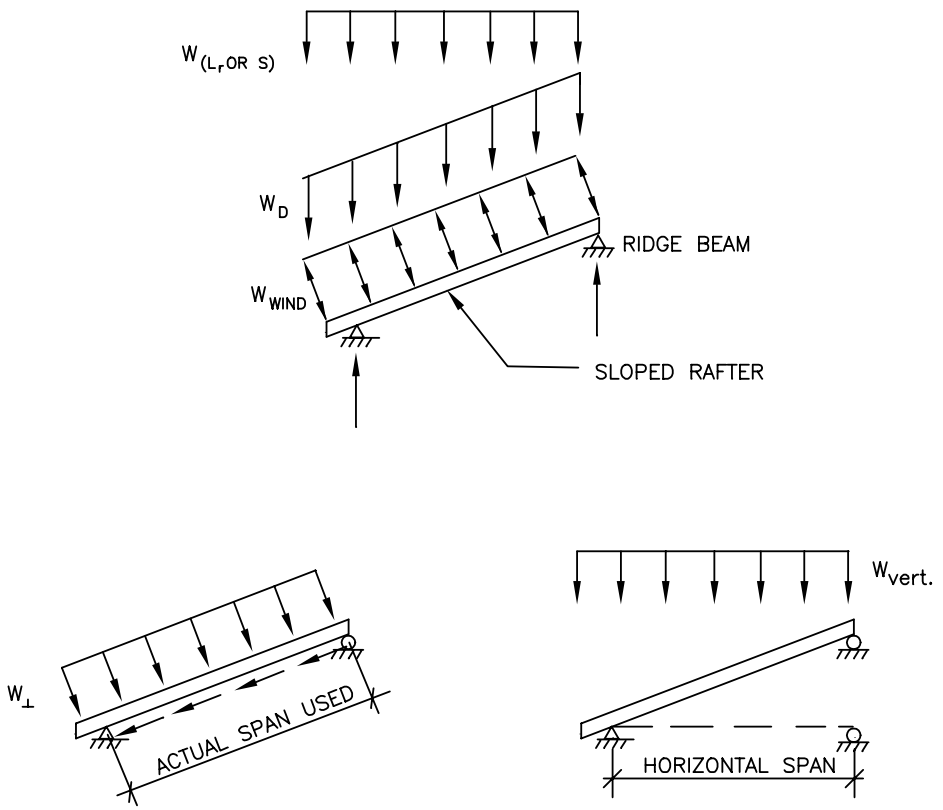
FIGURE 5.8 Design Methods and Assumptions for a Sloped Roof Rafter



Roof truss manufacturers normally provide the required engineering design based on the loading conditions specified by the building designer. The building designer is responsible for providing the following items to the truss manufacturer for design:

- design loads;
- truss profile;
- support locations; and
- any special requirements.

The building designer should also provide for permanent bracing of the truss system at locations designated by the truss designer. In general, such bracing

may involve vertical cross-bracing, runners on the bottom chord, and bracing of certain web members. In typical light-frame residential roof construction, properly attached roof sheathing provides adequate overall bracing of the roof truss system and ceiling finishes normally provide lateral support to the bottom chord of the truss. The only exception is long web members that may experience buckling from excessive compressive loads. Gable endwall bracing is discussed separately in Section 5.6.6 as it pertains to the role of the roof system in supporting the walls against lateral loads, particularly those produced by wind. For more information and details on permanent bracing of trusses, refer to *Commentary for Permanent Bracing of Metal Plate Connected Wood Trusses* (WTCA, 1999). Temporary bracing during construction is usually the responsibility of the contractor and is important for worker safety. For additional guidance on temporary bracing, consult the *Metal Plate Connected Wood Truss Handbook* pages 14-1 through 15-12 and Appendix L (WTCA, 1997). For additional guidance on roles and responsibilities, refer to *Standard Practice for Metal Plate Connected Wood Truss Design Responsibilities* (WTCA, 1995).

The National Design Standard for Metal Plate Connected Wood Truss Construction (ANSI/TPI 1-95) governs the design of trusses. Available from the Truss Plate Institute (TPI, 1995a and b), ANSI/TPI 1-95 includes the structural design procedure as well as requirements for truss installation and bracing and standards for the manufacture of metal plate connectors. A computer program, PPSA, is also available for a detailed finite element analysis (Triche and Suddarth, 1993). Truss plate manufacturers and truss fabricators generally have proprietary computerized design software based on ANSI/TPI 1-95, with modifications tailored to their particular truss-plate characteristics.

The designer should note that cracking and separation of ceiling finishes may occur at joints between the walls and ceiling of roofs. In the unfavorable condition of high attic humidity, the top chord of a truss may expand while the lower roof members, typically buried under attic insulation, may not be similarly affected. Thus, a truss may bow upward slightly. Other factors that commonly cause interior finish cracking are not in any way associated with the roof truss, including shrinkage of floor framing members, foundation settlement, or heavy loading of a long-span floor resulting in excessive deflection that may “pull” a partition wall downward from its attachment at the ceiling. To reduce the potential for cracking of ceiling finishes at partition wall intersections, 2x wood blocking should be installed at the top of partition wall plates as a backer for the ceiling finish material (i.e., gypsum board). Ceiling drywall should not be fastened to the blocking or to the truss bottom chord within 16 to 24 inches of the partition. Proprietary clips are available for use in place of wood blocking and resilient metal “hat” channels may also be used to attach the ceiling finish to the roof framing. Details that show how to minimize partition-ceiling separation problems can be found on the WTCA website at (www.woodtruss.com) or by contacting WTCA to obtain a “Partition Separation” brochure.

Trusses are also frequently used for floor construction to obtain long spans and to allow for the placement of mechanical systems (i.e., ductwork and sanitary drains) in the floor cavity. In addition, trusses have been used to provide a complete house frame (NAHBRC, 1982). One efficient use of a roof truss is as a structural truss for the gable end above a garage opening to effectively eliminate the need for a garage door header. For other efficient framing design concepts and