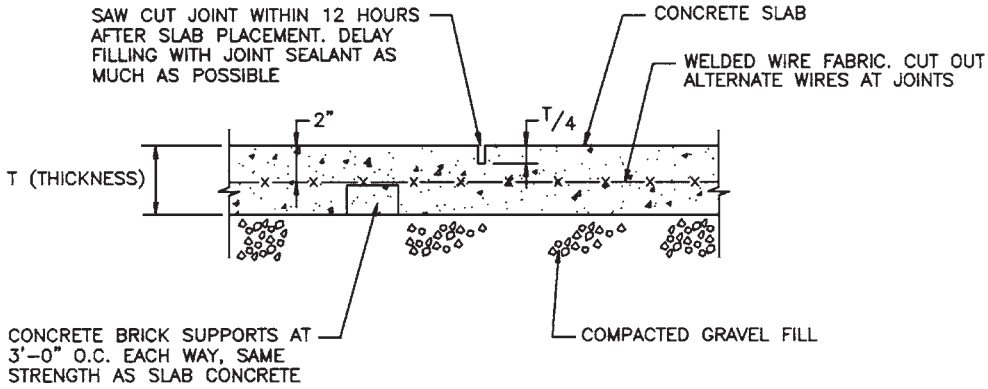

FIGURE 12.40 Typical slab control joint.

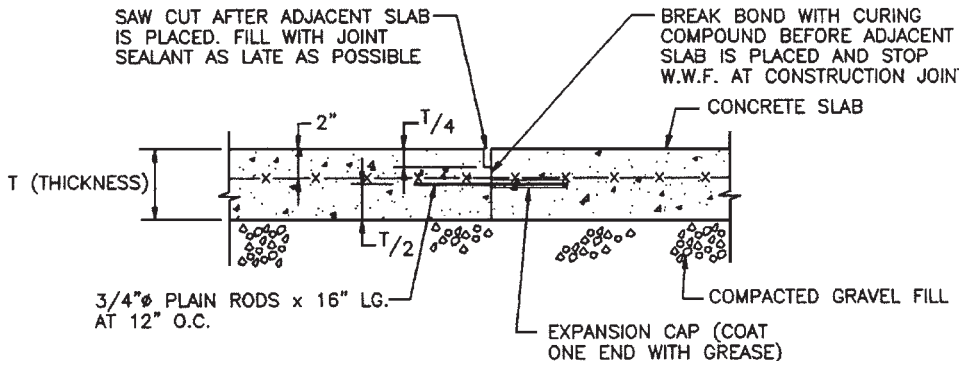

FIGURE 12.41 Typical slab construction joint.

4. NAVFAC DM-7.2, Foundations and Earth Structures, Department of the Navy, Naval Facilities Engineering Command, Alexandria, VA.

5. A. Kleinlogel, *Rigid Frame Formulas,* Frederick Ungar Publishing Co., New York, 1964.

6. A. Newman, "Engineering Pre-engineered Buildings," *Civil Engineering,* September 1992, p. 58.

7. *CRSI Design Handbook,* Concrete Reinforcing Steel Institute, Schaumburg, IL, 2002.

8. Roy E. Hunt, *Geotechnical Engineering Techniques and Practices,* p. 548, McGraw-Hill, New York, 1986.

9. ACI Committee 318, Building Code Requirements for Structural Concrete (318-02) and Commentary (318R-02), American Concrete Institute, Farmington Hills, MI, 2002.

10. ACI Committee 436, Suggested Design Procedures for Combined Footings and Mats, ACI 336.2R-66, American Concrete Institute, Detroit, MI, 1966.

11. Edwin H. Gaylord, Jr., and Charles N. Gaylord (eds.), *Structural Engineering Handbook,* 2d ed., p. 5-66, McGraw-Hill, New York, 1979.

12. D. W. Lee and J. E. Breen, "Factors Affecting Anchor Bolt Development," *Research Report* 88-1F, Project 3-5-65-88, Cooperative Highway Research Program with Texas Highway Department and U.S. Bureau of Public Road, Center for Highway Research, University of Texas, Austin, August 1966.

13. R. W. Cannon, D. A. Godfrey, and F. L. Moreadith, "Guide to the Design of Anchor Bolts and Other Steel Embedments," *Concrete International,* July 1981.

14. ACI Committee 349, Code Requirements for Nuclear Safety Related Concrete Structures (ACI 349) Appendix B, American Concrete Institute, Farmington Hills, MI, 1997.

15. John G. Shipp and Edward R. Haninger, "Design of Headed Anchor Bolts," *AISC Engineering Journal,* Second Quarter, 1983.

16. Mario N. Scacco, "Design Aid: Anchor Bolt Interaction of Shear and Tension Loads," *AISC Engineering Journal,* Fourth Quarter, 1992.

17. James M. Fisher, "Structural Details in Industrial Buildings," *AISC Engineering Journal,* Third Quarter, 1981.

18. ACI Committee 302, *Guide for Concrete Floor and Slab Construction,* ACI 302.1R-96, American Concrete Institute, Detroit, MI, 1996.

19. *Concrete Floors on Ground,* Portland Cement Association, Skokie, IL, 2001.

20. Robert A. Packard, *Slab Thickness Design for Industrial Concrete Floors on Grade,* Portland Cement Association, Skokie, IL, 1976.

21. Standard Test Method for Determining Floor Flatness and Levelness Using the F-Number System, ASTM E 1155-87, ASTM, Philadelphia, 1987.

22. ACI Committee 117, Standard Specifications and Commentary for Tolerances for Concrete Construction and Materials, ACI 117-90, ACI, Detroit, MI, 1990.

23. Eldon Tipping, "Bidding and Building to F-number Floor Specs," *Concrete Construction,* January 1992.

REVIEW QUESTIONS

1 Compare advantages and disadvantages of headed and L-shaped anchor bolts.

2 List and explain the design issues that have to be addressed by designers of tie rods.

3 Why do many engineers question long-term adequacy of hairpin bars?

4 Using tables in Appendix D, find the approximate column reactions for a 60-ft-wide single-span rigid frame with 18-ft eave height and 20-ft bay spacing. The frame is subjected to a 20-psf roof live load and a wind speed of 80 mph, Exposure C, computed per ASCE 7-95.

5 Who is responsible for anchor bolt design, including establishing minimum edge distances?

6 What are some factors to be considered in specifying column pier sizes prior to manufacturer selection?

7 Which load combinations are most likely to govern the design of foundations and anchor bolts?

8 Name two kinds of lateral-load-resisting devices placed in sidewalls that may require enlarged column piers.

9 List at least two challenges facing specifiers of downturned slabs for metal building foundations.