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Do you need Seismic Bracing for your Sprinkler System?

Over the past few months there has been an increased awareness and enforcement of seismic bracing on sprinkler systems across Canada. In the GTAA area alone there have been approximately six to nine new municipalities who are now actively enforcing and inspecting seismic bracing on sprinkler systems. If your company wasn't familiar with seismic bracing requirements before, you are not alone. In the past only active seismic zones such as Vancouver and the Ottawa Valley regularly enforced seismic bracing. I can honestly state that my experience and knowledge of seismic bracing for fire sprinklers was "limited" at best. Located in the GTAA area for the past seven years, there was very limited enforcement or requirements for seismic bracing on fire sprinklers.

With the recent awareness and enforcement you may be wondering what code change has taken place to now require seismic bracing? and when did the code change take place? I will answer those questions as well as offer some guidelines and suggestions for your company to use going forward to determine if you need seismic bracing on your job.

When doing some research, and educating myself on the topic I quickly learnt that seismic bracing requirements for buildings is not new. In fact, since the early 1970's there have been seismic protection provisions written in the National Building Code and Provincial Building Codes. With the new release of the National Building Code in 2005 there were technical modifications to the "Earthquake Protection" provisions located in Part 4, and it is these new provisions that are currently enforced across Canada.

In summary, there was no new code change that was implemented that now requires seismic bracing. Older projects may have not required seismic protection based on a number of factors. For example, the older projects may have not required seismic bracing based on the Building Code provisions at that time, or there may have been a misinterpretation by municipality staff about the requirements for seismic protection on the building. That being said, I believe more and more municipalities across Canada are becoming more educated and aware of the seismic protection provisions, and you will see an increased enforcement of seismic protection for buildings going forward.

Determining Seismic Protection for a Building

When a building is being designed a structural engineer will utilize the provisions in Part 4 of the current Building Code to determine what level of seismic protection for that building is needed. In simple terms there are three factors that determine the

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Seismic Risk for the building. They are; Building Importance (I_E), Site Class (F_A), and Spectral Analysis ($S_A(0.2)$). These three factors all play an important role on determining the level of seismic protection needed for the building. Every building will have a different level or "risk" based on these three factors. For example, a building being constructed on rock (Class B) will have a lower risk compared to a building constructed on Soft Soil

(Class E). The structural engineer will conduct a series of calculations based on these three factors and will come up with the appropriate level of seismic protection for the building. This level of protection is correlated based on the results of the calculations.

It is important to note that not all buildings requiring some level of seismic protection will require seismic bracing for the fire sprinkler system and other mechanical systems. Provision 4.1.8.17 in Part 4 of the National Building Code "Elements of Structures, Non-Structural Components and Equipment" addresses all non-structural components located in the building, and offers how? and when? to protect these types of systems.

If you look at Table 4.1.8.17 in the NBC you will notice a series of categories numbered 1 through 21. While "Sprinkler Piping" and "Standpipes" is not listed as one of the main categories, it would appear that "Sprinkler Piping" and "Standpipes" would fall under category 15 – "Pipes, ducts, cable trays (including contents)".

There is a provision in the current code that exempts certain non-structural elements to be seismic protected in certain situations. **Sentence (2) of 4.1.8.17 states "For buildings other than post-disaster buildings, where $I_E F_A S_A(0.2)$ is less than 0.35, the requirements of Sentence (1) need not apply to Categories 6 through 21 of Table 4.1.8.17.**

To put it simply, if the calculation of the Building Importance (I_E), Site Class (F_A), and Spectral Analysis ($S_A(0.2)$) is less than 0.35 and the building is not designated as a **post disaster building** then the building would not require seismic bracing for the fire sprinkler system. If the calculation is equal to or exceeds 0.35 then seismic bracing for the fire sprinkler system is needed.

Note-if the building is designated a **post disaster building**, all fire sprinkler piping and standpipes shall be seismic braced.

In summary, it may appear very confusing and complicated on how to determine if the building needs to be seismic protected. Please do not be alarmed! It is not the duty or responsibility of the Fire Protection Contractor to calculate the seismic protection requirements for a building. That being said, I would caution all contractors during the tendering process and review of your contract to make sure that you have submitted a request for information and documentation from the Structural Engineer and or Architect asking what is the Building Importance (I_E), Site Class (F_A), and Spectral Analysis ($S_A(0.2)$) of the building? and the resulting calculation? If the number is 0.35 or greater

warning bells should be going off, and you should begin to have discussions about the need for seismic protection for the sprinkler system.

Seismic Design for Sprinkler Systems

If you have determined that the building and non-structural components must be seismic protected, we are now faced with the task calculating the force loads, design and layout of the braces, and installation procedures for the seismic braces.

My first recommendation would be to contact your local AHJ as soon as possible. You will want to confirm with your local AHJ that the installation and layout guidelines will be in accordance with NFPA 13. The current Building Code does not offer any guidance on the installation and or layout of the seismic braces, and NFPA 13 is not referenced in Part 4 of the National Building Code. Most AHJ's already accept and utilize NFPA 13 guidance as the proper installation and layout guidelines for seismic bracing.

Finally you will want to confirm which calculation formula you are intending on using when calculating the force loads. There is a discrepancy between the formula used in NFPA 13 and the National and Provincial Building Codes. While both formulas look similar, they are quite different. That being said, the results from either set of calculations are fairly similar. However, it appears the calculations from the NFPA 13 formula is slightly more stringent compared to the National Building Code. In my opinion either option would be acceptable, but you should make it aware to your AHJ so there is no confusion during the review process.

Summary

- Remember to request for the proper information from the Structural Engineer and or Architect during the tendering process for **each and every job**, just because you didn't have to provide seismic bracing in the past in one municipality does not guarantee that new projects will have the same seismic protection design in the future.
- Contact your AJH early in the process so you both are on the same page when it comes to the installation and layout guidelines, as well as what calculation formula will be accepted

Seismic Bracing for Sprinkler Piping and Standpipes can be complicated, confusing, stressful and expensive if you are not educated nor prepared to handle seismic bracing requirements. In order to make sure your company is properly prepared, I highly recommend you ensure that your office staff, and field personal receive proper training and knowledge on how to design, layout, price, and install seismic bracing. Companies who spend the time and resources to ensure their staff are

well equipped to deal with seismic bracing will be more efficient, professional, and profitable compared to their competitors who don't choose to educate themselves.

If you would like more information on the technical aspect from the National Building Code and or NFPA 13 regarding Seismic Bracing, please feel free to contact me at the CASA office at anytime.



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