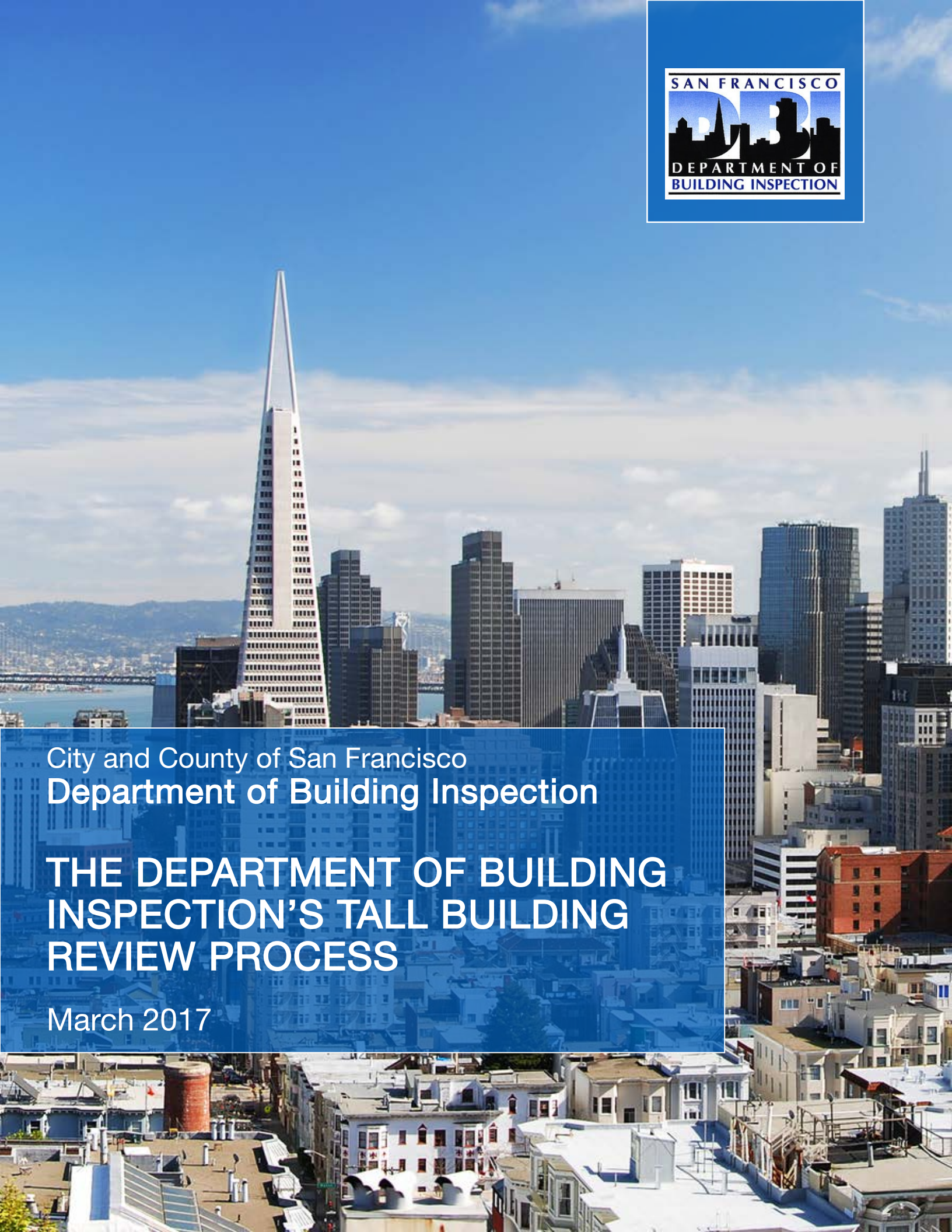

City and County of San Francisco

Department of Building Inspection

THE DEPARTMENT OF BUILDING INSPECTION'S TALL BUILDING REVIEW PROCESS

March 2017

The Department of Building Inspection's Tall Building Review Process Report was prepared by the Department of Building Inspection in March 2017.

Department of Building Inspection
City and County of San Francisco
1660 Mission Street
San Francisco, CA 94103
Tel: (415) 558-6088
Fax: (415) 558-6401
www.sfdbi.org

LETTER FROM DIRECTOR

The City of San Francisco is home to more than 200,000 buildings, which are designed by the project sponsor's or owners' architects and engineers, and constructed to meet the City's unique topographical, geographical, and climate challenges. The Department of Building Inspection (DBI) plays an important regulatory and oversight role in its review and inspections of these buildings – including the handful of tall buildings that dot the San Francisco skyline.

As requested by the Building Inspection Commission (BIC) in its December 6, 2016 letter, this report examines the current status of tall buildings in San Francisco, as well as DBI's Charter-mandated role in regulating and monitoring safe building construction that meets and/or exceeds minimum building code requirements. DBI inspectors spot-check periodically throughout construction the project sponsor's technical teams' work, while the project sponsor's multiple, full-time, special inspectors are the responsible parties to implement the detailed specifications stipulated in the code-compliant approved plans.

As we describe in this report, DBI's role is well established and defined through the San Francisco Building Code: DBI is responsible for building permit approval coordination, inspecting and verifying code compliance, and responding to complaints. Our agency does not propose building plans, make repairs, construct, or design buildings.

I am immensely proud of DBI staff in our work to protect building and life safety, and our agency's many accomplishments, particularly related to the safety of tall buildings in San Francisco. These include:

- DBI was one of the first building departments in the nation to codify its tall building process with two published Administrative Bulletins, 082 and 083, in March 2008 – and DBI took steps as recently as this past October to improve our tall building peer review/supplementary expert plan review process to ensure the independence of outside experts;

- San Francisco's current record retention requirements go above and beyond California Building Code—and DBI is working to improve the process to ensure the more than 2 million records are more easily retrievable; and

- The Structural Engineers Association of Northern California (SEAONC) recently confirmed they will be reviewing Administrative Bulletins 082 and 083 with the goal of obtaining additional engineering expertise to help us make San Francisco's tall building policies and procedures even more rigorous and more effective in terms of building safety.

As you will see in this report, the safety of tall building construction has long been – and continues to be – one of DBI's top priorities. Living in one of the world's most at-risk seismic zones strengthens our agency's resolve to do everything humanly possible to make certain tall buildings are as safely built as contemporary engineering permits. Even though we do not build very many tall buildings in San Francisco – they are a fraction of one percent of the City's total building projects over the past 16 years – we will continue to do everything possible to regulate code-compliant requirements in coordination with project owners and the owners' design professionals.

Tom C. Hui, S.E., C.B.O.
Director
Department of Building Inspection

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EXECUTIVE SUMMARY

The City of San Francisco is home to more than 200,000 buildings, which are designed and constructed to meet the city's unique topographical, geographical, and climate challenges.

This report examines tall buildings – defined as over 240 feet – including the governing codes, number, and type of construction.

Though tall buildings remain rare, representing less than 1 percent of San Francisco's cityscape, the number of tall building project proposals received by the Department of Building Inspection (DBI) has increased since the early 2000s. In response, the department has rigorous safety processes and protocols in place to ensure that these complex structures are safe and adhere to the stringent requirements of the San Francisco Building Code.

This report provides a summary of these measures as well as an overview of the development of the San Francisco Building Code and DBI's responsibilities as a regulatory and code enforcement agency.

In response to questions received by DBI from the Building Inspection Commission (BIC) in December, this report provides answers and insights to DBI's regulatory policies and procedures.

A complete list of the questions received from the BIC with abbreviated answers is offered at the end of this report.

Topics covered by the BIC's questions include:

- San Francisco Building Code;
- Review and construction of new tall buildings;
- Differences between code-prescriptive and performance-based structural designs;
- Peer review requirements for projects;
- Permit review and issuance;
- Building inspection; and
- Official document and file retention.

GLOSSARY

Key Term	Definition
Administrative Bulletin	Guiding document drafted by the Code Advisory Committee as an addendum to the San Francisco Building Code and approved by the Building Inspection Commission.
Certificate of Final Completion and Occupancy	Attests that a building is safe for occupancy and is issued after DBI conducts its final inspection. Upkeep, maintenance, and ongoing safety of the building is the owner's responsibility.
Code-Prescriptive Structural Design	Adheres to the design methods and materials prescribed by the San Francisco Building Code; representative of over 99 percent of buildings in San Francisco.
Department of Building Inspection	Regulatory building safety agency responsible for overseeing the effective, efficient, fair, and safe code enforcement of the City and County of San Francisco's more than 200,000 commercial and residential buildings.
Dewatering	Removal of groundwater or surface water from a construction site to achieve a clean, dry site required for pouring concrete; not a DBI responsibility.
Engineer of Record	Hired by the project sponsor and is responsible for ensuring that the building plans and construction meet or exceed the safety standards set in the building code.
Geotechnical Engineer of Record	Is a member of the design team hired by the project sponsor or developer, and is responsible for investigating soil conditions at project site and providing the geotechnical report used as the basis for structural design.
High-Rise	Differs from a tall building; defined and measured by the San Francisco Fire Department based on the building's ability to fight fire.
Information Sheet	Guiding documents drafted by DBI to provide consistency in the interpretation and implementation of building codes by DBI staff and customers.

Life Safety Systems	The plumbing, electrical, building, and fire systems of a building; must be designed and installed to meet or exceed the minimum standards of the San Francisco Building Code.
Owner	Responsible for the building permit, construction and maintenance of the building; same responsibilities may also be considered to apply to the project sponsor or developer.
Performance-Based Structural Design	Uses advanced analysis to develop an alternative structural design method and/or use of alternative materials to design and construct tall buildings. Represents 0.4 percent of building permits for new buildings from 2000 to 2016, and utilized primarily by large projects where performance-based design is significantly more beneficial than code-prescriptive design and meets/exceeds building code requirements.
Proposition M	Passed by San Francisco voters in 1986 and established an annual limit of 475,000 square feet for high-rise development and total annual office development limit of 875,000 square feet in the city.
Records Management Division	The section within DBI responsible for maintaining records for the more than 200,000 buildings in San Francisco.
San Francisco Building Code	Embodies the International Building Code, the California Building Code—which includes mechanical, electrical, plumbing, green building, and energy requirements—and San Francisco amendments intended to address the city's unique topographical, climate, and seismic challenges. The San Francisco Building Code provides the minimum standards for protecting life safety, health, property, and welfare of the general public.
Site Permit	A set of conceptual plans that serves as the first step in applying for a project; issuance of a site permit does not allow for construction of any kind.
Special Inspection	Required by San Francisco Building Code and performed by certified, highly skilled, third-party specialists, who are hired by the owner and report directly to the engineer of record, and who monitor daily materials and workmanship critical to building's construction, per approved plans.
Special Inspection Report	Final, wet-signed compliance reports submitted for each area of special inspection; compiled and stamped by the engineer of record prior to submitting to DBI. These records are kept permanently by DBI, as required by the department's Record Retention Policy.

Structural Design Review (Peer Review)	An independent, two- to-three person panel consisting of a seismic expert, structural engineer, and geotechnical engineer that reviews the structural design plans of a proposed building; codified requirement for all new tall buildings since March 2008.
Tall Building	Code-defined since March 2008 as 240 feet for code-prescriptive structural designs.
Temporary Certificate of Occupancy	Issued to property owners who request permission to occupy a building prior to all work being completed under the building permit; all life-safety and disabled access work must be completed prior to occupancy.

THE DEPARTMENT OF BUILDING INSPECTION (DBI)

DBI's VISION

Work with all San Franciscans for a safer community.

DBI's MISSION

Under the direction and management of the seven-member citizen Building Inspection Commission, DBI oversees the effective, efficient, fair, and safe enforcement of the City and County of San Francisco's Building, Housing, Plumbing, Electrical, and Mechanical codes, along with Disability Access regulations.

DBI's CORE SERVICES

- Review plans and designs from licensed, registered architects and engineers, hired by a project sponsor, for compliance with building code provisions in effect at the time of submission.
- Conduct site inspections to verify the performance of construction work is in accordance with approved plans.
- Address code compliance issues raised through complaints by San Francisco residents.

About the Department of Building Inspection

Founded in 1994 by voter referendum Proposition G, the Department of Building Inspection (DBI) was created to provide the public with more responsive and more responsible building inspection services by separating the Bureau of Building Inspection from the Department of Public Works and creating a new department.

DBI is overseen by the seven-member citizen Building Inspection Commission (BIC), also established by Proposition G. The BIC provides representation for the various communities that interact with the Department of Building Inspection.

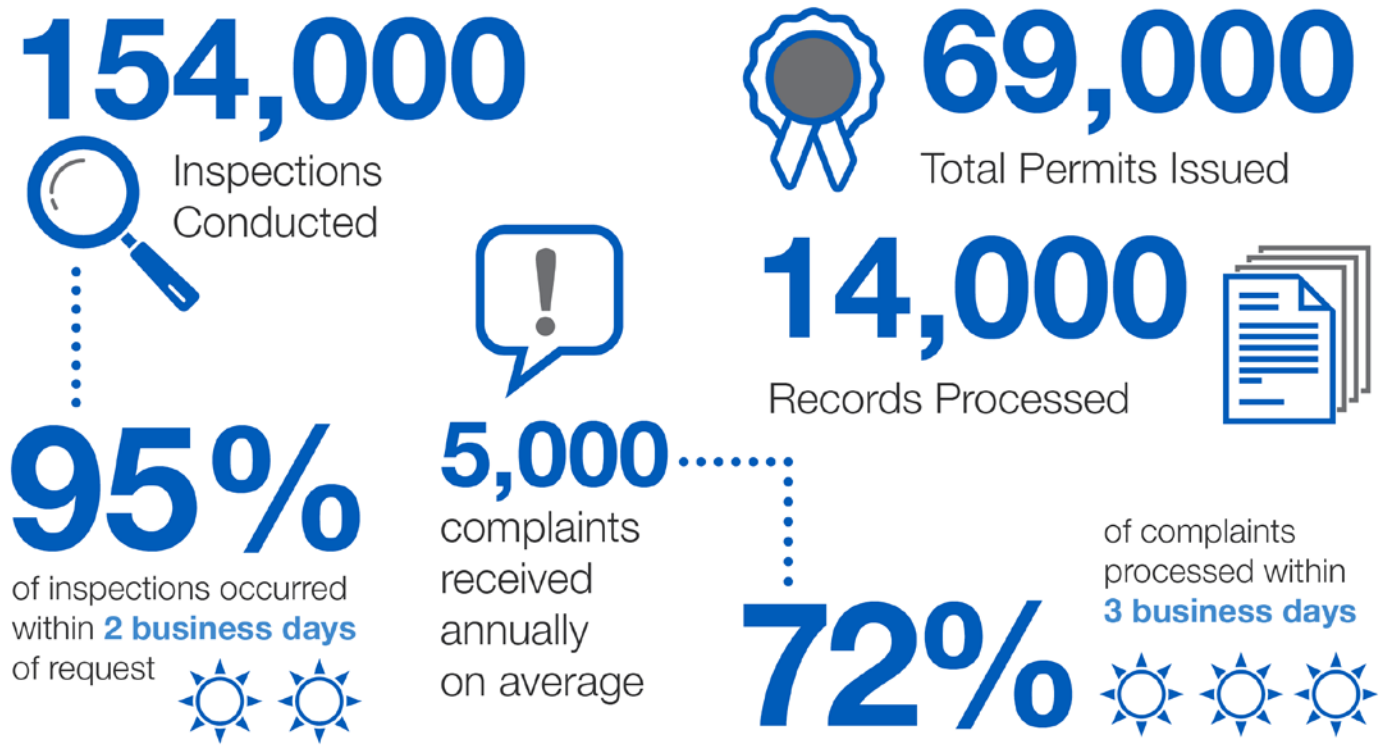
Experts in Service of the City

DBI is responsible for the proper and judicious implementation of the San Francisco Building Code, as well as the City's disability access regulations, as it applies to the more than 200,000 residential and commercial buildings in the City.

In 2016, DBI employed 280 staff members across the department. Its teams of engineers; building, electrical, plumbing and housing inspectors; permit technicians; and clerical staff bring decades of experience and expertise to their positions.

The department continually updates the qualifications and training required by its staff in order to promote effective and efficient navigation of the city's complex – and regularly changing – building codes.

DBI Stats for FY 2015–2016 (Figure 1)



DBI is made up of various divisions, each one with a particular function or focus area, such as:

- Plan Review
- Inspections
- Code Enforcement
- Disabled Access
- Special Programs
- Lead Hazard Reduction
- Records Management Division

Across these divisions, DBI staff works closely with a building's developer and/or owner, and the developer's or owner's chosen design team, to ensure that submitted project plans and their construction follow the San Francisco Building Code. The San Francisco Building Code provides the minimum standards contractors need to follow for protecting life safety, health, property, and welfare of the general public.

DBI staff also assists residents, property owners, and construction professionals in properly routing their construction plans, completing required inspections, and obtaining a Certificate of Final Completion and Occupancy to allow for building occupancy.

What DBI Does - and Doesn't - Do

DBI's role in reviewing and inspecting buildings is well established and defined through the San Francisco Building Code. The department performs its enforcement of the City's building codes by regulating the design, construction, quality of materials, use and occupancy, and location of all structures – and certain specifically regulated equipment – within its jurisdiction. In FY2015-16, DBI reviewed and issued 72,617 permits for construction.

DBI does not propose building plans, make repairs, nor construct or design buildings. Its inspection includes verification that life-safety systems in a building are code compliant. Once DBI issues a Certificate of Final Completion and Occupancy, upkeep of the building, including continued maintenance and safety, is the responsibility of the owner.

DBI does not randomly inspect buildings without cause, but the department will respond to any citizen complaint filed about a building by performing a visual site inspection. Complaints may be filed with DBI online, in person, through email, or through the City's 311 central complaint line.

After a complaint has been filed and entered into DBI's system, its progress can be followed online. DBI's inspector will post a Notice of Violation on the property for any unpermitted work or code violations present upon the visual inspection of the complaint.

DBI RECOGNITION

DBI is continually recognized by its state, national, and international peers as a leader in building safety, as evidenced by the Pacific Earthquake Engineering Research Center (PEER) endorsement in 2008 of the newly published ABs 082 and 083. DBI periodically hosts international colleagues to share how we effectively meet the many topographical challenges inherent to building in San Francisco.

GOVERNING CODES

San Francisco is internationally recognized for having among the most stringent building codes of U.S. cities.

Updated every three years, building codes serve as "living documents," constantly revised by state and local jurisdictions in an effort to improve regulations and update the minimum building safety standards.

The San Francisco Building Code, compliant with international, national, state, as well as specific, additional City requirements, provides the minimum safety standards buildings constructed must meet or exceed.

Through San Francisco's leading code update process, DBI serves as a leader in building safety and innovation, upholding groundbreaking measures such as the first green building code in California.

This section reviews development of the San Francisco Building Code.

KEY TERMS

- San Francisco Building Code (SFBC)
- Administrative Bulletin (AB)
- Information Sheet (IS)

An Internationally Recognized Building Code

Building codes govern the construction of buildings. San Francisco is internationally recognized as having among the most stringent building codes in the U.S. The City's building codes comply with international, national, and state requirements, as well as specific, additional City requirements which address San Francisco's unique topographical, geographical, and climate demands.

San Francisco Building Code provides that buildings constructed must meet the minimum and/or exceed its standards for:

- Building quality
- Strength
- Effectiveness
- Fire resistance
- Durability
- Safety

The San Francisco Building Code includes mechanical, electrical, plumbing, green building, and energy requirements, as well as additional San Francisco amendments.

Developing the San Francisco Building Code

The International Building Code (IBC) is a model building code developed by the International Code Council (ICC). It is adopted and used as a base code standard throughout most of the United States. The Building Standards Commission (BSC) in California amends the IBC, adding more restrictive provisions for California, resulting in the California Building Code (CBC). San Francisco amends the CBC, adding more restrictive provisions for San Francisco, resulting in the San Francisco Building Code.

THE SAN FRANCISCO BUILDING CODE

San Francisco Building Code provides that buildings constructed must meet the minimum and/or exceed its standards for:

- Building quality
- Strength
- Effectiveness
- Fire resistance
- Durability
- Safety

Administrative Bulletins and Information Sheets

DBI issues guiding documents to further clarify and refine practices, policies, and processes beyond the San Francisco Building Code. These documents are known as Administrative Bulletins and Information Sheets.

Administrative Bulletins (ABs) are guiding documents drafted by the Code Advisory Committee as an addendum to the San Francisco Building Code and are approved by the Building Inspection Commission. The Code Advisory Committee is an independent body from DBI, comprised of experts from the construction trades and technically proficient in multiple codes, whose focus is to strengthen constantly the SFBC to insure building safety.

Information Sheets (IS) are developed by DBI. They are used to provide consistency in administrative policies and code interpretation and implementation by DBI staff and other users of the San Francisco Building Code.

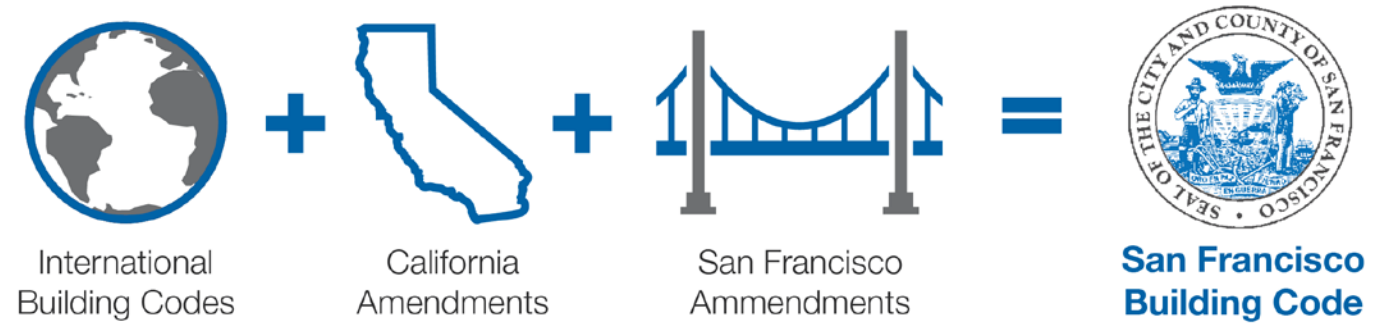
San Francisco Building Code Updates Regarding Tall Buildings

There are many code requirements now in effect that were not in place even ten years ago. Notably, for tall buildings in San Francisco, these new requirements include Administrative Bulletins (ABs) 082 and 083.

Administrative Bulletin 082

- Establishes guidelines and procedures for structural design review (peer review);
- Defines the qualifications, role, responsibility, and selection criteria for a peer review member; and
- Identifies peer review as a panel consisting of a California seismic expert, California registered structural engineer, and California registered geotechnical engineer.

Governing Codes (Figure 2)



San Francisco is internationally recognized as having among the **most stringent** building codes in the U.S.

3 Updated every **years**

by experts, and serve as "**living documents**."

There are many code requirements now in effect that were not in place even just

10 years ago

Administrative Bulletin 083

- Establishes peer review as a mandatory code requirement for all new tall buildings (240 feet and over);
- Provides requirements and guidelines for the submittal of seismic structural designs for new tall buildings using non-prescriptive seismic design procedures;
- Requires that a peer review verify the ability of a non-prescriptive seismic structural design to meet the same minimum standards prescribed by the San Francisco Building Code; and
- Assigns the same responsibilities and selection criteria for assembling a peer review as AB 082.

DBI initiated development of Administrative Bulletins 082 and 083 in November 2005.

The Department worked closely with experts at the Structural Engineers Association of Northern California (SEAONC), a professional organization based in San Francisco that is part of the four regional branches that make up the Structural Engineers Association of California. The organization's mission is to enhance the life safety, environmental health, and economic well-being of the public served by structural engineers.

ABs 082 and 083 were presented to the Code Advisory Committee and formally adopted by the Building Inspection Commission and made part of the San Francisco Building Code in March 2008.

TALL BUILDING UPDATES

There are many code requirements now in effect that were not in place even ten years ago.

Notably, for tall buildings in San Francisco, these new requirements include Administrative Bulletins 082 and 083, which were implemented in March 2008 and in force today.

Recent Changes to Peer Review

Tall buildings are complex structures, and DBI is constantly reviewing its policies and procedures to improve building safety requirements. Specific areas recently reviewed by DBI include a thorough analysis of the role of mandatory peer review.

In October 2016, DBI Director Tom Hui, in coordination with the Building Inspection Commission (BIC), tightened the regulations regarding peer review panels to ensure true independence of outside experts and ease of collaboration with DBI staff.

Since October 2016, all peer review appointments are now made by DBI without input from the project sponsor. All peer review panelists continue to be compensated at the expense of the project sponsor. However, DBI is developing a new policy to increase peer review independence via DBI payment of review panels.

Further amendments initiated by DBI include an expansion of peer review requirements based on the soil composition for a projected site. As of November 2016, a second geotechnical engineer is required to review new tall building projects located in Class F soils, the softest grounds, which have the greatest magnification of ground shaking during an earthquake.

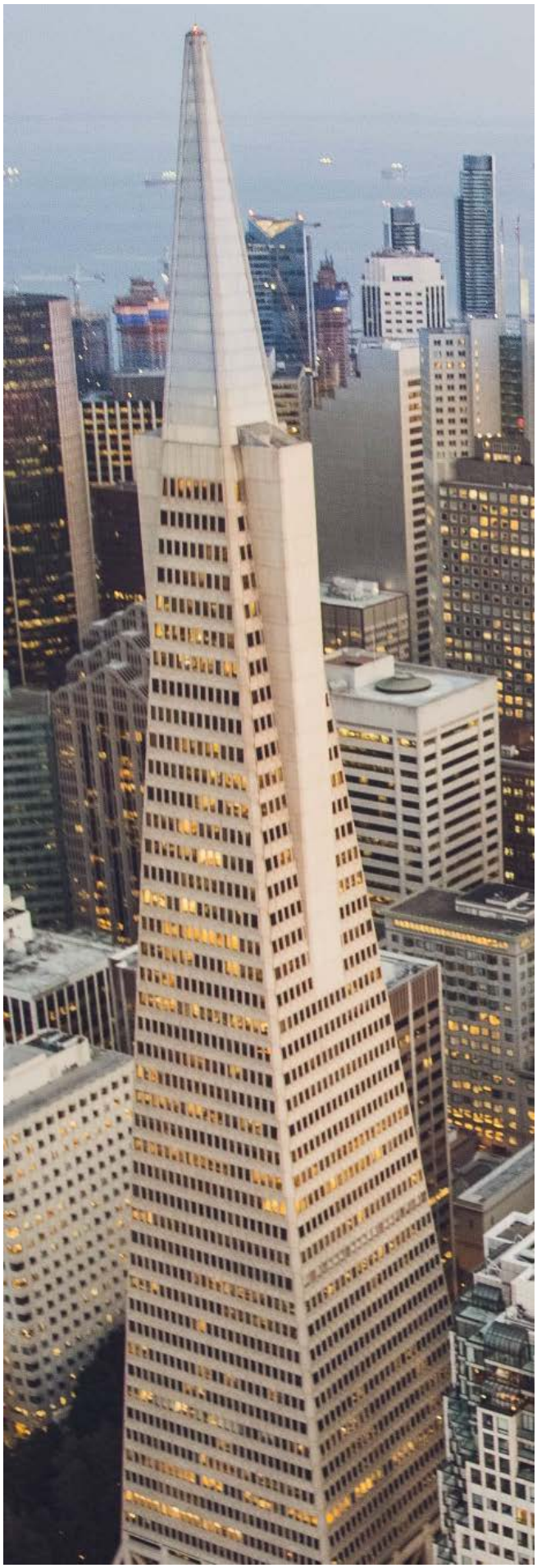
In addition:

- DBI is working to create a pool of vetted, qualified experts to work with on future peer review projects.

- DBI staff has reviewed peer review requirements of other cities and found San Francisco's requirements to be among the most stringent.

- Since 2008, San Francisco Building Code explicitly prohibits conflicts of interest with peer review experts. Any current updates would only seek to strengthen these provisions.

In late 2016, DBI Director Tom Hui also contacted the Structural Engineers Association of Northern California (SEAONC) to request its separate analysis of Administrative Bulletins 082 and 083, the sections of the San Francisco Building Code governing tall building construction and peer review. The organization's president has responded to Director Hui and confirmed that SEAONC is assembling a committee and setting a meeting schedule to review and provide feedback on Administrative Bulletins 082 and 083.



STRUCTURAL DESIGNS

San Francisco's cityscape is comprised of more than 200,000 buildings. Between FY2000 and FY2015, DBI issued 997,786 total permits, including 3,866 permits for new buildings.

New buildings are constructed using what is known as either a code-prescriptive or performance-based structural design. The vast majority – over 99 percent – of buildings in San Francisco follow a code-prescriptive structural design, meaning that they are designed and built according to San Francisco Building Code requirements, which regulate a building's strength, safety, durability, quality, and fire resistance, among other requirements.

Beginning in the early 2000s, the number of projects relying on performance-based structural design began to increase. When a project sponsor proposes using a performance-based structural design, he or she commits to employing advanced, detailed computer analyses and designs to develop a building that is capable of the same performance as a code-prescriptive structural design. Performance-based structural designs must also demonstrate their ability to meet or exceed the same code requirements found in the San Francisco Building Code. Performance-based designs remain rare—representing 0.1 percent of all buildings in San Francisco.

This section reviews the differences between code-prescriptive and performance-based structural designs in greater detail and provides common examples of the two design approaches.

KEY TERMS

- Code-Prescriptive Structural Design
- Performance-Based Structural Design

San Francisco's Cityscape

The City of San Francisco is home to more than 200,000 buildings, which are designed and constructed to meet the city's unique topographical, geographical, and climate conditions.

The San Francisco Building Code provides project sponsors and developers, building owners, architects, engineers, construction professionals, and material suppliers and fabricators with guidance on the minimum standards required for construction that buildings must meet and/or exceed in terms of building quality, strength, effectiveness, fire resistance, durability, and safety.

In oversimplified terms, design requirements in the San Francisco Building Code attempt to ensure all new construction meets the most current knowledge and rigorous standards that will ensure residents' and building safety in the event of a major earthquake.

Types of Buildings in San Francisco

There are five building construction types in the San Francisco Building Code, with each type defined by the construction material used:

- Type 1 – constructed from non-combustible material, such as concrete or steel;
- Type 2 – constructed from non-combustible material with height limitations to the structure;
- Type 3 – constructed from non-combustible and combustible material, such as wood;
- Type 4 – relates to buildings constructed from heavy timber; and
- Type 5 – constructed from non-combustible and combustible materials, and different from Types 1, 2, 3 & 4.

All new buildings in San Francisco are constructed using either an entirely code-prescriptive or performance-based structural design. Although these two types of building construction design may differ in method and established criteria, the buildings constructed are equivalent in their structural safety and adherence to minimum building code standards required by the San Francisco Building Code.

Code-Prescriptive Structural Designs

Code-prescriptive structural designs are projects designed and built according to San Francisco Building Code (SFBC) requirements. Project sponsors are required to strictly adhere to the methods, design, and materials provided in the SFBC to build a code-prescriptive building.

A typical code-prescriptive design is a four-story, wood-framed building, which is characteristic of the majority of buildings in San Francisco. In fact, over 99 percent of buildings in San Francisco are code-prescriptive.

Each code-prescriptive project is reviewed according to the building code in effect when a site permit application is filed and received by DBI. A site permit consists of a set of conceptual design plans. Owners apply for a site permit as their first step in obtaining approval for a new project.

If a site permit is approved by the regulating city agencies, the owner can then proceed to develop the details of their conceptual project plans. The site permit, addenda, and subsequent related permits for a project are bound by the same San Francisco Building Code as were in effect when the site permit was first filed.

Examples of Common Performance-Based Design Projects

Performance-Based Structural Designs for New Buildings

When choosing to submit a performance-based structural design, the project sponsor commits to employing advanced detailed computer analyses and designs to develop a building that will have the same performance as a code-prescriptive structural design project and meets or exceeds code requirements found in the San Francisco Building Code.

Buildings using performance-based designs remain rare and first joined the San Francisco landscape in the early 2000s.

Code-Prescriptive vs. Performance-Based Structural Design (Table 1)

Code-Prescriptive Structural Design

- Projects designed and built according to San Francisco Building Code (SFBC) requirements.
- Project sponsors are required to strictly adhere to the methods, design, and materials provided in the SFBC to build a code-prescriptive building.

Performance-Based Structural Design

- When choosing to submit a performance-based structural design, the project sponsor commits to employing advanced detailed computer analyses and designs to develop a building that will have the same performance as a code-prescriptive structural design project and meets or exceeds code requirements found in the San Francisco Building Code.
- Although these buildings are constructed using alternative materials, design or methods from what is written in the SFBC, the construction of the building must meet either the minimum and/or exceed the standards (e.g. quality, strength, effectiveness, fire resistance, durability, and safety) required in the SFBC.

Between FY2000 and FY2016, DBI completed 15 building permits for performance-based designs. In that same timeframe, DBI issued a total of 3,866 permits for new buildings: performance-based designs represented 0.4 percent of permits for new buildings in San Francisco. Currently, 0.1 percent of buildings in San Francisco are characterized as performance-based structural design.

Most performance-based designs are 30-story buildings (over 240 feet) or taller that are constructed out of concrete and have a core made of lateral resistive concrete walls. Examples of relatively recently designed buildings using performance-based designs include the completed condominiums of Infinity Tower and One Rincon Hill, as well as the business offices of the Salesforce Tower, currently under construction.

Choosing Between a Code-Prescriptive and Performance-Based Structural Design

The choice between a code-prescriptive or performance-based design is solely that of the permit owner, developer, or project sponsor.

Applications for a new project must be based on one or the other structural design method, indicating either a completely code-prescriptive structural design or a wholly performance-based structural design. Performance-based design is chosen rarely, and primarily by tall building projects where the design is significantly more beneficial than the more commonly selected code-prescriptive design, and meets/exceeds building code requirements.