The least allowable diameters for rollers are one and three-quarters \((\frac{3}{4})\) inches for bridges of Class A, and one and a half \((1 \frac{1}{2})\) inches for bridges of Classes B and C. The spaces between rollers must never exceed three-quarters \((\frac{3}{4})\) of their diameter.

**Turn Buckles and Sleeve Nuts.** — All turn buckles and sleeve nuts must be made so strong, that they will be able to resist without rupture the ultimate pull of the bars which they connect, and without distortion, the greatest twisting-force to which they could ever be subjected. U-nuts are not to be used in any part of a bridge.

**Sizes of Nuts.** — The dimensions of all square and hexagonal nuts for the various diameters of rods are to be taken from Carnegie’s “Pocket-Companion” (pp. 130, 131), excepting those nuts on the ends of pins which are subject to but a slight tendency to shear the thread: in this case, these dimensions may be diminished, in direct proportion to this tendency, until the thickness reaches the limit of one-half \((\frac{1}{2})\) of an inch.

**Washers and Nuts.** — Washers and nuts must have a uniform bearing. Cast-iron washers must be used under the heads and nuts of all timber bolts, when the bearing is on the wood.

**Beam Hangers.** — Whenever possible, four \((4)\) beam hangers per beam are to be used. The screw ends are to be provided with check nuts.

**Jaws.** — Great care must be taken, in designing jaws for the ends of any strut, that they be so strong in every respect, that, when the strut is subjected to its ultimate load, it will fail near the middle rather than at the ends.

**Brackets.** — Brackets, or knees, must be used to connect each overhead strut to the posts or batter braces. They should be of straight tee, angle, or channel iron: if made curved, no dependence is to be placed upon them, either for strength or stiffness. When there is no vertical sway bracing, each intermediate bracket must be proportioned to resist the compression induced in it by the wind pressure concentrated at the windward and leeward points of that panel of the top chords to which the bracket belongs; and each portal bracket, to resist the compression induced in it by one-half of the total wind pressure concentrated at the panel points of the top chords.