Premises Liability Issues For Constructors

Neil D. Opfer, P.D., CPC and David Shields, Ph.D., P.E.
University of Nevada, Las Vegas
Las Vegas, Nevada

Premises liability exposures for construction organizations result when a person is seriously injured or a death results due to deficiencies in the completed facility. The two most common exposures are from slip-and-fall and trip-and-fall incidents. Premises liability issues are increasing such as falls particularly due to an aging population. Constructors are taking on increased responsibilities for materials selections such as flooring particularly when performing design-build work. Constructors need to understand the critical importance of this area along with techniques such as planning, value engineering, and risk management techniques to lessen the impact of premises liability issues.

Key Words: slip-and-fall, trip-and-fall, testing, materials selection, risk management.

Introduction

Premises liability issues are becoming an area of increasing concern for construction organizations. Construction organizations are seeing an increased number of claims related to premises liability issues. There are a number of reasons for this including a U.S. population that is becoming older with estimates that from 2005 through 2020, the number of seniors will grow from 35 million to 77 million (NSFI, 2005). A minor fall to a young person resulting in no injury may to an older person result in significant injuries due to brittle bones and other issues.

By definition, a premises liability issue arises from a defect or dangerous condition of a constructed facility that results in the injury or death of a person. In many states, construction organizations are responsible for their completed work for a period of ten years. If the defect or dangerous condition can be traced to this original construction and it falls within this ten-year period, the liability can then fall onto the construction organization. Construction organizations involved in design-build work achieve increased liability exposure when certain design responsibilities are taken over by construction forces. Premises liability issues create greater problems than traditional time and cost claims since they can come many years after construction which means that historical records and project personnel may not be present to properly defend these claims. In addition, many experienced owners, to protect themselves in such instances, include construction-contract indemnity clauses requiring the construction organization to be responsible for all involved costs borne by the owner including attorney's fees. Further complicating this situation is the fact the traditional construction insurance methods from insurers such as commercial general liability policies are limiting themselves in certain cases to time periods as short as three years. Contrasting a three-year insurance policy period limit to a ten-year statute of repose for construction liability presents an obvious problem. Constructors need to be proactive in the area of premises liability and properly manage these risks.

Some construction organizations have been very successful in essentially eliminating and mitigating these problems in the premises liability area. Their techniques have included an understanding of key premises liability exposures, value engineering, strategic/tactical mitigation planning, and risk management.

The Premises Liability Setting

The setting for premises liability claims stems from a number of factors. Construction projects are being built with tighter budgets and schedules. Construction projects are wanted "yesterday" by clients and there is a lack of contingencies in project budgets to account for project problems. The pressure is not only on the construction side of the equation but on the design side as well. Designers are confronted with design budgets and time schedules that dictate less attention on drawings to crucial construction details. With less attention to details, construction

personnel in the field are left to make decisions that may result in less than an optimal choice. Moreover, building code officials are often just performing spot checks during the construction process and often lack awareness themselves of premises liability concerns. Construction decisions made may also result in facilities that are difficult for owners to maintain from a premises liability standpoint.

Constructors are concerned with completing the present project and moving on to the next one. However, they need to think about how this project will perform in terms of premises liability exposures. During construction, progressive firms have adopted comprehensive construction safety programs resulting in less accidents and a lowered worker's compensation profile. What many of the same firms have not paid attention to is the operating performance of the facility in terms of public accommodations with end users.

Fall Statistics

On an annual basis for the United States, the National Safety Council (NSC) publishes its Injury Facts Summary [National Safety Council, 2009]. For 2009, NSC found that falls resulted in 21,600 deaths in the U.S. which resulted in a rate of 7.2 deaths per 100,000 population. This has been a steadily increasing trend from the 2003 numbers which were 17, 229 deaths for a rate of 5.9 deaths per 100,000 population. In 2009, 16,000 of these deaths were considered to be of the slip-and-fall variety. The average cost of a slip-and-fall incident that does not result in death was $20,228.

Premises Liability Critical Areas

The two primary categories of premises liability issues tend to be from either slip-and-fall incidents or trip-and-fall incidents based on an unpublished survey by this writer of thirty-four major owners (one million square feet or more under utilization) [Opfer, 2008]. The main cause of a slip-and-fall incident is typically flooring surfaces that have poor slip-resistant characteristics. Footwear of the pedestrian may also be a cause but that is obviously out of the control of the constructor and facility owner. Trip-and-fall incidents can be caused by a variety of circumstances including poor condition of walkway surfaces, improper stair/step construction, or lack of adequate guardrails and handrails.

Slip-And-Fall Incidents

Slips on flooring surfaces result from the traction breakdown interaction of the pedestrian's footwear with the surface. The four key factors are (1) footwear, (2) manner of walking, (3) flooring surface, and (4) flooring surface contaminants. The constructor obviously has no influence over footwear or the manner in which a person walks but can have an impact on the flooring surface construction/composition and sometimes the presence of flooring surface contaminants.

Slips can result from flooring materials that exhibit poor slip-resistant characteristics. Numerically, this slip resistance is quantified by coefficient of friction numbers. Coefficient of friction from standard physics principles is termed to be between 0.0 and 1.00. The 1.00 coefficient of friction (COF) number would apply to surfaces with the highest coefficient of friction reading while 0.0 would be characterized as very slippery and hence at the bottom of the scale. The number of 0.50 as the coefficient of friction standard has been developed based on allowances for a factor of safety and is widely accepted in the U.S. [English, 2003]. This number on flooring surfaces is ascertained with testing equipment following standards promulgated by groups such as ASTM with two key relevant standards here being ASTM F1677 and ASTM F1679 [ASTM 2009, Di Pilla, Vidal 2002]. The two standards here (F1677 and F1679) reflect the differences in the two test equipment types referenced by the applicable standards. As an example, the authors have tested ice in a dry condition and found that it meters out at 0.20 when adhering to ASTM F1679 requirements. Somewhat surprisingly there are commercially-available stone flooring products tested under wet conditions (water on the flooring) that meter out at less than 0.20. This is obviously far under the 0.50 criteria.

Dry, uncontaminated flooring surfaces do not typically present slip-and-fall problems. Based on the author's extensive experience over nearly three decades, most dry surfaces will test above 0.50. However, in the presence of contaminants such as water, oil, grease, a number of flooring types fall below the 0.50 standard. The most common

surface contaminant confronting pedestrians is water from climatic events or other sources. These flooring types that suffer contaminant-induced slipping issues include a number of common flooring materials including marble, granite, terrazzo, and many tile materials including a number of ceramic and vinyl varieties. Material selections such as installed carpet have not been found to present problems unless it is saturated with a contaminant. The critical factor in preventing slip-and-fall incidents in the presence of a contaminant is whether the sharpness of the flooring surface is such to still be able to provide foot grip resistance to the pedestrian. Therefore the flooring surface sharpness (surface asperities) needs to be able to penetrate the contaminant layer.

When flooring materials are selected by the constructor, care should be taken to ensure that they exhibit a coefficient of friction with water present meeting the 0.50 standard based on tests conducted in accordance with ASTM F1677 or ASTM F1679. If the flooring will be in an area common to other contaminants such as oil, this should then be the test environment. Ideally the constructor can obtain such certifications from the manufacturer but the wisest course of action is to verify this slip resistance with independent third-party verification such as with a consulting firm's services. The manufacturer may not be using a wet-environment recognized testing method such as the ASTM F1677 and ASTM F1679 criteria. Some flooring contractors have this testing capability in-house to verify the safety of their installation work.

Materials such as concrete should ideally have a rough bristle-broom finish to provide adequate slip-resistant characteristics. Smooth steel-trowel concrete finishes do not provide the flooring surface sharpness (surface asperities) needed to be able to penetrate a typical contaminant layer such as water. These issues also negate the selection of exposed aggregate concrete finishes for floors unless sharp aggregates are selected for this purpose. Another common problem with concrete finishes is the usage of excessive mix water during concrete placing activities. It is well-known that an excessive water-cement ratio results in lowered concrete strength. However, this excessive mix water can also have an impact on the slip-resistant characteristics of the finished concrete surface. On even a bristle-broom concrete finish, the weakened surface character resulting from excessive mix water leads to increased surface wear resulting in a smoother concrete surface over time. A slip-and-fall incident occurring on this now-smooth concrete surface can result in liability to the contractor within the ten-year time limit of liability based on exceeding the standard water-cement ratio.

Trip-And-Fall Incidents

Trip-and-fall incidents often take place due to the poor condition of walkway surfaces, defects in stairs or steps, and the lack of adequate guardrails or handrails. Unless resulting from maintenance issues with the facility, often these can be traced back to the original contractor. In one survey for a real estate investment trust (REIT) involving several large apartment complexes, non-code compliant defects from original construction were found in 65% of the staircases surveyed for the REIT [Opfer, 2007]. The defects ranged from improper handrail construction to failure to meet code-mandated 3/8-inch per flight maximum stair tread and stair riser tolerances.

The International Building Code (IBC) requires that "stair riser heights shall be 7 inches (178 mm) maximum and 4 inches (102 mm) minimum. Stair tread depths shall be 11 inches (279 mm) minimum [International Code Council, 2006]." In addition, dimensional uniformity is required as a tolerance to not exceed 0.375 inch (9.5 mm) for tread depth and riser height in any flight of stairs. Stair treads must not slope more than 2% (1:48) and handrails must be a minimum of 34 inches to a maximum of 38 inches in height [International Code Council, 2006].

Other trip-and-fall incidents may result due to differential heights between flooring surfaces. The IBC through the incorporated ANSI A117.1 standard allows 0.250 inch (6.33 mm) vertical difference between surfaces. Up to 0.500 inch (12.67 mm) vertical displacement height, that second 0.250 inch (6.33 mm) vertical difference must be beveled at a 1:2 slope [International Code Council, 2006]. Upon construction completion the constructors need to ensure that surface elevation differences adhere to these requirements. Common problems seen here include settlement of adjoining floor or sidewalk concrete slabs which may be often due to inadequate original compaction. Another key driver of elevation differences can result from landscaping such as tree roots causing sidewalk displacements which would be an owner responsibility.

One common problem, based on the authors experience, is that few in construction ever check to ascertain whether or not these criteria are complied with for the constructed product regarding stairs and steps. These IBC criteria were developed specifically to provide pedestrian safety. Some would place responsibility for adherence with these criteria on building code inspectors. However, during periods of heightened-construction activity, inspectors with a multitude of items to inspect simply do not have the time to check for all stairs and their steps for compliance with these tolerances. Whether stairs are made of wood, concrete or steel, the installing contractor should be required to provide verification of compliance. Further checks can then be done as part of quality assurance/quality control activities by those in responsible charge or by the owner such as through verification inspections by a third-party quality control organization.

The Design-Construction-Maintenance Divide

With less detail on drawings, decisions may be made by craft personnel in the field. In addition, with tighter budgets, owners, while it is false economy, may not retain third-party quality control capabilities and contractors, in the same vein, may not pay attention to these details as well. Additional trends towards more segmentation in both design and construction can lead to a lack of overall understanding of premises liability concerns. In years past, design of a project was by an A/E firm was handled with a relatively few consultants. Construction was similarly undertaken by a general contractor that self-performed significant elements of the work with a relatively few subcontractors. The current situation is that of a series of numerous firms on both the design side and the construction side each performing what amounts to a small slice of the overall project. In terms of specialized knowledge brought to bear on specific problems, this plethora of firms can be a sound solution set. But facilities are composed of many systems that interact with each other. To make this process work on the design and construction sides requires strong editorial control by the A/E firm and general contractor/construction manager respectively. At the top of the project pyramid these two firms in their respective realms must be able to avoid conflicts in the process and produce a viable constructed product. To have this process work perfectly is probably an impossibility and when errors occur and accumulate in an area, premises liability issues can be the unfortunate result.

Combined with these pressures for system understanding along with budgets and schedules can be a lack of knowledge leading to a lack of concern for project elements. If field construction personnel don't understand the design rationale and intent for a particular construction detail, choices may be made that compromise the system. One framing subcontractor may move a backing support for a handrail several inches to another higher/lower location. If this detail is covered up by other trades, the follow-on handrail contractor and general contractor don't understand that this movement has taken place, it can become installed with correct hardware application but in the wrong location. On a large complex such as a series of apartment buildings, the mistake may be carried as a pattern throughout the series of buildings based on original layout sketches. With exterior curtain-wall construction, these processes effectively hide the incorrectly-located support from view. This construction defect may not become apparent for many years until it is discovered during a premises liability event when the handrail comes off the wall or is discovered in building maintenance, a retrofit, or during a more general construction defects investigation. This defect is not an obvious or patent defect but instead would be classified as a hidden or latent defect. Lack of knowledge on the part of the framing contractor led to the creation of a premises liability issue.

The premises liability setting is further fueled by the fact that maintenance practices for a particular facility may have been inadequate. As a result, the original materials of construction have suffered damage that could have been avoided through sound maintenance policies. Grease, oils, and food spills are a fact of restaurant operations. Normally at the end of the shift restaurant hard-surface floors are cleaned by wet-mopping practices. However, this mopping duty typically goes to the lowest-ranking person at the facility. Moreover, this person often lacks even rudimentary training. Therefore grease, oil, and food spills don't get removed from the restaurant floor but instead are spread around in a distributed fashion during the mopping process. This can build up a scale on flooring surfaces that continues to accumulate eventually resulting in a slip-and-fall accident. If sound hard-floor surface-cleaning procedures are not to be followed, the better practice is to replace these hard-surface floors such as tile or stone with carpet. The carpet has a variegated pattern such that food spills tend to blend in to the carpet's pattern. Once a shift, the carpet is vacuumed and once per month steam cleaning takes place. The return on investment from this has proven to be approximately six months [English, 2007]. A knowledgeable constructor can assist both designer and owner by selecting materials such as carpeting over hard-surface floors for these restaurant and other similar

environments. In "back-of-house" areas such as kitchens, materials such as a rough-finish quarry tile may be a sound selection.

Or a maintenance retrofit may have been done that contributes to a premises liability defect. A maintenance retrofit to a facility may lead to replacement of a high-slip-resistant flooring type with one less so. This may take place a few years after construction but still within the statute of limitations period for the constructed facility. Original design and construction practices were correctly followed but client maintenance/replacement practices caused the system defect. Another example could be cited of poor maintenance practices wherein an owner seeking a "brighter look" for hard-surface flooring selects a wax and has the floors buffed to a high sheen. The problem here is that the flooring maintenance practices lead to a less slip-resistant floor with resultant accidents. The owner mat then attempt to retroactively place blame on the design/construction process. Sound documentation practices including document retention and digital photographic records can assist constructors in defending against these owner-directed changes after project completion.

Value Engineering

Value engineering is a key element involved in the prevention of premises liability issues. Value engineering can be defined as an organized effort to make a product accomplish a desired function at lowest cost and thus to maximize its real value [Dell'isola (1988)]. The application of value engineering techniques to premises liability circumstances is important from a number of perspectives. An owner or a designer may find a particular flooring type, as an example, to be desirable from an aesthetic standpoint. However that same flooring may create significant slip-and-fall issues in the future. A knowledgeable constructor can assist in selecting flooring with the lowest overall life cycle cost profile. In some cases the particular flooring type may be selected but with an added finish such as surface roughening that provides the necessary degree of pedestrian safety.

Value engineering efforts as early as possible should identify those high potential areas of the potential premises liability problems. By the term high cost, either the per incident cost is high or the total number of potential incidents in an area is high thus driving a high total end cost. Pareto's Law of Optimality states that 20% of the elements of a project contribute to 80% of the costs. Review of premises liability concerns often indicates the same pattern. Therefore, value engineering efforts should focus on this 20% of elements that constitute 80% of the costs. An example would be pool surfaces such as at a hotel pool. The natural condition of pool surrounds is that they will have water saturation as a characteristic. In addition, such hotel pools in season experience high usage rates particularly in resort cities. Therefore flooring surface selection should take such factors into account. One resort hotel pool during the summer season was witnessing three slip-and-fall incidents per month. The original construction contractor was brought in for a remodel to include a solution for this problem. With a value-engineering flooring solution with a high COF surface (measurements in water in excess of 0.65 COF under ASTM F-1679), the number of slip-and-fall incidents dropped to an average of one per season. The return on investment from the enhanced pool-surround surface took one summer season [Opfer, 2009].

The ideal result from value engineering would be a design that also has sound constructability characteristics in the field. A concrete ramp to be poured in place may need to be placed at a 1:12 (one inch in 12 inches) slope. The 1:12 criteria meet both ADA and IBC requirements. Technically, if the finished concrete surface ends up as 1-1/8:12 (one and one-eighth-inches in 12 inches), this is non-code compliant. Neither IBC nor ADA allows a slope greater than the 1:12 standard. A potential solution would be to have a slope less than 1:12 such as 7/8:12 and therefore if the concrete surface slightly exceeds this slope it would still meet the ADA and IBC 1:12 requirements. Short of this the solution is concrete grinding to bring non-code compliant concrete slopes back into compliance in this situation.

Strategic/Tactical Mitigation Planning

Premises liability issues like many construction defects typically result from design errors, construction errors, inspection errors or from some combination of these items. The underlying source of the errors may stem from ignorance, incompetence, negligence, and avarice [Carper, 1989]. The cause of the premises liability situation may be from environmental forces or inadequate maintenance practices. In some instances the methods/materials forming the subject construction assembly may be new and unproven resulting in issues such as excessive wear on a flooring

surface. The combination of certain methods and materials with others resulting in a different combination may result in unique problems. Design and construction methods that have marginal safety factors and require unrealistic tolerances may result in further problems. Education and training for the disciplines of design, construction, and inspection is a continual requirement [Dell'isola, 1988, Kaminetzky, 1991].

Strategic and tactical mitigation planning covers a number of issues relating to premises liability concerns. The first would be an overall strategy in an organization such to satisfy the concerns in the above paragraph. The tactical approach implements the strategy.

The best way to plan for premises liability litigation is never to get involved in the first place. How should a contractor mitigate or minimize their exposure potential for premises liability issues? A general contractor should concern themselves with hiring quality personnel for their own operations along with quality subcontractors. The three key ingredients on any construction project are time, cost, and quality. Unfortunately, some construction organizations focus on time and cost with little emphasis on quality. Some general contractors try to hire subcontractors and then force low contract prices on their subs. As one builder/developer stated, "your best friend on a project is a subcontractor that is making money [Lay, 1994]." A subcontractor that is losing money on a contract may try to cut corners on quality. Unrealistic contract prices can put pressure on subcontractors to cut corners. Inadequate coordination of subcontractors can lead to stacking of trades on a project resulting in confusion particularly when another subcontractor's work is covered up by another trade. A contractor shows up to install handrail but attachment points are not present or others may have been covered up by the stucco contractor. The result is a poorly-attached handrail that gives way when a person falls and attempts to arrest their fall by use of the railing. Poor scheduling on the part of the general contractor may result in a trade such as handrail-attachment backing being left out of certain parts of the project.

Unless the project is design-build, the design professionals on a project are chosen by the project owner or developer. Design firms must make the same decisions on consultants as do generals regarding subcontractors. Design consultants to the principal design firm should have fair margins in order to perform a quality effort. Does the interior designer making flooring selection decisions do so based on anti-slip characteristics? Some form of construction surveillance required of the design firm and applicable consultants can be a wise investment for a developer. Periodic construction surveillance at key stages of a construction project can ascertain whether or not design intent is being carried out by the job's construction firms. Developers sometimes reason that since they are employing a general contractor, design firm surveillance is unnecessary. On a relatively uncomplicated project with competent contractors, the surveillance may prove just to be extra cost. However, the surveillance cost must be measured against the potential for the occurrence of premises liability problems. Avoiding one significant premises liability case can pay for construction surveillance on a large number of projects.

The changing of flooring design concepts by a developer without design input into those changes can result in problems. Again, design surveillance should be a key focus as the design intent is best understood by the original design firm. Flooring material details may be changed by the developer to other materials that may be more aesthetically-pleasing but again, design consultation is usually essential since these changes may lead to problems in this area.

Inspection can play a key role in avoiding premises liability issues. Quality assurance and quality control (QA/QC) efforts can provide assistance to construction field forces. QA/QC efforts should be from both an internal and external focus. Internal QA/QC will be met by construction supervisory personnel and their daily interactions with craft workers and subcontractors on site. They set a standard of quality. This standard of quality must be one that is acceptable for the materials and methods of the particular construction process. Variations occur from the subject construction process in a range. Field supervisory personnel must determine what are the limits of this variability? Concrete finishing is subject to some individual differences between personnel. Flooring manufacturers may slightly change a pattern from one batch to another.

External QA/QC efforts come from outside the organization. This may consist of inspection agencies enforcing building codes, independent testing firms, and design surveillance. The owner or project developer should ensure the independence of this process with either retention of design surveillance services or independent testing firms.

These organizations should not be retained by the particular contractors actually performing the work. Independent testing firms should be retained with an adequate budget to ensure that necessary QA/QC work can take place.

Another aspect of avoiding premises liability problems is project documentation. On a major project, document generation through meeting minutes, daily project reports, plans and specifications changes can be extensive. When changes are generated through the design, construction, and/or inspection process, documentation is essential. The information should be kept in organized fashion and then retained after project completion by the constructor. The sheer volume of project documents necessitates volume reduction via document storage technology. Issues such as flooring selection can be recorded via video and photographs to document the final construction product. In a state with a ten-year statute of limitations period, these records should be retained to a point safely past this date.

Risk Management

Constructors need to practice risk management in addressing premises liability concerns. Too often the authors have found that constructors only pay attention to the construction process and fail to focus on liability for end users due to premises issues after project completion. Risk management is the practice of identifying and analyzing loss exposures while taking steps to minimize the impacts of these loss exposures. Risk management includes risk analysis, risk control, risk transfer, and risk mitigation [Cavignac, 2009].

Risk analysis needs to concern itself with the identification of possible loss exposures such as a premises liability issue. Risk control involves techniques to lower the frequency or severity of a premises liability event. In risk control, constructors should make internal efforts towards quality in hiring practices of both employees and subcontractors. Risk transfer involves dealing with the potential loss stemming from a premises liability occurrence. Risk transfer involves techniques such as contractual risk transfer and insurance techniques such as CGL coverage enumerated earlier. Contractual risk transfer might mean that subcontracting is utilized to deal with the risk of premises liability or that risk in this area is transferred back to the owner through favorable contract clauses. Other methods of risk transfer include retention of the risk such as through self-insurance or high deductibles.

Risk in premises liability litigation is difficult to delegate since all firms involved in a project in an affected premises area may be named in a lawsuit. All participants to the project should carry adequate insurance and the insurance should provide coverage for possible litigation in the future [Cavignac, 2009]. Construction and design organizations need to follow a reasonable standard of care in the performance of their work. These organizations should have qualified personnel that follow codified state-of-the art procedures. Combining this together with complete, accurate, and objective documentation is the best risk management strategy. This documentation should verify construction through scope enumeration and photographic techniques such that the constructor has a verifiable record of the subject installation. Items such as the aforementioned flooring installation in a previous section may be changed out years after the construction was complete so if then a premises liability issue arises from different flooring, this can be an important defense.

One caveat should be mentioned in terms of risk management. Some think that risk management means avoiding any responsibility in terms of defects for the work of their particular entity involved in the litigation. If there was a change in the plans and/or acceptance of their work by other entities on the project, this may have validity. A general contractor may order a subcontractor to perform work at variance to the plans. Anyone with experience in the construction industry recognizes that no project is ever built completely in accordance with the plans. Construction organizations also do make mistakes. When those mistakes are of a serious nature, the proper risk management strategy is not to blame others for your own mistakes. Mistakes made without knowledge of other entities on the construction process fall squarely on the shoulders of the firm making the mistake. The strategy should not be to deny responsibility for the mistake. The same would apply to a contractor who incorrectly ordered flooring material during the construction process at variance with the plans or specifications. Responsible risk management means taking responsibility for an entity's own actions.

Summary

Construction organizations need to take a proactive approach concerning premises liability issues. Premises liability issues are becoming more important as the U.S. confronts an aging population. Construction techniques such as proper flooring selection and stair/step construction with an eye towards premises liability reduction can yield significant benefits in reducing slip-and-fall and trip-and-fall incidents. Constructors should focus on this often-neglected area because they, in many states under statute of limitations' laws, are liable for up to ten years for the completed facility including injuries to end users. Moreover, trends in commercial general liability insurance are restrictive policy periods of three years in some instances presenting an obvious coverage problem for this exposure. Strong risk management practices including improved construction techniques on stair/ramp areas and decisions made by constructors including flooring selections can mitigate problems in this area. Some of these techniques are as simple as creating a rough-broom finish concrete walk as opposed to a smooth-steel-trowel finished surface. This finish is less expensive for the constructor and provides a slip-resistant surface for the owner. When selecting flooring materials, criteria for coefficient-of-friction testing in compliance with ASTM F1677 and ASTM F1679 should be part of the selection process. Concepts such as value engineering can produce the lowest life cycle costs when balancing potential premises liability exposure against initial construction costs for the owner. Liability can be significantly reduced and mitigated by constructors if they pay attention to this area.

References

ASTM International Digital Library (2009) at http://www.astm.org/DIGITAL_LIBRARY/index.shtml

Carper, K., (1989), Learning from Failures in Forensic Engineering. Kenneth Carper, Ed. New York, Elsevier Science, p. 19.

Cavignac, J., (2009), Managing Risk in a Construction Company, *Construction Business Owner*, November Vol. 6 No.: 11, pp. 29-31.

Dell'isola, A. (1988), Value Engineering in the Construction Industry, Third Edition Washington, D.C. Smith, Hinchman, & Grylls, pp. 1-11.

Di Pilla, S., Vidal, K. (2001), Slip-Resistance Measurement: The Current State of the Art, *ASSE by Design: Engineering Practice Specialty Newsletter*, Fall 2001, Vol. 1, No.: 1, pp. 1, 3, 6-8.

English, W., (2003), Pedestrian Slip Resistance, Rose Publishing, Tallahassee, FL., pp. 47-50.

English, W., (2007) Using the English XL VIT Expertly, Philadelphia, PA., June.

International Code Council, (2006) 2006 International Building Code, Country Club Hills, IL. pp 212-215.

F. Jackson., (2007) Private interview. Orlando, FL. January.

Kaminetzky, D., (1991), Design and Construction Failures: Lessons from Forensic Investigations. New York, McGraw-Hill, pp. 1-53.

Lay, K., (1994), The Pulte Home Construction Process Presentation. Las Vegas, NV. March.

National Safe Flooring Institute (2005) – NSFI Flooring Safety Facts Pamphlet, 2005, Chicago, IL.

National Safety Council Injury Facts, 2009 Edition (2009), National Safety Council, Itasca, IL.

Opfer, N., (2008), Unpublished Premises Liability Study of Thirty-Four Owners and Their Experiential Records.

Opfer, N., (2009), Hotel Pool Area Consulting Study.
Opfer, N., (2007), Apartment Building Survey.