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### SliDeRule: A New Website to Assess Safety Risk in Design

Is a reinforced concrete building safer to build than a steel building? How does a brick masonry exterior compare to precast panels in terms of construction worker safety? Our experience tells us that some building designs present more safety hazards and risk than others. Architects and engineers designing buildings select design features, materials, and components and therefore impact the hazards to which construction workers are exposed.

The prevention through design (PtD) concept advises us to select designs which eliminate hazards from the construction site. However, identifying construction site safety hazards during design can be difficult. The scale and complexity of today's building designs and construction processes make implementing PtD challenging. In addition, identifying how to change the design to reduce safety risk cannot be done without knowledge of the impact which each design element has on construction worker safety.

Researchers in the School of Civil and Construction Engineering at Oregon State University have recently created a website to address this problem. The website, titled SliDeRule for "Safety in Design Risk Evaluator," assists building designers with assessing the construction safety risk associated with their designs. SliDeRule is intended for use during the design phase of a building. As a building is being designed, architects and engineers can use SliDeRule to: determine the level of safety risk associated with their design; compare prospective designs based on construction safety risk; and create building designs that minimize the risk of construction worker injury.

SliDeRule features:

- o Applicable to multi-story buildings
- o Assess an entire building, a specific building system, or each of the many design features within a building
- o Evaluate nine different building systems containing a total of 141 possible design elements
- o Considers the risk of near misses and low-, medium-, and high-severity injuries
- o Accounts for the amount of worker exposure based on building size and material quantities

How was it developed? SliDeRule uses risk factors to calculate safety risk. The design risk factors are based on the frequency of an incident occurring, severity of a potential incident, and duration of worker exposure to the hazards associated with constructing each design element. SliDeRule includes risk factors for all of the 141 design elements contained within the website.

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The researchers began by creating a list of the systems present within buildings and the typical design elements within each system. Nine building systems are addressed by SliDeRule: foundation, structural frame, exterior enclosure, roof, interiors, fire suppression, plumbing, HVAC, and electrical. The list of design elements includes all of the potential alternatives for each of the elements (e.g., both precast and cast-in-place concrete for beams). For each listed element, the researchers identified the specific construction tasks required to construct each element. Lastly, the researchers identified the typical worker productivity associated with the construction of each element (e.g., the number of worker hours required per cubic yard of concrete).

The risk factors were then determined and quantified for each construction task and design element using targeted interviews and surveys of experienced construction personnel who build each design element. Their experience working on the site and daily exposure to the hazards is an invaluable resource of safety knowledge. The site personnel were additionally asked to identify any special design features that either increase or decrease the safety risk associated with each design element.

How does the website work? For each design element contained in a building design, the designer enters the quantity of the design element into SliDeRule (e.g., 100 linear feet of pipe, 500 cubic yards of concrete, or 200 square feet of roofing). SliDeRule then uses the entered quantities to calculate the safety risk associated with each design element, building system, and the entire building. The risk is calculated for an entire building, each building system, and each of the design features included within the building. Risk values may be calculated for different design options and then compared to optimize the design based on safety risk.

SliDeRule calculates and reports a numerical risk value. A lower risk value indicates less safety risk to construction workers who are constructing the building. The risk value for one design may then be compared to that of another design in order to select the best possible design for preventing construction worker injuries and fatalities. By using SliDeRule, hazards can be eliminated, safety risk reduced, and construction worker injuries and fatalities prevented.

Where can you find SliDeRule and additional information? SliDeRule is located online at [www.constructionsliderule.org](http://www.constructionsliderule.org). Research and development of SliDeRule and the SliDeRule website were funded in part through financial support from the National Institute for Occupational Safety and Health (NIOSH). For more information about SliDeRule, please visit the website or contact Dr. John Gambatese at [john.gambatese@oregonstate.edu](mailto:john.gambatese@oregonstate.edu).

Posted by John Gambatese on **Sep 20, 2013**

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