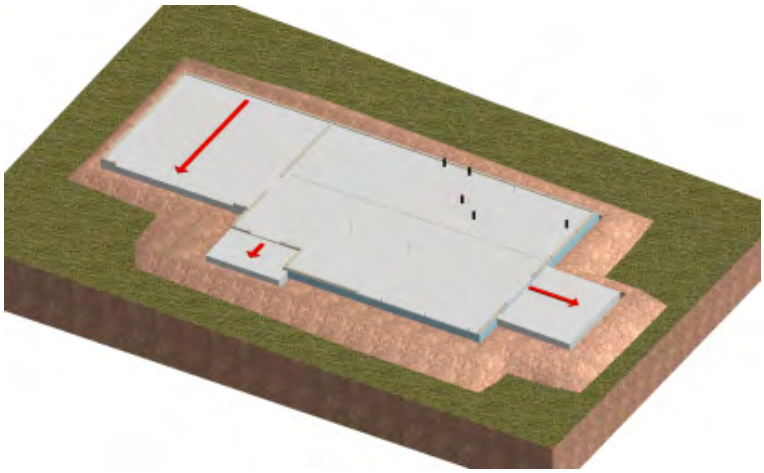
***GENERAL DESCRIPTION_**WITH THE EXCEPTION OF DECK CONSTRUCTION THIS CONDITION IS OUTSIDE THE MAINSTREAM OF RESIDENTIAL CONSTRUCTION EXCEPT IN HIGH WIND AND COASTAL AREAS, AND MAYBE SOME OTHER VERY SPECIAL SITE CONDITIONS.
***THIS ILLUSTRATION_**SHOWS A SIMPLE GRID SYSTEM WITH PILE SUPPORT MEMBERS AND BEAMS SITTING A TOP OF NOTCHED INTO THE POSTS. THE DISTINCTION FROM THE 3 METHODS ABOVE IS THE PILE SUPPORT- WHICH HAS NO FOOTING. THE PILE IS DEEPER IN THE GROUND AND UTILIZES THE MECHANICS OF FRICTION AS THE SUPPORT VEHICLE.
***THE PILE IDEA_**A PILE IS A POST. IT IS PLACED IN A VERTICAL HOLE IN THE GROUND THAT IS DUG OR DRILLED, OR IS DRIVEN (HAMMERED) INTO THE GROUND. THE DEEPER IT GOES THE MORE FRICTION IS REALIZED THE MORE SUPPORT IS GENERATED. THE PILE OR POST IS 'LOCKED' INTO THE GROUND. THE MANY VARIATIONS OF PILE TYPE EXIST BECAUSE MOTHER NATURE'S SOIL VARYING SOIL CONDITIONS.

INTRODUCING COMPOSITE FOUNDATIONS



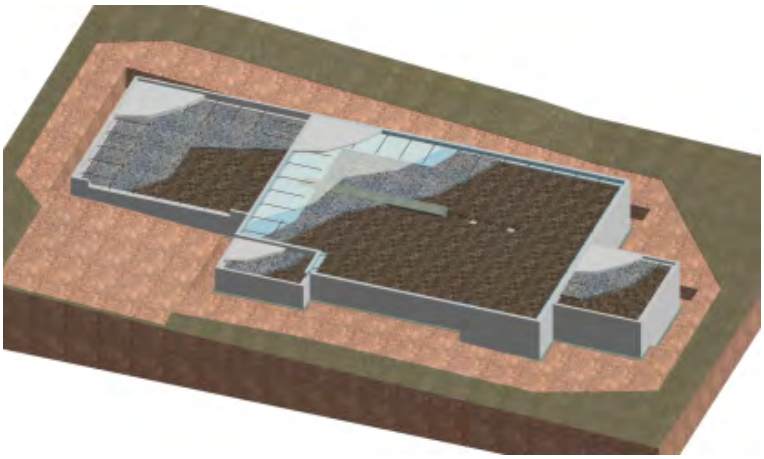
COMPOSITE FOUNDATION

***PRIME FOUNDATION**_DISCUSSIONS TO DATE HAVE CONCENTRATED ON THE PRIME FOUNDATION-THE FOUNDATION UNDER THE PRIMARY HOME/LIVING AREAS. THIS PAGE INFORMS THAT MANY/MOST HOMES WILL REQUIRE APPROPRIATE FOUNDATIONS UNDER SEVERAL DIFFERENT COMPONENTS. REFERED HERE SIMPLY AS A COMPOSITE FOUNDATION.
***THE COMPONENTS**_THE HOUSE PRIME COMPONENT MAY OR MAY NOT SHARE THE SAME FOUNDATION THINKING AS THE GARAGE, AND PORCHES. THE ONLY CONSISTENTLY TREATED COMPONENT IS THE GARAGE, WHICH IS USUALLY A SLAB ON GRADE CONSTRUCTION ALBEIT WITH DIFFERENT 'DETAILING' DEPENDING ON THE HOUSE FOUNDATION AND ITS ACTUAL SITE ELEVATION. CAPTIONS BELOW MERELY LIST THE FOUNDATION TYPES SELECTED FOR THESE SAMPLE PROJECTS. THE CONSTRUCTION GUIDE CHAPTER (c1) OFFER FURTHER DETAIL FOR ALL THESE CONDITIONS.



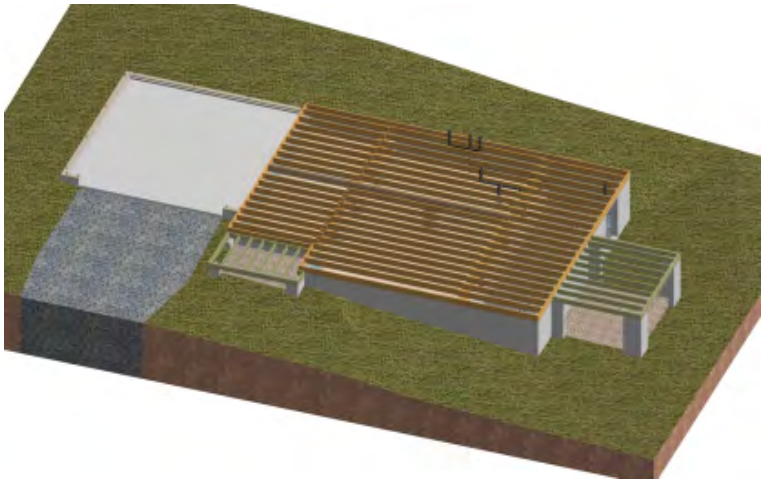
SLAB ON GRADE WITH INTEGRAL FOUNDATION

***GARAGE**_SLAB WITH INTEGRAL FOUNDATION
***ENTRY PORCH**_SLAB WITH INTEGRAL FOUNDATION
***SIDE PORCH**_SLAB WITH INTEGRAL FOUNDATION..
NOTE THIS ILLUSTRATION SHOWS THE BUILDING PAD BEING LIFTED/LEVELED BEFORE FOUNDATION EXCAVATION+PREP.



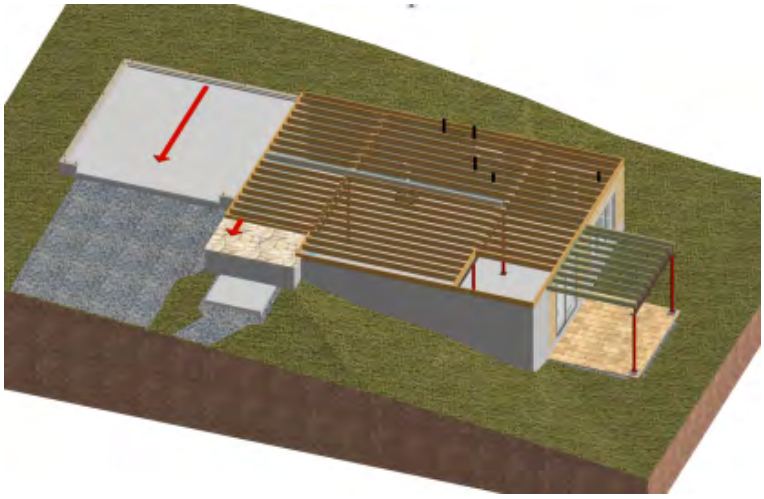
SLAB ON GRADE WITH STEM WALL -PRIME FOUNDATION

***GARAGE**_SLAB WITH STEM WALL
***ENTRY PORCH**_SLAB WITH STEM WALL.
***SIDE PORCH**_SLAB WITH STEM WALL.. NOTE THIS ILLUSTRATION IS CERTAINLY PUSHING THE LIMIT ON FILL. A STRUCTURED SLAB MAY BE A MORE ECONOMICAL SOLUTION HERE



CRAWL SPACE WITH STORAGE -PRIME FOUNDATION

***GARAGE**_SLAB WITH STEM WALL
***ENTRY PORCH**_MASONRY PIERS WITH BEAM AND JOISTS
***SIDE PORCH**_MASONRY PIERS WITH BEAM AND JOISTS



WALKOUT BASEMENT -PRIME FOUNDATION

***GARAGE**_SLAB WITH STEM WALL
***ENTRY PORCH**_SLAB WITH STEM WALL
***SIDE PORCH**_STEEL POSTS, WD BEAM, AND JOISTS