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WTCA Update

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Best Practices for Converting from ANSI/TPI 1-1995 to ANSI/TPI 1-2002 by WTCA Staff

Got the conversion blues? Review these best practices and learn how to compare apples to apples!

The intent of this article is to assist Truss Manufacturers in understanding the changes that take place to lumber and plate inventory during the conversion of truss designs to the 2002 design standard. This article will also address the differences between the 1995 (Figure 1) and 2002 (Figure 2) standards.

FIGURE 1

FIGURE 2

WTCA recommends the following steps as an aid in understanding how this change affects your business and inventory:

WHEN COMPARING DESIGNS, USE A PURE APPLES TO APPLES COMPARISON

It is very important to use the following concepts:

- Identical design
- Identical loading
- Identical plate and lumber inventory
- Identical procedure for designing the truss (i.e., optimizing)
- Identical lumber prices

- Identical plate prices
- Identical plate rotation checks

By making these checks, you will have a proper comparison of the effects of the change. You will be able to make more educated decisions on how best to manage this change, so that it has the most positive effect on your business.

RUN A SAMPLING PLAN ON Y0UR BASE SETS OF JOBS

Take a sampling of about 30 typical 1995 truss designs that you produce. You should contact your software provider to discuss the proper way to do this. Run each of the selected designs using the comparison concepts listed above, with the latest truss design software version using the 2002 Tooth Count Method (TCM) (i.e., with a C_q [Quality Control Factor] of 1.25). Run each design with and without rotation checks. Next run each of the selected designs using the same software package except change to the 2002 Plate Placement Method (PPM) (i.e., using a C_q of 1.00). Run each design with and without rotation checks.

When running the designs, make sure that the handling factors are identical for both the TCM and PPM designs. Ideally, set all the adjustable factors in the plate software to 1.0 which eliminates any side effects on lumber and plate sizes. The goal is to have the design software size the plates based only upon the pure member stresses.

After you have run the sampling plan, determine:

1. The CSI (Combined Stress Index) differences for lumber, and
2. The JSI (Joint Stress Index) differences for plates. This information will help you determine lumber and plate inventory changes.

LUMBER INVENTORY CHANGES

There are new repetitive member factor benefits on tension and compression design values in TPI 1-2002. In the procedure described above, the lumber CSIs should drop under the new standard, which should create situations where lower lumber grades can be used for identical trusses.

TRUSS PLATE INVENTORY CHANGES

Under the TCM, the 1995 and 2002 trusses should have identical plating if the plate sizes are controlled by the QC requirements. The one change that can influence plate sizes is the rotation check, which is automated in the 2002 design software. This is why it is important to run the truss with the rotation check turned off. With the rotation check turned off, the plate sizes should be identical. If plate sizes increase using the TCM method with the rotation check turned off, it is due to the new moment equations that were implemented in the new standard, not the new QC requirements.

Under the PPM, plates are provided more placement flexibility. As such, it generates more conservative plate sizes. In general, our findings have been that if you have handling and other design factors built into the design software you are using and you do NOT have a complete line of all plate sizes in inventory, the plates used on trusses in 1995 will be very similar to the plate sizes used to comply with the 2002 standard. The plate sizes generated in the analysis above should be compared to your current inventory. There may be a few areas where you will want to change the inventory to maintain design consistency.

If you have optimized your plate inventory for your typical 1995 truss designs and move to the 2002 PPM or TCM, you may be upsizing plates more than you need to because your current inventory does not match up with an optimal 2002 design. For example, consider the following:

- A 3x8 needs to be upsized when fully optimized to a 3.2x8.2.
- Given your current inventory you need to use a 4x10 plate.
- You may need to consider changing your inventory to include a 3x9 plate and the analysis you do may indicate that you can transform your inventory to minimize your inventory and cover the majority of the joints you produce.

INVESTIGATE WHAT IS REALLY GOING ON IN YOUR PLANT

Some additional questions to ask include:

- Is all plate handling taken into account by your technical department or is upsizing taking place on the line?
- Is this upsizing random or is there a known pattern?
- When a line is out of a certain plate size, do they get an-other box or just use the next size plate that is closest to the line?

As a rule of thumb, truss plate upsizing should always be done during the design process rather than during fabrication. Truss plate upsizing rules due to handling or other factors should be pre-determined based on experience of the technical, shop and shipping departments. If plates are being upsized during fabrication, find out why. You may find that the “cultural plant” upsizing is more than anticipated; it may also be more than what is required from a PPM design standpoint. By taking “cultural plant” upsizing out of the picture and upsizing plates during the design phase, you will more efficiently plate critical joints.

SUMMARY OF KEY CONCEPTS TO CONSIDER WHEN CHANGING YOUR TRUSS DESIGN PROCESS FROM 1995 TO 2002

In general, trusses designed under the 1995 or 2002 TCM standards should output the same plate sizes. Prior to the 2002 edition, truss design methods did not account for combined flexure and axial loading in metal connector plates. In some cases, this may increase plate sizes.

The 2002 edition provides new repetitive member adjustments to lumber tension and compression design values. The overall truss costs can actually decrease due to lumber grade or size decreases.

PPM adjusts the plate size to account for 20 percent of each plate area to be ineffective due to teeth in a lumber defect, rolled teeth, or teeth in a gap. This may or may not upsize the original plate size. The goal of PPM is to speed up the inspection process by using a quick tolerance polygon assessment or "visual tooth count." See Figure 3 for an example of a PPM Joint QC Detail. TCM designs assume all the teeth are effective. Thus, the inspection involves the task of counting teeth that are effective and those that are not to ensure that there are enough effective teeth to transfer the loads. Plants can take specific action to control the amount of defects in the plate area. Work is in progress to allow the use of the quicker PPM method of inspection and also take advantage of the methods a plant uses to reduce the defects in the plate area so that they are consistently less than the 20 percent allowed. This method will all allow the C_q to be adjusted where manufacturers prove that they have a given level of defects in the plate area. For example, if a component manufacturer controls this such that they only have 5 per-cent defects in the plate contact area; they should be able to take advantage of this, which is one of the purposes of In-plant WTCA QC database program.

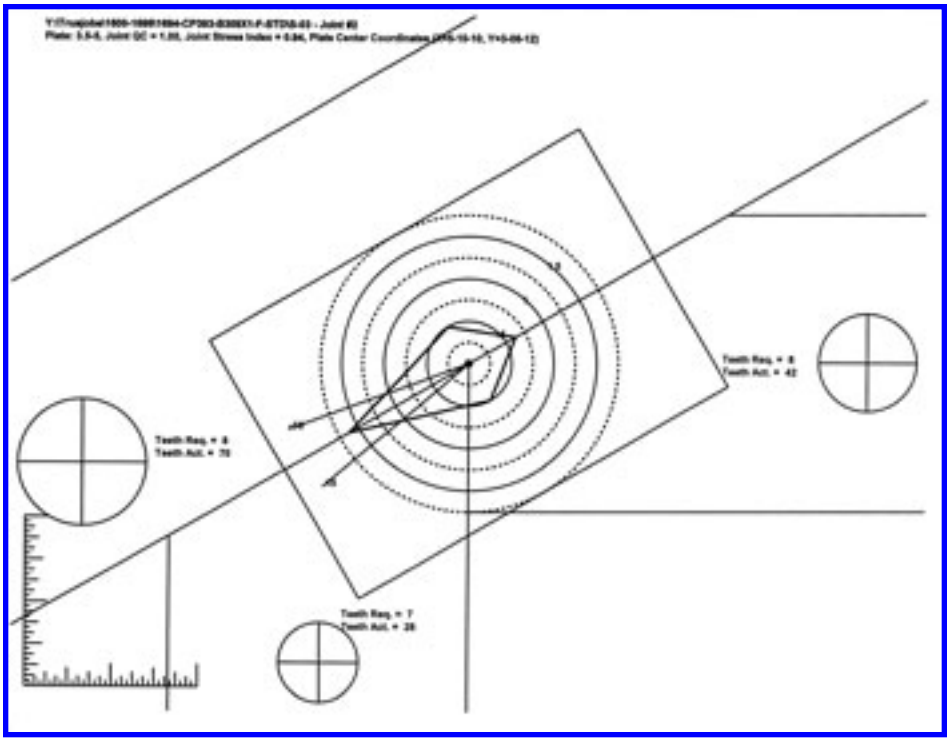

FIGURE 3: EXAMPLE PPM JOINT QC DETAIL

Rotation tolerance can also be managed. Maintain the C_q=1.00 value (PPM) and lower the rotation limit if you find that the default of ten degrees is too large for the plate rotation you are actually seeing in your operations. For instance, consider five degree rotation in roof trusses and two degree rotation in floor trusses. Plate rotation problems in the plant will cause plate sizes to increase, hence controlling plate rotation is critical.

WTCA staff can help you understand the pros and cons of both TCM and PPM as you go through the decision making process, allowing you to make the best implementation decision for your

plant.

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