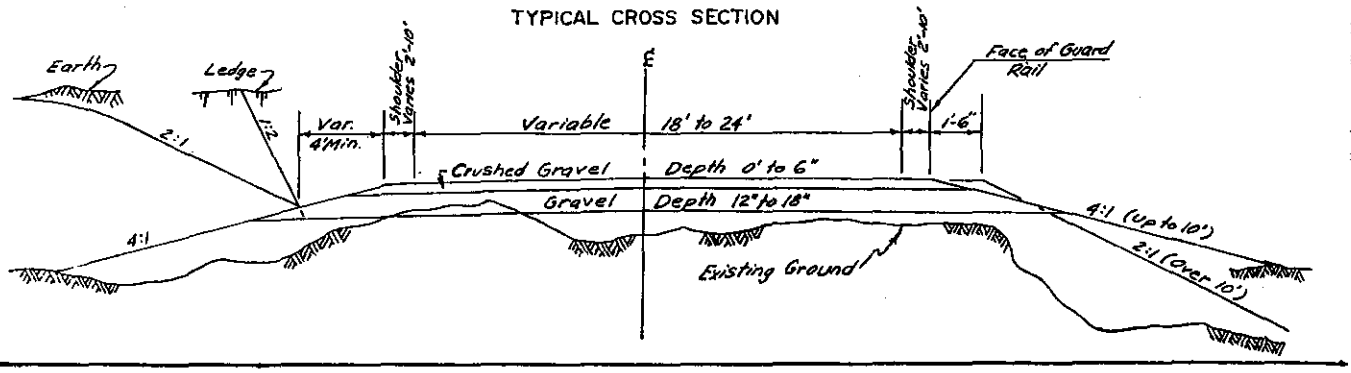

The above diagram shows a typical cross section of road based on minimum geometric and structural guides for local streets. (reprinted with permission from the New Hampshire Department of Transportation).

Road Design Standards

Suggested minimum design standards for rural subdivision streets

Below are suggested minimum design standards to be followed in the absence of local subdivision controls. Every effort should be made to exceed these minimums whenever possible. The circumstance of topography and other physical factors may require an occasional exception to these standards; however, the selectmen should exercise reasonable judgment before granting such variations.

For a visual summary of the below minimum design standards the reader is referred to the above diagram of a typical cross section of road and the chart of minimum geometric and structural guides for local roads and streets on the bottom of this page.

1. General Street Plan: Approval of the general development street plan should be required before allowing construction of small integral phases of the plan.

2. Street Layout: Streets shall be laid out so as to intersect at right angles as nearly as possible and no street shall intersect another at less than 60 degrees. Streets shall be continuous and in alignment with existing streets as far as possible.

3. Dead-end Streets: Dead-end streets, designed to be so permanently, shall be longer than 1000 feet and shall be provided with a turn a round having an outside roadway diameter of at least 110 feet.

4. Street Names: All streets shall be named without duplication with other streets in town.

5. Right-of-Way: The minimum width of right-of-way shall be 50 feet. A greater width may be required for arterial and collector streets.

6. Highway Right-of-Way Bounds: Highway bounds, of a type approved by the Board of Selectmen, shall be installed at all intersections of streets, at all points of change in direction and at any other points the Board may deem necessary to designate the street lines.

7. Alignment: No streets shall be constructed with a curvature of less than a 230 foot radius.

8. Grades: Street grades, where feasible, shall not exceed 10 percent, nor shall any be less than 0.50 percent. Special care shall be taken to provide flat grades at all intersections.

9. Construction Supervision: Construction of the roadway drainage facilities must be done under the supervision of and with the approval of the Board of Selectmen.

10. Clearing: The entire area of each street shall be cleared of all stumps, brush, roots, boulders and like material, and all trees not intended for preservation.

11. Subgrade Preparation: All loam and other yielding material shall be removed from the roadway and replaced with suitable fill material. All boulders and ledge shall be removed to a uniform cross sectional depth of not less than 12 inches below the subgrade and replaced with gravel.

12. Drainage: Surface water shall be disposed of by means of culverts of sufficient capacity at water courses as determined by standard hydraulic design methods and by construction of a longitudinal storm drainage system whenever required to relieve water in the ditch sections. Construction to be in accordance with New Hampshire Standard Specifications, 1983, Section 603 and 604.

13. Gravel base: All streets shall be constructed with a minimum of 12 inches of gravel per New Hampshire Standard Specifications, 1983, Section 304.

continued on p. 3

The table below relates minimal structural guides for local roads and streets relative to average daily traffic (reprinted with permission from the New Hampshire Department of Transportation).

NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION
MINIMUM GEOMETRIC & STRUCTURAL GUIDES FOR LOCAL ROADS AND STREETS

Ave. Daily Traffic (Veh./Day)	0-50	50-200	200-750	750-1500	1500 & over
Pavement Width (Feet)	18 min.	20	20	22	24
Shoulder Width (Feet)	2	2	4	4	8-10
Center of Road to Ditch Line	15	16	18	19-21	Varies
Pavement Type	Gravel	Asph. Sur. Treated	Hot Bituminous	Hot Bituminous	Hot Bituminous
Slope of Roadway	½" per Foot	⅜" per Foot	¼" per Foot	¼" per Foot	¼" per Foot
Base Course Depth - (Gravel)	12"	12"	12"	12"	18"
(Cr. Gravel)	-	-	4"	6"	6"

NOTES
1. Gravel Surface should be Paved where Steep Grades occur.
2. For Average Daily Traffic over 1000 Veh./Day Paved Shoulders should be considered.
3. Base Course Depths may need to be increased in areas of Poor Soils.

Design Standards. . .
continued from p. 2

14. Asphalt Surface: The asphalt surface may be a Bituminous Surface Treatment, Specification Section 410, or Hot Bituminous Pavement, Section 403, as required by the Selectmen. The minimum width should be 20 feet for up to 300 vehicles per day, 22 feet for 300 to 600 vehicles per day and 24 feet for over 600 vehicles. A 44-foot wide pavement may be required in areas where on-street parking is expected. Angle parking shall not be allowed.

15. Gravel Surface: In unusual cases of low traffic volumes where the Selectmen feel an asphalt surface is not required, the total usable roadway width shall be a minimum of 28 feet so that the ultimate design may be a 20 foot asphalt surface with 4 foot gravel shoulders.

16. Gravel Shoulders: A four foot gravel shoulder, equal to the base course depth, shall be constructed adjacent to all 20-, 22- and 24-foot asphalt surfaces.

17. Bridges: On stream crossings with a span of 10 feet or more, the structure shall be designed to HS-20 loading (AASHTO Specifications). The minimum roadway width shall be 24 feet.

18. Sidewalks: Sidewalks of two inch thick asphalt, on a four-inch gravel base, not less than 4 feet in width and no closer than 22 feet to the street center line shall be constructed on one or both sides of the street when in the opinion of the Board such sidewalks are necessary.

19. Erosion Control: Erosion shall be controlled by placing mulch or matting on all surfaces disturbed by construction of the roadway and on all other surfaces where there is danger of eroded material being carried to the roadway area.

20. Utilities: Utility poles should be kept close to the right-of-way line, in no case closer than the ditch line and always well back of a curb. Water and sewer mains should be constructed outside the surface area and preferably outside the ditch line.

21. Safety: Safety is an important factor on all roadway improvements. On development roads it may not be possible or practical to obtain obstacle-free roadsides but every effort should be made to provide clear areas within the maintenance limits. The use of flatter slopes, the use of guard rail where necessary, and the use of warning signs are other safety factors to be considered.

22. Minimum Standards: The use of more liberal values than these minimum standards is recommended. For additional guidance and design of local development roads and streets with high volumes of traffic, reference should be made to the American Association of State Highway and Transportation Officials, "A Policy on Geometric Design of Highways and Streets," 1984.

The above minimum standards were developed by the New Hampshire Department of Transportation and provided by Robert W. Greer, Administrator, Bureau of Municipal Highways ■

"Ware" Am I?

Computer Hardware and Software
by Dr. Dot

The last computer article discussed the widespread availability of computers and how they have become a major part of our everyday experiences. It is now time for us to meet this beast face to face and learn how to tame it.

There are two commonly used terms associated with computers; hardware and software. Hardware refers to the parts of the computer that you can touch and feel. The keyboard, printer, monitor and disk drives are examples of hardware. Software refers to any program or logic instructions (usually written on magnetic disks) that control the operation of the hardware. Word processing, spreadsheet, and pavement management programs are examples of software.

There are many types and brands of computers on the market. The best way to find out what's right for you is to determine your software needs and then to match the hardware to the specs dictated by the software.

How do you identify your software needs? Computers are basically used to handle tasks that are repetitious and burdensome in nature. The idea is to find activities that you do routinely or jobs that are too time-consuming and computerize them.

There are many different software packages available for the highway professional. Programs have been designed to handle such highway related tasks as pavement management, equipment maintenance, parts inventory, bridge ratings, budgeting, truck routing, and sign inventories.

Once your needs have been identified it's time to search for available software. Association journals, computer publications, your peers, and the Technology Transfer Center are major sources of information.

In the next Road Business article we'll take a closer look at some of the computer software packages now on the market.

Do you have any specific questions about computers? We would be glad to assist you in finding out the answer. Just call us on our toll free number (1-800-423-0060) or write to the following address:

Technology Transfer Center
University of New Hampshire
Department of Civil Engineering
Transportation Research and
Computation Group
Durham, NH 03824 ■

Timber Bridges. . .
continued from p. 1

Timber bridges are not damaged by freeze-thaw cycles, and are impervious to the action of deicing agents. Timber absorbs energy well, and can withstand severe short term overloads. Lightweight timber is more readily installed with smaller equipment than are steel and concrete. Timber's light weight also means that existing abutments can often be reused, sometimes even with an allowable load increase because of the structure's lighter imposed loading. Initial maintenance and life cycle costs are often smaller with timber bridges than with steel and concrete spans.

Timber bridges do, of course, have certain shortcomings. Wood, an organic material, is subject to damage from fire, insects, fungus (rot), and accidental impact. However, modern pressure treatment with preservatives can prevent most of these problems indefinitely. Timber bridges often have deeper sections than would their steel or concrete counterparts. This can mean a decreased hydraulic opening. Finally, procuring the larger timber members is for many a new experience, and may involve delays and supplier searches.

A recent search of the Federal Highway Administration's National Bridge Inventory[1] revealed some interesting data on existing timber bridges. There are more than 65,000 timber bridges in the country, not including those spans shorter than 20 feet, the Forest Service's 8,000+ timber bridges, or the railroads' 1,500 miles of timber bridges and trestles. The great majority of these bridges are owned by local governments and are subject to fewer than 100 vehicles a day. Most are 40 feet long. Impressively, the majority of the timber bridges are not only open, but carry no load posting at all. Analysis of the age and estimated remaining service life is more than fifty years. This figure speaks particularly well of timber bridges durability when one considers that many of the inventoried timber spans predated modern pressure treatment procedures.

When people think of timber bridges, they often conjure up an image of a picturesque covered bridge. Actually, the vast majority of the nation's (and the state's) timber bridges are simple girder/deck spans. The girders can be solid-sawn or glulam timber, steel or even concrete. Most timber decks are laminated planks on edge, running transverse to the bridge axis and main members. The planks used to be simply spiked to each other (nail-laminated), but are now almost always laminated with glue (glulam) into panels. The glulam panels tend to develop better load sharing and reduced reflective cracking in the asphaltic overlays. New timber decks are readily available and can be installed by most town road crews.

continued on p. 4