Tech Notes SBCA

Construction Loading

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Introduction:

Construction loads are those loads imposed on the unfinished building as a result of the construction process. Typical construction loads include the weight of the workers, equipment, and building materials, to name a few. In view of the life span of a building, construction loads are very short-term in nature lasting only minutes or as long as a few days or weeks. This *Technical Note* focuses attention on construction loads produced by stacks of building materials such as bundles of drywall or plywood.

Issue:

Building materials such as drywall, structural sheathing, shingles, etc., are often stacked on the floors and/or roof of the unfinished structure to provide easier access for the workers installing these materials. It is common practice to consolidate these materials into a relatively small area to minimize interference with surrounding construction activities. This consolidation can concentrate a considerable amount of weight from these stacked materials into a very localized area, which then can overload the structural members in that area. This overloading can easily result in long-term serviceability problems with the structural members that have been overloaded, which reflects itself in excessive deflection, "softness" and/or "bounciness", but can also cause more severe structural damage and potentially lead to failure. Care must be taken during the construction process to ensure that the weight and location of stacks of building materials do not adversely affect either the structural integrity or serviceability of the building or its structural components.

Recommended Actions:

Job site safety must always be a priority throughout the construction process. Proper handling and storage of building materials allows the construction site to run in an efficient manner and minimizes the risk of injury or property damage. Remember these four main points in regard to the proper handling and stacking of construction materials:

1) The structure must be properly restrained and braced before the loads are applied;
2) The amount of load must be controlled;
3) The duration that the loads are applied must be considered and controlled; and
4) The placement of the loads must be managed.

Consideration and implementation of these four items will make the job site safer and reduce the potential for personal injury or property damage. For more information on this very important topic please see BCSI or CFSBCSI Section B4 and/or the BCSI and CFSBCSI B4 Summary Sheet.

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Discussion:

There are four main factors that must be considered when looking at the effects of stacking building materials on a structure that is being constructed. These include:

1) Stability of the structure
2) Magnitude of the load
3) Duration of the load
4) Placement of the load

Stability of the Structure:

First, the structure must be stabilized to prevent buckling of the structural members and the building. Lateral restraint and diagonal bracing must be installed before setting bundles of building materials onto the building. BCSI, *Guide to Good Practice for Handling, Installing, Restraining & Bracing of Metal Plate Connected Wood Trusses* and CFSBCSI, *Guide to Good Practice for Handling, Installing, Restraining & Bracing of Cold-Formed Steel Trusses* provide minimum industry guidelines and recommendations for properly restraining and bracing truss systems. The building designer may also provide this information as part of the construction documents. Building material loads should only be placed on fully restrained and braced structural members.

Magnitude of the Load:

The magnitude of the building material loads being applied to the trusses must also be considered. Trusses are typically designed to support a combination of uniformly distributed loads that account for the weight of the building materials used in the floor/ceiling or roof/ceiling assembly, occupants and their possessions and environmental effects (e.g., snow). The weights from construction materials that have been stacked within a concentrated area can easily exceed the design limits for the trusses in that area. Table B4-1 of *BCSI* and Table CFSB4-1 of *CFSBCSI* provide the maximum recommended stack heights of various construction materials for trusses that have been designed to support a design live load of 40 pounds per square foot (PSF). These stack heights should never be exceeded without specific approval from the building designer, truss designer or truss manufacturer. Trusses that have been over-stressed due to excessive construction loading will usually show excessive sagging (deflection). At least a portion of this deflection will remain even after the load has been removed. In more severe cases, broken webs and/or chord members, plates starting to peel away from webs and chords, or web members that have pulled out of the plated joints may result. Property damage, personal injury and/or death are possible if overloading causes the building, or a portion thereof to fail and collapse.

Duration of the Load:

The length of time that the load is applied to the trusses is also of concern. The stack heights provided in Table B4-1 of *BCSI* and Table CFSB4-1 of *CFSBCSI* assume that the building materials are stacked for a relatively short time period (i.e., usually a week or less (see Table B8-2 of *BCSI*). Loads from stacks of construction materials stored for excessive periods of time can cause permanent deformation of the truss and/or structural damage to the structural integrity of the system. Care needs to be taken to limit the length of time trusses are exposed to construction loading. Proper staging of materials on the job site can avoid many problems and allow the project to run more efficiently. If materials must be received and stored for longer periods of time, they should be stored on the ground with proper protection from the weather and not on the floor or roof systems.

Placement of the Load:

Finally, the placement of construction loads is an important consideration. Areas susceptible to be overloaded are areas of convenience (i.e., balconies, areas next to stairwells and open areas). Scrap piles of roofing materials, for instance, should never be allowed to accumulate in a concentrated area of the roof, as this can easily cause an overloaded condition in this area. Stacks of sheathing materials should

always be stacked flat and, where possible, should be stacked with the long dimension of the sheathing oriented perpendicular to the trusses. This allows the load to be distributed over a larger number of trusses thereby decreasing the magnitude of load on each individual truss. Always place stacks of sheathing materials on supports spaced no more than 24 in. apart and placed as near as possible over the trusses supporting the load. The supports allow air to flow under the materials, thereby preventing damage to the materials or the structure due to moisture accumulation. Placement of the supports over the trusses helps transfer the stack load directly to the trusses and prevents potential overloading and damage of the floor and/or roof deck. The supports also provide room for material jacks to get under the stack in case they need to be moved.

Do not lean materials against walls or stack in such a manner as to overload a single truss or small group of trusses. Care should also be taken to stack materials as close to bearing supports as possible, not in the center of truss spans, allowing the loads to transfer efficiently through the structural support of the building and into ground. Likewise, concentrated loads should never be placed in cantilevered areas of trusses or near truss-to-girder connections as this can cause system stability problems.