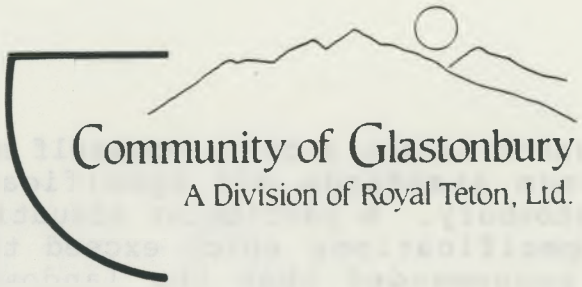

Specifications and Standards For Gravel Road Construction

Glastonbury Administrative Office
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This document is not a do-it-yourself manual and sets forth only minimum standards and specifications for the Community of Glastonbury. A particular situation may require standards and specifications which exceed those set forth herein. It is recommended that the landowner study the material referenced in this publication in order to become more informed. It is also recommended that the landowner use qualified personnel in the planning and execution of this type of project. The Glastonbury Administrative Office maintains a list of contractors who have submitted at least three (3) references for this type of work, which is available for inspection.

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1.0 INTRODUCTION

The purpose of this document is to help Glastonbury landowners plan and contract for the construction of a road or driveway.

This document is not a do-it-yourself manual and sets forth only minimum standards and specifications for the Community of Glastonbury. A particular situation may require standards and specifications which exceed those set forth herein. It is recommended that the landowner study the material referenced in this publication in order to become more informed. It is also recommended that the landowner use qualified personnel in the planning and execution of this type of project. The Glastonbury Administrative Office maintains a list of contractors who have submitted at least three (3) references for this type of work, which is available for inspection.

The landowner should carefully plan his project, solicit bids from several contractors, and enter into a written agreement with the chosen bidder for execution of the project. We strongly recommend that verbal understandings or agreements be avoided.

2.0 PLANNING AND REVIEW

In order to plan a road or driveway, it is necessary to prepare a parcel master plan, select and stake the best route, develop a site drawing, fill out and submit the Glastonbury Project Review and Evaluation Application, including Sheet "A" with the required attachments, and await the approval of the project.

An experienced contractor or consultant can and should be engaged in the planning process.

The application and review process with the Glastonbury Project Review Committee is required before any construction can take place.

2.1 PARCEL MASTER PLANNING

The landowner should consider all the possibilities for the development of his land and develop a long-range plan so that the project can unfold in an orderly manner. Roadways should then be situated to provide access for all of the potential uses.

A detailed on-site inspection of the property by the landowner and any other interested parties is recommended before final decisions are made.

2.2 ROUTE SELECTION

The best route should be selected after considering the following factors: distance, terrain, water courses,

soil conditions, drainage, safety, vegetation, exposure, snow drifting, access to building sites, and access to a Community Road and to other parcels.

Climbing grades should be kept less than 10% and preferably between 6% and 8% for easier driving and safer winter usage.

Topographic maps, including the Glastonbury Certificate of Survey Topo maps, aerial photographs, and soil maps may be useful in identifying alternate routes. Verification on-site is essential before a final decision is made in selecting the route.

2.3 SITE DEVELOPMENT

The selected route should be staked-out on the ground and accurately drawn on a topographic map of the parcel. See Figure 1, page 3. Significant features such as water courses, building sites, borrow areas, turnouts, and culverts should be identified on the map. Any section of the route that cannot be built to specifications (i.e. a narrow stretch constricted by surface features) should be clearly noted on the map.

2.4 PROJECT REVIEW

Before construction can begin on a road, the project must be evaluated and approved by the Glastonbury Project Review Committee (the "Committee"). The purpose for review is to insure that the technical standards and aesthetic values of the Community are uniformly administered and maintained at a minimum level for the benefit of all residents.

The review is initiated by the landowner filling out the Glastonbury Project Review and Evaluation Application, together with Sheet "A", from the information obtained in the site planning phase. Once the form has been executed, and all of the required submittals appended, they should be forwarded to the Projects Coordinator for the Committee. In most cases, the Projects Coordinator will arrange for the site and proposed development to be visited and independently evaluated by one of the members of the Royal Teton Ranch Engineering and Planning Department. The Committee will then review the project and communicate its decision and any recommendations or conditions to the landowner. Once the project has been approved, the landowner is free to begin the construction necessary to build the road or driveway.

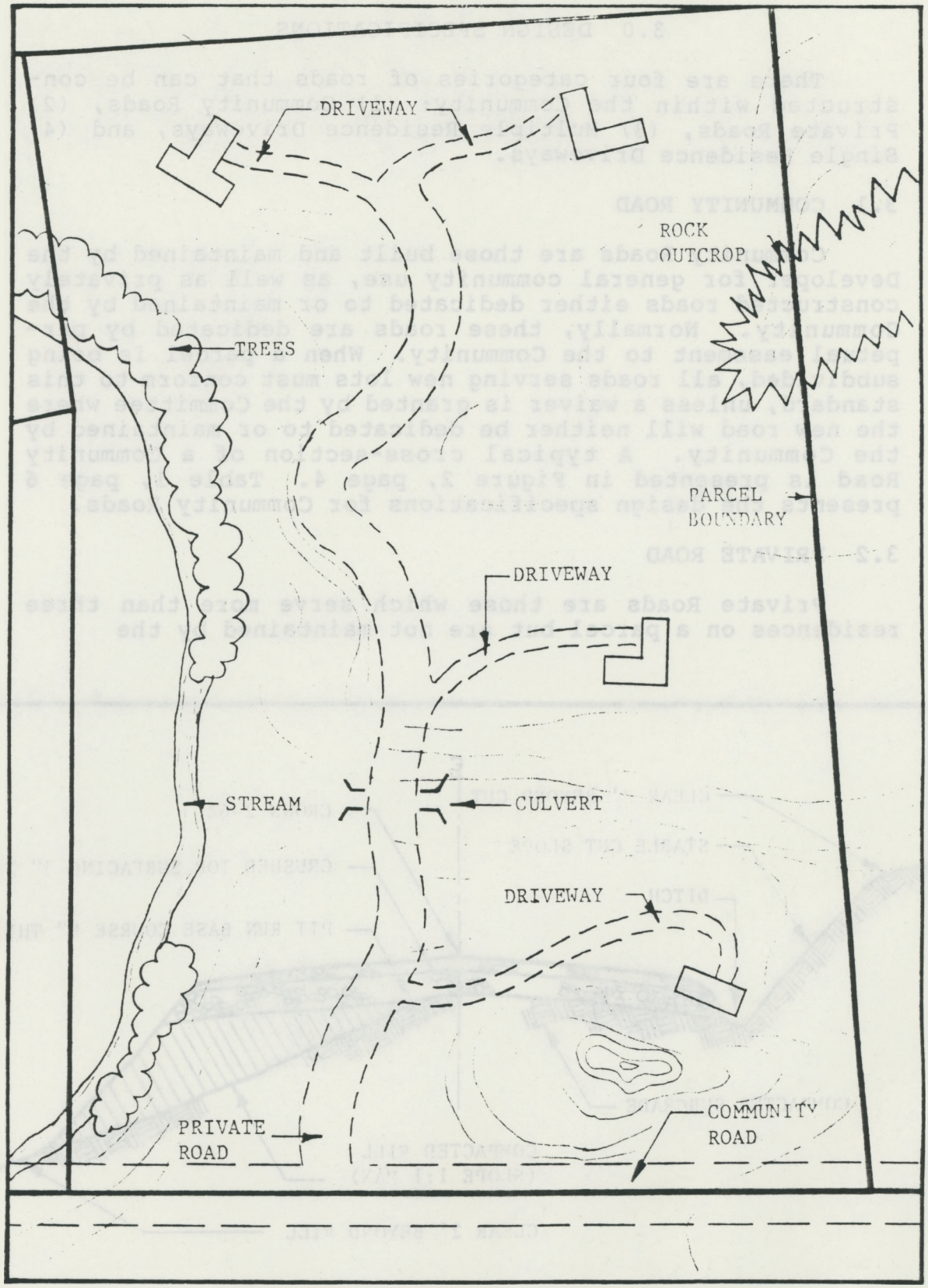

Figure 1: PLANNED ROUTE DRAWN ON A TOPOGRAPHIC MAP

3.0 DESIGN SPECIFICATIONS

There are four categories of roads that can be constructed within the Community: (1) Community Roads, (2) Private Roads, (3) Multiple Residence Driveways, and (4) Single Residence Driveways.

3.1 COMMUNITY ROAD

Community Roads are those built and maintained by the Developer for general community use, as well as privately constructed roads either dedicated to or maintained by the Community. Normally, these roads are dedicated by perpetual easement to the Community. When a parcel is being subdivided, all roads serving new lots must conform to this standard, unless a waiver is granted by the Committee where the new road will neither be dedicated to or maintained by the Community. A typical cross-section of a Community Road is presented in Figure 2, page 4. Table 1, page 6 presents the design specifications for Community Roads.

3.2 PRIVATE ROAD

Private Roads are those which serve more than three residences on a parcel but are not maintained by the

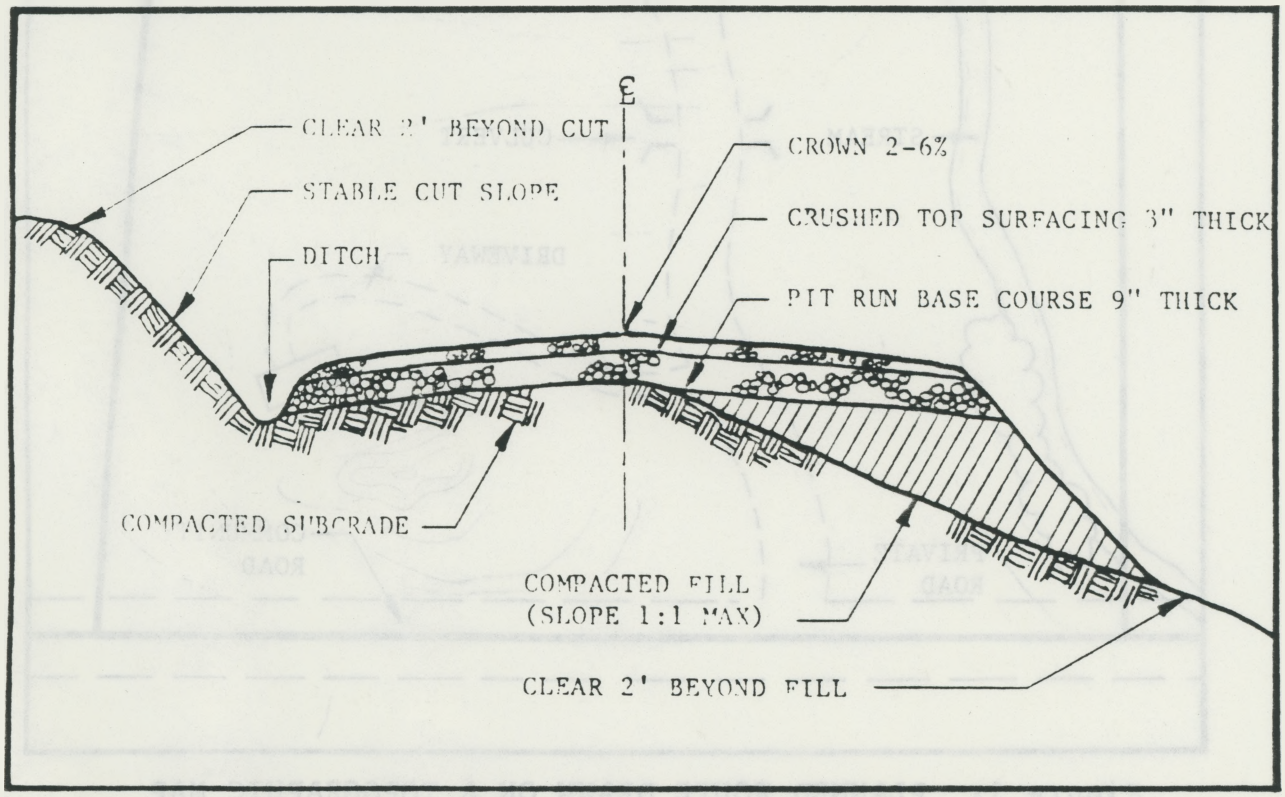

Figure 2: CROSS SECTION OF TYPICAL COMMUNITY ROAD

Community. Design specifications for private roads are presented in Table 2, page 6.

3.3 MULTIPLE RESIDENCE DRIVEWAY

Multiple Residence Driveways are those which serve two or three residences. Table 3, page 7 presents the design specifications for this type of driveway.

3.4 SINGLE RESIDENCE DRIVEWAY

The minimum standards for a driveway serving one residence are presented in Table 4, page 7. However, in most cases, the design minimums for a single residence driveway will actually be dictated by the access required during construction of the home. Consideration must be given to access by concrete mixers, earth moving equipment, materials deliveries, septic tanks, and mobile home deliveries. The road base is not as critical as in other categories, particularly on well-drained sites.

4.0 CONSTRUCTION STANDARDS

This section contains the general standards for construction that are to be utilized for road projects in the Community.

4.1. CLEARING AND GRUBBING

The construction zone should be cleared two feet beyond the toe of the fill and the top of the cut, as illustrated in Figure 2, page 4. All leaning and undercut trees should be removed. On a Community Road, visibility should be clear for at least 240 feet to insure safety.

All brush, stumps, logs, debris and boulders should be removed from the construction zone and disposed of in a suitable manner, such as by burning or burying.

Topsoil must be stripped whenever terrain will permit and stockpiled for use in reclaiming borrow areas and cut and fill slopes.

4.2 SWITCHBACKS

Switchbacks are to be avoided, but if the terrain makes them necessary, they should be carefully laid out as shown in Figure 3, page 8.

Table 1: DESIGN SPECIFICATIONS - COMMUNITY ROADS

Minimum Right of Way (Easement)	60 feet
Normal Width of Driving Surface	24 feet
Minimum Width of Driving Surface in Mountainous Terrain	20 feet
Maximum Grade	12%
Maximum Continuous Grade For More Than 500 Ft	10%
Minimum Road Visibility	240 feet
Minimum Frequency of Turnouts in Sections Narrower Than 24 Feet	500 feet
Minimum Turning Radius	50 feet
Depth of Base Course Rock	9 inches
Depth of Crushed Surface Gravel	3-6 inches
Rock & Gravel Specification	see Table 6
Compaction	see Section 4.3
Angle of Repose on Cuts and Fills	see Table 5
Drainage	see Section 4.5
Dead Ends	Cul de Sac or Adequate Turn Around

Table 2: DESIGN SPECIFICATIONS - PRIVATE ROADS

SERVING > 3 RESID.

ROW	40 feet
Normal Width of Driving Surface	20 feet
Minimum Width of Driving Surface in Mountainous Terrain	16 feet
Maximum Grade	12%
Recommended Maximum Continuous Grade For More than 500 Feet	10%
Minimum Frequency of Turnouts in Sections Narrower Than 20 Feet	500 feet
Minimum Turning Radius	50 feet
Depth of Base Course Rock	9 inches
Recommended Depth of Optional Crushed Surface Gravel	3 inches
Rock & Gravel Specification	see Table 6
Compaction	see Section 4.3
Angle of Repose on Cuts and Fills	see Table 5
Drainage	see Section 4.5
Dead Ends	Turn Around Required

ROW 28' up to 2 lots. cf. Table 6. Park Co. std.

multi residence 1-2 res. 16' road
private driveway 3-5 res. 20' road
county road >5 res. 26'-road

Table 3: DESIGN SPECIFICATIONS - MULTIPLE RESIDENCE DRIVEWAYS

SERVING 2 OR 3 RESID. 25' or 40' ROW

Normal Width of Driving Surface	14 feet
Minimum Width of Driving Surface in Mountainous Terrain	12 feet
Maximum Grade	14% (Notes "a" & "b")
Frequency of Turnouts	Discretionary
Turning Radius	Note ("b")
Recommended Depth of Base Course Rock	6 inches
Recommended Depth of Optional Crushed Surface Gravel	3 inches
Rock & Gravel Specification	see Table 6
Compaction	see Section 4.3
Angle of Repose on Cuts and Fills	see Table 5
Drainage	see Section 4.5

(a) Maximum Grade 14%, provided safety is ensured and adequate stopping distance is provided. Grades in excess of 10% may require 4WD when icy.

(b) Mobile home delivery will be made easier by providing a turning radius of approximately 1.1 x length of home and a maximum grade of 10% unless special equipment is employed for delivery.

Table 4: DESIGN SPECIFICATIONS - SINGLE RESIDENCE DRIVEWAYS

Normal Width of Driving Surface	12 feet
Recommended Minimum Width of Driving Surface in Mountainous Terrain	10 feet
Maximum Grade	14% (Notes "a" & "b")
Frequency of Turnouts	Discretionary
Turning Radius	(Note (b))
Recommended Depth of Base Course Rock	6 inches
Recommended Depth of Optional Crushed Surface Gravel	3 inches
Rock & Gravel Specification	see Table 6
Compaction	see Section 4.3
Angle of Repose on Cuts and Fills	see Table 5
Drainage	see Section 4.5

(a) Maximum Grade 14%, provided safety is ensured and adequate stopping distance is provided. Grades in excess of 10% may require 4WD when icy.

(b) Mobile home delivery will be made easier by providing a turning radius of approximately 1.1 x length of home and a maximum grade of 10% unless special equipment is employed for delivery.

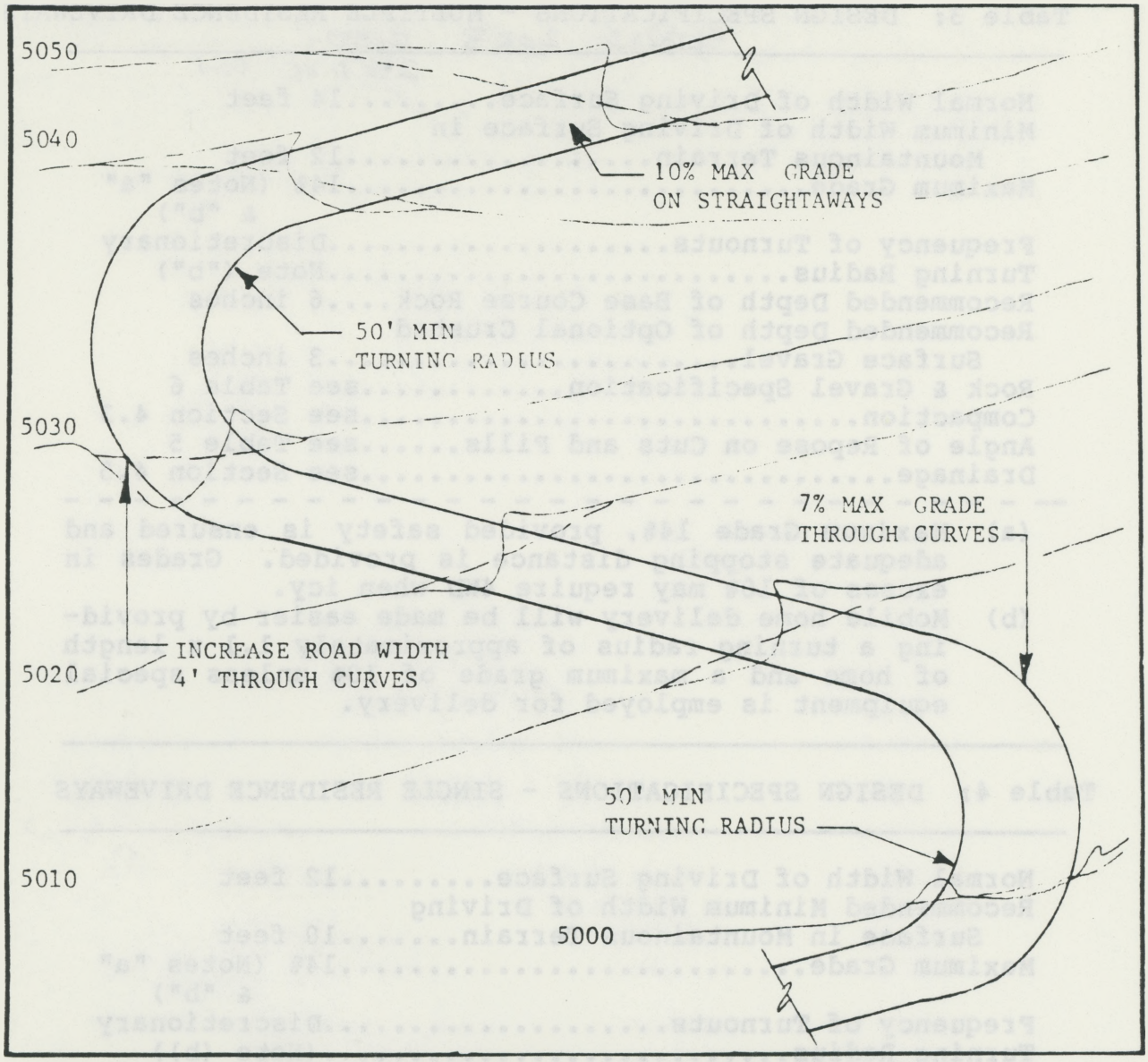

Figure 3: SWITCHBACK SPECIFICATION

4.3 SUBGRADE PREPARATION

Cut and fill slopes must be laid back to a stable angle of repose depending upon soil characteristics, to prevent erosion. Table 5, page 9 gives the recommended minimum angle in terms of horizontal run to vertical rise.

For compaction of subgrades, fill sections should be placed in layers and compacted to 90% relative density. Whenever available, water should be applied to obtain optimum moisture content for proper compaction. Sod and organic material must be excluded from fill sections.

Table 5: MINIMUM ANGLE OF REPOSE FOR CUT & FILL SLOPES

FILL SLOPES		
SOIL TYPE	RUN:RISE (< 3 ft)	RUN:RISE (> 3 ft)
Common	3:1	1.50:1
Rock	-	1.25:1

CUT SLOPES	
SOIL TYPE	RUN:RISE
Solid Rock	0.25:1
Hardpan/Soft Rock	0.50:1
Common, Slopes > 55%	0.75:1
Common, Slopes < 55%	1:1
Common, Cuts < 3 ft	2:1
Unstable Plastic Soil	3:1

4.4 ROAD BASE AND SURFACE MATERIALS

Base course and finished surface materials for roads built in the Community should consist of rocks and gravel graded according to the specifications in Table 6, below.

Table 6: ROCK & GRAVEL MATERIALS SPECIFICATION

Base Course Rock (Pit Run)	
MATERIAL SIZE	PERCENT OF TOTAL
> 6"	0%
2" to 6"	40 - 65%
1/4" to 2"	15 - 50%
Fines & Binder	10 - 20%

Crushed Surface Gravel (Type "A")	
MATERIAL SIZE	PERCENT OF TOTAL
> 1"	0%
1/4" to 1"	40 - 60%
1/10" to 1/4"	20 - 55%
Fines & Binder	5 - 20%

4.5 DRAINAGE OF ROAD SURFACES

The components to consider in providing adequate drainage are the road crown, inslopes, outslopes, ditches and culverts.

4.5.1 Surface Profile

The purpose of shaping a road surface is to shed water into the side ditches. Typically, a crown or side slope of 2% to 6% is necessary to permit rapid drainage.

The type of soil in the subgrade will govern the amount of crown required. Light sandy soil will drain quickly, requiring less crown than heavy clays. On stable soils the roadbed may slope outward to the fill slope, eliminating the need for a crown and ditches. Insloping roads are recommended in mountainous terrain, allowing the discharge of water into the ditch and providing greater protection for motorists during winter. Figure 4, below, illustrates these design alternatives.

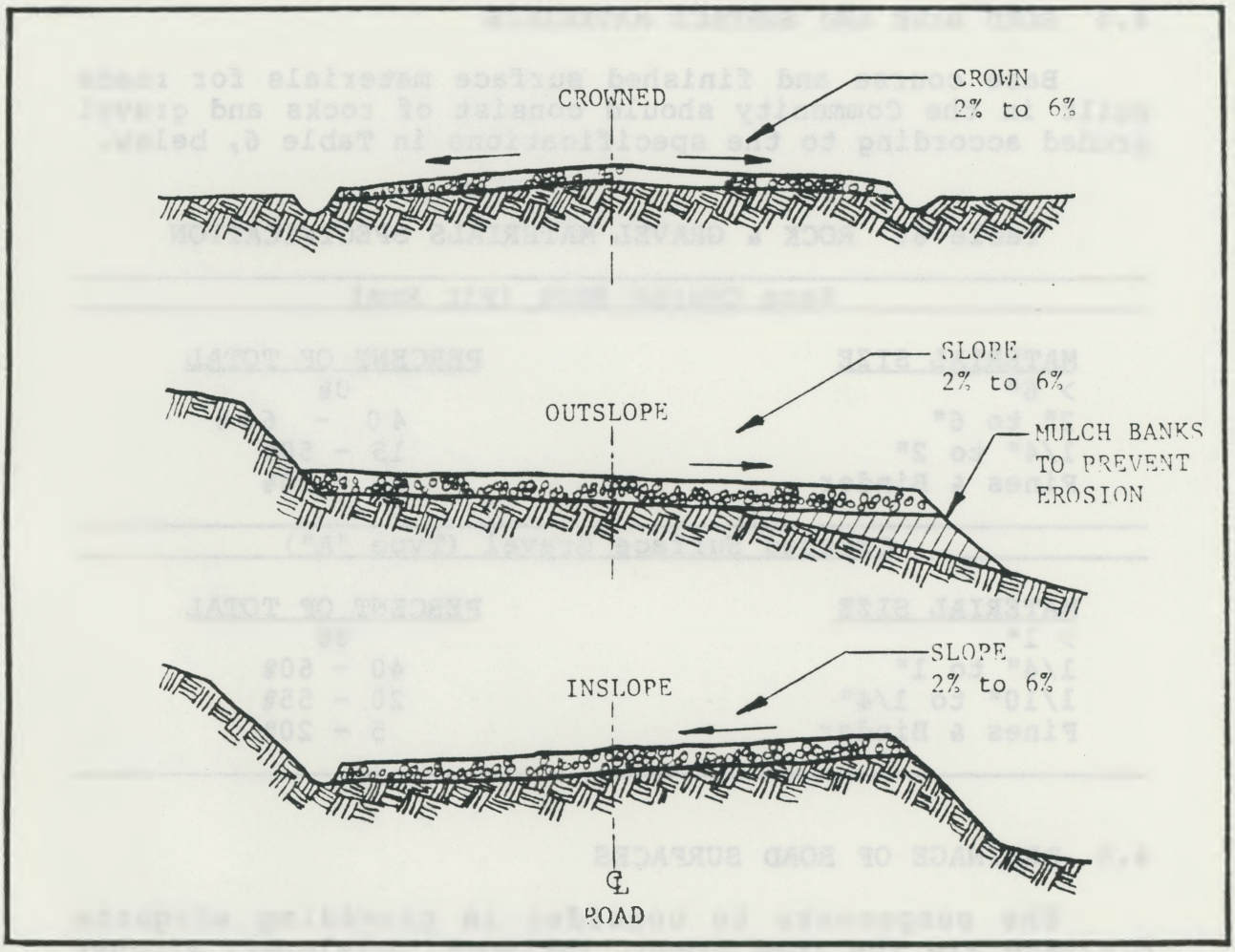

Figure 4: SURFACE PROFILES

4.5.2 Ditches

Grades should be from 0.4% to 8.0% for ditches lined with well established grass or riprap, or where provided with velocity control devices. Plain soil and unlined ditches should not exceed a grade of 0.5%. Sideslopes should have a ratio of one foot of rise per two feet of run. Depth should be at least one foot.

4.5.3. Culverts

Culverts are required where roads cross any ditch or water course. They are also needed at intersections with other roads and at designed intervals underneath elevated portions of roadways to prevent ponding. It is preferable to provide drainage at frequent intervals rather than concentrating water into one large conduit.

Culverts should be sized to the maximum expected flow in fifty years for a given location, with consideration to the size of the watershed, permeability of the soil, vegetation, and slope of the drainage ditch. They should be of sufficient length to allow construction of a driving surface consistent with the width of adjacent sections of the roadway.

Installation of culverts should be in accordance with generally accepted standards, with attention given to the details of bedding, compaction, and erosion control.

The following are the acceptable culvert materials within the Community: (1) Corrugated galvanized steel (AASHTO M36 or M218), (2) Corrugated aluminum (AASHTO M196), or (3) Corrugated polyethylene pipe (AASHTO M252 and M294).

4.6 INTERSECTIONS

Whenever possible, roads should intersect at right angles, or angles greater than sixty degrees. Visibility should be given prime consideration in locating intersections. A minimum corner radius of twenty feet should be constructed. When proposing to intersect a county road, it is necessary to consult the County Road Superintendent for permission and construction guidelines prior to beginning work.

4.7 TREES

Whenever possible, roads should be situated to avoid unnecessary removal of trees. Care should be taken not to scar trees with equipment. It is preferable to completely remove a tree or stump than to bury it in the fill slope.

Wood products should be removed as soon as possible to avoid burial under the roadway.

Standing trees should not be relied upon to provide support for a roadway. Dead, leaning or undercut trees which pose a hazard to a roadway should be removed.

4.8 RECLAMATION OF DISTURBED AREAS

In order to protect the land from erosion and the spreading of noxious weeds, cut and fill slopes and borrow areas must be covered with topsoil, mulched and planted with appropriate ground cover at the earliest suitable season. The choice of species to be used should be based on the advice of the Glastonbury Road Superintendent, who is in consultation with the local Soil Conservation Service. If weed growth does appear, immediate steps must be taken by the parcel owner to remove or treat the infestation to prevent it from spreading.

4.9 SAFETY CONSIDERATIONS

The safety of a road is directly related to the standard of its design and the quality of workmanship in its execution. The following table presents a list of safety criteria which apply to the construction of Community Roads. These are also recommended for all other types of roads in Glastonbury.

Table 7: SAFETY CONSIDERATIONS

Hazards	to be posted
Minimum Radius of Curvature	50 ft.
Surface	must be compacted and stable
Minimum Vertical Clearance	14.5 ft.
Minimum Visibility	240 ft.
Width	must be consistent

5.0 REFERENCES

American Public Works Association, Southern California Chapter, Standard Specifications for Public Works Construction, Building News, Inc., Los Angeles, 1979

Anonymous, Standard Specifications for Road and Bridge Construction, 1981, (adopted by the Montana Dept. of Highways and Montana Highway Commission)

Forbes, R.D., Forestry Handbook, Chpt. 18, Ronald Press Co., NY, 1961