Building Codes and Standards is for anyone who needs to understand how codes and standards affect the construction, maintenance and alteration of buildings. This presentation deals with how codes and standards have evolved through the ages to provide for the health, welfare, and safety of the general public and how they continue to evolve today. Case studies will bring the words-on-paper to life, and model the path of analysis required in code interpretation.

Design professionals should design in compliance with codes and standards. General contractors should build to conform to codes and standards. Building officials are entrusted to interpret and enforce codes and standards. Some deviations from codes and standards can place the general welfare of the public at risk and can expose the design professional and construction professional to legal liability. Others do not require such a strict reading. So there is a lot to talk about.

Codes and standards today are more accessible than ever. They can be used in an effective quality control program that begins at project design, is reinforced in the contracting phase, and performance compared to standard can be verified during the course of construction.

Pete Fowler Construction Services, Inc. is a general contracting, construction management and expert construction services provider. We specialize in getting or keeping our clients out of unpleasant construction related situations as quickly and as inexpensively as possible. Our team of construction professionals uses our unique, proven systems to develop and deliver the most accurate and comprehensive solutions that best serve the interests of our clients.

Summary Outline

1. *Introduction (15 Minutes)*
2. *Introduction to Codes (20 Minutes)*
3. *History of Codes & Standards (25 Minutes)*
4. *Introduction to Standards (25 Minutes)*
5. *Codes and Standards in Construction Today (30 Minutes)*
6. *Conclusion (5 Minutes)*

Agenda

1. Introduction
- A. Learning Objectives
- B. Who We Are: PFCS and Audience
- C. Case Study: Guard Rails

2. History of Codes & Standards
- A. Ancient History
- B. Medieval Cathedral Architecture
- C. Great Fire Of London, 1666
- D. Weights & Measures in the United States
- E. The Industrial Age (1862-1900)
- F. National Bureau Of Standards: Established In 1901
- G. The Great Baltimore Fire Of 1904
- H. The Triangle Shirtwaist Fire Of 1911
- I. 20th Century Codes & Standards
- J. The Northridge Earthquake, 1994

3. Introduction to Codes
- A. Introduction
- B. What Are Codes? What Is The Big Difference?
- C. Why Do We Have Codes?
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- E. Code Requirements: Prescriptive & Performance
- F. What Do The Codes Regulate?
- G. Who Writes The Codes?
- H. Case Study: Stairs

4. Introduction to Standards
- A. What Are Standards?
- B. Why Do We Have Standards?
- C. "UBC Standards" / "IBC Referenced Standards"
- D. Who Writes Standards?
- E. How Are Standards Used
- F. Case Study: Window Flashing

5. Codes & Standards in Construction Today
- A. Today's Codes
- B. California's Codes
- C. Oregon's Codes
- D. Today's Consensus Standards
- E. Today's Industry & Private "Standards"
- F. The Real World

6. Conclusion
- A. Learning Objectives
- B. Back-Up Materials
- C. Optional Homework
- D. The End

Building Codes & Standards

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Building Codes & Standards

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Pete Fowler Construction Services, Inc.
April 2010

Outline

1. Introduction
2. History of Codes & Standards
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5. Codes & Standards in Construction Today
6. Conclusion

1. Introduction

A. Learning Objectives
B. Who We Are: PFCS and Audience
C. Case Study: Guard Rails

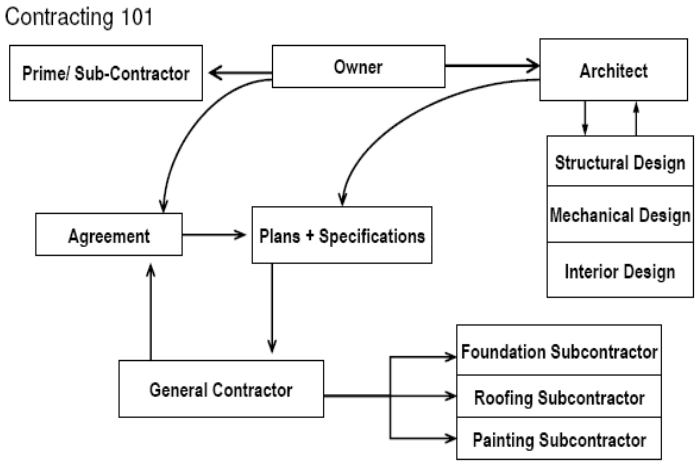
A. Learning Objectives

1. Explain what codes and standards are and how they are used in the building industry.
2. Orient the participant to how critical codes and standards are to our modern economy.
3. Give the participant insight into how and why codes have evolved over time.
4. Conduct case studies on real buildings, referring to actual codes and standards in use today, analyzing how the applicable codes have evolved in the recent past, and discussing how decisions are made in practice.
5. Show the participants how to find applicable codes and standards.
6. Discuss where codes and standards are likely to go in the future.

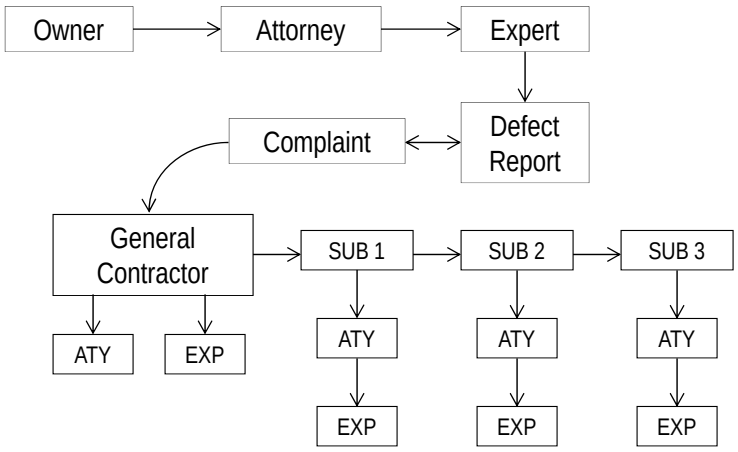
B. Who We Are: PFCS

Pete Fowler Construction Services, Inc. (PFCS) is a team of building consultants with expertise in construction design, cost estimating, construction management, inspection and testing, construction claims and construction training. We combine these skills to serve as “expert construction consultants” who aid clients with all types of *building problems*: from physical building performance issues like defects or leaks, to building-process issues like scheduling or disputes. We use our unique systems to develop and deliver comprehensive solutions that steward our clients through their situation in the fastest, most cost effective way, creating actionable information that everyone can understand and use to make informed decisions.

B. Who We Are: Audience



B. Who We Are: Audience



C. Case Study

Guard Rails

Building Codes & Standards 1. INTRODUCTION

C. Case Study

Guard Rails

1. Multi-family complex in Oregon. Built in 1991.
2. A guest who was sitting on the guard rail of a 3rd floor private deck fell off.
3. The top of the guard rail is 36 ¼-inches above the deck.
4. The applicable building code is 1988.
5. The project is classified Group R, Division 1 (see back-up materials).
6. 1988 UBC Section 1711 calls for a 42-inch minimum height.

C. Case Study

Guard Rails

7. 1988 UBC 1711. "Exceptions: 1. The top of guardrails for Group R, Division 3 and Group M, Division 1 Occupancies and interior guardrails within individual units and guest rooms of Group R, Division 1 Occupancies may be 36-inches in height."
8. All private decks in the project have 36-inch guardrail height, suggesting the code official had accepted the condition.
9. Code Check with 1997 UBC / 2000 IRC referring explicitly to this language says "36-inches if only accessible from one unit."
10. Current IBC / Oregon Structural exception applies only to locations "…whose top rail also serves as a handrail…"

C. Case Study

Guard Rails: Code Check 2000 IRC / 1997 UBC

Guardrails

☐ Req'd for any walkoff >30in above floor or grade	F52 [312.1]	{509.1}
☐ Screened porches req guards if walkoff >30in	[312.1]	{509.1}
☐ {Min height 42in in multi-family} OR min height 36in if only accessible from one unit (34in if stair handrail)	[312.1]	{509.2X1}
☐ Max opening size <4in EXC	F52 [312.2]	{509.3}
☐ 6in opening OK at tread/riser/rail triangle	[312.2X]	{509.3X}
☐ Open risers on stairs must not allow 4in sphere to pass through	[311.5.3.3]	{509.3}
☐ Guardrail must be strong enough to resist 200 {50}pounds point load any direction	[301.5]	[1607.3.4]

Date:	January 29, 2008
To:	Mary Smith Underground Insurance PO BOX 55555, Portland, OR 95851-1108 T: (555) 852-5555 E: mary.smith@undergroundinsurance.com
From:	Pete Fowler Construction Services, Inc.
Project:	Bob's Properties – Nice Apartments PFCS # 07-373
Regarding:	Opinion Letter
Note:	Confidential Attorney-Client and Attorney Work Product. Protected under all applicable evidence codes.

Dear Ms. Smith:

As requested, PFCS performed a site inspection on January 9, 2008. At that time, we created diagrams and took photographs showing the current layout of the handrails. Our findings are set forth in this preliminary report.

Project Summary

The property in question is an apartment complex located at 12345 SE Main Road in Portland, Oregon. The Nice Apartments were constructed in 1991 and have a total of 200 units in 14 buildings, labeled A through N. The buildings are two- and three-stories in height. The walkways/staircases at the front elevation and private decks at the back elevation have guardrails composed of metal piping with horizontal intermediate members (See photos SM 01.009 and SM 01.014).

In May 2007, a woman was visiting Unit 29 in Building C and fell from the third level guardrail which she was sitting on. We were told the injured woman broke her pelvis but has since recovered. To this date, no lawsuit has been filed.

Observations

Upon arrival at the Nice Apartments, PFCS met with Bob Jones, the on-site manager. Bob directed us to the location of the accident, which was at the back deck of Unit 29.

Unit 29's deck is at the third level, is 10-feet by 6-feet, and positioned on the inside corner of the structure with a section of exterior wall approximately 27-inches wide on the east, outside corner (SM 01.028 & SM 01.029). There are two guardrails: the main rail at the back of the deck and a smaller side rail. The main guardrail is just over 9-feet long and the side guardrail is approximately 3-1/2-feet long. The horizontal railing members are 2-inch steel pipes and are welded to vertical support posts. Each support post is attached to the support beam below with two lag bolts through each welded plate

on the vertical posts. The main guardrail has three support posts and the side guardrail has two. The spacing between the horizontal guardrails is approximately 6-inches at the topmost space and approximately 5.5-inches in the remaining lower areas (SM 01.038).

In addition to the vertical support members, the side guardrail also has a single lag bolt attachment at the right end of the topmost horizontal member (SM 01.040). However, the main guardrail lacks any attachments at either end and is solely supported by the vertical posts (SM 01.043). The main guardrails at several units appeared to be leaning away from the buildings, though Unit 29's appeared to be aligned properly (SM 01.056).

The top of guardrails are approximately 36-1/4-inches above the deck surface. The deck surface is concrete with wood framing and is 18-feet from the ground. This would put the top of the guardrail at approximately 21-feet from the sidewalk below (SM 01.050).

Research

The 1988 Uniform Building Code (UBC), which likely prevailed when this project was constructed, requires a minimum height of 42-inches for guardrails. The 1988 UBC designates apartment buildings to be classified as Group R, Division 1. The code includes an exception allowing some guardrails to be only 36-inches in height. The wording is somewhat open to interpretation. Section 1711 Exception 1 reads "The top of guardrails for Group R, Division 3 and Group M, Division 1 Occupancies and interior guardrails within individual units and guest rooms of Group R, Division 1 Occupancies may be 36-inches in height." Excerpts from the 1988 UBC are attached. Since all the guardrails at these private decks have a uniform 36-inch height, is appears the building official considered the 36-inch requirement applied to these private decks. In addition, we have in our office third-party commentary (Code Check) related to this section that states "36-inch if only accessible from one unit." The 1997 UBC had the same language as 1988. The current prevailing code does not have this exception.

While the current codes require a maximum of 4-inches of space between each intermediate member, the 1988 UBC only required a 6-inch maximum, which these guardrails meet. Additionally, the 1988 UBC only requires a lateral load capacity of 20-pounds, whereas later code editions require a 200-pound lateral force capacity.

Conclusion

Although the guardrail height requirement is open to interpretation, we believe the guardrails met the code requirements as interpreted by the building official at the time of construction. Assuming no major renovations have been performed on the building, it is not necessary for the guardrails to meet current code requirements.

A separate issue unrelated to code requirements is the lack of lateral support at either end of the main guardrail. While this is not a code violation, we did observe leaning guardrails at various units. The leaning could be prevented by an attachment similar to that found at the top of the side guardrail.

Photographs

local.live.com – Aerial Image (Building C is outlined in red)

SM 01.056 Unit #29; Back elevation; Looking east, typical building.

SM 01.038 Unit #49; Back elevation; Deck. Main guardrail fastened to beam with large lag bolts.

SM 01.043 Unit #49; Back elevation; Deck railing. Side guardrail at left, main guardrail at right. Note attachment to wall at right side of left guardrail.

Chapter 12
REQUIREMENTS FOR GROUP R OCCUPANCIES

Group R Occupancies Defined

Sec. 1201. Group R Occupancies shall be:

Division 1. Hotels and apartment houses.

Convents and monasteries (each accommodating more than 10 persons).

Division 2. Not used.

Division 3. Dwellings and lodging houses.

For occupancy separations, see Table No. 5-B.

A complete code for construction of detached one- and two-family dwellings is in Appendix Chapter 12 of this code. When adopted, as set forth in Section 103, it will take precedence over the requirements set forth in Parts I through X and Chapter 60 of this code.

Construction, Height and Allowable Area

Sec. 1202. (a) **General.** Buildings or parts of buildings classed in Group R because of the use or character of the occupancy shall be limited to the types of construction set forth in Tables No. 5-C and No. 5-D and shall not exceed, in area or height, the limits specified in Sections 505, 506 and 507.

(b) **Special Provisions.** Walls and floors separating dwelling units in the same building shall be of not less than one-hour fire-resistive construction.

Group R, Division 1 Occupancies more than two stories in height or having more than 3000 square feet of floor area above the first story shall be of not less than one-hour fire-resistive construction throughout except as provided in Section 1705 (b) 2.

Storage or laundry rooms that are within Group R, Division 1 Occupancies that are used in common by tenants shall be separated from the rest of the building by not less than one-hour fire-resistive occupancy separation.

For Group R, Division 1 Occupancies with a Group B, Division 1 parking garage in the basement or first floor, see Section 702 (a).

For attic space partitions and draft stops, see Section 2516 (f).

Location on Property

Sec. 1203. For fire-resistive protection of exterior walls and openings, as determined by location on property, see Section 504 and Part IV.

Exits and Emergency Escapes

Sec. 1204. Stairs, exits and smokeproof enclosures shall be as specified in Chapter 33.

Basements in dwelling units and every sleeping room below the fourth story shall have at least one operable window or door approved for emergency escape or rescue which shall open directly into a public street, public alley, yard or exit court. The units shall be operable from the inside to provide a full clear opening without the use of separate tools.

shall extend to the same height as any portion of the roof that is within the distance where protection of wall openings would be required, but in no case shall the height be less than 30 inches.

Projections

Sec. 1710. Cornices, eave overhangs, exterior balconies and similar architectural appendages extending beyond the floor area as defined in Section 407 shall conform to the requirements of this section. (See Sections 3305 and 3306 for additional requirements applicable to exterior exit balconies and stairways.)

Projections from walls of Type I or II construction shall be of noncombustible materials.

Projections from walls of Type III, IV or V construction may be of noncombustible or combustible materials.

Combustible projections located where openings are not permitted or where protection of openings is required shall be of one-hour fire-resistive or heavy-timber construction conforming to Section 2106.

Projections shall not extend more than 12 inches into the areas where openings are prohibited.

For projections extending over public property, see Chapter 45.

For combustible ornamentation, see Section 1705 (d).

Guardrails

Sec. 1711. All unenclosed floor and roof openings, open and glazed sides of stairways, landings and ramps, balconies or porches, which are more than 30 inches above grade or floor below, and roofs used for other than service of the building shall be protected by a guardrail.

EXCEPTION: Guardrails need not be provided at the following locations:

1. On the loading side of loading docks.
2. On the auditorium side of a stage or enclosed platform.

The top of guardrails shall be not less than 42 inches in height.

EXCEPTIONS: 1. The top of guardrails for Group R, Division 3 and Group M, Division 1 Occupancies and interior guardrails within individual dwelling units and guest rooms of Group R, Division 1 Occupancies may be 36 inches in height.

2. The top of guardrails on a balcony immediately in front of the first row of fixed seats and which are not at the end of an aisle may be 26 inches in height.

3. The top of guardrails for stairways, exclusive of their landings, may have a height as specified in Section 3306 (j) for handrails.

Open guardrails shall have intermediate rails or an ornamental pattern such that a sphere 6 inches in diameter cannot pass through.

EXCEPTION: The open space between the intermediate rails or ornamental pattern of guardrails in areas of commercial and industrial-type occupancies which are not accessible to the public may be such that a sphere 12 inches in diameter cannot pass through.

2. History Of Codes & Standards

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I. 20th Century Codes and Standards
J. The Northridge Earthquake, 1994

A. Ancient History

"Man is the measure of all things"

-The Greek Philosopher, Protagoras