DEEP FOUNDATIONS INSTITUTE

44th ANNUAL CONFERENCE

CHICAGO

Future Forward

Hilton Chicago | Illinois | October 15-18, 2019

2019 PROCEEDINGS

PREFACE

On behalf of Deep Foundations Institute (DFI) and the 2019 Annual Conference Organizing Committee, we would like to extend our thanks and appreciation to all attendees, exhibitors, underwriters, invited speakers, presenters and session moderators who helped make the 44th Annual Conference on Deep Foundations a success. This year's conference was held October 15-18, 2019, in Chicago, Illinois. Chicago has a rich history of contributions to geotechnical practice and foundation engineering and construction; and was a fitting location to look ahead to the future.

When the Organizing Committee was working to develop the central theme of the 44th Annual Conference, we explored the potential significance of the conference's number. Through numerology, or the study of the relationship between numbers and coinciding events, we discovered that the number 44 relates to business, and especially business which builds something that benefits many generations. The number 44 represents building for both the present and the future: it seeks for rewards for present work and a large positive effect on the future. Considering the conjunction of the legacy of Chicago in global foundation practice and the "meaning" of the conference identifier, we settled on a theme of ***>Future >Forward***. The intention of the conference was to promote the development of forward-thinking plans in deep foundation practice and related areas through technical presentations and panel discussions.

We believe we succeeded.

Our conference began with The Chicago Legacy which included a local celebrity, Geoffrey Baer who presented his impressions of the history, culture and people that have shaped the Chicago River corridor. We then followed with a panel of geotechnical experts who gave insight and offered predictions into the future of the geotechnical work which is integral to the magnificent high-rise structures of the Chicago skyline. Our spirited panel included Rich Finno, P.E., Ph.D., D.GE, Tony Kiefer, P.E., Steve Scherer, Bob Schock, Bill Walton, P.E., S.E., and Mike Wysockey, Ph.D., P.E.

>Future >Forward is also about the next generation of engineers and contractors and we were grateful to have former professor and current contractor, Rick Deschamps, Ph.D., P.E., present on the intricacies of the Mentor/Mentee relationship. Our final first-day plenary session theme was DFI and Technology which included presentations by the leaders of the DFI Project Information Management Systems (PIMS) committee which was formed in response to the industry trend towards digitalization of data, the increased use of data management and geospatial tools. The innovative panel, moderated by Gianfranco DiCicco, included Massimo Mucci, Vanessa Bateman, P.G., P.E., Mark Petersen, P.E., G.E., and Jamey Rosen, P.Geo.

The conference also hosted the Manufacturer Supplier and Service Provider (MSSP) Trade Expo Sessions in the Exhibit Hall and showcased presentations by DFI corporate members on services and products. The conference closed with our theme of ***>Future >Forward*** in mind with plenary sessions on Safety in Geo-Construction and The Digital Future. The conference welcomed undergraduate and graduate students throughout the Midwest with a formal program, including a networking session with participating industry professionals.

This publication contains peer-reviewed technical papers in the session areas selected by the Conference Organizing Committee: Crawl, Walk, Run - Improving Future Practice, Deep Foundations, The Digital Future, Developments in Safe Geo-Construction, Pile Foundations, Complex Excavations, Alternative Foundations, Earth Support, Underpinning and Soil Nailing, Ground Improvement, Drilled Shafts and Exploration and Testing.

As with past conferences, this event could not have been a success without the significant contributions and dedication of all stakeholders. We are grateful to the DFI Staff, Conference Organizing Committee, Session Chairs and Moderators, authors, reviewers, underwriters, exhibitors and volunteers. Finally, the

Chicago Organizing Committee is grateful for the opportunity to contribute to the success of the 44th Annual Conference on Deep Foundations.

Conference Chair: Dhooli Raj, P.E., Collins Engineers, Inc.

Program Co-Chairs: Ray Franz, P.E., D.GE, Hayward Baker Inc.
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DFI - Finding Common Ground®

Mission Statement

To bring together multidisciplined individuals and organizations to find common ground and create a shared vision and a consensus voice for continual advancement in the deep foundations industry.

Alternative Foundations

Complex Excavations

Crawl, Walk, Run: Improving Future Practice

Deep Foundations

Developments in Safe Geo-Construction

Drilled Shafts

Earth Support

Exploration and Testing

Ground Improvement

Pile Foundations I

Pile Foundations II

The Digital Future

Underpinning and Nailing

EXCAVATION RISKS ADJACENT TO EXISTING STRUCTURES IN ILLINOIS AND URBAN ENVIRONMENTS - IDENTIFYING AND MANAGING TECHNICAL AND LEGAL ISSUES

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ABSTRACT

New construction in metropolitan areas has direct impacts on immediate neighbors and abutters. While noise and dust are generally nuisance concerns, demolition, vibrations, excavation, and dewatering can cause structural damage to adjacent structures. Different cities, states, or jurisdictions have different regulations that dictate requirements, roles, or responsibilities for varying parties during construction. The authors will introduce and discuss risks of new construction adjacent to existing structures, and the legal framework in Illinois which requires the owner of the new construction project to provide adequate protections for adjacent existing structures. The authors, who are engineers and attorneys, will discuss technical and legal concerns, and will highlight the importance of early and frequent communication among project participants to manage risks, despite whether or not any local regulations exist to drive the process.

Keywords: abutter, adjacent construction, excavation-induced movements, demolition, vibration, claims, regulations, ALEPA

RISKS IN ADJACENT CONSTRUCTION

New construction in metropolitan areas inherently involves some combination of noise, dust, ground-borne vibrations, earth excavation, and subgrade dewatering. These issues have potential to directly and adversely affect abutters and their property. Noise and dust can be nuisance concerns, while vibrations, excavation, and dewatering can result in damage to abutters' structures. Noise and dust are unlikely to lead to physical damage to abutters' property, and can be controlled with limited work hours and good housekeeping practices. Vibrations and excavations, however, if not well understood, planned for, and mitigated, can result in serious damage to abutters' structures. In turn, this damage introduces additional and often significant costs and schedule delays.

Vibrations can be caused by a wide range of construction activities including, but not limited to, blasting, excavation, demolition, driven shoring, and/or driven foundation elements. Vibrations can cause soils to densify or liquefy, and can damage archaic or fragile structures. Excavations can lead to a wide range of problems associated with abutters' property, particularly due to horizontal or vertical movement of the existing foundations. Movements can result from a support-of-excavation with insufficient strength and stiffness, dewatering that lowers the water table, and/or direct undermining of abutters' structures.

THE IMPORTANCE OF PLANNING AND COMMUNICATION

The success of a construction project adjacent to existing structures ("adjacent construction project") is based in proactive planning and communication. Leaving the responsibility to a single party leads to a reactive response to issues, impacts schedule, adds costs, and frequently results in claims.

Overall, the most prevalent risk for adjacent construction projects is lack of planning and communication between the project team members and the abutters. Methods and processes for mitigating the effects of adjacent construction projects are well established; lack of planning and lack of communication are typically the origin of problems.

A well-organized and proactive project addresses the potential effects of adjacent construction projects during the design phase. The owner/design team for the new construction can identify the potential impacts of vibration and/or excavations, and evaluate existing adjacent structures to understand the type of construction and potential response to the new construction work. Preconstruction evaluations are often part of this work to document the existing materials, structural systems, and conditions. This information can be shared with the abutters and the construction teams bidding the project.

While the construction team may ultimately be responsible for the means, methods, and sequences of construction, the owner/design team for the new construction needs to provide guidance at the bidding stage through either performance or prescriptive specifications. The geotechnical report for the project, which is typically issued prior to developing bid/construction documents, should address not only design recommendations but also construction considerations associated with vibration-inducing activities or support of excavation systems. The design team can then use the information to develop an instrumentation program, acceptable thresholds for vibration and movements (of existing structures, support-of-excavation system, and ground), acceptable thresholds for groundwater levels, limitations on construction means, methods and sequences, and a process for addressing construction-phase modifications when threshold values are reached. While the means, methods, and sequences of construction ultimately fall to the construction team, communication during the design phase will allow all parties to become educated on important issues, and appropriate limitations can be set forth in the project specifications to allow each party to perform its job better.

LOCAL REGULATIONS FOR ADJACENT CONSTRUCTION

Some cities, states, or jurisdictions have regulations that dictate requirements, roles, or responsibilities for varying parties during construction. However, not all have established or codified requirements for adjacent construction practice; the risks of damage to adjacent structures can be highest in in the absence of guidance. Regardless of local code requirements, it is incumbent upon the design and construction team to be knowledgeable about the adjacent construction, the risks that are introduced by the new construction, and the appropriate protections and monitoring of the adjacent structures.

EXCAVATION LAW AND LIABILITY ISSUES IN ILLINOIS

Introduction.

There is significant property damage risk associated with excavations under (1) the risk allocation clauses contained in procurement contracts for design professionals and contractors, (2) common negligence law, and (3) individual state statutes. For the purposes of the subsequent discussion, we define the following terms:

- Strict Liability. Strict liability is generally defined as one's liability that does not depend on an actual negligent act or an intent to harm. This is liability that is created as result of an act without

intent and whether caused negligently or by other means. For example, the party committing the act is liable for the mere commission of the action regardless of what the intent or mental state at the time of the occurrence.

- Negligence Liability. Negligence liability results when someone fails to act with the level of care that someone of ordinary prudence would have exercised under the same or similar circumstances. Negligent liability arises when there is a duty on one party's part to act with this level of care and a resulting failure to act resulting and causing damages to another party. Negligence liability is based upon actions which are not directly intentional.

- Statutory Claim. A statutory claim is a claim based upon a direct written state statute or law.

- Tort Claim or Tort Liability. A tort claim or tort liability is understood as a civil wrong (as opposed to criminal) which results in legal liability for the person who commits a negligent or intentional act resulting and causing damages to another party.

- Common Law. Common law is known as judge-made law or case law and is a body of law derived from legal decisions of courts or similar tribunals.

Excavations, which can impact abutters in dense metropolitan areas, carry design and construction obligations under the law and contract clauses. Different cities, states, or jurisdictions also manage property damage risk allocation differently for owners of new construction owners and abutters. It is, therefore, necessary to examine excavation risks under the law in the relevant jurisdiction before performing design and construction in dense metropolitan areas. The excavation risks for property damage to adjacent structures include, but are not limited to, the following general areas of significant risk:

- What is the new construction owner's procurement philosophy with respect to allocating risk for property damage caused by excavations (to whom is the risk assigned)?

- Has the new construction owner assigned the risk of protecting the adjacent structures to the design professional, the contractor, or no one?

- What are the contract or statutory deliverables required from design professionals and contractors with respect to the protection of abutters' property?

- What indemnifications have the design professional and/or contractor given to the new construction owner or third parties with respect to damage to abutters' structures?

- Is the new construction owner's, professional engineer's or contractor's self-insured retention under applicable insurance policies so large that it renders insurance coverage meaningless (i.e., the $10,000,000 self-insured retention)?

- Is a contractor generally aware that certain deliverables are required of a design professional in designing the project to protect abutters' property (has the contractor seen or asked for these deliverables)?

- What notice to abutters needs to be provided (and who has to give that notice) for new construction projects, so that the abutters can review the intended design or construction?

- What are the impacts to adjacent multi-unit condominium owners, where some of the owners are close to the new construction, and some are remote? Does liability extend to remote adjacent owners?

- Are both individual condominium owner's claims for property damages and the condominium association's claim for common element property damages recoverable?

- What common law negligence theories permit property damage recovery from designers or contractors for new construction projects?

- Does the state or local government unit have a statute or ordinance for risk allocation for new construction and property damage to abutters (i.e., is any property damage covered on a strict liability basis)?

- What sovereign immunity defenses and limitations do public owners of new construction projects possess in a given jurisdiction with respect to direct claims against public owners from abutters?

- Will sovereign immunity of public owners of new construction projects affect claims against design professionals and contractors?

- What defenses to liability for property damage to abutters' structures exist in both the public and private sectors for design professionals and contractors?

- How is a defect determined to be a design defect or a construction defect when multiple tiers of contractors and design consultants are involved in executing large metropolitan projects?

- How are delay claims by contractors impacted when property damage to an abutter's structure interrupts a construction schedule and project?

From the foregoing risk management issues, excavations in dense metropolitan areas carry significant legal and monetary risks. Different cities, states, or jurisdictions have different regulations, statutes, and procurement risk allocation programs which dictate the requirements, roles, and responsibilities of various design professionals and contractors both before and during construction. Given the nature of high-density construction and excavations in metropolitan areas, these risks also often play out in the context of high-profile and newsworthy events involving significant and important buildings.

Illinois deep excavation law – Adjacent Landowner Excavation Protection Act (ALEPA).

In 1957, Illinois joined a number of other states by enacting a state statute that provides that abutters to construction projects are legally and statutorily entitled to continuous lateral and subjacent support received from adjoining land. It is through this statute that contractors and design professionals become secondarily liable through procurement contracts and common law.

Under the Adjacent Landowner Excavation Protection Act (ALEPA), Chapter 765 of the Illinois Compiled Statutes (ILCS) Section 140, rights are conferred upon abutters to adjacent construction projects and duties are placed upon owners of excavation projects to make proper excavation for purposes of construction or improvements to property. In nearly all cases, new construction owners do their best in their contract procurement documents to pass this obligation to their contractors, subcontractors, architects, engineers, and other service providers. This usually includes standard contractual indemnification clauses that require the contractor and design professionals of the new construction to contractually defend and indemnify the owner of the new construction projects, which would include liability under ALEPA.

ALEPA notice provisions and requirements.

ALEPA requires new construction owners or possessors of land intending to excavate their property to give "due and reasonable notice in writing to the owner or owners of adjoining lands and of adjoining buildings

and other structures stating: (1) the depth to which the excavation is intended to be made and (2) when the excavation will begin." 765 ILCS 140/1(1).

Required time and duty for abutters to protect property under ALEPA.

If the excavation is of a depth greater than 8 ft below the established grade of the street (or, if there is no established grade, if it is below the surface of the abutters' land), and if it appears that the excavation is to be of a greater depth than the walls or foundations of any abutters' building or other structure and is to be so close as to endanger the abutters' building or structure, then abutter shall be allowed a reasonable time (not less than thirty days) to take measures to protect the abutters' land, building and structures from damage or to extend the foundations, and for that purpose the abutter must be given a license to enter onto the land on which the excavation is to be or is being made. 765 ILCS 140/1(1), (4).

The new construction owner of the excavated land, if provided a license by the abutter, shall protect the adjoining land and any building or other structure thereon, without cost to the abutter, by furnishing lateral and subjacent support" to the adjoining land and all buildings and structures thereon to protect them from damage by reason of the excavation, and the new construction owner shall be liable to the abutter for any damage to the land or to any buildings or other structures including liability to occupant and tenants. 765 ILCS 140/1 (2), (5), (6).

The language of this statute expands damages to more than just repairs to the adjoining land and structures, and also to business losses and economic related expenses of occupants and tenants which are usually excluded under common law.

This liability also extends to state and local governmental agencies. There is no case law that concludes that sovereign immunity (the rule of government immunity to legal action for liability) prevents the application of ALEPA to state and local government.

The City of Chicago excavation lateral support regulations which exceed ALEPA.

The City of Chicago (the City) has its own excavation regulations which may create additional liability. *Bockweg v. Konopiots*, 2013 IL App. (1st) 121112 is an action brought under Illinois Municipal Code and Chicago Municipal Code regarding excavation requirements. The Chicago excavation regulations contain additional requirements for notice, bracing and liability when compared to the state law of ALEPA. See Chicago Municipal Code §13-124-380 et seq.

The City regulations include requirements for thirty days advance notice of excavation to neighboring properties and the alderman, §13-124-390; bracing of neighboring structures within 5 ft of the excavation, §13-124-400; fencing in certain circumstances, §13-124-411; and insurance requirements, §13-124-420.

Unlike ALEPA, the City regulations allow declaration of liability upon contractors as well as new construction owners. As a result both owners and contractors can be declared to be jointly liable for "any damage, death, or injury caused by sagging, settling, cracking or collapsing of the public way or of the foundation or walls of a structure located within 5 ft of the excavation, due to absent or insufficient reinforcement or bracing or due to any other act or omission in the performance of such excavation." §13-124-410. This would include costs of salvage, relocation, temporary housing and costs incurred by the City.

Additionally, violators are subject to penalties including fines from $1,000-$10,000 for each offense not resulting in the injury or death of any person and misdemeanor criminal liability; and a fine of at least $10,000 for excavation resulting in the injury or death of any person, and license revocation. §13-124-440.

The Chicago regulations expressly exempt the City, but not its contractors, from the notice and insurance requirements under the City Municipal Code. §13-124-450.

The strict liability problem under ALEPA and the City's Municipal Code.

Generally, the doctrine for strict liability does not apply to construction activities in Illinois. Construction activities in most construction projects do not meet the definition of a "product" under Section 402A of the Restatement of Torts, and, therefore, such activities should not give rise to strict liability actions. Typically, legal texts such as the Restatement of Torts provide that strict liability is usually involved in litigation over the manufacture of "products." If a construction project is not considered a "product," one would presume that there cannot be strict liability which would result from construction activities.

Some might determine that this universally removes strict liability (or the risk of liability without negligent acts) from the construction context altogether. However, the obligations under ALEPA and City's ordinance are statutory obligations, which if breached, give rise to strict liability for new project owners based upon the language of these written laws.

The Illinois Appellate Court explored the history and intent of ALEPA in the case of *Proud v. W. S. Bills & Sons, Inc.*, 119 Ill. App. 2d. 33 (1970). Based upon a reading of the *Proud* case, it is possible to read ALEPA as a combination of a statutory claim and a tort claim. This means that statutory liability could arise based upon failure to meet the requirements of the written statute or tort liability could arise if a new project owner fails to meet the common law. The mere fact that a new construction owner unintentionally fails to meet the requirements of the written statute (ALEPA) would be construed as strict liability.

Therefore, the response from the affected abutters thus may be that there are indicators that ALEPA creates its own statutory right of action under strict liability. For example, ALEPA provides specific damages for injuries arising out of violations of its terms.

Remedies for abutters under ALEPA parallels common law relief but does not state that it authorizes a type of tort claim directly, and thus ALEPA can be construed to create strict liability. There is anecdotal support for this interpretation in that ALEPA claims are often asserted in lawsuits against violators with a combination with, and separate from, a tort claim. See for example the case of *Chicago Province of Society of Jesus v. Clark and Dickens*, LLC, 383 Ill. App. 3d 435 (1st Dist. 2008), in which claims are alleged including ALEPA, negligence, and Illinois Municipal Code and Chicago City Code violations regarding building collapse caused by neighboring excavation.

Commercial insurance products to cover third party and abutter liability risks.

The type of insurance and exclusions under insurance coverage are also important to review before engaging in an excavation project. A self-insured retention (SIR) is an amount that must be paid by the insured before the insurance policy will apply to a covered loss under a commercial general liability policy (which policies provide coverage for third party claims). An SIR is a form of coinsurance commonly used in the construction industry to offset premium costs, but creates a level of coinsurance on the part of the insured which the insured must pay, up to the SIR limit, before insurance takes effect under the policy. Contractors should be aware of these coinsurance limits because they can apply per claimant. In the case of a large SIR limit, combined with an event involving multiple parties, the SIR could eliminate insurance coverage and passing of risk to a contractor's or design professional's insurance company.

One should also review the scope and provisions of coverage under an insurance policy. Various endorsements to the policy which change the policy terms may eliminate coverage. For example, some insurers endorse liability policies to eliminate coverage for property damage caused by earth subsidence or movement. When a contractor is performing work that might be implicated, especially when performing

foundation work, it is particularly important to specify that coverage for earth subsidence and movement are included in the policy terms.

Attention should also be paid to Explosion, Collapse, or Underground coverage, which is usually modified by insurance carriers. Many carriers eliminate this coverage by endorsement to eliminate coverage for explosion, collapse, or underground risks (known as XCU risks). If those risks are implicated in a project, it is good practice to specify that the XCU endorsement eliminating coverage will not be allowed.

BEST PRACTICES

There is a spectrum of approaches to protecting abutters' structures and mitigating the potential for damage and delay. The project team for the new construction is in the best position to establish criteria and expectations for the work. Approaches can range from reactive to proactive; a proactive approach invariably sets better project expectations and provides enhanced awareness and protections for existing adjacent structures. The two extremes are presented in the table below.

Table 1 – Approaches to Mitigate Issues Associated with Adjacent Construction

Potential Action	Reactive Approach	Proactive Approach
Open Communication with Neighbors	No discussion of means and methods of the work, and potential impacts on neighboring structures.	Establish meetings prior to construction with neighbors to explain potential impacts on neighboring structures, and expectations to mitigate those impacts.
Knowledge of Construction of Adjacent Building	No research or investigation to understand conditions or potential risks.	Obtain information on superstructure and substructure through walkthroughs, construction drawings, test pits, or other methods.
Knowledge of Soil and Groundwater Conditions	No understanding or effort to obtain this information.	Obtain information through existing records or through subsurface explorations.
Documentation of Before and After Conditions	No site walkthroughs of neighboring structures.	Perform pre-construction condition assessments, with photos, to compare with conditions during- and post-construction.
Instrumentation to Monitor Performance of New Work and Adjacent Structures	No instrumentation program established to evaluate ground movement, structure movement, earth support system movement, groundwater levels, or vibration levels.	Develop an appropriate instrumentation and monitoring program to evaluate ground movement, structure movement, earth support system movement, groundwater levels, and/or vibration levels. Establish response levels for instrumentation data to provide early warning when adjustments in new construction might be necessary. Share data with abutters to encourage open communication.

The proactive approach results in educated and informed parties, including the project team for the new construction and the abutters. As a result, all parties are in a better position to understand and mitigate risks, identify problems, and collaborate to make corrections as the work proceeds. This collaborative and informed approach can effectively mitigate damage, associated costs and delays, and potential litigation.

CASE STUDY OF A PROACTIVE APPROACH

On an urban site where two buildings partially share the property line, a developer planned to demolish an old building and replace it with a new structure with a 25 ft deep basement/parking area. The existing, adjacent structure consists of load-bearing, mass-masonry walls supported by shallow footings. The basement for the new structure extended more than 15 ft below footings of the existing building, and in some locations the footings were right on the property line. Fig. 1 illustrates site conditions.

Fig. 1 – Building to be demolished on right, adjacent structure to the left.

Before construction, the developer understood the risks of the construction process, and actively engaged in discussions with the abutter about potential risks. The abutter's engineer reviewed the proposed demolition and excavation support plans and worked collaboratively with the developer and developer's engineer prior to and during construction. As a group, the team defined risks, developed expectations, and set requirements for the construction work to mitigate potential impacts from the adjacent work. Involvement of the abutter and the abutter's engineer positively affected the protection and monitoring of the adjacent structure, and included the following:

- Review of pre-construction condition surveys and supplemented the surveys with photo and video documentation.
- Periodic monitoring during demolition to assess if the work was being performed in accordance with the approved submittal.
- Performance of test pit excavations to confirm existing foundation assumptions and documented the soil and foundation conditions in the pits.
- Analysis of potential excavation-induced building movements, which led to modifications to the excavation support design (Fig. 2) and building movement monitoring during construction.

Fig. 2 – Proximity of excavation to existing adjacent structure.

- Identification of threshold and limiting movement values to minimize potential distress that may manifest on the adjacent structure.

- Review of survey data to evaluate building performance during the excavation work.

- Evaluation of post-construction photographs of the adjacent structure to identify changes from pre-construction conditions that could have been related to the construction activity.

This collaborative and proactive approach, while adding costs and time to the construction process, effectively identified concerns, set expectations, and allowed the construction to proceed without significant incidents. It is the uncollaborative and reactive approach that is far more likely to result in problems. Problems that develop during construction have the potential to substantially increase construction costs, introduce unexpected repair costs due to adjacent structure damage, and in turn cause costly construction delays and potentially litigation.

In situations where the abutter is not willing to engage with the team for the new construction, the owner, contractor, and design team should still be proactive in communicating to the owner the process and measures taken to protect against damage. Detailed planning and records are a strong hedge against future claims.

SUMMARY AND CONCLUSION

Construction professionals need to be aware of the risk associated with adjacent construction projects, particularly excavation projects, adjacent to existing structures. In Chicago, strict construction liability for owners, contractors and engineers exists based upon state statutory and local city ordinances and regulations. These risks are passed on by new construction owners to contractors and construction professionals through the procurement documents. Failure to be aware of state and local laws and taking proactive approaches can result in third-party damages, increases in project costs, and repairs that escalate construction costs and cause delays. In certain cases, project costs can further escalate from damage to abutters' property, as attorney's fees (especially under the Chicago Municipal Code) can also be awarded.

Best practices for a successful project include understanding and planning for the technical, legal, and insurance risks, engaging and educating abutters prior to and during construction, and monitoring construction to allow for appropriate course correction as issues arise.

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