CMAS – INTRO TO LAND AND BUILDING IN THE FOOTHILLS

MOUNTAIN METRO ASSOCIATION OF REALTORS

CONTINUING EDUCATION COURSE



DEAN DALVIT, AIA, PE & BRIAN WELCH, PE



- ENGINEERING AND ARCHITECTURAL EXPERTISE ACROSS MULTIPLE FRONT RANGE COUNTIES
- SPECIALIZE IN LAND DEVELOPMENT
- SINGLE FAMILY, MULTI FAMILY, SUBDIVISIONS, AND COMMERCIAL DEVELOPMENT
- TEAM OF ENGINEERS AND ARCHITECTS INCLUDING CIVIL, STRUCTURAL, MECHANICAL, ELECTRICAL, AND PLUMBING TO TACKLE PROJECTS FROM START TO FINISH

TODAY'S TOPIC - FROM DREAMING TO BUILDING



LAND USE AND DESIGN; CIVIL ENGINEERING

- 1. THE PROPERTY SEARCH AND WISH LIST
- 2. LOCATIONAL CHALLENGES
- 3. BUYING
- 4. DESIGN THROUGH PERMITING
- 5. BUILDING



PROPERTY SEARCH



What type of lot is your client looking for?

Every client is different, the more requirements that they have, the more challenging and costly it will likely be

Explain to your client that the iconic geography of Colorado presents many building challenges. Mountains to our West are great but it makes building very challenging due to topography

The more complex the lot, the more important the due diligence

HELP SET EXPECTATIONS EARLY AND OFTEN!



PROPERTY SEARCH



- 1. THE PROPERTY SEARCH AND WISH LIST
 - LOCATION
 - REMOTE OR EASILY ACCESSIBLE
 - PAVED OR GRAVEL
 - TERRAIN
 - 8% DRIVEWAY WILL SET HOUSE ELEVATION
 - ~150' LENGTH BEFORE EMERGENCY TURN AROUNDS.
 - GARAGE ACCESS CAN BE 12' ABOVE ROAD
 - TYPICAL MOUNTAIN LOT VARIES BETWEEN 15-35%.
 - UTILITIES
 - VERIFY WELL/WATER DISTRICT AND AVAILABLE TAPS
 - VERIFY SEPTIC/SEWER DISTRICT AND SPECIAL DISTRICTS

- DRY UTILITIES (ELECTRIC, GAS, FIBER)
- VIEWS
 - MOUNTAIN VIEWS
 - ELEVATION
 - ROCK OUTCROPPINGS
 - OTHER BUILDABLE LOTS
- EXPOSURE
 - SOUTH & WEST VIEWS
 - NORTH & EAST VIEWS

CASE STUDY – FOX RIDGE





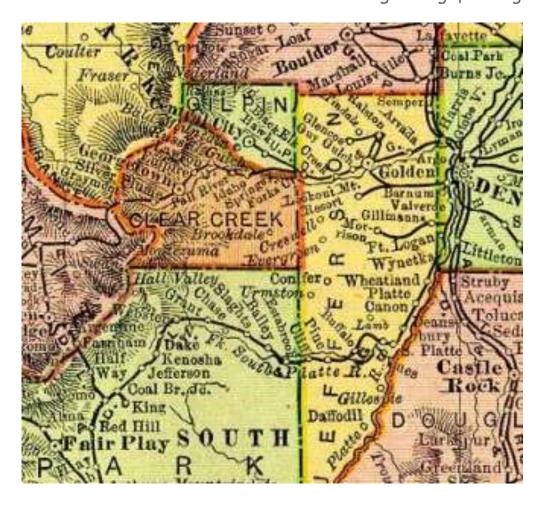
TOTAL COST OF SITE

LOCATIONAL CHALLENGES



architecture: engineering: planning

- 2. NOW YOU KNOW WHAT THEY WANT, BUT WHERE?
 - LOCATIONAL CHALLENGES
 - COUNTY/CITY
 - ZONING
 - HOA
 - REGIONAL DISTRICTS
 - PROPERTY BACKGROUND



COUNTY MOUNTAIN LIVING CHECKLISTS

- MAKE SURE PROPERTY IS A LEGAL PARCEL
- ZONING, REGS, LAND USE PLANS, HOA
- PROOF OF ACCESS
- BUILDING PERMIT REQUIREMENTS
- CONSTRAINTS TO DEVELOPMENT
 - EASEMENTS, MINERAL/WATER RIGHTS, ABANDONED MINES, FLOODPLAINS/GEOLOGIC HAZARDS
- WATER AND SANITATION
- PUBLIC SERVICES AND UTILITIES
- LIVING CONDITIONS
 - HOA, SCHOOLS, CLIMATE, RECREATION
- WILDLIFE CONSTRAINTS
 - PETS, PLANTINGS
- WILDFIRE DANGER



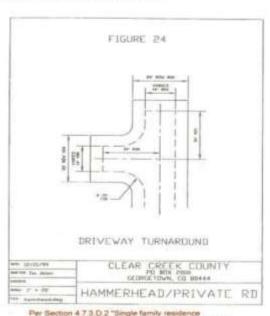


EXAMPLE COUNTY DESIGN STANDARD DOCUMENTS



CLEAR CREEK COUNTY

• UNLESS OTHERWISE REQUIRED BY THE SITE DEVELOPMENT COORDINATOR, ALL NEW DRIVEWAYS GREATER THAN 100 FEET IN LENGTH SHALL BE ENGINEERED BY A LICENSED COLORADO ENGINEER THAT MEETS ENGINEERED GRADING REQUIRMENTS OUTLINED IN SECTION X107.4 OF THE 2009 IRC AND THE 2009 IBC.



driveways in excess of 100 feet in length shall provide an adequate turnaround for emergency equipment to

within 50 feet of the dwelling unit."

All driveways shall have a minimum driveway surface width of 12 feet if the driveway is less than 200 feet long or 14 feet if the driveway is equal to or greater than 200 feet long. These widths do not include additional width required for proper drainage.

All horizontal curves shall have a minimum curve radii of 30 feet measured from the centerline of the driveway to the center point of the curve.

• All driveways shall end in an approved turnaround area with a minimum 13.75 foot radius.

11-23-15

PARK COUNTY

Section 7-204 Driveways

- A. Driveways shall serve no more than two (4) residential Lots. Driveways shall not provide service or access to commercial or industrial zoned property unless approved by the Planning Department.
- B. All driveways serving or located on more than one Lot shall be created by written and recorded easement, plat, deed, or other legally accepted documentation, which ensures perpetual and permanent access and which demonstrates consent and approval of all fee owners of property upon and through which the driveway is located.
- C. Driveways shall meet the following requirements:

	Minimum Width of Traveled Surface	Minimum Centerline Curve Radius	Maximum Linear Distance from Access	Maximum % of Grade Within First 50 Feet from Road	Maximum % of Grade After the First 50 Feet From Road
Driveway serving one or two single family residential lots	16 feet	30 feet	Per Zone District	1st 10 feet <2%, then 10%	12%
Driveway serving three or four single family residential lots	20 feet	40 feet	1000 feet	1st 10 feet <2%, then 10%	12%

GENERAL COUNTY REQUIREMENTS



County	Max Driveway Slope	Minimum Driveway Width	Driveway Radius	Emergency Turnaround	Max Grade Slope	Permits Reqd.	Retaining Wall Permit	GESC Req	Drainage Req	Defensible Space Requirement
Jefferson	10% (12% if South facing)	10' Drive - 2' Shoulders (14' Total)	<u>30'</u>	Required After 150'	<u>50%</u>	NOI Grading	<u> f > 36"</u>	>5000 sf disturbance or >20% grade	Mountain Porous Landscape Device	<u>Yes</u>
Clear Creek	10% (12% with permission)	<200' = 12' total >200' = 14' Total	<u>30'</u>	<u>After 100'</u>	<u>100%</u>	Driveway and Excavation Permit	<u>lf > 48"</u>	> 2500CY Earthwork or >20,000SF Disturbance	Infiltration System if roof > 1750 SF	<u>Yes</u>
Park	<2% for 10' then 10% (after 50' 12%)	16'	30'	N/A - If longer than 200' need all weather surface	Per Geotech	Driveway Cut Permit	If > 48"	N/A	N/A	Voluntary (Insurance may require)
Gilpin	12%	12	30'	After 150'	Per Geotech	Access Permit (First 20')	If > 48"	N/A	Can't increase runoff more than 10%	Voluntary (Insurance may require)

LOCATIONAL CHALLENGES



- ZONING, HOA, AND LOT RESTRICTIONS
 - FIRST PART OF DUE DILIGENCE BEFORE STARTING DESIGN
 - CAN RESTRICT MANY THINGS.
 - ENTRANCE LOCATION
 - STRUCTURE LOCATION SETBACKS
 - STRUCTURE SIZE AND TYPE
 - ARCHITECTURE MATERIALS
 - FUTURE POTENTIAL FOR GUEST HOMES OR ADDITIONAL STRUCTURES

- UTILITIES AND LOCAL SERVICES
 - WATER DISTRICTS
 - LIMITED TAPS
 - TAP AND SERVICES COSTS
 - WATER RIGHTS AND FEES
 - SEWER DISTRICTS
 - SEPTIC AND COMMUNITY SEWER
 - ADVANCED TREATMENT DISTRICTS
 - SEPTIC LOCATIONS AND PUMPING

CASE STUDY – SILVER ROCK MANOR





BUYING



3. BUYING

- THIS IS YOUR DEAL
 - AS DESIGN PROFESSIONALS, WE LOOK FOR A LIST OF ITEMS PRIOR TO DESIGN, IT WILL SAVE THE BUYER TIME AND EXPENSE TO SPEND MORE ON A PREPARED LOT. HAVING AN ENGINEER VET OUT POSSIBLILITIES BEFORE SELLING OR PRIOR TO BUYING IS A VALUABLE INVESTMENT.
 - MOUNTAIN HOME DESIGN WILL REQUIRE A SURVEY, PROVIDING ONE WHILE SELLING OR HAVING ONE BEFORE BUYING IS HIGHLY RECOMMENDED.
 - MOST STRUCTURAL ENGINEERS WILL REQUIRE A GEOTECHNICAL SOILS REPORT PRIOR TO DESIGN

YOU CAN ADD VALUE ON THE BUYER OR THE SELLER SIDE OF THE DEAL!

- RESEARCH AND INVESTMENT WILL RESOLVE MANY OF THE ISSUES WE PRESENT TODAY, ENGINEERS ARE OFTEN WILLING TO VISIT THESE LOTS TO HELP STREAMLINE THE PROCESS AND ELIMINATE POTENTIAL ISSUES.
 - ACCESS EASEMENTS, RIGHT OF WAY, PLAT, RECORDINGS
 - HOA RESTRICTIONS AND COVENANTS
 - WATER AND SEWER AVAILABILITY

BUILDING



LET'S TALK ABOUT SQUARE FOOTAGE!





DESIGN THROUGH PERMITTING



4. The permitting process for large homes is now treated similarly to that of retail or commercial developments; standards and requirements are very thorough, long, and tough. Long driveways, existing private roads, and extensive grading can all cause tens of thousands of dollars of improvements.

- PERMIT PROCESS
 - DEFENSIBLE SPACE
 - LAND DISTURBANCE PERMIT
 - TERMS AND ACRONYMS
 - GRADING REQUIREMENTS
 - STORMWATER DESIGN
 - EROSION CONTROL
 - DRIVEWAY DESIGN
 - RETAINING WALL DESIGN
 - ACCESS PERMIT
 - BUILDING PERMIT
 - WELL PERMIT
 - SEPTIC PERMIT

PROFESSIONAL DISCIPLINES AND SCOPE

Estudio architecture: engineering: planning

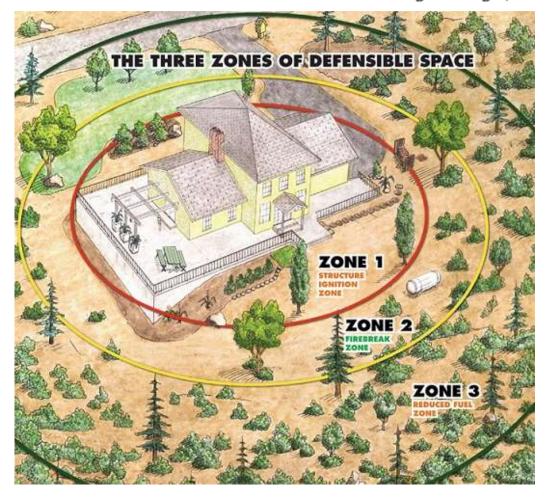
- CIVIL ENGINEERS TOPICS COVERED TODAY
- ARCHITECTS
 - PROGRAMMING AND DESIGN OF RESIDENCE
- SURVEYORS
 - SURVEY OF LOT, TOPOGRAPHY, RESEARCH OF EASEMENTS OR OTHER ENCUMBERANCES
- GEOTECHNICAL ENGINEERS
 - SOIL TESTING DETERMINES TYPE OF FOUNDATION TO BE USED
 - OTHER ISSUES BEDROCK LOCATION, HIGH GROUNDWATER
- STRUCTURAL ENGINEERS
 - DETERMINE STRUCTURAL COMPONENTS NEEDED TO BUILDING ARCHITECTS DESIGN
 - DESIGN RETAINING WALLS NEEDED
- MECHANICAL, ELECTRICAL, PLUMBING (MEP) ENGINEERS
 - HVAC (HEATING, VENTALATION, AIR CONDITIONS)
- CONTRACTORS
 - OBTAINS PERMITS USING APPROVED ENGINEERING PLANS FROM APPROPRIATE AUTHORITIES
 - CONSTRUCTS APPROVED DESIGN

DEFENSIBLE SPACE



architecture : engineering : planning

- INSURANCE REQUIREMENTS
- APPLIES TO WOODED LOCATIONS
- DENSITY AND DISTANCE FROM STRUCTURES TAKEN INTO CONSIDERATION



CASE STUDY- RED FOX RUN



architecture : engineering : planning





DO I NEED A GRADING PERMIT?



Part 1

Will the project involve?

- A.

 Yes No Disturbance of more than 5,000 square feet of area, including, but not limited to stripping of vegetation?
- B. Yes No Grading of individual lots and/or tracts and/or parcels under the same ownership, and the total of all grading on all lots is more than 5,000 square feet of area? See Section 16.B.3.a of the Zoning Resolution.
- C. Tes No Land disturbed in accordance with an approved Site Plan Application for drilling and production of oil and gas wells.
- D. Yes No Working within sensitive areas which include: North and South Table Mountain, Green Mountain, the Hogback, existing slopes greater than 20%, geologic or floodplain overlay zones, disturbance of more than one acre?
- E. Yes No Land Disturbance Area exceeds one Acre.

Part 2

If you answered **NO** to *all* of the questions in Part 1, you **do not** need a Land Disturbance Permit. **However, you still need to comply with the Grading and Erosion Control Performance Standards listed on page 2 of this form.** If you answered **YES** to either A, B, or C, but **NO** to D and E, a Notice of Intent is required. If you answered **YES** to either A, B, or C, and **YES** to D or E, a full Grading Permit is required. If you answered **YES** to *any* of the questions in Part 1, please answer the following exemption questions:

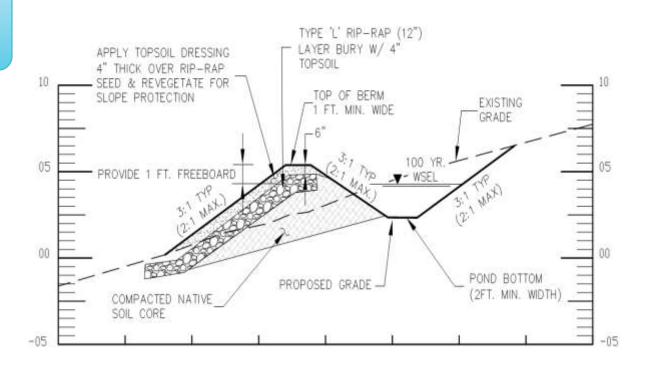
CASE STUDY- MOUNTAIN MODERN RESIDENCE





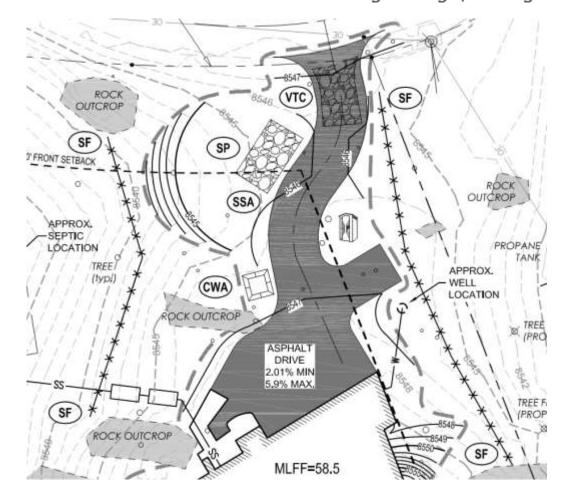


- MPLD MOUNTAIN POROUS LANDSCAPE DEVICE
- GESC GRADING, EROSION, AND SEDIMENT CONTROL PLAN
- SLOPE (3H:1V) VS. GRADE (%) --- 3:1 = 33%
- BMP BEST MANAGEMENT PRACTICES
- SWMP STORM WATER MANAGEMENT PLAN
- NOI NOTICE OF INTENT
- LOMA & LOMA-F --- LETTER OF MAP AMENDMENT - FILL (FEMA RELATED)



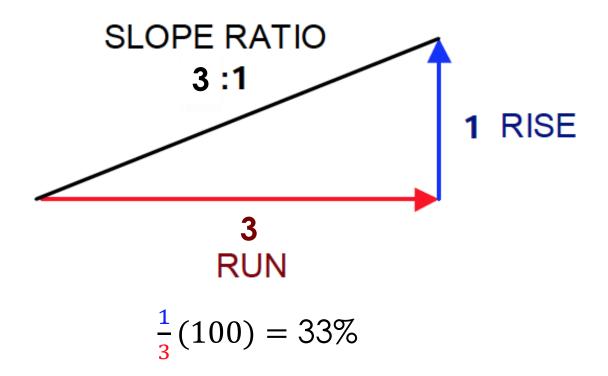
- E/studio
- architecture: engineering: planning

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Table 2-1. Primary, Secondary and Incidental Treatment Process Provided by BMPs

	Hydrologic Processes			Treatment Processes					
	Peak	Vo	olume	P	hysical		Chemical	Biological	
UDFCD BMP	Flow Attenuation	Infiltration	Evapo- transpiration	Sedimentation	Filtration	Straining	Adsorption/ Absorption	Biological Uptake	
Grass Swale	1	s	1	S	S	P	s	S	
Grass Buffer	1	s	1	S	S	P	S	s	
Constructed Wetland Channel	1	N/A	P	P	S	P	s	P	
Green Roof	P	s	P	N/A	P	N/A	1	P	
Permeable Pavement Systems	Р	Р	N/A	S	Р	N/A	N/A	N/A	
Bioretention	P	P	S	P	P	s	S¹	P	
Extended Detention Basin	P	1	1	P	N/A	s	S	1	
Sand Filter	Р	P	1	P	P	N/A	S¹	N/A	
Constructed Wetland Pond	P	1	P	Р	S	s	Р	P	
Retention Pond	P	1	P	P	N/A	N/A	Р	s	
Underground BMPs	Variable	N/A	N/A	Variable	Variable	Variable	Variable	N/A	

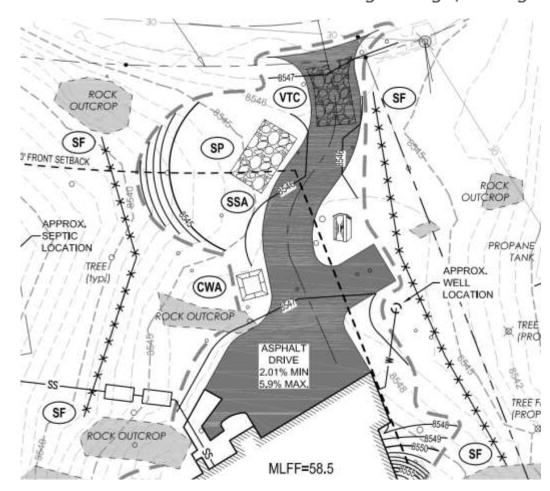
P = Primary; S = Secondary, I = Incidental; N/A = Not Applicable

Depending on media



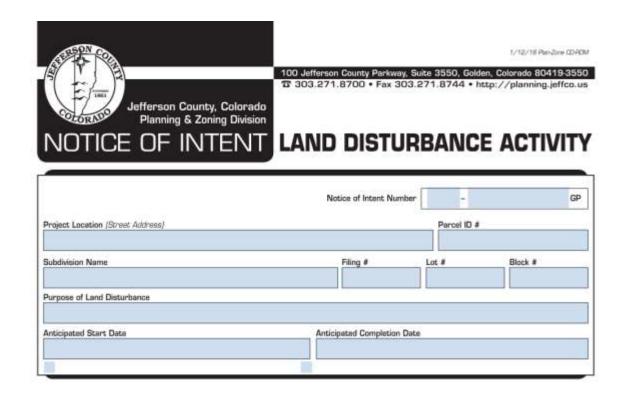
architecture: engineering: planning

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architecture: engineering: planning

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- LIMITS THE MAXIMUM SLOPE OF THE FINAL SURFACE AFTER CONSTRUCTION
 - HITTING ROCK MAY ALLOW STEEPER SLOPES –
 DETERMINED BY GEOTECHNICAL ENGINEER
- AMOUNT OF DIRT MOVED MAY TRIGGER BMPs OR DIFFERENT PERMITS.
- ROOF AREA DETERMINES NEED FOR MPLDs (<u>JEFFCO</u>, <u>CLEAR CREEK</u>)
- AREA OF DISTRUBANCE DETERMINES NEED FOR ADDITIONAL BMP MEASURES



CASE STUDY-BUCHANAN DRIVE







- LIMITS THE MAXIMUM SLOPE OF THE FINAL SURFACE AFTER CONSTRUCTION
 - HITTING ROCK MAY ALLOW STEEPER SLOPES DETERMINED BY GEOTECHNICAL ENGINEER
- AMOUNT OF DIRT MOVED MAY TRIGGER BMPs OR DIFFERENT PERMITS.
- ROOF AREA DETERMINES NEED FOR MPLDs (<u>JEFFCO</u>, <u>CLEAR CREEK</u>)
- AREA OF DISTRUBANCE DETERMINES NEED FOR ADDITIONAL BMP MEASURES

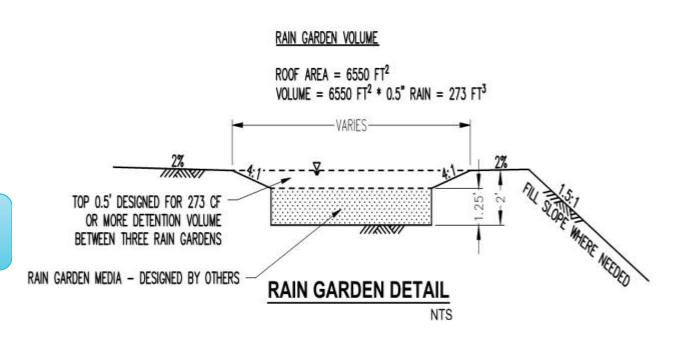
UNADJUSTED E	EARTHWORK VOLUMES
CUT	4100 C.Y.
FILL	4100 C.Y.
NET	0 C.Y. (FILL)

AREAS				
IMPERVIOUSNESS 13,682 S.F.				
DISTURBED AREA	42,505 S.F. (0.97 AC.)			

OVER 1 ACRE OF DISTURBANCE

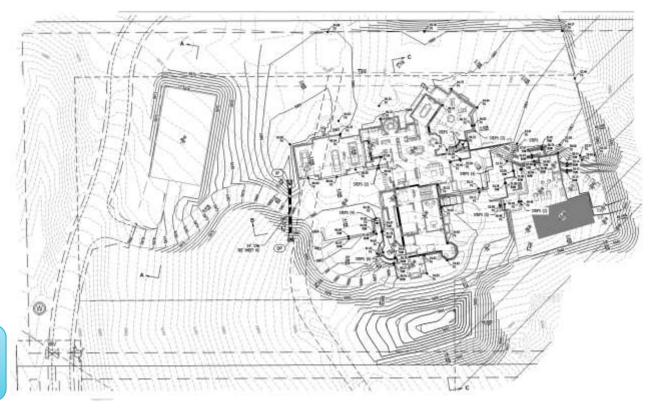


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- AMOUNT OF DIRT MOVED MAY TRIGGER BMPs OR DIFFERENT PERMITS.
- IMPERVIOUS AREA DETERMINES NEED FOR MPLDs (<u>JEFFCO</u>, <u>CLEAR CREEK</u>)
- AREA OF DISTRUBANCE DETERMINES NEED FOR ADDITIONAL BMP MEASURES





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 - HITTING ROCK MAY ALLOW STEEPER SLOPES DETERMINED BY GEOTECHNICAL ENGINEER
- AMOUNT OF DIRT MOVED MAY TRIGGER BMPs OR DIFFERENT PERMITS.
- ROOF AREA DETERMINES NEED FOR MPLDs (<u>JEFFCO</u>, <u>CLEAR CREEK</u>)
- AREA OF DISTRUBANCE DETERMINES NEED FOR ADDITIONAL BMP MEASURES



OVER 1 ACRE OF DISTURBANCE – TRIGGERED DRAINAGE REPORT AND LARGER DETENTION BASIN

CASE STUDY – DIAMOND BUILDING

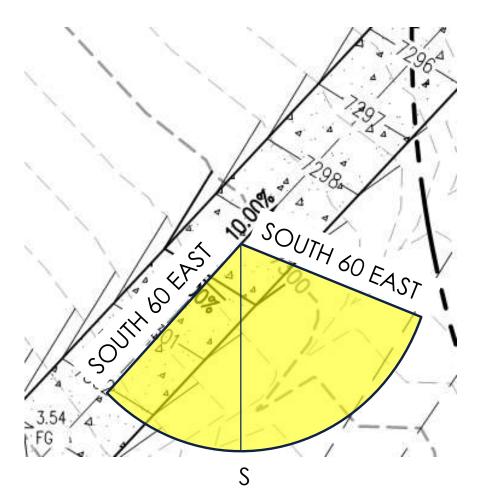




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- MAXIMUM SLOPE
 - ANGLE OF EXPOSURE
- MINIMUM WIDTH (SHOULDER REQUIREMENTS)
 - CLEAR SPACE
- MINIMUM RADIUS
- MAXIMUM LENGTH
 - EMERGENCY TURNAROUNDS
 - PULLOUTS
 - SPRINKLER SYSTEMS



CASE STUDY – KERR GULCH



architecture : engineering : planning





- MAXIMUM SLOPE
 - ANGLE OF EXPOSURE
- MINIMUM WIDTH (SHOULDER REQUIREMENTS)
 - CLEAR SPACE
- MINIMUM RADIUS
- MAXIMUM LENGTH
 - EMERGENCY TURNAROUNDS
 - PULLOUTS
 - SPRINKLER SYSTEMS

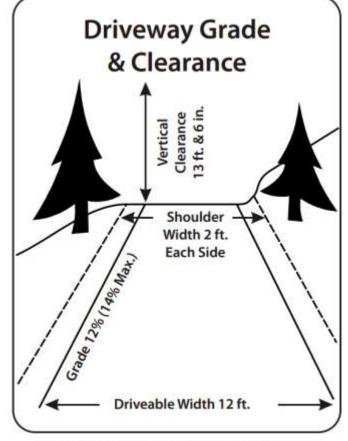
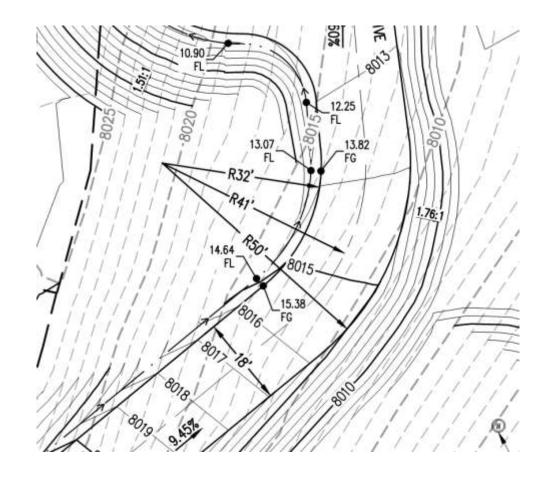


Figure 1: Driveway Grade & Clearance.

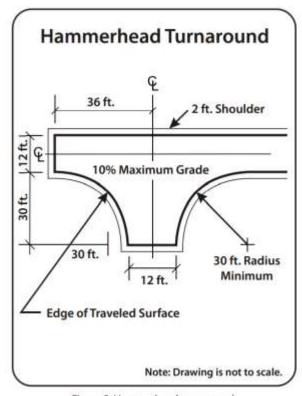


- MAXIMUM SLOPE
 - ANGLE OF EXPOSURE
- MINIMUM WIDTH (SHOULDER REQUIREMENTS)
 - CLEAR SPACE
- MINIMUM RADIUS
 - 30' RADIUS, 50' WITH GREATER SLOPES
- MAXIMUM LENGTH
 - EMERGENCY TURNAROUNDS
 - PULLOUTS
 - SPRINKLER SYSTEMS





- MAXIMUM SLOPE
 - ANGLE OF EXPOSURE
- MINIMUM WIDTH (SHOULDER REQUIREMENTS)
 - CLEAR SPACE
- MINIMUM RADIUS
- MAXIMUM LENGTH
 - FIRE REVIEW OF ALL DRIVEWAYS, REGARDLESS OF LENGTH
 - EMERGENCY TURNAROUNDS REQUIRED OVER 150' DRIVEWAY
 - PULLOUTS
 - SPRINKLER SYSTEMS





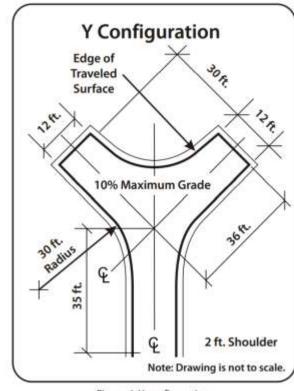
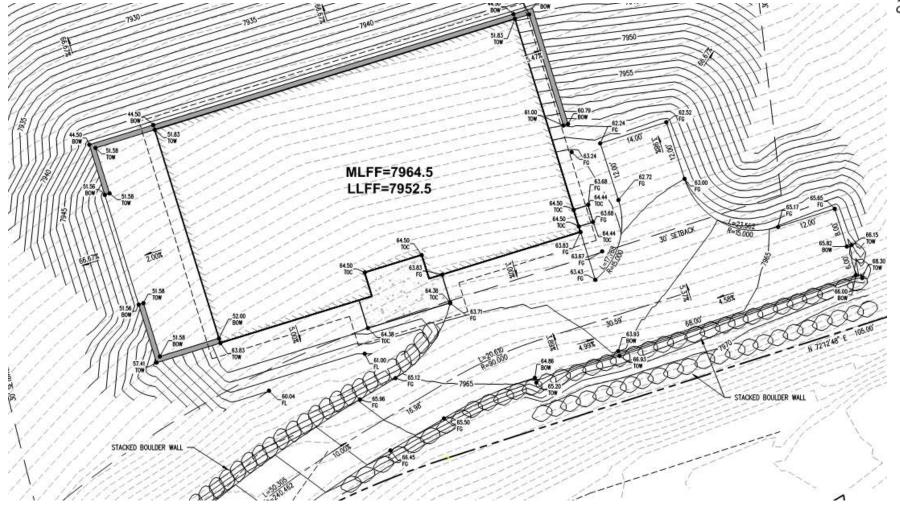


Figure 4: Y configuration.

EXAMPLE OF TURNAROUND





CASE STUDY – 350 PACKSADDLE

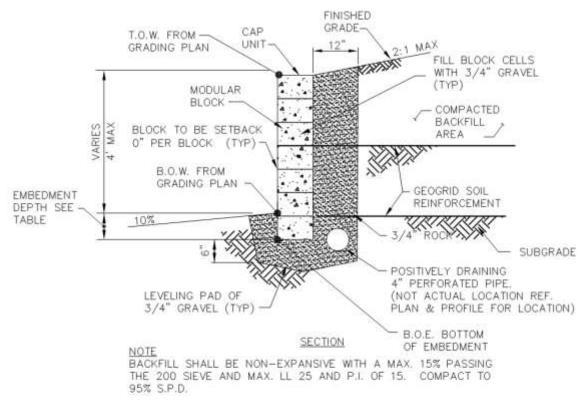




RETAINING WALLS

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- EXPOSURE LOCATION, APPEARANCE, MATERIAL, AND COST
- TYPES OF WALLS
 - STRUCTURAL
 >3-4' EXPOSED WALL
 - NON-STRUCTURAL <3-4' EXPOSED WALL



TYPICAL WALL SECTION

RETAINING WALLS

E/studio

architecture : engineering : planning

- TYPES OF WALLS
 - BOULDER
 - LANDSCAPE BRICK
 - CONCRETE
 - SOIL NAIL/SHOTCRETE
 - DRYSTACK OR MORTARED STONE
 - TIMBER/RAILROAD TIES
 - GABION BASKETS



CASE STUDY – EVERGREEN TERRACES





WELLS AND SEPTIC SYSTEMS



- WATER WELLS
 - PARCEL SIZE
- SEPTIC SYSTEMS
 - DISTANCE FROM STRUCTURES
 - DISTANCE FROM WATER FEATURES
 - DISTANCE FROM WELLS

- A. Ordinary household use inside one single-family dwelling (NO outside water use allowed): Generally, this is all that can be approved on parcels less than 35 acres.
- B. Ordinary household use in 1 to 3 single-family dwellings, irrigation of up to one acre of home garden and lawn, and watering of domestic animals: Generally, permits can be approved on parcels of land of 35 or more acres.

WELLS AND SEPTIC SYSTEMS



- Table A-1 MINIMUM HORIZONTAL DISTANCES IN FEET BETWEEN COMPONENTS OF AN OWTS AND WATER, PHYSICAL AND HEALTH IMPACT FEATURES
- Wells, potable 200² 200° 50¹ 100 50 200² (100)5,6 (100)5 springs, suction lines 501 501 100² 100 50 100^{2} 100² Springs Potable water 101 101 25¹ 101 25¹ 101 50¹ 101 supply lines 25 25¹ 25 25 25 25 50 water cisterns Dwelling or 20 15 15 25 125 occupied building Property lines, piped or 101 10 NA 10 10 lined irrigation ditch Subsurface drain, intermittent irrigation 101 25 10 25 10 25 0 lateral, drywell or storm water infiltration structure Lake, watercourse, 50² 25² irrigation ditch, stream, 50¹ 50 25 25 100 $(25)^3$ 25 Dry gulch, cut bank, fill 101 10 10 25 15 10 area (from crest) (10)4

- WATER WELLS
 - DISTANCE FROM STRUCTURE
 - DISTANCE FROM WATER FEATURES
- SEPTIC SYSTEMS
 - DISTANCE FROM STRUCTURES
 - DISTANCE FROM WATER FEATURES
 - DISTANCE FROM WELLS

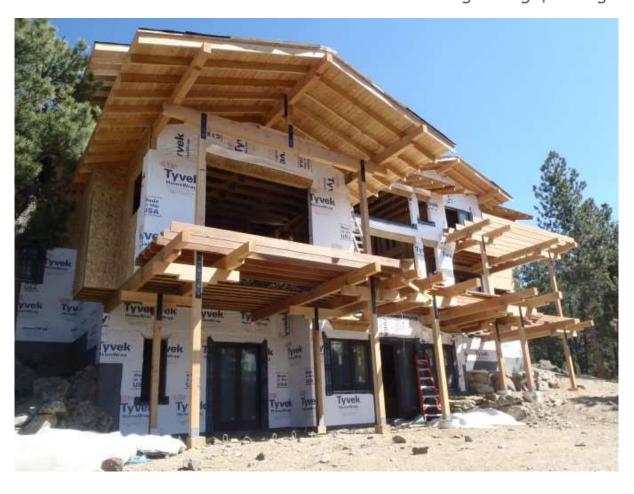
BUILDING



architecture : engineering : planning

5. BUILDING

- SITE CONDITIONS DRIVE VARIATION AND ADJUSTMENTS TO PLANS
- CONTINUOUS COMMUNICATION WITH OWNER, CONTRACTOR, AND DESIGNERS
- COUNTY REQUIRED SITE CERTIFICATION POST CONSTRUCTION



QUESTIONS & ANSWERS















