July 25, 2013

Mr. Joseph McDonald
Safe Home and Market Analysis Program
South Carolina Department of Insurance
1201 Main Street, Suite 1000
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Subject: Responses to questions regarding panel of experts initial report (June 27, 2013) on **Evaluation of Hurricane Catastrophe Models Used in South Carolina**

Dear Joseph,

Thank you for your in depth review of the subject report and formulating a set of very good questions which should help SCDOI in review of the report and filing rates.

Attached is the list of your questions (in **bold**) and my responses to them regarding the subject report.

Please let me know, if you have any further question.

Regards,

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QUESTIONS AND RESPONSES

1. **When discussing the "current 2006 South Carolina Building Code" and "post 2006 construction" is the panel referring to the 2006 International Codes implemented on July 1, 2008 and the International Residential Code implemented on July 1, 2009, or to the 2003 Codes that were implemented in January and July of 2005 and in effect in 2006?**

   In general hurricane catastrophe models should address the potential impact of building codes on the performance of buildings during a hurricane event. For example if a building is designed and built per a building code in effect in 1990 and. a similar building designed and built per a different building code in effect in 2013, these two buildings might perform differently in a similar hurricane environment. So it is imperative this difference is addressed by the models. This will include the "current" building code in effect.

   South Carolina requires that every local jurisdiction adopt a code and mandates which codes the local government must adopt, making certain codes mandatory throughout the state (Ref. 1). See Figures 1 and 2. Local jurisdictions may amend the codes to make them more stringent with the approval of the South Carolina Building Codes Council (BCC) (Ref. 1). See Figures 3 and 4 for Charleston and Columbia, respectively. As of the writing of the panel of experts report, the "current" building/dwelling code was 2006 International Residential Code and 2006 International Building Code, which both had been adopted on November 28, 2007 and with the former implemented on July 1, 2009 and the latter implemented on July 1, 2008 (Ref. 2). Since the report was completed, the "current" building/dwelling code is 2012 International Residential Code and 2012 International Building Code, which both had been adopted on August 29, 2012 and implemented on July 1, 2013 (Ref. 2).

   So what the panel is referring to the "current" building code are 2006 International Residential Code and 2006 International Building Code. By "post 2006 construction" it is meant constructions built per these two buildings codes, i.e., after July 1, 2008 and July 1, 2009 respectively.

   As noted in Ref. 2, other recent code revisions are 2000 International Residential Code, 2000 International Building Code, and 2003 International Building Code. It is imperative for the modelers to review these various codes and investigate if there are significant impacts on performance of buildings due to these codes and model them accordingly.

2. **Was there any speculation on whether or not the models would begin to take into account the 2012 Code, implemented on July 1, 2013, and if so, what the impact of this code would be on the models themselves?**

   It is not expected for the models to immediately address impact of a new code for each state and jurisdiction. Moreover, at the time of the modelers' responses, the 2012 of codes series had not been even implemented in South Carolina. So it was not expected for them to address impact of these 2012 codes. But it was expected for them to address impact, if any, of the previous codes, such as 2000, 2003 and 2006 code series. Going forward and in a couple of short years, they shall address the impact of 2012 code series.

As noted above the modelers should address your question regarding the impact of 2012 code series. But if you and SCDOI would like me to address such potential impact, it would be a more extensive study, and I would be happy to make a proposal to do so.

3. **Why are the provisions of the 2006 Building Code not considered in the models? And specifically, the effects of taking into account the wind speed maps?**

   There may be many reasons why modelers in general, or a specific modeler, did not address the impact of 2006 codes series, or any other code for that matter. Maybe up to until now, there was no one questioning the impact of building codes on models' output for use in South Carolina. It could be other priorities for modelers, with regard to other hazards, other regions, or other aspects of hurricane risk modeling. In summary, as we recommended, the question should be put to the modelers to provide reasonable answers.

4. **With respect to lack of recognition of variation in design wind speeds, will justification be enough or should the model be revised to reflect this? If justification is provided, does the panel need to review this? How will we be satisfied with the justification?**

   Again this requires a study and investigation by each of the modelers to reasonably justify the lack of consideration of such variation. A qualified licensed professional engineer might be able to review the modelers' justification, if they provide one. However, a qualified engineer with some experience with catastrophe hurricane risk model development and modeling will be in a better position to review such justification.

   As noted in response to question 2, I would be happy to provide a proposal to study the impact of various code series on vulnerability of building stock designed and built per various codes.

5. **When the models do not address the 2006 Building Code in what way do they "account for variations in the building code based on year of construction, adoption of building codes and addressing the regional variation per design wind speed"? Was this done up to the adoption or implementation of the 2006 Building Codes? If prior variations were taken into account, why did the models cease to do so with the 2006 Building Codes?**

   The building code development, adaptation and implementation are only happening in recent years on a regular basis. They also are reviewed and adopted at state level, with amendments by local jurisdictions. So the modelers should address these more recent ones. The older buildings, however, may or may not have been designed and built per code. The codes were also not uniformly adopted and/or enforced. So typically there is a tendency to group those older buildings over a much longer period (Ref.3).

   The emphasis on the 2006 code was because it was the current code and it was used as an example to bring a point that the modelers need to address impact of the codes, specially the recent ones.

6. **How would the models be impacted by addressing the 2006 Building Code? If the models did address the 2006 Building Code, how would this impact insurance rates for construction built using this code?**

   Again this needs to be addressed by the modelers. However, we can also perform a study as mentioned above to see if there is significant impact, for which regions of the state, and for which building constructions etc. There is no quick answer to this. Assuming,

and this is a reasonable assumption but may not always be true, newer codes are generally more restrictive, thus in general the rates should be less for buildings designed and built per newer codes.

7. **Does the justification regarding the mobile home vulnerability need to be reviewed by the panel? If not, what is the standard we will use to review the justification?**

   Not necessarily. Again, a licensed civil engineer might be able to review the modelers' justification. However, a qualified engineer with some experience with catastrophe hurricane risk model development and modeling will be in a better position to review such justification, and especially familiarity with Manufactured Home Construction and Safety Standards (HUD Code) should be helpful to review the justification.

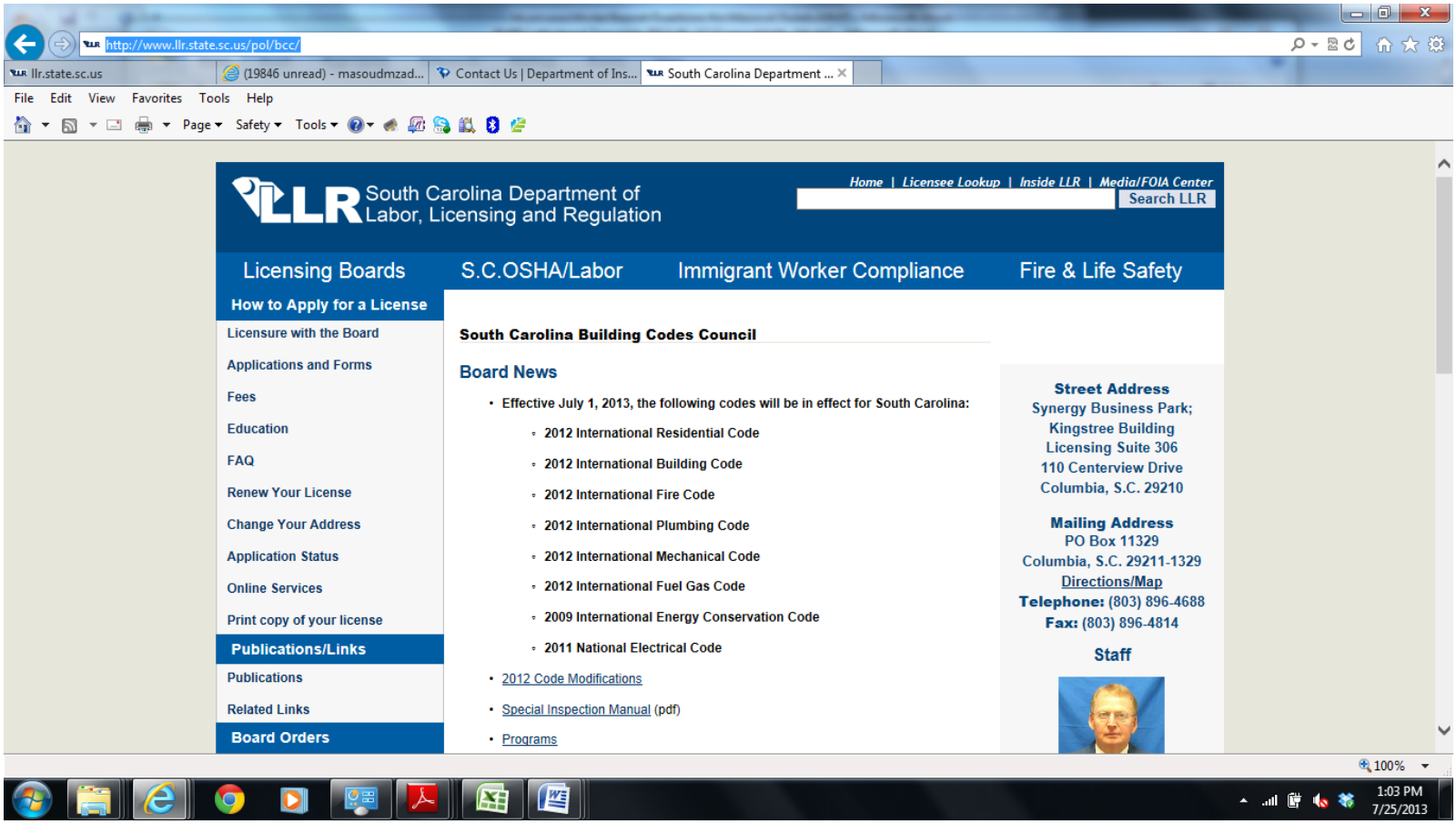

Figure 1 – Current (as of 7/25/2013) Codes in effect accepted by South Carolina Building Code Council (Source: http://www.llr.state.sc.us/pol/bcc/)

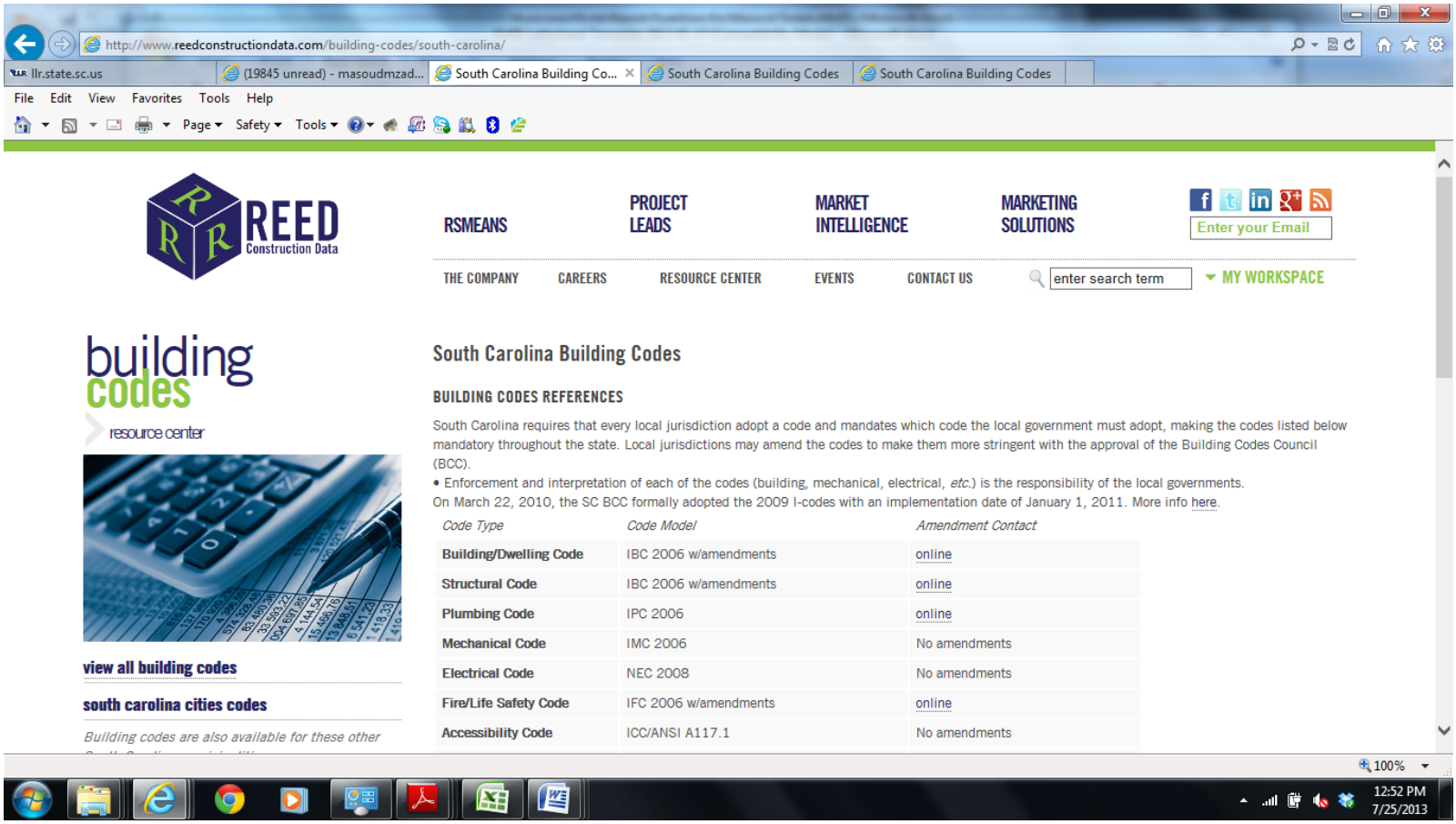

Figure 2 – Current (as of the writing of the report by the panel of experts) South Carolina Building Codes (Source: http://www.reedconstructiondata.com/building-codes/south-carolina/)

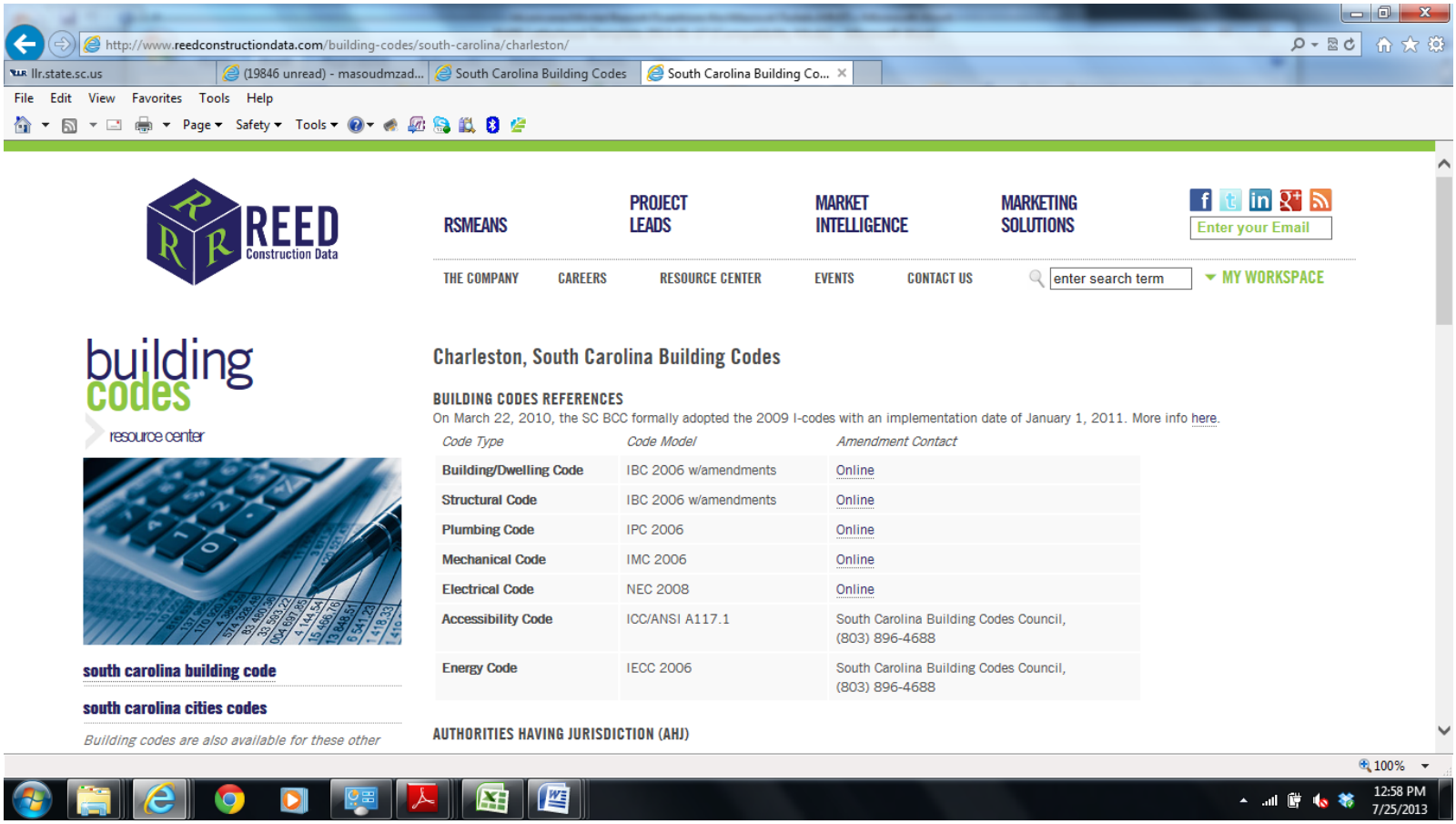

Figure 3 – Current (as of the writing of the report by the panel of experts) Charleston, South Carolina Codes (Source: http://www.reedconstructiondata.com/building-codes/south-carolina/charleston/)

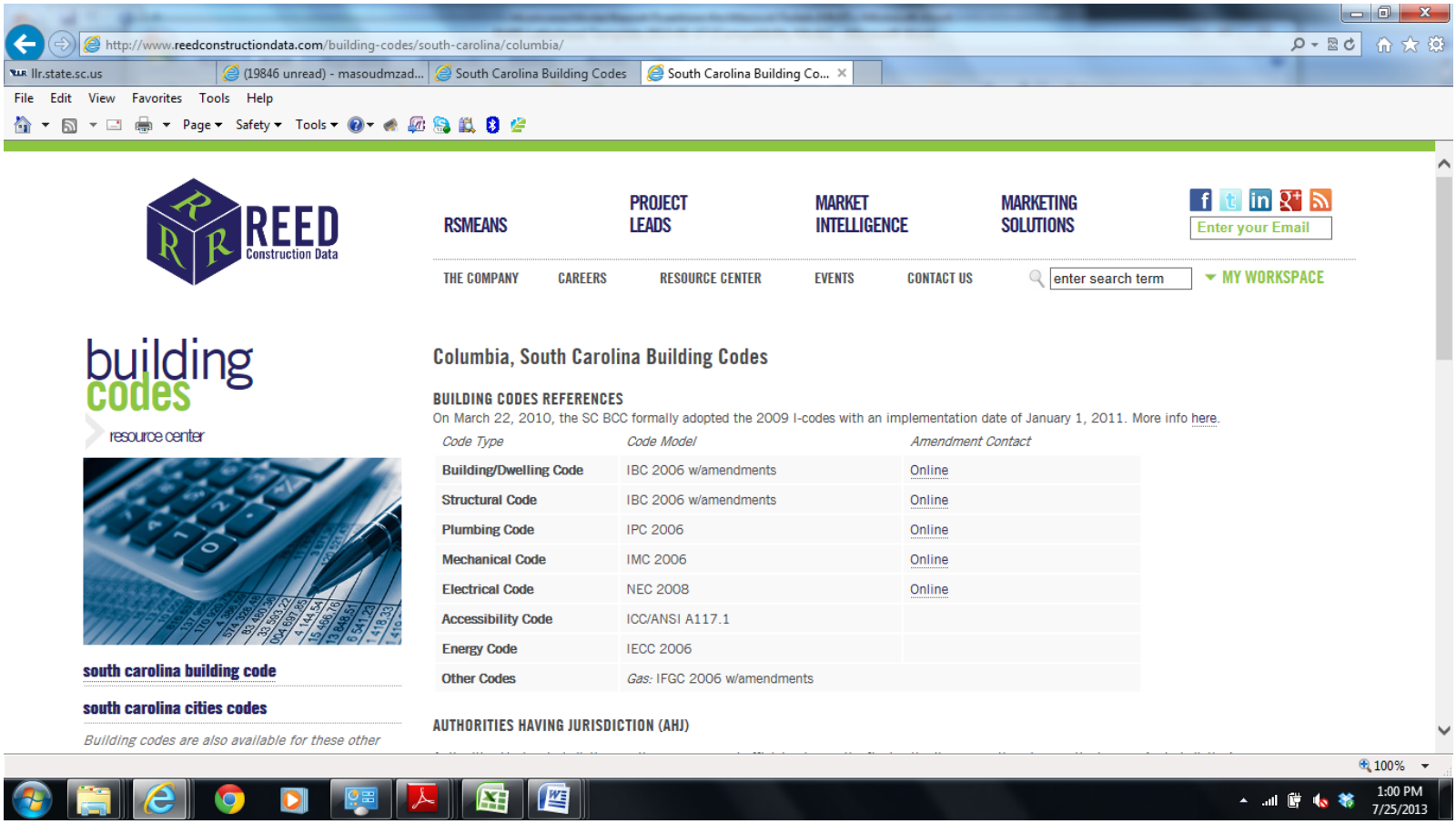

Figure 4 – Current (as of the writing of the report by the panel of experts) Columbia, South Carolina Building Codes (Source: http://www.reedconstructiondata.com/building-codes/south-carolina/columbia/)

REFERENCES

1. South Carolina Building Codes Council, "Building Codes Council History and Overview," South Carolina Department of Labor, Licensing and Regulation (LLR), http://www.llr.state.sc.us/POL/bcc/index.asp?file=HISTORY_BCC.htm , as of 7/25/2013
2. South Carolina Building Codes Council, "Building Codes in Effect for South Carolina," South Carolina Department of Labor, Licensing and Regulation (LLR), http://www.llronline.com/POL/BCC/index.asp?file=BCCinfo.htm as of 7/25/2013
3. Wiggins, Gary, "History of Adoption and Use of Building and Related Codes in SC", South Carolina Department of Labor, Licensing and Regulation, Columbia, SC, 2013