DEPARTMENT OF GENERAL SERVICES
BUREAU OF CAPITAL OUTLAY MANAGEMENT
Serving Government. Serving Virginians.

BCOM Newsletter

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In this Issue:

Avoiding Corrosion in Dry Pipe Fire Sprinkler Piping Systems

Sprinkler piping corrosion and the resulting water leaks can create maintenance issues for building owners in many ways. Pinhole leaks are expensive to repair and can become an almost continuous maintenance chore. Leaking pipes can damage the building, critical equipment, and furnishings. Sprinkler piping repairs can disrupt normal business activities. In addition, pipe corrosion can render the sprinkler system inoperable during a fire event by blocking sprinkler water flow.

Dry pipe and preaction systems are particularly susceptible to corrosion. Iron, water, and oxygen are the three elements needed for corrosion and they are all present in a dry pipe system. The system's air compressor regularly adds warm moist oxygen into the piping making an optimum environment for corrosion. According to industry sources 73% of dry pipe and preaction systems have serious corrosion issues in less than 13 years. Ironically the more often the system is repaired, even more leaks will develop. Every time the system is serviced, more oxygen and water are introduced. Even worse, a diligent building owner that has their system tested and maintained in accordance with the requirements of NFPA 25 will likely be rewarded with additional leaks.

While oxygen is the culprit, nitrogen is the solution. The atmosphere is approximately 78% nitrogen and 21 % oxygen. Nitrogen generators separate nitrogen from other gases in the atmosphere leaving behind an inert 98% pure nitrogen gas. Pressurizing dry pipe and preaction systems with 98% pure nitrogen virtually eliminates corrosion in steel piping. Research has shown that the life of black steel pipe used in a dry pipe system will be extended from 20 years up to 60 years when using nitrogen.

Galvanized pipe should not be used in an air maintained system as it corrodes faster than black steel. In an air system galvanized pipe will need to be replaced in 8 to 9 years while steel pipe in the same system will have a 20 year life. Some air pressured systems will fail in 2 years or less. When galvanized pipe is used with a nitrogen system the system is expected to last for up to 150 years. Considering the 30% increase for galvanized pipe this is probably not a cost effective choice.

Installing a Nitrogen generating system will effectively extend the life of the sprinkler system piping. Monitoring and maintaining a 98% nitrogen level will provide optimum corrosion control. The cost of 500 gallon nitrogen system is approximately $12,000. The initial cost of installing a nitrogen system is minimal compared to the cost of replacing the entire sprinkler piping system in 8 to 9 years. ❑

Photograph of a nitrogen generator system currently in service at the Virginia Museum of Fine Arts.

Reminder: BITS AAC Responsibilities

BITS Agency Access Coordinators (AACs) are individuals appointed by their agency's chief facility officer or other executive management for overseeing their agency's staff use of DGS's Building Information Tracking System (BITS). More specifically, AACs are responsible for:

1. approving their agency users' access to the BITS system
2. approving their users' permissions (i.e., "view only", "create/edit", and "approve/submit") for processing each of the various types of CO forms contained in BITS
3. notifying the BCOM BITS Administrator when a user's access should be disabled (for example, if user is terminated, retires, or changes job duties to no longer require BITS access).

Agency Access Coordinators are excellent at performing responsibilities 1 & 2 listed above, but sometimes fall short in performing the third responsibility. To notify BCOM to disable a user's BITS account, the Agency Access Coordinator need only submit an updated User Account Request (UAR) form to bits@dgs.virginia.gov (preferred) or fax it to (804)225-4709. The "disable" UAR form need only include the following data fields: the user's first and last names, the user's agency, the AAC's signature, and the date.

Copies of UAR forms are available for download from the BITS UAR page on the BCOM website.

A listing of Agency AACs is provided on the BITS AAC page on the BCOM website. ❑

The Importance of Proper Detailing of Wood Bolted Connections in Design Documents for Safety and Constructability

WOOD, STRUCTURAL BOLTING

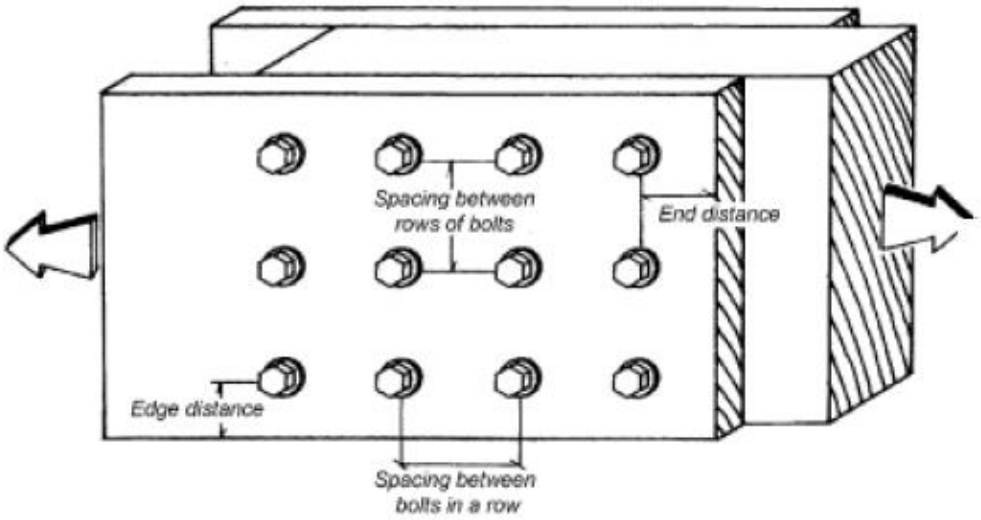
(Reference: 2012 edition, *Virginia Construction Code*, Chapter 35: Refer to AF&PA - NDS 2012 - *National Design Specifications (NDS) for Wood Construction with 2012 Supplement*)

The most critical design details required by the Responsible Design Professional (RDP) are the locations of the bolts in timber construction. Bolted connections are often not properly detailed and/or have been left up to the carpenter to locate the bolts to the best of his ability. The following items are necessary and critical in the design of bolted wood connections and can be used by the RDP as a reminder for proper detailing:

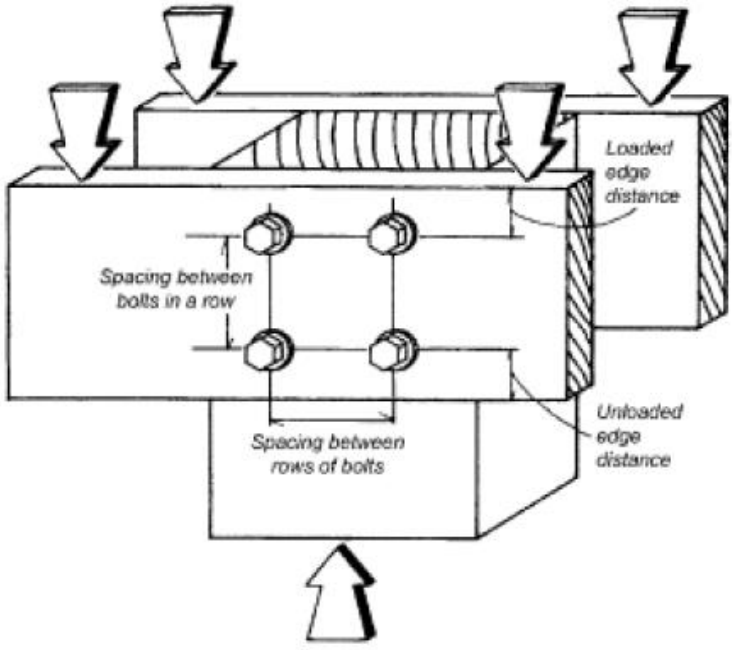
1) End distance for tension parallel to grain: 7 times the bolt diameter for soft woods & 4 times the bolt diameter for hard woods. Distance is measured from the end of the wood piece to the center of the bolt.
2) End distance for compression parallel to grain: 4 times bolt diameter for all species. Measure same as #1 above.
3) After establishing the end distance for parallel to grain loading, detail the edge distance (Edge Margin), 1½ times the bolt diameter (Check for L/D ratio)
4) Spacing of bolts between rows for parallel to grain loading: Minimum 1½ times bolt diameter.
5) Spacing of bolts in a row for parallel to grain loading: Minimum 4 times bolt diameter.

The five items above are for detailing and do not include the actual force that would be applied to the wood member. Where a force has been calculated; the RDP can then calculate the number of bolts and size required. He would consider bolt bearing on the wood and bolt shear.

Spacing, End, and Edge Distance:



Parallel to grain loading in all wood members ($Z_{\parallel}$)



Perpendicular to grain loading in the side member and parallel to grain loading in the main member ($Z_{s\perp}$)

Above images courtesy, American Wood Council, Leesburg, VA

Example: Bolts Parallel to Grain

RDP calculates the need for (6) 1" diameter bolts for Tension at the end of a 2X6 oak (Hard Wood). There would be two rows of bolts w/ 3 bolts in each row. Starting at the end, find the spacing for each row using the 5 items discussed on Page 3. Start with dimensions from the end to the last bolt in each row: First bolt 4" from the end, second bolt 1½" from the first bolt, third bolt 1½" from second bolt. We now have two rows of 3 bolts in each row. Now, how far are the bolts to be from the Margin and what is the distance between the two rows? A nominal 2X6 is 5½" wide, therefore the edge margin is 1½", the row spacing 2½", the other edge margin is 1½" thus a total width with spacing = 5½" (Note: The 2½" row spacing is what was left over from the 3" deducted by the 2 margin dimensions. This dimension could have been 1½".)

Example: Bolts Perpendicular to Grain

We can now look at a perpendicular to grain loading. Attach a 2X6 structural wood beam at 90 degrees to the side of a 6X6 post with bolts. Remember we are assuming the RDP made his calculations and (4) 1" diameter bolts will be used with 2 bolts in each row.

DESIGN SPECIFICATIONS:

1) Edge margin distance toward which bolt is pushing (top bolt): Minimum 4 times bolt diameter.
2) Edge margin on the opposite side (bottom edge of the (2X6) : Minimum 1½ times bolt diameter.
3) Center to center of perpendicular to grain loading on the 2X6: Minimum spacing 2½ times bolt diameter for L/D ratio 2 or less. (L/D = 1.5/1 = 1.5) Other L/D ratios will impact the spacing.

DETAIL:

The 5 items in the parallel to grain loading will have to be checked with the 6X6 post.

Continuing with the 2X6 beam connected to the post. Check beam depth for constructability:

Edge margin at the top = 4", edge margin at the bottom = 1 ½", center to center = 2 1/2" Therefore the minimum depth of beam required is 4" + 2.5" + 1.5" = 8"

- 2X6 = 5 ½" < 8"
- 2X8 = 7 ¼" < 8"
- 2X10 = 9 ¼" > 8" - Use a 2X10

We have already checked that a 6" wide wood member, with bolt dimensions and parallel to grain loading and using (4) 1" bolts, is satisfactory for the dimensions phase. Therefore the 6" post with the 4 bolts is satisfactory.

It should be noted that the 2X6 beam was satisfactory to carry the design loads but may have failed due to the violation of bolt placement.

A RDP should never delegate the required engineered bolting of any structural member to the carpenter on the job. The proper dimensions shall be shown and engineered by the RDP. ❑

Position Opening
Mechanical Review Engineer
Position # EE006

The Bureau of Capital Outlay Management seeks a qualified licensed Engineer to perform all tasks related to Mechanical Engineering Review of building plans and specifications.

The successful applicant has:

1) a bachelor's degree in Engineering with emphasis in Mechanical Engineering,
2) a Professional Engineering license in Virginia, and
3) a valid driver's license.

In addition the applicant has knowledge and experience in the application of the Virginia Uniform State Building Code, Virginia Mechanical Code, Virginia Plumbing Code, Virginia Fuel Gas Code, Virginia Energy Conservation Code, Americans with Disabilities Act, and state regulations.

Required attributes are:

1) substantial knowledge and experience in responsible charge (preferably with an A/E professional practice) for the design of HVAC and plumbing systems for new and renovated buildings for a variety of facility types and sizes, including engineering analyses, problem solving, contract document preparation, and inspection of construction in progress,
2) the ability to work independently under general supervision to prioritize and schedule normal workload and special deadlines; to communicate effectively orally and in writing in preparation of oral and written reports to management and clients, and to use good interpersonal skills and personal discipline to conduct interactions with work associates and clients in a professional, fair, and cooperative manner; and
3) the ability to use word processing, and agency specific software.

Selected candidates must pass a finger-print based criminal background check.

Submit application through https://virginiajobs.peopleadmin.com/postings/85767 ❑

Coming in the September Issue ...

... the new 2017 CPSM !