TPI/WTCA's POSITION ON
PERMANENT BRACING OF PIGGYBACK TRUSSES

The Truss Plate Institute and Wood Truss Council of America, the two United States trade associations most knowledgeable about the design, construction, and bracing of metal plate connected *(MPC)* wood trusses, do not believe that there is a significant problem, as has been suggested by others, with MPC wood trusses that are a component of a piggyback trussed roof system. TPI, whose members manufacture truss plates and provide the designs for wood truss components, and WTCA, whose members build trusses, based on their combined 47 years of industry experience are able to state unequivocally that the number of reported instances of piggyback truss performance problems is infinitesimal when compared with the number of piggyback roof trusses in buildings.

What are piggyback trusses? Long span or high pitched MPC wood trusses which are too large to be manufactured, shipped, and erected in one piece. At times, the building designer or truss designer may choose to design trusses in two or more pieces to be assembled on the jobsite. In general terms, a supporting-or -carrying truss that is topped with a smaller, supported (cap) truss carried directly on top of the supporting truss is often referred to as a piggyback truss assembly.

After an article raising concerns about the performance about MPC piggyback wood trusses, appeared in the March 1998 *Journal of Light Construction*, TPI conducted a preliminary telephone survey of a limited number of forensic investigators and truss incidents to determine whether it could reach a conclusion whether there was a problem or potential problem with buildings containing piggyback trusses and, if so, the magnitude of the problem. TPI has not been able to conclude, as the author suggests, that piggyback truss assemblies are in imminent danger of collapse due to *"incomplete bracing of the piggyback system"*. To the contrary, it would appear that the number of incidences of piggyback trussed roofs experiencing performance problems are de minimus when compared with the hundreds of thousands of piggyback trusses sold, manufactured and erected in the U.S. each year. Further, it is impossible based on available data to attribute any performance problem solely to one specific cause, such as the lack of diagonal bracing, installing trusses out of plumb, installing damaged trusses, inadequate anchorage of continuous lateral bracing, inadequate anchorage of trusses, inadequate fastening of the diaphragm to the pitched portion of the truss, etc.

As described in a forthcoming publication entitled; ***"COMMENTARY FOR PERMANENT BRACING OF METAL PLATE CONNECTED WOOD TRUSSES*** by John F. Meeks, P.E., with contributions

from TPI's Technical Advisory Committee and WTCA's Engineering Review Committee, it is important to remember that while the truss designer and truss manufacturer may provide recommendations for temporary bracing, it is up to the building designer (who is the individual or organization responsible for the overall design of the building, and is typically one of the following -- owner, contractor, architect or engineer.) to provide complete engineered structural framing systems, including proper permanent bracing to support in-service loads both for piggyback and for other type of trusses. The truss designer is not in a position to know how the building designer intends to analyze and transfer loads due to the effect vertical or lateral loads of the trusses on the building or the effect of vertical or lateral loadings of the building on the trusses. The truss designer only applies the loads determined by the building designer to the trusses he or she designs.

The top chord of the piggyback truss assembly or supporting truss will require some type of lateral restraint to prevent the top chord from buckling out from under the supported truss, and from moving out of plane. This is most often accomplished by 4x2 dimension lumber continuous lateral bracing. The required spacing of this bracing is generally provided on the truss design drawing by the truss designer, together with the assumed thickness of the bracing and the minimum connection requirements between the cap truss and the carrying truss.

It is imperative that the building designer, in turn, review this information and ensure that all potential loading conditions have been accounted for. Further, the building designer must integrate the truss member (chords & webs) requirements for continuous lateral bracing, as specified by the truss designer, into the overall building design. The building designer can anchor the continuous lateral bracing into solid end walls or other load resisting elements, and/or stabilize the continuous lateral bracing with bays of diagonal bracing at intervals along the length of the building, or some other equivalent means. If the building designer neglects transferring the lateral top chord forces into the building, the top chord members and the continuous lateral bracing can move in unison in the same direction. This type of shift may gradually occur over time and may progressively worsen, although little is known about the specifics of in-place system buckling and all the construction factors that may lead to in-place performance problems. Our industry experience indicates that such occurrences are rare and are usually caused by construction or installation practices that disregards bracing, bracing anchorage, proper truss connection details, and/or proper nailing schedules. Regardless of all of this, it is important for the building designer to assure that truss reactions (uplifts, horizontal thrusts, and gravity) and truss member lateral forces are transferred into the building structure which must have adequate strength to resist them.

Industry documents which provide recommended design and handling procedures for trusses include

ANSI/TPI 1-1995, WTCA 1-1995, and HIB-91. *National Design Standard for Metal Plate Connected Wood Truss Construction* (ANSI/TPI 1-1995, model code approved), and *Standard Responsibilities in Design Process Involving Metal-Plate-Connected Wood Trusses. WTCA 1-1995* (pending ANSI approval as ANSI/TPI/WTCA 4-2000) both specify that the anchorage of the truss, and the stabilization and anchorage of continuous lateral bracing per truss design requirements is the responsibility of the building designer. *Commentary and Recommendations for Handling. Installing & Bracing Metal Plate Connected Wood Trusses –HIB-91* recommends temporary bracing for use during installation to hold trusses true to line and plumb and to prevent toppling or dominoing collapse of the trusses. Most of the major building codes recognize HIB-91 as an acceptable method of installation for many truss installation applications. The document, however, is not intended to supersede the building designer's specific installation method for a particular project.

TPI and WTCA will continue to review and provide information concerning piggyback and other trusses their members design and build in their ongoing effort to responsibly design and build structurally sound trusses for integration by the building designer into buildings across America.

Towards this end, WTCA has formed a Product Safety & Loss Control Committee which is comprised of representatives having a broad exposure to the wood truss industry, such as engineering, production, quality control, and business development. Among the many activities of this committee will be receiving and acting on field reports and truss incidents where appropriate, ensuring compliance with applicable regulations, standards and codes, and educating truss manufacturers, building designers, contractors, owner and consumers on truss product safety. The committee is furthermore committed to work on all issues in an immediate manner. The committee and its representatives may be reached by contacting WTCA at 603-274-4849 (phone), 608-274-3329 (facsimile) or wtca@woodtruss.com (email). TPI may be reached at 608-833-5900 (phone) and 608-833-3764 (facsimile).