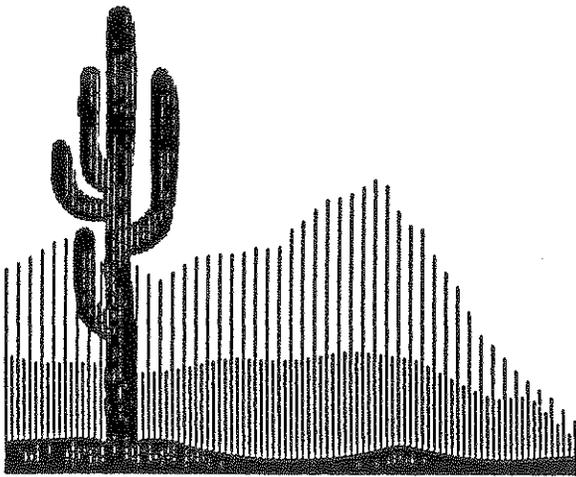


GRADING DESIGN MANUAL

**Ordinance 1990-61
Adopted June 5, 1990 by
Pima County Board of Supervisors**



CONTENTS

TABLE OF CONTENTS

001: Introduction.

- | | |
|-----------------|-----|
| A. Purpose | 1 |
| B. Introduction | 1 |
| C. Users Guide | 1-5 |

002: Recommended Type 2 Site Inventory of Existing Conditions.

- | | |
|--|---|
| A. Scope | 6 |
| B. Inventory and Assessment of Existing Conditions | 6 |
| C. Map Composite | 7 |

003: Grading Design.

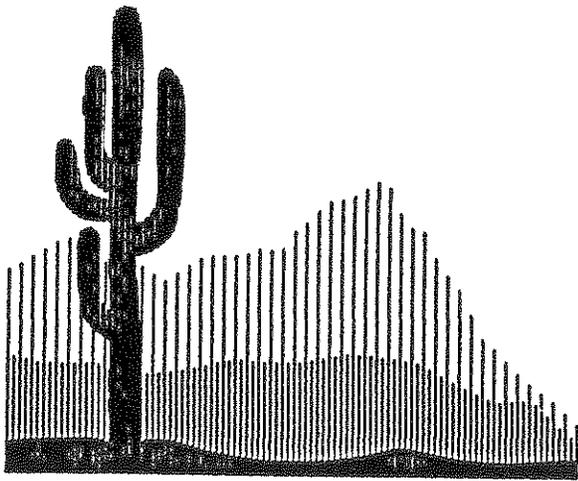
- | | |
|------------------------|-------|
| A. General Guidelines | 8-12 |
| B. Specific Techniques | 13-20 |

004: Grading Construction.

- | | |
|------------------------------------|-------|
| A. Clearing, Brushing and Grubbing | 21 |
| B. Cut or Fill Slopes | 21-22 |
| C. Cuts | 23 |
| D. Fill | 23-24 |
| E. Terracing | 24 |
| F. Stabilization | 24 |
| G. Setbacks | 24-26 |
| H. Roadway Construction | 26 |

005: Grading Mitigation.

- | | |
|--|-------|
| A. Dust Control | 27 |
| B. Revegetation | 27-29 |
| C. Erosion and Drainage Control | 29 |
| D. Stabilization | 29-33 |
| E. Surface Drainage Control Structures | 33-36 |
| F. Subsurface Drainage Control Structures | 37 |
| G. Type 2 Interim Drainage Control Systems | 37 |
| H. Site Stabilization | 37-38 |



INTRODUCTION

Section 001: Introduction.

A. Purpose:

The purpose of this design manual is to provide direction for grading design in order to comply with Chapter 18.81 of the Zoning Code, reduce the visual impact of excavation and make the final graded land form and development appear natural. Grading is the mechanical modification and sculpturing of the existing land surface to create usable areas for specific land uses, to create special topographic features, or to solve visual and technical problems associated with development. It may involve excavation or filling of the original surface to any depth, or a combination of grading and filling. It includes initial clearing, brushing, and grubbing. Standards and guidelines have been prepared to illustrate more desirable approaches to grading.

B. Perspective:

The Sonoran Desert is a fragile environment. Vegetation takes years to establish itself, because of low rainfall. The soils are the result of deposition and, therefore, highly erodible (see Figure 1).

The physical characteristics of Pima County create vistas of both scenic beauty and the built environment. Grading for development can severely scar the land unless appropriate design and revegetation measures are included in a grading plan.

C. Users guide:

1. Regulations versus guidelines:

This manual is structured to provide (a) the specific Chapter citation; (b) pertinent regulations, and (c) alternatives and suggestions to implement the regulations. The regulations (including those at the discretion of the county engineer) are shown in *special typeface and are mandatory*; the alternatives and suggestions are guidelines.

2. All development projects shall require a Type 1 or Type 2 grading permit, except as exempted in Sec. 18.81.020-D. In general, small private grading operations do not require a grading permit (although consideration of the materials in this manual is recommended for all grading), major grading for custom home development requires a Type 1 permit (refer to Figure 2), and general grading for larger development projects requires a Type 2 permit (refer to Figure 3).

Type 1

submit to central
permits;
grading sketch;
cut and fill limits;
slope stabilization;

permit issued.

Type 2

submit to
DOT/FCD;
grading plan;
inventory &
assessment;
stabilization;
topography;
drainage devices;
soils report;
DOT/FCD review;
concept approval;
resubmittal (if needed);
final approval;
permit issued.

Type 2 Application Process

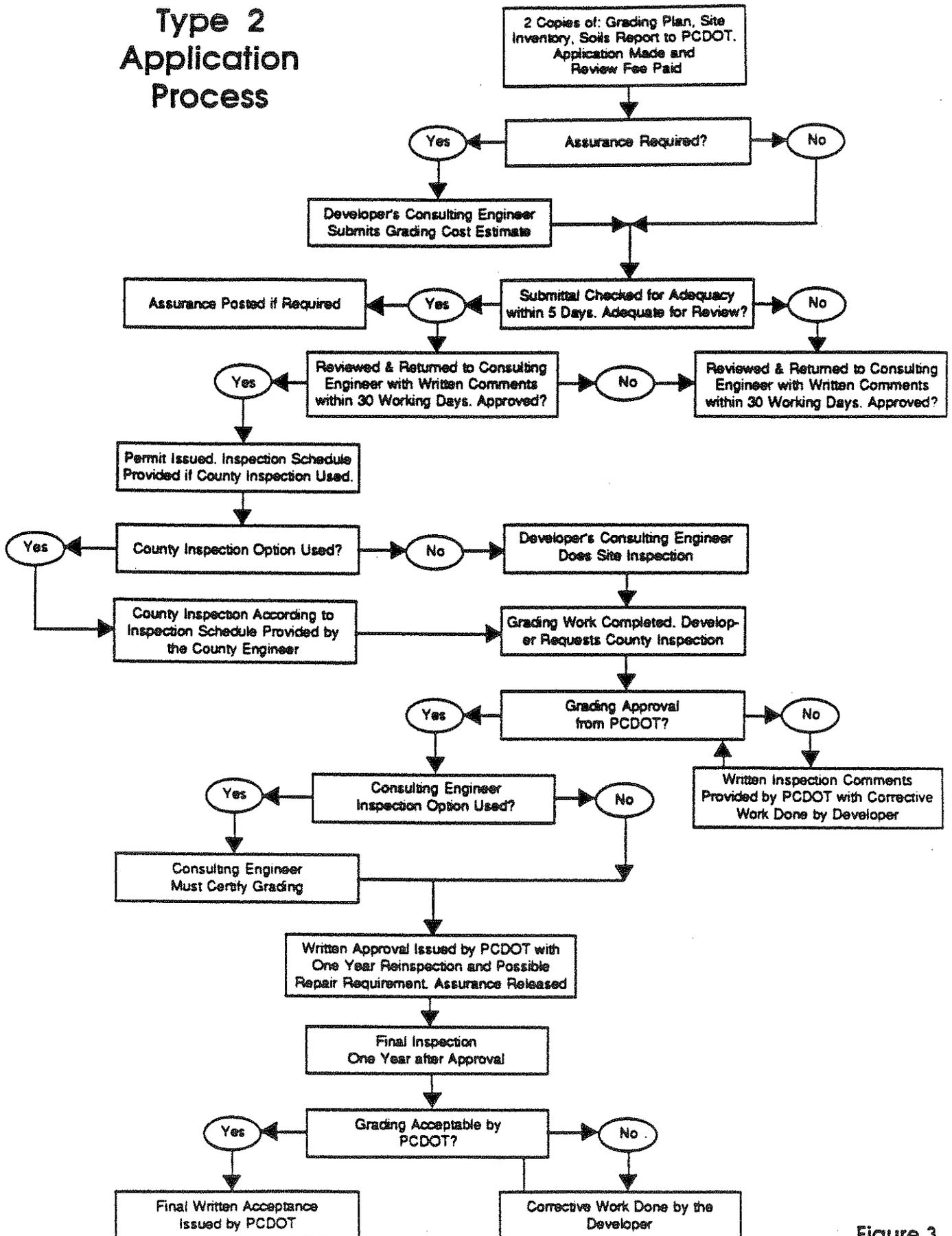
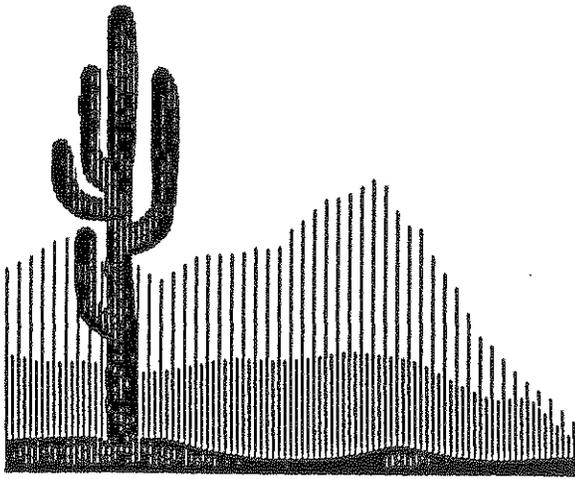


Figure 3



**RECOMMENDED TYPE 2
SITE INVENTORY OF EXISTING CONDITIONS**

Section 002: Recommended Type 2 Site Inventory of Existing Conditions.

18.81.060-B.13

"For superior project design and grading performance, it is encouraged that the project designer prepare, for project design use, an existing site inventory, identifying and quantifying vegetation, soils, on- and off-site viewshed constraints, slope analysis and drainage"

A. Scope:

Prior to the preparation of a Type 2 grading plan, an on-site inventory and assessment of existing conditions is recommended. The purpose is to identify and quantify existing conditions to alert the grading designer to existing on-site physical, visual and biological constraints, and to consider measures needed to mitigate adverse grading impacts. This inventory is intended to assist the project designer and is not a requirement for approval of a Type 2 grading plan, but shall be considered a special circumstance for preliminary grading approval (refer to 18.81.060-G).

B. Inventory and assessment of existing conditions:

1. Slopes:

Identify on a contour base map and quantify the areas of each of the following slope categories:

- a. 0% To 5%;
- b. over 5% to 15%;
- c. over 15% to 30%;
- d. over 30%; and
- e. rock outcroppings.

2. Vegetation:

Identify, locate and quantify on the contour base map, all saguaro and barrel cactus, and significant stands of:

- a. ocotillo and yucca;
- b. mesquite, ironwood, acacia, blue palo verde, foothill palo verde and hackberry having a crown of a minimum of 15 feet;
- c. crucifixion thorn, hopbush and jojoba.

3. Viewsheds:

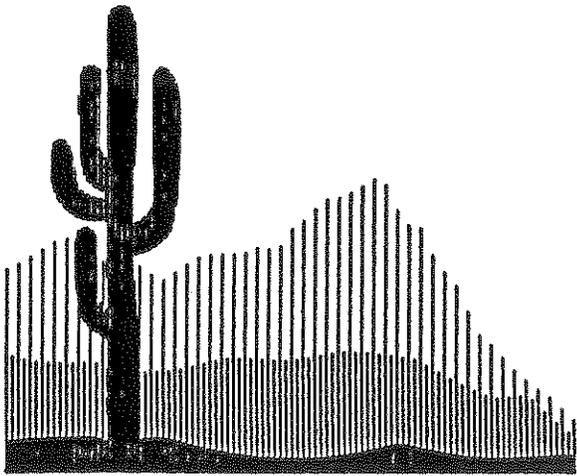
A. Identify on the contour base map the:

- 1) primary views from the site to off-site features, such as mountain, city, ridge lines and valley; and
- 2) off-site views to the site based on the visual exposure from existing development.

B. Viewsheds shall be delineated as foreground, middle-ground and background, with the angle or cone of vision shown from specified areas.

4. Hydrology and drainage:

Identify on the contour base map the drainageways of the site, direction of flow and the 100-year floodplain of drainageways of 100 cubic feet per second or greater.



GRADING DESIGN

Section 003: Grading Design

A. General guidelines:

1. Approach to grading design:

A. Each site presents a unique set of conditions that influences the grading design. A grading concept that would be ideal for one site might be inappropriate for another.

B. Grading design involves solving complex technical and aesthetic problems. Grading solutions should be an expression of good, skilled design that harmonizes with the existing environment.

C. There are two distinct approaches to grading design: architectural and natural:

Architectural grades are parallel and perpendicular with slope, steep, uniform and straight with sharp transitions between existing and new use areas. Forms and shapes are crisply defined and molded to express man's dominance and separation from nature (see Figure 5).

Natural grading on the other hand is carefully conceived to blend with nature. This approach creates land forms that approximate existing grades with less severe, rounded transitions (see Figure 6).

The use of these approaches is personal and depends on project design philosophy and the site's opportunities and constraints.

D. All site development requires at least some remodeling of the earth's surface. The remodeling is specified by the grading sketch or plan, which is the key document in site planning. As the grading plan evolves it may cause the concept to be significantly modified. The skill in which the plan is made will have a major bearing on the technical adequacy of the overall project and its functional, economic and visual success.

E. Grading design is conceptualizing and subsequently molding land into functional and visually pleasing forms which must successfully relate to other design considerations.

2. Functional reasons for grading:

A. Direct surface runoff to natural drainage features or flood control systems;

B. Create local drainage swales;

C. Create proper pads or gradients for specific structural improvements;

D. Create circulation routes; or

E. Solve other technical problems, such as unfavorable subgrade, soil conditions, noise, or wind barriers.

3. Visual guidelines for grading (see Figures 7, 8, 21, 25):

A. Emphasize existing land form or create interest to a flat site;

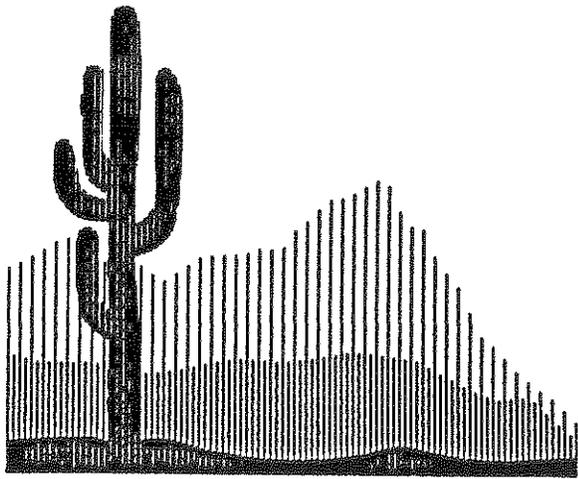
B. Hide undesirable views or enhance existing or potential views;

C. Relate site to surrounding physical features;

D. Relate and integrate structures into the site;

E. Emphasize or control circulation routes;

F. Create visual illusions by enhancing or subduing size or shape of spaces and structures.



GRADING CONSTRUCTION

Section 004: Grading Construction.

A. Clearing, brushing and grubbing:

1. The first step in actual grading is the clearing, brushing or grubbing of only those areas of the project site which later will be constructed upon, landscaped or surfaced.
2. *Existing vegetation and areas that are to remain undisturbed shall be protected by flagging, roping or other physical means that will visually warn grading or construction equipment away from these areas.*
3. *The contractor shall maintain adequate grading supervision during the clearing, grading or brushing to ensure that only those areas to be graded in accordance with the grading permit are disturbed.*
4. *Dust control in accordance with Sec. 005-A shall be maintained during clearing, brushing or grubbing, and until revegetation or site stabilization has occurred.*
5. *Interim drainage control using surface or subsurface drainage devices may be required by the county engineer.*

B. Cut or fill slopes:

18.81.040-C

"All exposed cut or fill slopes shall be revegetated or stabilized"

1. Grading of cuts or fills (refer to Figure 18):

- A. *Cut or fill slopes shall be no steeper than 1.5:1, unless stabilized or otherwise provided for in the approved soils report;*
- B. *Cut or fill slopes 3:1 or less steep shall be revegetated in accordance with Sec. 005-B;*
- C. *Cut or fill slopes steeper than 3:1 shall be protected by approved measures in accordance with Sec. 005-D;*

2. Fill slopes for Type 1 grading permits:

When a Type 1 grading permit is approved without an accompanying soils report, fill shall be placed in accordance with the following criteria:

- A. *Such proposed slopes shall not have an adverse effect on adjacent properties;*
- B. *Fill slopes shall not be contiguous to a public or private roadway. Refer to Sec. 004-G for setback requirements;*
- C. *Fill shall be placed in vertical lifts of no more than eight inches in uncompacted depth and then rolled with a rubber-tired vehicle or dozer tracks for a minimum compaction effect;*
- D. *The finished fill shall be less than 15 feet in height and shall be revegetated or protected in accordance with Sec. 005;*
- E. *Erosion or drainage control devices may be required in accordance with Sec. 005-C.*

3. Fill slopes for Type 1 with a soils report, and Type 2 grading:

Fill slopes shall be treated in accordance with Sec. 005 and the design recommendations of the approved grading plan and soils report.

C. Cuts:

1. Type 1 grading excess cut disposal:

A. The disposal site location, amount of spoils (in cubic yards) and haul route for the off-site disposal of grading cut or fill spoils material (such as soil, rock, organic material or debris) shall be identified within the Type 1 grading statement;

B. When unanticipated spoils occur, the permit holder shall provide the above information to the county engineer for review and approval prior to the disposal of any spoils material.

2. Type 2 grading excess cut disposal:

As provided for in the grading plan.

D. Fill:

18.81.040-E

1. Import of fill:

The import of fill shall be clearly noted in the grading statement or grading plan.

2. Composition:

All imported fill shall be free of boulders greater than twelve inches in diameter and any detrimental organic material or refuse debris.

3. Fill compaction:

"When required by the grading design manual, fill shall be compacted and soil tested"

A. Fill compaction shall conform to the design and recommendations of the approved plans, soils report and this section. Recommended compaction equipment for fill is conventional vibratory, sheepfoot or rubber-tired rollers. "Jumping jacks", "vibrating turtles" or similar small mechanical compaction equipment are recommended for tight areas such as foundation trenches;

B. The county engineer may require soil tests to be taken by an approved testing agency upon completion of any compaction work.

C. For projects requiring a Type 2 grading permit, the civil engineer or soils engineer of the developer shall provide written certification of the placement and compaction of fill.

4. Fill within a right-of-way or slope easement:

Fill shall be placed in increments no greater than eight inches in uncompacted depth per lift and shall be compacted to 95% density, per Arizona Department of Transportation test methods 225, 226, 227, 230, or 231 and 232, or as recommended in the soils report or plans approved by the county engineer.

5. Fill related to structures:

Fill upon which structures are to be built shall be placed and compacted according to local building code criteria and the county building code, Chapter 15.29.

Terrace Section

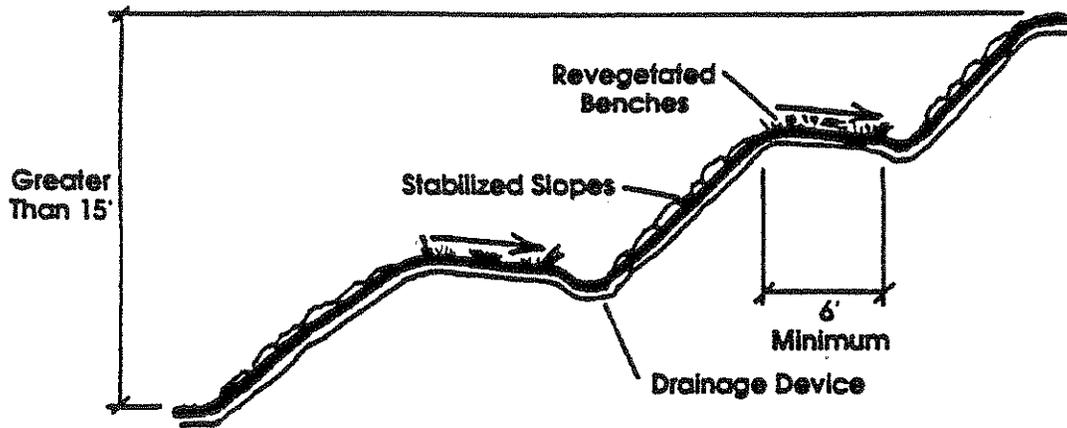


Figure 19

Terracing

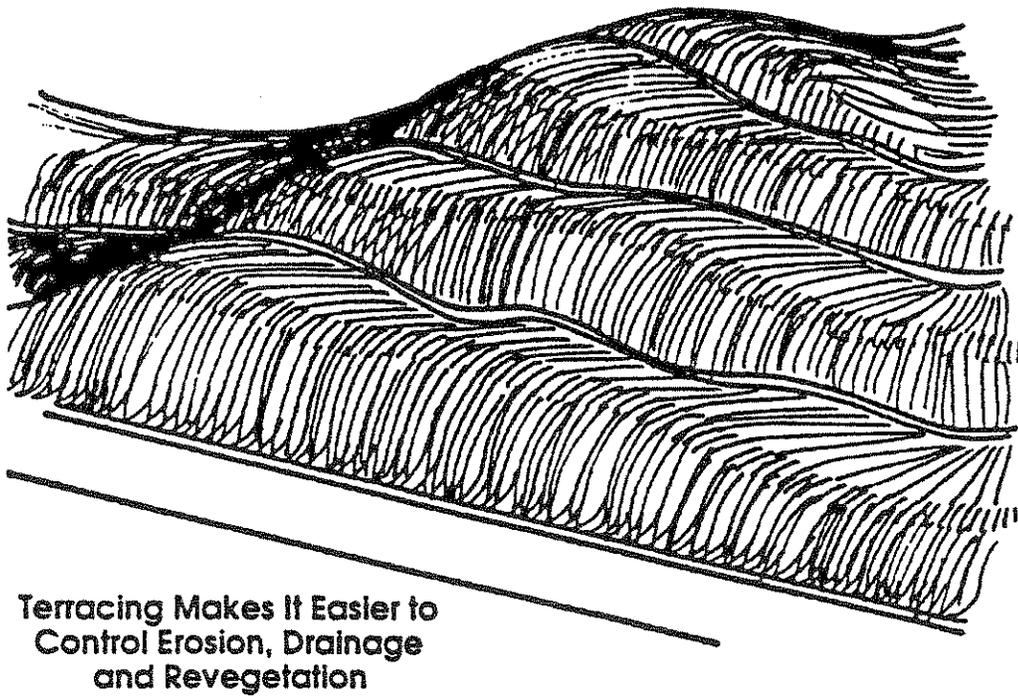
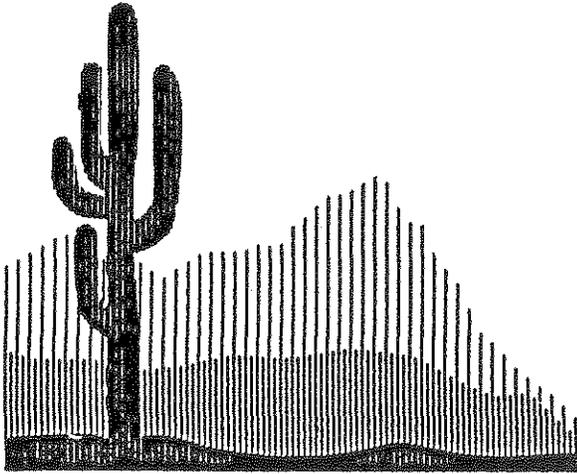


Figure 20



GRADING MITIGATION

Section 005: Grading Mitigation.

A. Dust control:

18.81.040-L.1

"During grading, and until revegetation or stabilization has taken place, dust shall be minimized through application of approved dust controls."

1. The frequency of application, quantity and types of palliatives shall be specified at the time of grading application and shall be incorporated into the approved grading plan or sketch. The county engineer may make site inspections to determine the adequacy of dust control and may require modified mitigation measures, if necessary, due to inadequate dust control.

2. Dust control permit:

All dust mitigation shall comply with Title 17, "Air Quality Control", of the county code. A dust control permit shall be obtained from the county air quality control district of the Department of Environmental Quality, prior to any grading activity.

3. Recommended dust control methods:

A. Acceptable dust controls:

1. Magnesium chloride: this product does not have adverse effects on plant life and is presently a low-cost treatment;

2. Lignum sulphate: this product does not have adverse effects on plant life;

3. Water: the use of water to control dust may be employed during or after grading, as may be approved by the county engineer;

4. Ground cover: a ground cover of decomposed granite, wood chips or other decorative landscape materials may be used in conjunction with revegetation on graded areas other than on slopes or areas subject to vehicular or pedestrian traffic.

B. Unacceptable dust controls:

Any product that would have an adverse effect on human, animal or plant life, or cause property damage.

C. Generally unacceptable dust controls:

1. Motor oil or oil treatment, due to its residual nature, leaching characteristics and adverse effects on plants and groundwater.

2. Sodium chloride, due to its residual nature and adverse effect on plant life.

B. Revegetation:

18.81.040-B, C

1. Graded areas that are to be revegetated according to an approved plan shall be revegetated with approved plant-list species appropriate to the site and its surrounding native habitat. Appropriate, in this sense, means that revegetation will be done, to the extent practical, with the same species and density present on undisturbed adjacent or nearby sites.

2. Exposed slopes with a slope ratio of 3:1 or flatter shall be revegetated, to include the planting of one-gallon desert trees on ten-foot centers

(average) and the planting of seeds for desert shrubs, grasses and trees upon the entire exposed slope, to resemble the natural desert environment. Seeds may be raked into the soil with appropriate mulch material, or hydro-seeding methods approved by the county engineer may be used. (See Figure 22).

3. The substitution of large specimen cacti for trees shall not exceed 50% of the number of desert trees required.

4. Refer to the landscape design manual for recommended revegetation species. Use those species that are compatible with the site, soils and conditions in which they will be planted.

5. During the effective period of the grading permit, any graded area that becomes overgrown with weedy species (e.g., russian thistle, telegraph plant, desert broom, ragweed, pigweed, or burro brush) shall be controlled in order to prevent the spread of such species onto adjacent properties.

6. Terraces shall be revegetated with approved grasses (e.g., grama grass), shrubs (e.g., white brittlebush) and such trees and cacti which would help control surface drainage and reduce erosion potential.

7. The survival of revegetation shall be enhanced by appropriate irrigation and other maintenance procedures needed to establish the plants. A waiver may be obtained in accordance with Section 18.81.090.

C. Erosion and drainage control:

1. Erosion and drainage control measures may include:

- a. Revegetation;
- b. Stabilization;
- c. Surface and subsurface drainage structures;
- d. Temporary or permanent dust palliatives.

2. It is recommended that grading be phased so that prompt revegetation or construction can control erosion. Only those areas which will later be resurfaced, landscaped, or built on should be disturbed. Resurfacing of parking lots and roadways should take place as soon as practicable.

3. The preservation of natural drainage courses shall be in accordance with applicable county policies or regulations. (see Figure 23).

4. During construction, drainage and erosion control devices shall be used, as required by the grading permit, to control runoff from construction sites.

D. Stabilization:

1. Alternative methods:

Alternative methods of stabilization may be approved by the county engineer provided that it can be demonstrated that the proposed method will provide resistance to soils loss.

2. Seeding:

Seeding may be used as an interim mitigation measure. Seeding shall consist of the planting of an approved seed mix incorporating the methods of Section 005-B.2. Seeding is intended for use in areas to be constructed on or regraded in the future.

3. Rip-rap:

A. *Exposed slopes with a slope steeper than 3:1 shall be rip-rapped with native rock or stone that blends in with the natural setting;*

B. *Rip-rapping may be used on all exposed slopes in combination with, or in lieu of, revegetation;*

C. *Rock or stone of four inches to eight inches in diameter ($d_{50}=6"$) shall be hand-placed and shall cover the entire exposed slope, filling all voids not occupied by trees or shrubs. It shall not encroach upon a floodplain nor upon adjacent properties;*

D. *If an exposed slope steeper than 3:1 ratio consists of soil material that is categorized as nonerodible, the county engineer may allow revegetation in lieu of rip-rapping, provided that data prepared by a registered soils or foundation engineer substantiating the nonerosive qualities of the exposed slope has been submitted to the county engineer, and provided the developer guarantees by covenant a two-year survival rate or replacement on all plantings.*

E. *Grouting or similar treatment may be required if soil characteristics mandate its use and shall be colored to appear the same as the rip-rap if augments. The rock shall be washed clean of all grout or shall be hand-placed in the grout, to present clean exposed rock faces;*

F. *Construction fabrics may be required beneath the rip-rap to prevent soil erosion.*

4. Retaining walls:

A. *Retaining walls shall comply with the county building code and be designed by a qualified professional engineer registered in Arizona;*

B. *The height of a retaining wall shall not exceed 15 feet. The color shall be consistent with the surrounding area.*

C. *Weep holes and other subsurface or surface drainage devices shall be provided, if required by the nature of the wall, the site or its soils or drainage characteristics.*

(See Figure 24)

5. Drainage devices:

A. *All hydrology design, sizing and flow calculations shall conform to methods used by and available from the county engineer;*

B. *Generally, slope drainage devices should be lined with concrete, gunite, rip-rap, grouted rip-rap or other approved designs, to minimize erosion caused by the velocity of intercepted flows;*

C. *Slopes may require drainage devices when water drainage patterns approach crests (tops) of slopes, toes (bottoms) of slopes or flow down the face of slopes. These devices may require collection and routing;*

D. *Slope drainage devices shall be designed to accommodate the 25-year flow or greater (not to exceed the 100-year flow), as determined by the county engineer. Their design and location shall be shown on the grading plan;*

E. *All intercepted drainage shall be routed to an acceptable outlet, as determined by the county engineer, which may include natural or*

man-made drainage facilities that are sized adequately to collect and convey the additional flow routed to them without adverse effects to up- or downstream properties. The proposed drainage routing shall comply with the county Floodplain and Erosion Hazard Management Ordinance and be approved by the county engineer;

F. Drainage and erosion control devices should be used when necessary, as determined by approved grading plans or soils reports, or grading sketches;

G. During the months of July through September, the effect of storm runoff on adjacent land uses and unstabilized banks shall be considered and mitigated through the use of approved structures or other measures, when required by the county engineer (see Figure 26).

6. Temporary or permanent erosion, sedimentation and siltation devices:

A. Such devices shall be provided when soils conditions and grading design necessitate their use as determined by the county engineer;

B. These devices may include temporary designs, such as straw bale dikes, siltation fences or similar devices;

C. Permanently designed traps or basins shall be provided when soils conditions and grading design necessitate their use, as determined by the county engineer.

E. Surface drainage control structures:

"Cut and fill slopes shall be provided with approved surface drainage for stability and erosion protection of affected properties"

"Surface drainage interceptors shall be provided at the top of cut and fill slopes where there is surface runoff and erosion potential"

"Drainage slopes to protect foundations shall be provided"

1. The following or similar devices may be designed for sediment and erosion control, cut and fill slope surface drainage and erosion control, surface drainage interceptors, for both temporary or permanent drainage and erosion control: drainage swales, lined or unlined "v" ditches (according to their use), earth berms for drainage diversion, or other similar devices that will serve the same function, as approved by the county engineer.

2. On slopes, such devices shall be located at the top and toe (see Figures 19, 30). The devices shall be located at the toe of the upper slope and shall be graded to cause the flow to collect within these facilities;

3. If natural or existing drainage routes are blocked during grading activity, drainage devices shall be used to intercept and route any blocked drainage;

4. Drainage slopes to protect foundations:

Provide positive drainage away from foundations for all structures.

5. Erosion and drainage control for utility equipment:

The installation and protection of utility equipment pads in and around sloping grades shall be considered in project design.

Straw Bale Siltation Interceptor

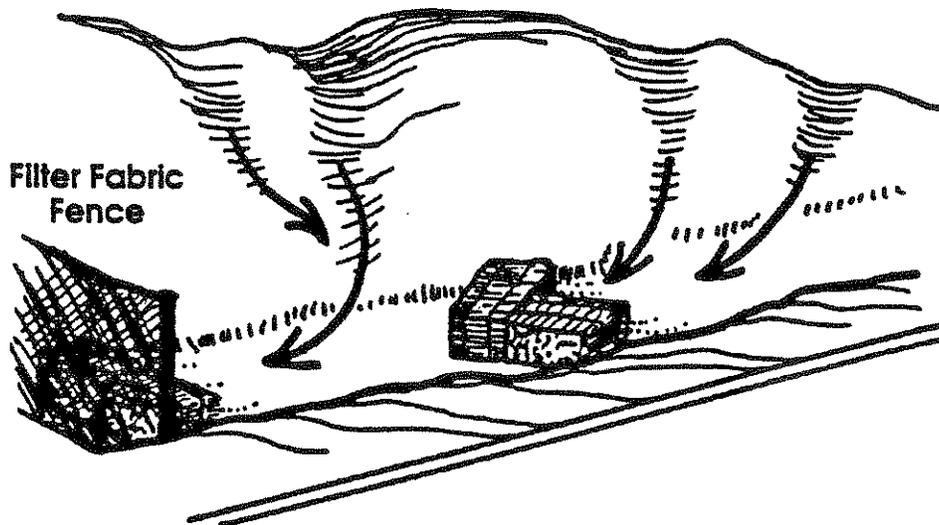


Figure 28

Temporary Paved Asphalt Drop Chute

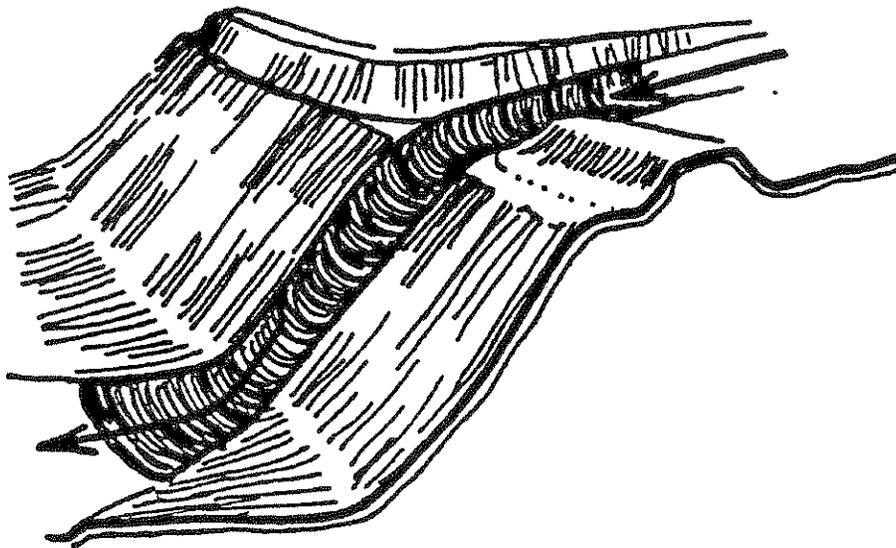


Figure 29

F. Subsurface drainage control structures:

18.81.040-I.6

"Subsurface drainage for stability and protection of affected properties from ground water seepage may be required"

1. Subsurface drainage devices shall be used when the soils of the cut and fill slopes require subsurface water collection and drainage routing, as determined within the approved soils report.

2. Subsurface drainage devices may consist of various catch basin designs, french drain systems or other similar designs, and conveyance systems, such as concrete, metal or other suitable pipe material (see Figure 31).

3. These drainage devices shall be sized to collect and convey all expected subsurface drainage to an acceptable drainage outlet. The design and location of all such devices shall be shown on the grading sketch or plan.

G. Type 2 Interim drainage control systems:

18.81.040-H.2

"Interim drainage control devices shall be provided in accordance with the grading design manual"

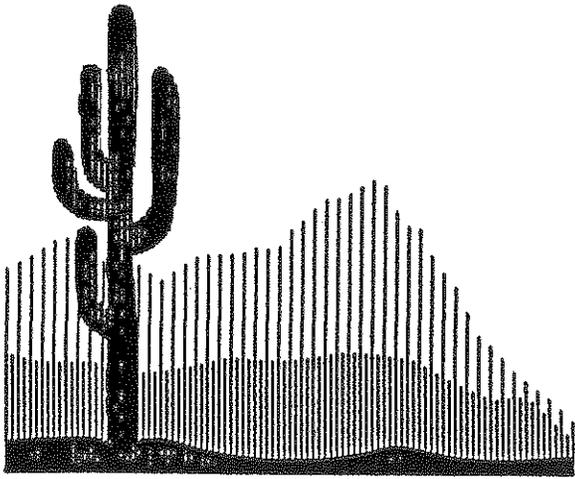
All Interim drainage systems shall be designed to function adequately through the short time they are to serve and shall require the approval of the county engineer. The ten-year flow is generally acceptable (see Figures 27, 28, 29).

H. Site stabilization:

18.81.040-B

"All graded areas not revegetated, stabilized or constructed on upon expiration of the grading permit shall be revegetated or stabilized within 60 days of permit expiration"

For site stabilization methods, refer to Sec. 005D of this manual. The treatment of these graded areas shall require the approval of the county engineer.



GRADING DOCUMENTS

Section 006: Grading Documents.

A. Type 1 grading sketch:

1. Plan preparation:

The applicant shall prepare a grading sketch as follows:

A. The sketch shall be drawn on a site plan at a scale no smaller than 1" = 100', on one sheet of paper no smaller than 8½" x 11" and no larger than 24" x 36";

B. All cuts and fills (including the location and quantity of any imported fill) shall be clearly shown on the sketch. Percent of slope and method of treatment shall be shown for all slopes. Natural open space shall be clearly delineated;

C. The grading permit application and fee, along with two copies of the grading sketch and statement shall be submitted to the central permits division and distributed (if necessary) to applicable review agencies;

D. Within five days of submittal, the permit (if approved) and one copy each of the sketch and statement shall be returned. If the application is determined to be inadequate, the applicant may submit, without additional fees, an amended sketch or statement;

E. If the site is subject to the Hillside Development Overlay Zone (Chapter 18.61) or the Floodplain and Erosion Hazard Management Ordinance, a more detailed sketch or analysis may be required;

F. Slope drainage devices may be required to be shown on Type 1 grading sketches, when the county engineer determines they are needed.

2. Soils report:

A soils report may be required by the county engineer to supplement a Type 1 grading sketch when technical concerns arise during the review of the sketch relative to the proposed control measures or design for one or more of the following:

a. Dust pollution;

b. Soil stability;

c. Structural design;

d. Erosion vulnerability;

e. Development of hazardous terrain (defined as a land surface which is underlain by a geologic hazard such as an active fault, consists of unstable soils, or is subject to flood hazards);

f. Stormwater discharge;

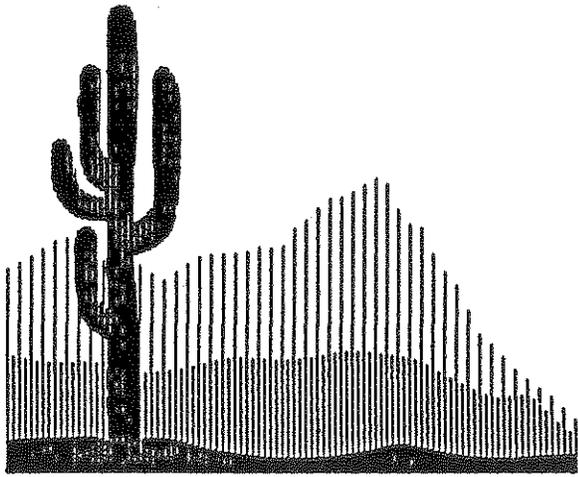
g. Siltation effects.

B. Type 2 grading plan:

1. Plan preparation:

A. Plans shall be drawn to scale upon substantial paper. The plans shall be of sufficient clarity to indicate the nature and extent of the proposed work, and conformance with this manual and Chapter 18.81 of the zoning code.

B. The first sheet of each set of plans shall give the location of the proposed grading, the name, address and telephone number of the owner, the



INSPECTIONS

Section 007: Inspections.

A. Type 1 Inspection procedures:

The county engineer may conduct spot checks during grading and shall perform a final inspection to ensure compliance with the grading sketch and permit conditions prior to final grading approval.

B. Type 2 Inspection procedures:

1. Projects using the county inspection process shall be provided by the county engineer an inspection schedule at the time of preliminary grading plan approval or issuance of a grading permit. The county engineer shall determine the type and frequency of inspections listed on the inspection schedule, based on the scope and complexity of the proposed grading.

2. The county engineer may inspect grading at points of completion in addition to those listed on the inspection schedule.

3. Inspection schedule:

18.81.070-A.1

"All grading which requires a permit shall be inspected by the county engineer in accordance with the grading permit."

The inspection schedule shall require inspection and approval by the county engineer upon completion of each stage, which may include:

- a. Existing site conditions;***
- b. Clearing, brushing or grubbing;***
- c. Creation of cut or fill slopes;***
- d. Placement of slope protection;***
- e. Revegetation;***
- f. Retaining walls;***
- g. Construction of slope drainage devices.***

4. Soils inspection:

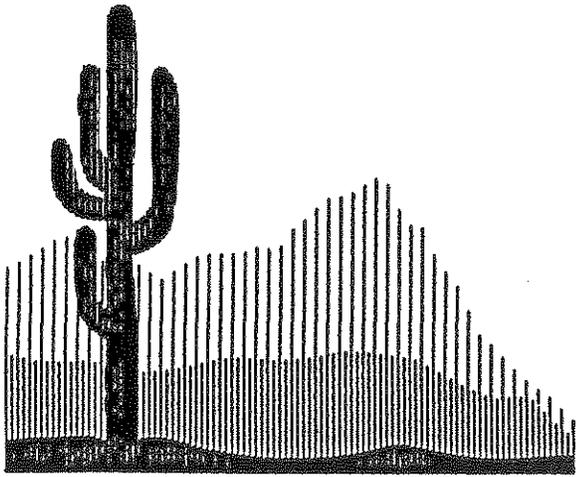
The civil engineer or soils engineer of the developer shall provide all necessary inspections of soils and shall provide written certification to the building official that the foundation sub-base requirements have been met, prior to any foundation inspections.

5. Final inspection of rough grade:

Upon completion of rough grading, and within two working days of a request for inspection, the county engineer shall inspect rough grading for substantial conformance with the grading permit and the approved plan:

A. If acceptable, the grading assurances shall be released and a certificate of substantial grading conformance shall be issued;

B. If unacceptable, the grading shall be brought into substantial conformance, or a stop-work order shall be issued until such time as a revised grading plan has been approved. Rough grading may then be completed.



APPEALS

Appeal Process

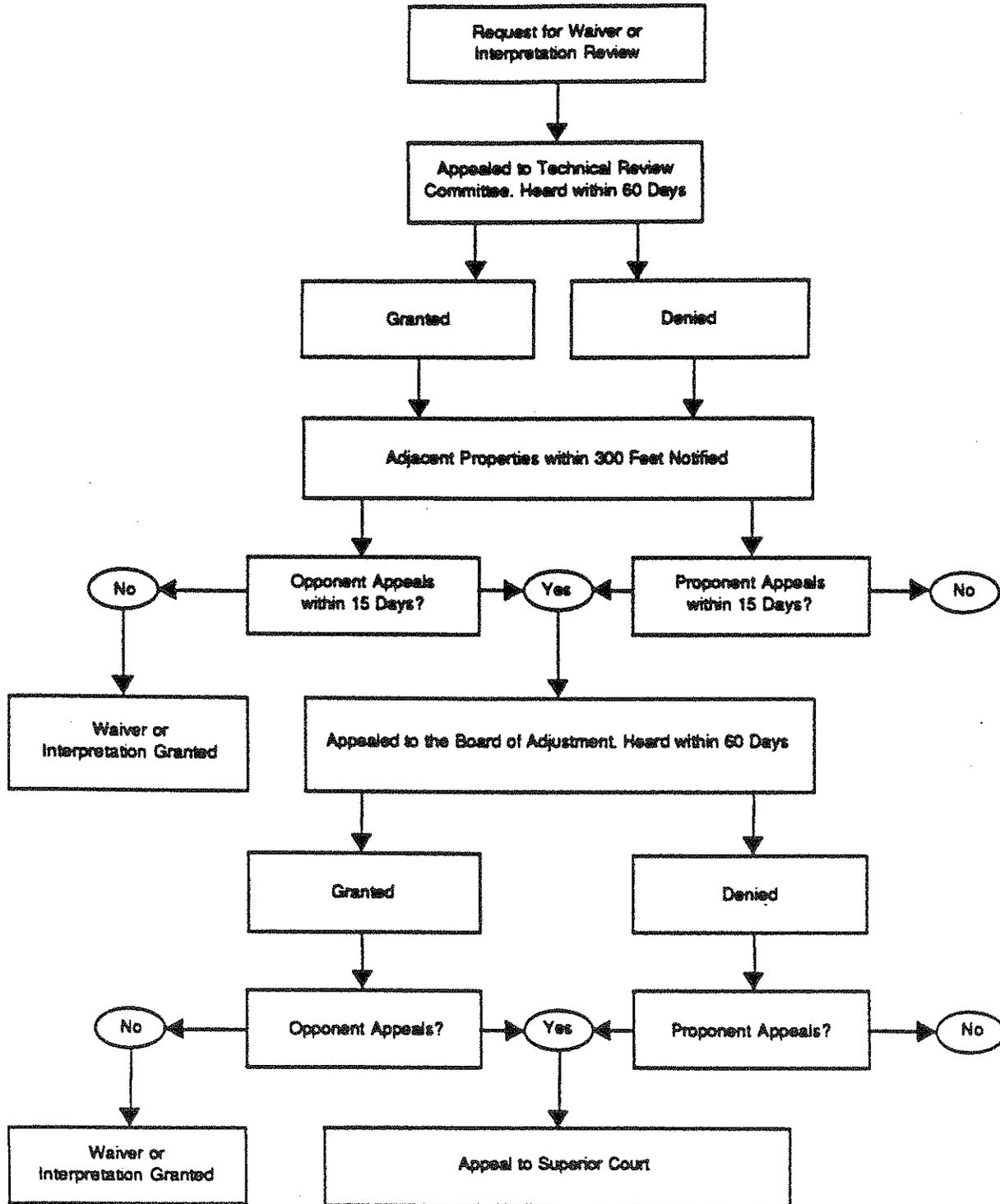
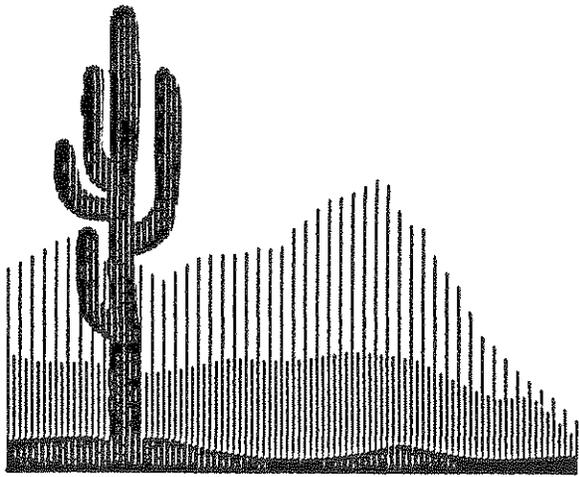


Figure 33



BIBLIOGRAPHY

Section 009: Bibliography.

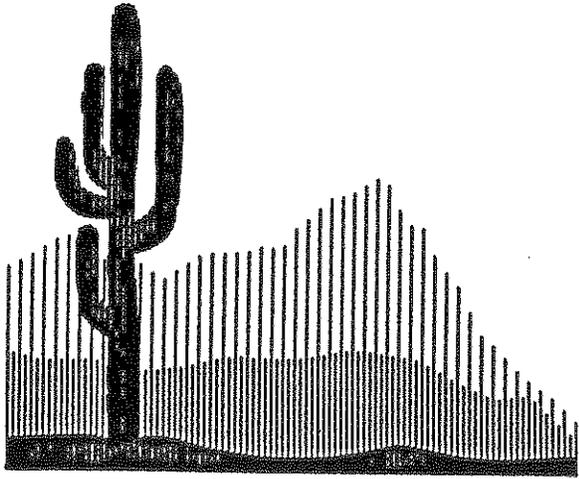
Section 002: Type 2 site inventory of existing conditions.

Miller, James D.

"Urban Forestry: Handbook of selected trees for southwestern urban environments".

Untermann, Richard K.

"Grade Easy".



APPENDIX

GRADING STANDARDS

CHAPTER 18.81
GRADING STANDARDS

Sections:

- 18.81.010: Purpose and interpretation.
 - 020: Applicability and exemptions.
 - 030: Definitions.
 - 040: General grading performance standards.
 - 050: Submittals and procedures: Type 1 (grading sketch).
 - 060: Submittals and procedures: Type 2 (grading plan).
 - 070: Inspections and performance defaults.
 - 080: Enforcement and penalties.
 - 090: Administrative modification.
 - 100: Waivers and interpretation review.
 - 110: Illustrations.
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18.81.010 Purpose and interpretation.

A. Purpose:

1. The purpose of this chapter is to protect the public health, safety, general welfare, and aesthetics by regulating grading (including initial clearing, brushing or grubbing, and subsequent excavating or filling) on private and public land, including county-owned land, within the unincorporated area of Pima County.
2. It establishes grading standards designed to:
 - a. Regulate the development of potentially hazardous terrain;
 - b. Conserve the general visual character of grading sites and settings;
 - c. Enhance the value of new development; and
 - d. Conserve the value of existing, affected properties.
3. The guidelines and standards of this chapter and the Grading Design Manual have been prepared in the context of Pima County's specific desert environment. They are intended to complement the applicable provisions of Chapter 18.61 (Hillside Development Overlay Zone) and the Floodplain Management Ordinance, and not to authorize any grading activity prohibited by this chapter or any county ordinance.

B. Interpretation:

1. This section shall be used as a guide whenever a conflict arises in the interpretation or enforcement of this chapter. The design, implementation and mitigation of grading regulated by this chapter (refer to Section 18.81.020) shall

4. Grading which requires a permanent cut or fill slope greater than five feet in height and steeper than a 3:1 slope, or grading on slopes of fifteen percent or greater.
 5. New pavement of more than three thousand square feet.
- C. Type 2 (grading plan) permit applicability: A Type 2 grading permit is required for:
1. Residential development which requires a subdivision plat or development plan.
 2. Nonresidential development which requires a subdivision plat or development plan.
 3. Stockpiling of more than fifty thousand cubic yards of material.
- D. Exemptions: The following activities are exempted from this chapter:
1. Residential development on a single lot, with a development envelope of less than fourteen thousand square feet;
 2. The subsequent expansion, by less than twenty-five percent and not violating the spirit of this chapter, of an exempted or approved graded area;
 3. The clearing, brushing or grubbing of an area of less than fourteen thousand square feet or for activities exempted in this subsection;
 4. Stockpiling of less than one hundred cubic yards of material;
 5. Resurfacing or maintenance of an existing paved surface;
 6. New pavement of less than three thousand square feet;
 7. Individual sewage disposal system with a county health department permit;
 8. Excavation below finished grade for a basement, foundation, wall or swimming pool authorized by a building permit or zoning construction permit (refer to Section 18.01.030E, General provisions);
 9. Cemetery graves;
 10. Refuse disposal site controlled by other regulations;
 11. Exploratory excavation under the direction of a soil engineer or engineering geologist, provided all excavation is properly backfilled;
 12. Archaeological exploration conducted under state permit by a qualified archeologist;
 13. Removal of selected individual plants for storage and replanting.
 14. Underground utility installations under a paved roadway surface or a continuously-maintained unpaved roadway surface;
 15. Grading for the maintenance of an existing private access, road or driveway, provided that it either existed prior to adoption of, or was established in conformance with, this chapter. Proof of such may be required by the county engineer;
 16. Grading for an appurtenant access or utility easement;
 17. Land uses under statutory exemption (refer to Section 18.01.030C, General provisions).
- (Ord. 1986-187 § 1 (part), 1986)

June - 1990

of the ordinance codified in this chapter.

16. **Grade, finished:** The final grade conforming to the approved grading sketch or plan.

17. **Grade, rough:** The stage at which grading substantially conforms with the approved grading sketch or plan.

18. **Grading:** The initial clearing, brushing or grubbing, and subsequent excavating or filling, of a site.

19. **Grading permit:** An official document issued by the county engineer authorizing the grading activity specified by the grading permit conditions.

20. **Grading permit conditions:** The specifications and requirements of the approved grading sketch or grading plan, grading statement, soils report or other documents necessary for grading permit approval.

21. **Grubbing:** The removal of trees and other large plants by their roots.

22. **Inspector:** A person authorized by the county engineer or building official to perform inspection on grading work.

23. **Retaining wall:** A wall designed to withstand lateral and hydrostatic pressures and built to keep earth from sliding, and which is two feet or greater in height from the lowest point of earth at the foundation to the top of the wall.

24. **Revegetation:** Placement of living plant material on sites or cut and fill slopes where the natural vegetation has been removed.

25. **Site:** Any lot or parcel of land, or contiguous combination of lots and parcels under the same ownership or unified control, where grading is to be performed.

26. **Slope:** An inclined ground surface, the inclination of which is expressed as a ratio of horizontal distance to vertical distance (refer to Illustration 18.81-2).

27. **Soil:** Naturally occurring deposits overlying bedrock.

28. **Stabilization:** Treatment with mitigation measures in accordance with the grading design manual, and approved by the county engineer, that contribute to the erosion or siltation resistance, or the structural strength, of a graded area.

29. **Stockpile:** The storage of uncompacted earth material.

(Ord. 1986-187 § 1 (part), 1986)

18.81.040 General grading performance standards.

A. Scope:

1. The performance standards of this section are general grading performance requirements. A companion grading design manual elaborates minimum performance standards referenced by this section and includes non-regulatory guidelines for superior grading performance.

2. The grading design manual shall be adopted and amended in accordance with Section 18.01.070 (General Provisions). The commission may hold the preliminary and public hearings concurrently. The technical review committee (refer to Section 18.99.040, Review Committees) shall provide a recommendation prior to commission public hearing.

June - 1990

- a. Erosion control shall be constructed and maintained to prevent erosion of slopes, and cleared, brushed, grubbed or graded areas, in accordance with the grading design manual.
 - b. Where cut slopes are not subject to erosion due to the erosion-resistant character of the native materials, erosion control may be omitted upon approval by the county engineer.
 - c. Erosion control devices to prevent erosion or sediment deposition on off-site property may be required in accordance with the grading design manual.
 - d. The shoulders of a paved public or private roadway shall be protected against erosion wherever curbing or constructed spillways are not provided, in accordance with the grading design manual.
 - e. Surface drainage:
 - 1) Cut and fill slopes shall be provided with approved surface drainage for stability and erosion protection of affected properties in accordance with the grading design manual;
 - 2) Surface drainage interceptors shall be provided at the top of cut and fill slopes where there is surface runoff and erosion potential in accordance with the grading design manual;
 - 3) Drainage slopes to protect foundations shall be provided in accordance with the grading design manual;
 - f. Subsurface drainage: Subsurface drainage for stability and protection of affected properties from ground water seepage may be required in accordance with the grading design manual.
 - 2. Interim systems: Interim drainage control systems shall be provided in accordance with the grading design manual.
- I. Import and export of earth material:
- 1. Loading of earth material shall occur only within the time limits of subsection J of this section, and dust palliatives shall be applied in accordance with the grading design manual.
 - 2. The transportation of earth material on public rights-of-way shall be in a manner that minimizes blowing soil and other hazards.
- J. Hours of grading:
- 1. Grading equipment operation within one half mile of a structure occupied by humans shall not be conducted between sunset and seven a.m.
 - 2. Normal equipment maintenance involving lights, motors or generators, and occurring within six hundred feet of a structure occupied by humans, shall not be conducted between nine p.m. and seven a.m.
 - 3. The county engineer may allow grading equipment operation or maintenance during other hours if such operations are not detrimental to the health, safety or welfare of the inhabitants of the structure.
 - 4. Permitted hours of operation or maintenance may be shortened by written notice, if the county engineer finds a substantial adverse effect on the health,

June - 1990

- application for a grading permit. The statement shall include, where applicable:
1. A description of stabilization, erosion and drainage control measures.
 2. The off-site disposal location and estimated quantity of earth material and vegetation to be removed from the site during grading;
 3. Estimated starting and completion dates;
 4. A description of the dust control method to be used during grading and until revegetation or stabilization has been completed.
- D. Documents preparation:
1. Documents shall be prepared in accordance with the grading design manual; and
 2. Information shall conform with rezoning conditions (when applicable) and shall be consistent with the rezoning site analysis (refer to Section 18.91.030F, Rezoning Procedures) and other applicable regulations.
- E. Application:
1. The grading permit application, grading sketch and other required materials shall be submitted for review to the central permits division of the county planning and development services department.
 2. When desired, a letter of intent to exercise the inspection certification option (refer to Section 18.81.070B) shall be submitted with the application.
 3. The grading permit application shall be completed and signed by the owner or authorized representative.
 4. Fees are payable to the county treasurer in accordance with the fees schedule adopted by county ordinance.
- F. Application review:
1. The grading sketch and statement shall be reviewed for consistency with the applicable regulations and standards, and, if approved, a grading permit shall be issued within five working days of application.
 2. If determined inadequate, the application shall be returned within five working days and the owner may resubmit, without additional fees, an amended grading sketch or statement.
 3. The county engineer shall require the plans and specifications be modified to make them consistent with this code or other applicable regulations. A grading permit may be issued with additional conditions.
- G. Grading permit issuance and expiration:
1. Issuance: Grading permits are issued by the county engineer. A copy of the grading permit and approved grading sketch shall be kept in an easily accessible location on the site.
 2. Expiration: A grading permit shall be null and void if the authorized work has not been completed within one year of permit issuance.

June - 1990

2. The final inspection shall be conducted by the county engineer prior to issuance of a certificate of substantial grading conformance or release of grading assurances (if required). The permit holder shall provide a minimum of twenty-four hours' notice to the county engineer when any phase of rough grading is ready for final inspection.

3. The county engineer may approve completed rough grading prior to completion of related work in cases of extreme hardship or where grading has been designed to be completed in phases, provided that no hazards exist and a performance bond has been posted to ensure completion of remaining grading work of that phase.

4. The soils report and certification of sub-base requirements shall be submitted to the building official prior to any foundation inspections.

D. Final grading inspection:

1. All required grading work shall be completed in accordance with the grading permit prior to final grading inspection by the county engineer and issuance of a certificate of final grading approval.

2. Where the conditions of a grading permit include the establishment of vegetation or other final site grading work that extends beyond the expiration of the grading permit, the county engineer shall make a post-grading inspection within six months of permit expiration or as required by the grading permit.

E. Maintenance of revegetation: The maintenance of revegetated areas shall be in accordance with Section 18.73.080 (Landscaping, Buffering and Screening Standards).

(Ord. 1986-187 § 1 (part), 1986)

18.81.080 Enforcement and penalties.

A. Grading permit enforcement:

1. The enforcement of this chapter and conditions of the grading permit shall be in accordance with this section and Chapter 18.95 (Compliance and Enforcement).

2. When the county engineer determines a substantial noncompliance with the conditions of the grading permit, the county engineer shall issue a stop-work order and hold in abeyance, by written notice, the county review of other submittals related to the development project and the issuance of county permits for any aspect of the development project until remedial actions have received the written approval of the county engineer.

B. Stop-work orders:

1. Whenever the county engineer determines that grading does not comply with this chapter or the grading permit conditions, or that the soil or conditions are not as stated on the permit, the county engineer may order the work stopped by written notice served on any person engaged in doing or causing such work to

June - 1990

10. No condition attached to the variance by the board is personal to the appellant.

18.81.100 Waivers and interpretation review.

A. Waivers:

1. **Scope:** A waiver from a provision of this chapter may be granted by the technical review committee (refer to Section 18.99.040, Review Committees) when the strict application of the provision would require work by the permit holder detrimental to the purposes of this chapter and cause an unnecessary hardship which substantially limits the preservation and enjoyment of property rights.
2. **Standards:** A waiver shall not be granted unless:
 - a. The hardship is not generally caused to other properties subject to the provision;
 - b. The waiver is the minimum necessary to afford relief;
 - c. The waiver will not be materially detrimental to the rights of owners and residents of other affected properties; and
 - d. The waiver is in harmony with the intent and purposes of this code and the provision of this chapter from which the waiver is requested.
3. **Conditions:** Conditions may be imposed on a waiver that will:
 - a. Secure the intent and purposes of this code and the provision of this chapter from which the waiver is granted; and
 - b. Provide adequately for the protection of surrounding property owners and residents.
4. **Application:** The request for waiver shall be made on a form provided by the planning and development services department and shall be heard within sixty days. Hearing fees shall be required.
5. **Review and notice:** The committee shall hold a hearing on the waiver request and, within five working days, notice of the decision shall be mailed to all property owners within three hundred feet of the grading site. Failure to provide notice shall not invalidate an action of the committee.
6. **Appeal:** A decision of the committee may be appealed within fifteen days of the decision to the board of adjustment in accordance with Chapter 18.93.

B. Interpretation review:

1. **Scope:** Upon request by an affected person who believes there has been a misinterpretation, the technical review committee shall review an interpretation of a provision of this chapter made by a county official.
2. **The request for review shall cite:**
 - a. The disputed interpretation made by the county official; and
 - b. The words alleged to have been misinterpreted.
3. **Application:** The request shall be made on a form provided by the planning and development services department and shall be heard within sixty days. Hearing fees shall be required.

June - 1990

Illustration 18.81-1
Building Height Contour Line

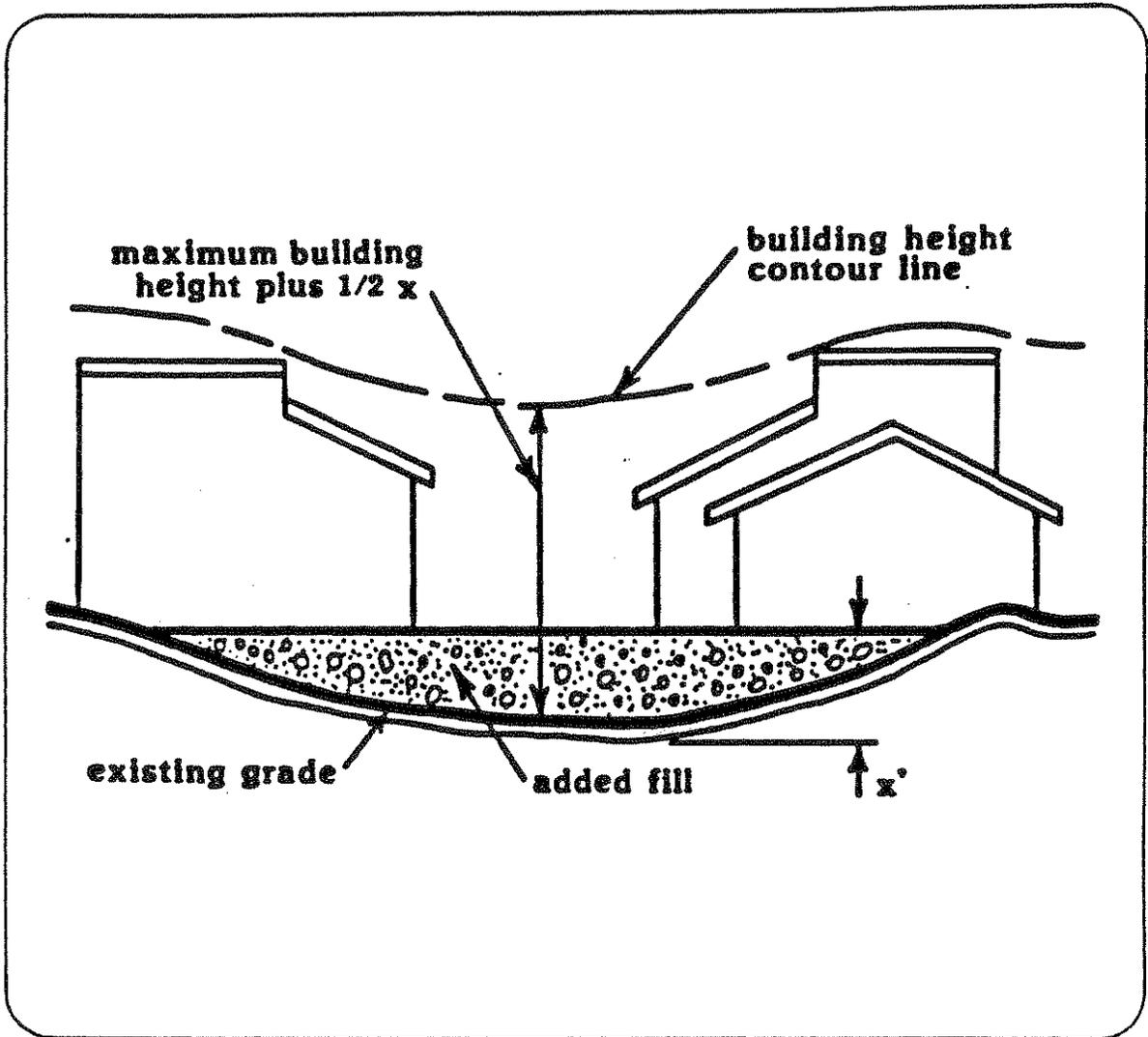
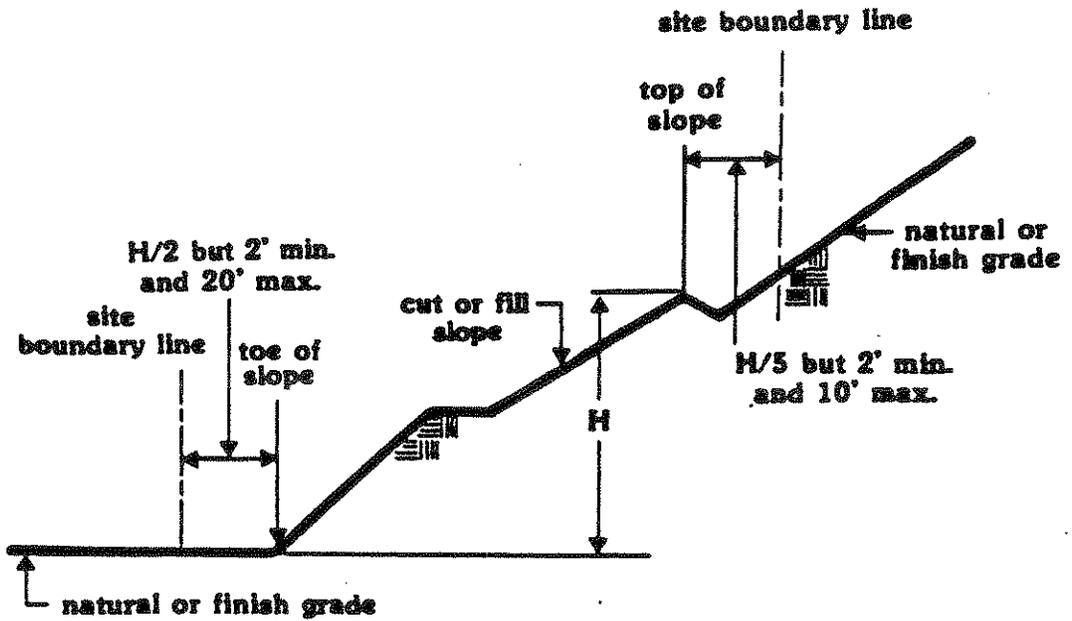


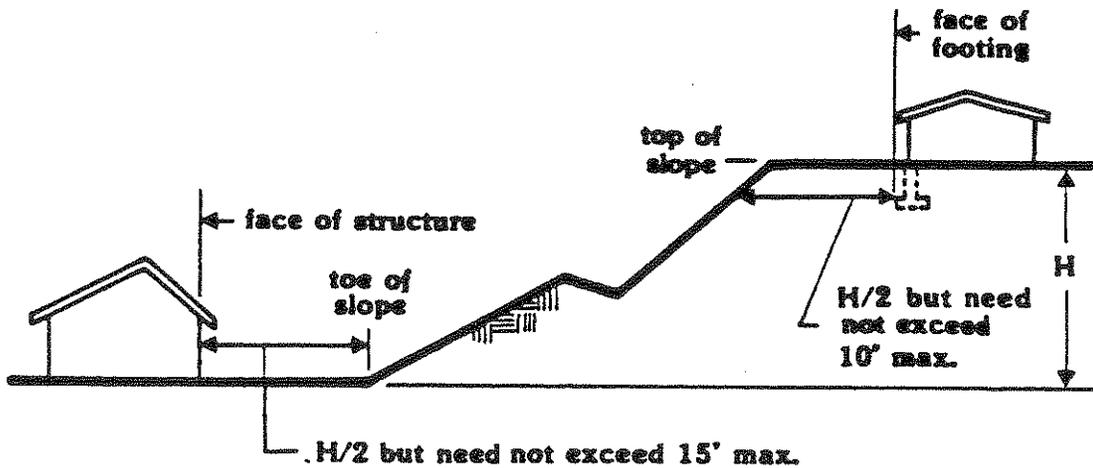
Illustration 18.81-3

Setbacks



refer to section 18.81.040F.1 and 2

Setbacks



refer to section 18.81.040F.3