| June 2017 ABC-UTC Webinar Featured Presentation: NCHRP 12-98, Part 1 - Tolerances for Prefabricated Bridge Elements and Systems (PBES) | |
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| **Q&A Session: Questions** | **Responses** |
| **Specifying Tolerances** | |
| Where is the best place for tolerances to reside - the Plans or the Specifications?? | It can be either way. We prefer the plans. People tend to not look at specifications as carefully. You could make a case for specifications also. |
| How are these the same or different from PCI tolerances? | Currently the recommended tolerances are very similar to PCI tolerances. Joint tolerances are not included in PCI tolerance manuals. |
| How does the proposed tolerance compare with the PCI tolerances? | Currently the recommended tolerances are very similar to PCI tolerances. Joint tolerances are not included in PCI tolerance manuals. |
| **Prefabrication vs. CIP** | |
| Comparisons to cast in place? | The designer would need to compare the recommended tolerances in the guideline to state standards. In general, precast tolerances are tighter than CIP. |
| **From Design to Fabrication to Field Installation** | |
| Why are tolerances, in addition or in lieu of PCI tolerances, necessary? | PCI does not have specific tolerances for bridge elements. Also, PCI does not cover joint tolerances and is somewhat light on how to specify tolerances on plans. |
| Discuss element tolerances during prefabrication and its effects on fitting within the specified dimensions during installation. | In the presentation |
| Please share any survey of actual tolerances of precast bridge elements (statistics from the precast concrete industry). | In the presentation |
| Is it difficult to meet these tolerances? % success? What remedy if members are out of tolerance? | NCHRP 12-98 intrinsically identifies that success is a trifecta collaboration effort/understanding between Designer, Fabricator, Contractor. The basis of the NCHRP work is a 95% success rate. Oftentimes, Owner's specification place the onus on the Contractor to develop a solution. With good design layout, submittal and reviews of erection plans along with survey, re-survey, field QA/QC and being proactive oftentimes leads to success for the project. In the worst cases, the erection and/or field adjustments can be made to facilitate issues. Design details and layouts using the recommendations of NCHRP 12-98 which allow for this is an example of "proactive design." |
| How do you compensate for time dependent changes in the dimensions of the precast elements? | Typically tolerances should be checked at several times. After casting to see if there may be a problem, and just before shipping. |
| What is a suitable tolerance for the use of grouted couplers in precast elements? | In the presentation |
| **Reference Lines** | |
| Some standardization is needed to know when to pull locations from center of member and when to pull from end. | In the presentation |
| **Other Materials/Other Shapes** | |
| Are precast tolerances compatible with other construction tolerances or is it up to the designer to investigate and specify? | In the presentation |
| Camber tolerances for prestressed concrete beams, especially NEXT D and NEXT F beams, as well as butted box and deck beams? | Beam fabrication tolerances are covered by other specifications ( PCI). The PCI Northeast Bridge Tech Committee is about to publish a guideline on managemwent of camber and roadway profiles with butted beams. Look to www.pcine.org for this information. |
| Do speakers recommend any tolerances for the bottom flange of steel tub (box) girder in compression like at internal supports? | Beam fabrication tolerances are covered by other specifications (AWS, PCI, NSBA). |
| What tolerance should be planned for in the use of UHPC connections? | The same as for any concrete connection. You need to ensure that you get the proper lap length after all tolerances are accounted for. This will be included in the guideline. |
| **Foundation Performance (tolerances) vs. Sub or Super Tolerances** | |

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| Do these tolerances demand that these bridge elements be used on any specific type of soil/ground capable of holding ground? | While not the focus of NCHRP 12-98, foundation settlement that results from the unloaded to loaded should be taken into consideration. This can be seen with MSE walls, sleeper slabs, approach slabs, foundations loaded with large dead load be it a column/cap/super. PBSystems like Lateral Slide projects - depending on the set-up can demonstrate issues if the foundation is required to resist the static/dynamic effects. |
| **Lessons Learned** | |
| Could you discuss some difficult lessons learned? | In the presentation |
| **N/A** | |
| Do you recommend Prefabricated Bridge deck on existing prestressed girder? Pros & Cons | Not really the subject of this presentation, but ….  Yes. It has been done several ways. If projecting rebar is used for the shear connections, the proposed provisions for projecting rebar would be appropriate. Others have used embedded plates with shear connectors to facilitate the connection. |
| Not knowing the content or abstract it is difficult. Dimensions, finish, loading, capacity, materials properties tolerances? | ???? |
| What is PBes? | Prefabricated Bridge Elements and Systems. See ABC-UTC website for more information (www.abc-utc.fiu.edu). |
| Touch upon pros and cons of prefabricated bridges (practicality and cost saving...) | Not the subject of this presentation. Refer to other presentations on the ABC-UTC website. |
| More design examples | Tolerance examples are in the presentation. |
| **Questions during Webinar** | |
| When doing the dry run, do you have the contractor separate the coupler piece sufficiently enough to inspect the inside of the coupler? | It is probably not feasible to do this. In theory, you could use a mirror to try to inspect this as it is installed. In practice, this has not been an issue. |
| Does the capacity of a grouted coupler connection become reduced if the rebar touches the edge of the coupler such that grout does not fit between the bar and the coupler? Some states recommend using a coupler one size larger to give some tolerance, but the above situation may still happen. | The one size larger coupler is a good idea. The bar can touch the side of the coupler (similar to a rebar contact lap splice). This can be verified by the manufacturers. |
| What temperatures are assumed for the precast v assembly for the tolerances? | Temperature does not affect the length of element much due to their typical short length. We do recommend using closure joints at ends of long bridges to accommodate overall structure movement due to temperature. |
| Slide 36: don't you mean 3/4" +/- 1" ? | No. The slide is correct. If you had this specification, the minimum joint width could end up as - 1/4", which is not possible. |
| On the example of modifying the tolerance for the wall element, should the final dimension not be 1 3/4" +/- 1" not 1 3/4' +/- 3/4"? The new tolerance was calculated as 1", not 3/4" | You are correct. We have revised the pdf of the presentation that is posted in the webinar archives. |
| The pocket at the top right sure does not appear to have the proper cover (1/2") but that may be a due to the photo. | We are not sure which slide you are referring to. |
| So the joint width is Required width+ tolerance? | Correct. |
| What is Temperature Tolerances in these equations? | Temperature does not affect the length of element much due to their typical short length. We do recommend using closure joints at ends of long bridges to accommodate overall structure movement due to temperature. |
| With regard to dowels & couplers, do you have an alignment tolerance, i.e., a tolerance to ensure the dowel can fit into the coupler in a parallel fashion (not skewed which would lead to the end of the dowel contacting/digging into the inside of the coupler)? | Engineers have typically not specified a tolerance on this. The fabricators are well aware that the bar needs to be plumb. Most jigs that I have seen are 3D (not just a 2D template). This guarantees that the bar is plumb in the form. You could specify that the template used to hold the bars include the ability to maintain plumbness (i.e. 3D).  In a worst case scenario, where the bar is not plumb: It is normally possible to bend the bar using a pipe sleeve if it is not perfect after stripping the forms. |
| Is it typical for the fabricator to outline tolerances on its shop drawings - so the approver and ultimately shop personnel have them handy? Same would go for erection plans for field assembly? | The fabricator typically has tolerance specifications on a fabrication inspection sheet in the shop. They can be on the shop drawings as well. The contractor should develop an assembly plan that includes erection tolerance information and ways to control geometry. The new AASHTO ABC Guide Specifications require this. |

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| Does any agency pre-qualify contractors for precast element projects? | Yes, many do. Some use PCI certifications or other similar certifications. If PCI certification is used, the certification can be for "precast" as opposed to "prestressed" concrete if prestressing is not used. Some states pre-qualify shops using their own criteria. |
| Do you have a go to answer to respond to folks which feel that engineers don't need to worry about tolerances, because they think fabricators can hold dimensions perfectly? | A successful project has to include engineering tolerance specifications, fabricators meeting the element tolerances, and the contractor erecting to the erection tolerances using a geometry control plan. Nothing is fabricated to exact dimensions. Even space shuttle parts have tolerances. |
| OK, but should the +/- value not be 1"? | You are correct. We have revised the pdf of the presentation that is posted in the webinar archives. |
| We should add or minus the tolerance? | The specified joint width is used to detail the prefabricated element (layout and shop drawings). The joint width tolerance is used in the field to ensure that the final joint is within tolerance. If the joint is wider than the maximum (minus dimension), or narrower than the minimum (plus dimension), then there is most likely a problem with layout or element tolerances. |