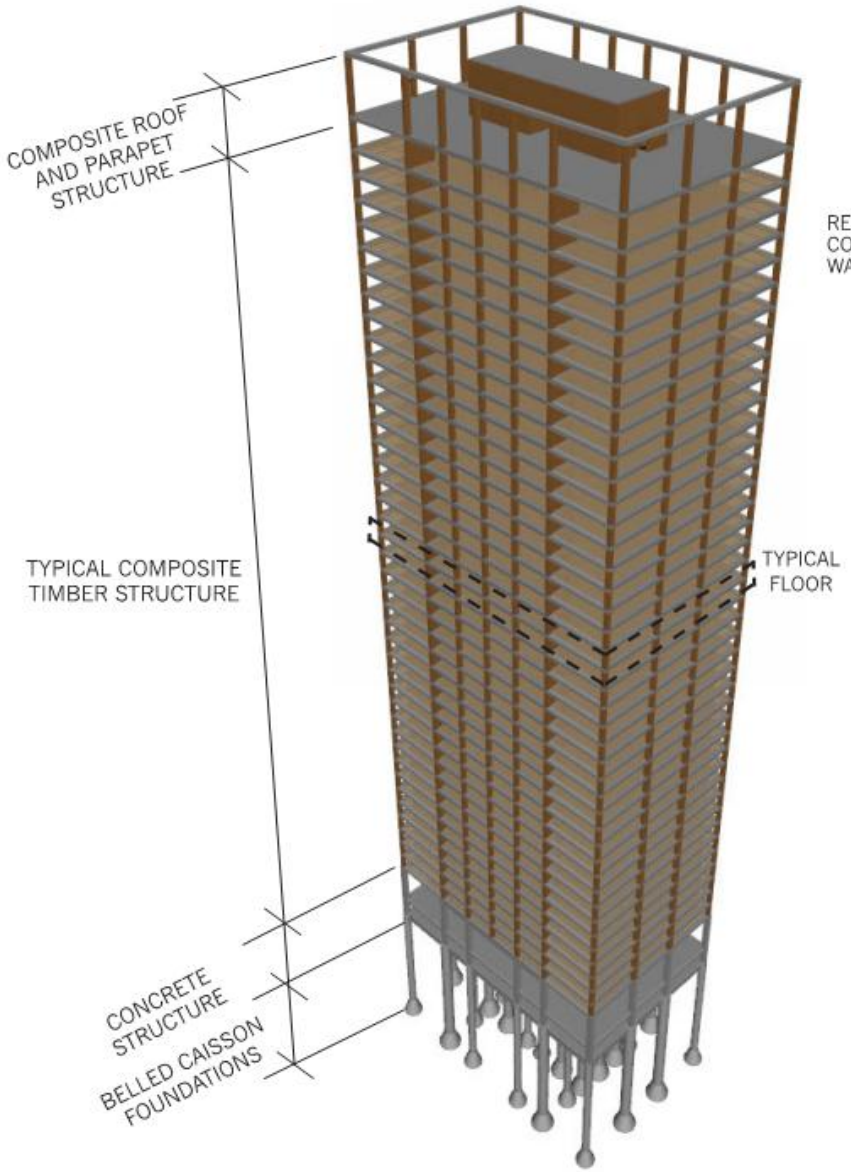
Structural Inspiration
for
Building Mid-Rise with Wood.

Matthew Reid, MASc., P.Eng

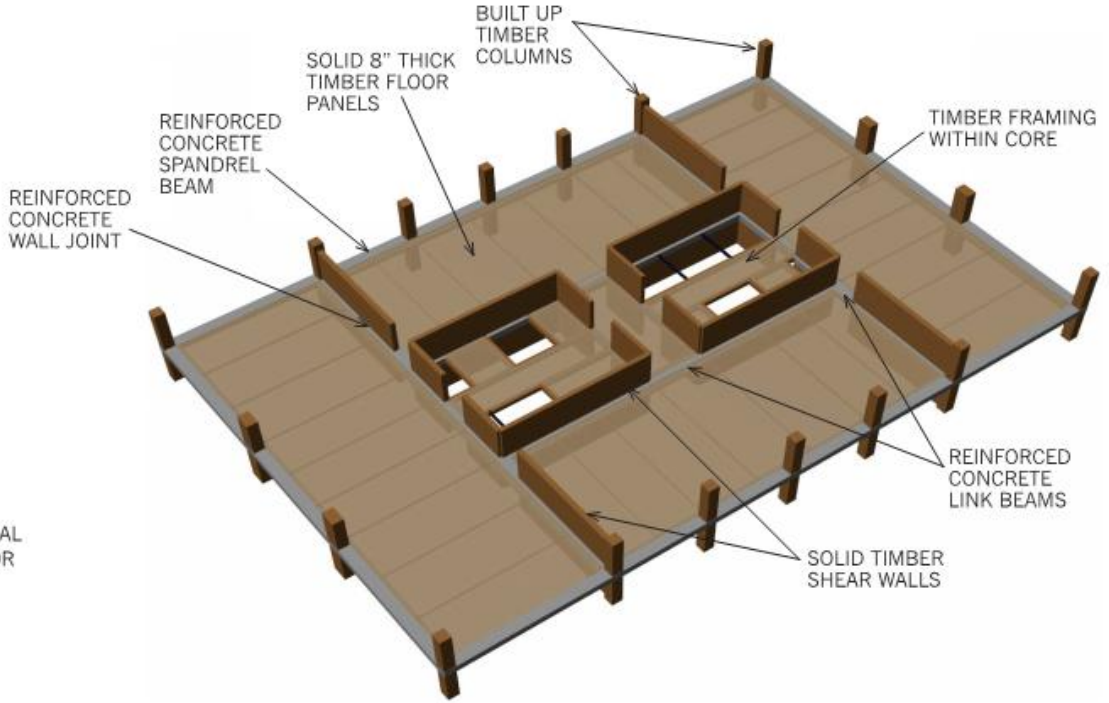
Read Jones Christoffersen
Consulting Engineers

What is Mid-Rise?

(5 to 11 stories)



OVERALL STRUCTURE



TYPICAL FLOOR STRUCTURE

STRUCTURAL SYSTEM DESCRIPTION

THE STRUCTURAL SYSTEM PROPOSED IS THE CONCRETE JOINTED TIMBER FRAME. THIS SYSTEM CONSISTS OF SOLID MASS TIMBER PRODUCTS FOR THE PRIMARY MEMBERS SUCH AS THE FLOOR PANELS, COLUMNS, AND SHEAR WALLS. THE PRIMARY MEMBERS ARE CONNECTED WITH STEEL REINFORCING THROUGH CONCRETE JOINTS.

THE GRAVITY FRAMING SYSTEM UTILIZES SOLID 8" THICK TIMBER FLOOR PANELS WHICH SPAN BETWEEN THE SHEAR WALL CORE AT THE CENTER OF THE BUILDING AND COLUMNS AT THE PERIMETER OF THE BUILDING. THE ENDS OF THE FLOOR PANELS ARE RESTRAINED FROM ROTATING BY THE CONCRETE JOINTS AND VERTICAL STRUCTURE. THIS CONNECTION SCHEME ALLOWS THE FLOOR SYSTEM TO BE MORE ECONOMICAL.

THE LATERAL LOAD RESISTING SYTEM UTILIZES SOLID TIMBER SHEAR WALLS WHICH ARE COUPLED WITH REINFORCED CONCRETE LINK BEAMS. THE SYSTEM IS DESIGNED TO BE EFFICIENT IN RESISTING NET UPLIFT DUE TO WIND OVERTURNING.

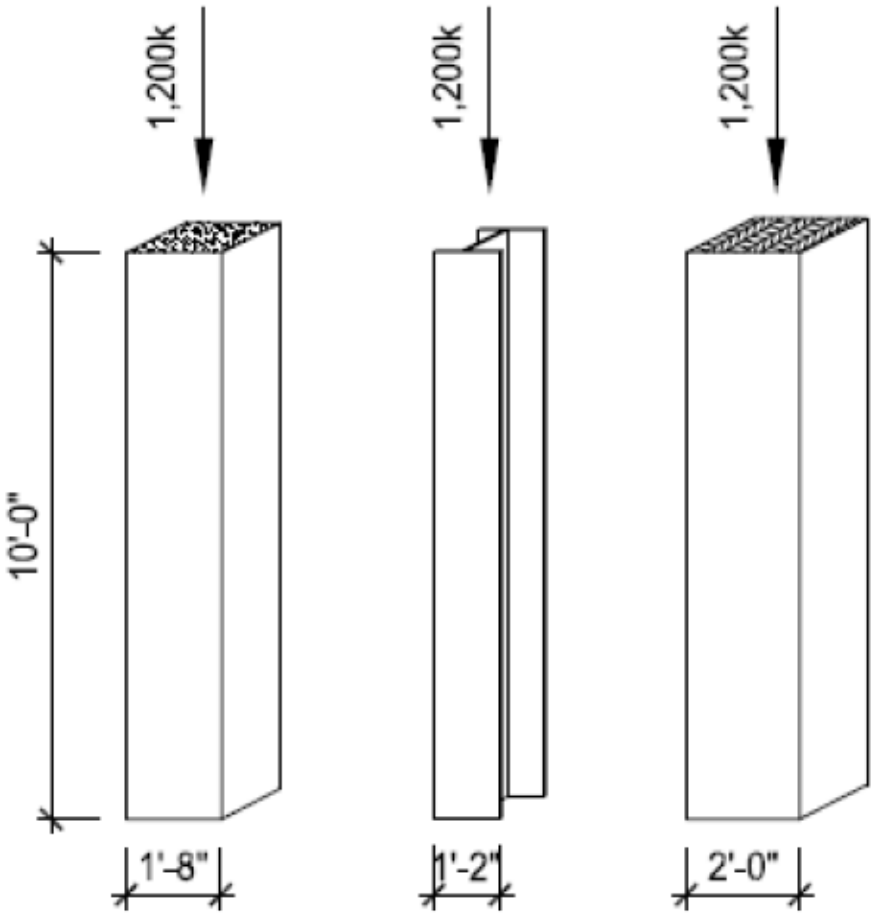
ESTIMATED QUANTITIES

SUB AND SUPERSTRUCTURE:
- TIMBER: 0.80 cu.ft/sf
- CONCRETE: 0.25 cu.ft/sf
- REINFORCEMENT: 1.7 psf
- STRUCTURAL STEEL: 0.3 psf

FOUNDATIONS:
- CONCRETE: 0.09 cu.ft/sf
- REINFORCEMENT: 0.1 psf

SLB SOFTWOOD LUMBER BOARD SOM

TIMBER TOWER RESEARCH PROJECT
STRUCTURAL SYSTEM DESCRIPTION



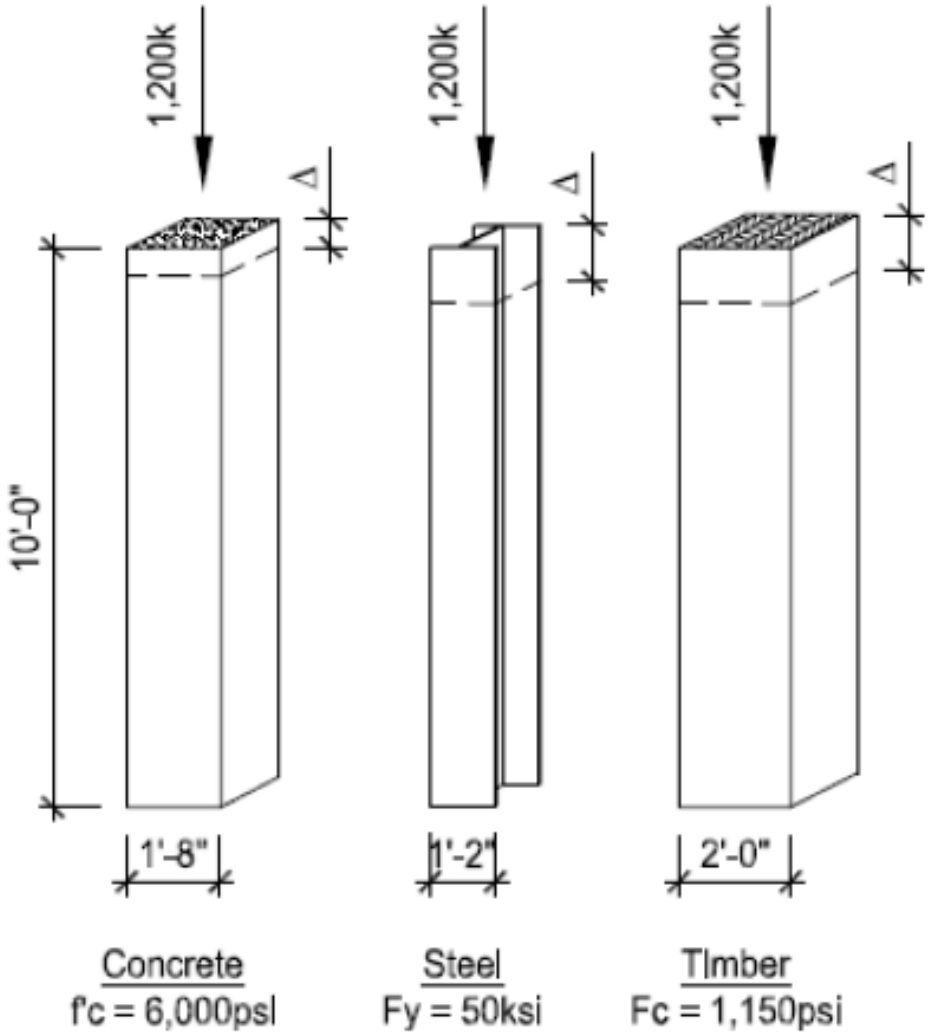
Concrete
f'c = 6,000psi

Steel
Fy = 50ksi

Timber
Fc = 1,150 psi

Material Axial Strength Comparison

Material	Reinforced Concrete	Steel	Timber
Cross Section	20"x20"	W14x99	24"x24"



Material Axial Stiffness Comparison

Material	Concrete	Steel	Timber
Cross Section	20"x20"	W14x99	24"x24"
Axial Stiffness	15,600 k/in	7,000 k/in	6,700 k/in
Movement, Δ	0.08"	0.17"	0.18"

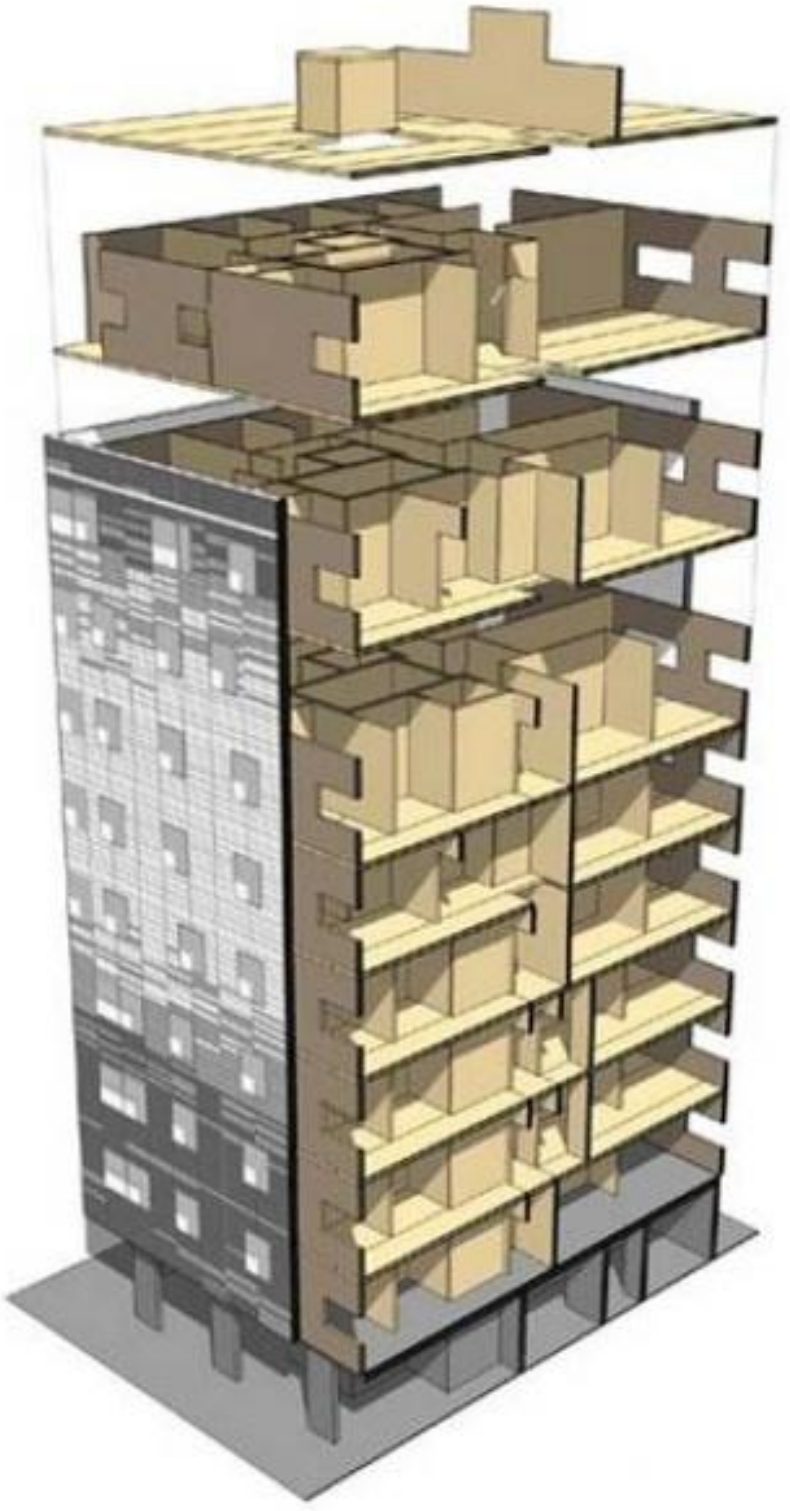
Figure A.2: Material Axial Stiffness

Wall panel anchored to floor panel.

Typical internal wall arrangement.

Floor panel installation.

Floor panel installation.




SIDEWALK
CLOSED

What Use?

Condos, Office

Mixed Use w/ Retail

APEGBC Technical and Practice Bulletin

Professional Engineers and Geoscientists of BC

www.apeg.bc.ca

Structural, Fire Protection and Building Envelope Professional Engineering Services for 5 and 6 Storey Wood Frame Residential Building Projects (Mid-Rise Buildings)

FPInnovations

Technical Guide for the Design and Construction of Tall Wood Buildings in Canada

Special Publication SP-55E

Edited by
Erol Karacabeyli P.Eng.
Conroy Lum P.Eng.

2014 – First Edition

fpinnovations.ca

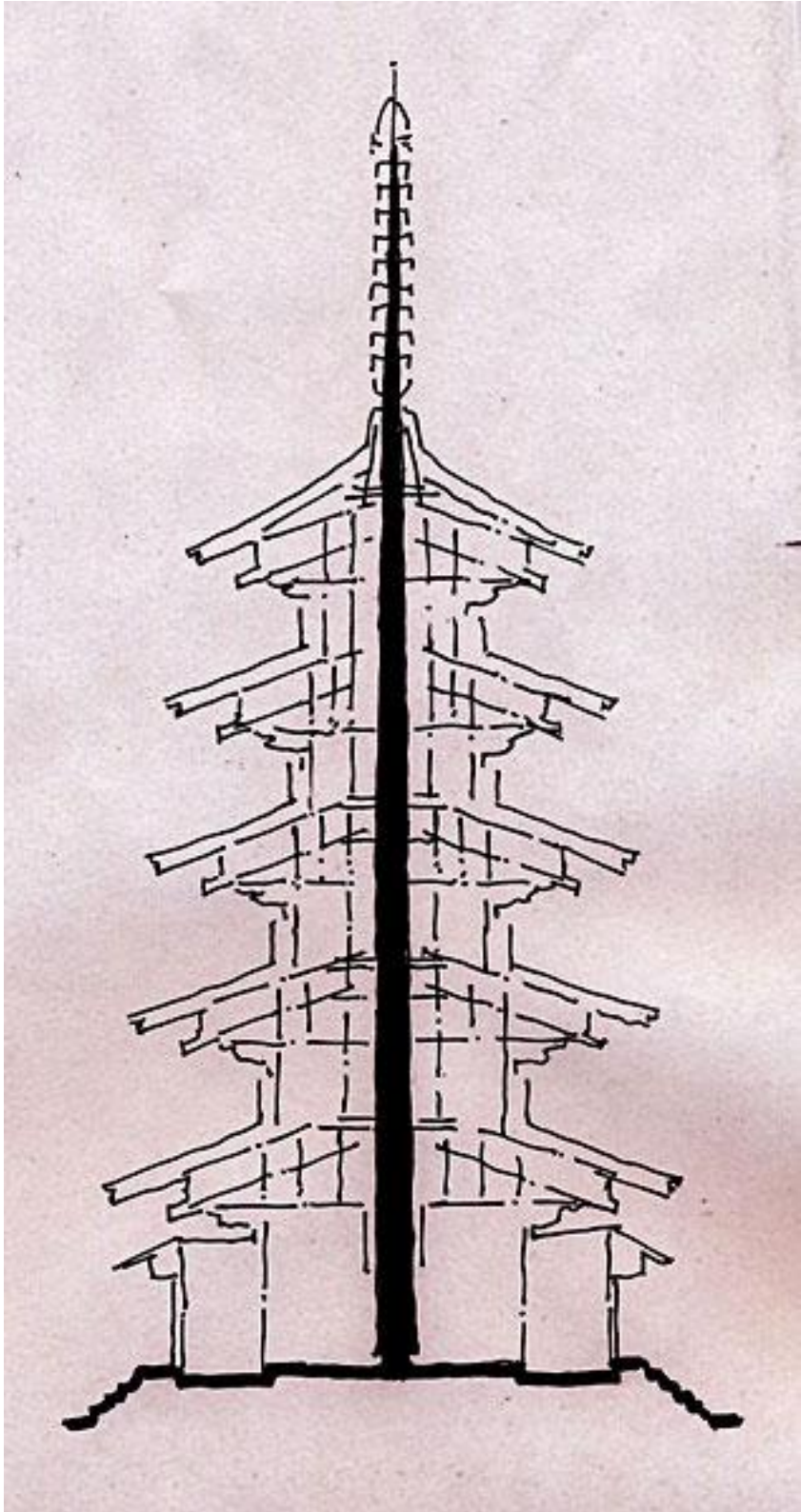
Inspiration for using Wood!

What’s your story?

The Japanese Pagoda

Central Core

鶴林寺三重塔（兵庫県加古川市）：全体
撮影日：１９９９年１２月４日



Who are you?

(Architect, Developer, Contractor, Engineer)

Century Old Lessons

Learning from 4-story Condos

An Urban Office

Framing Types

What are you used to?

Light Framing

Light Steel Studs

Light Wood Framing

Light Framing

Light Steel Studs

Light Wood Framing

Light to Heavy

OWSJ

Wood I-Joists

Heavy Framing

Structural Steel

- I-Beams
- HSS Tubes
- Channels

Heavy Timber

- Glulam
- Parallel Strand Lumber
- Solid Sawn

Heavy Framing

Structural Steel

Heavy Timber

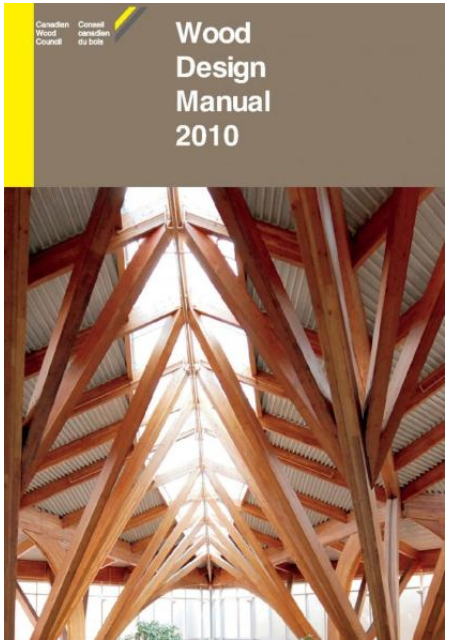
Glulam

Species

D.Fir (from BC)

Spruce-Pine (Quebec)

Nordic (Black Spruce)



Sizes

80, 130 – 365 (3 1/8” – 14”)

Laminations (38mm 1.5”)

Slabs (Mass Construction)

Concrete

- CIP Slabs
- Precast Slabs
- Walls

Mass Timber

- CLT – Cross Laminated
- LSL – Laminated Strand
- LVL – Laminated Veneer

Slabs (Mass Construction)

Concrete

Mass Timber

CLT

Nordic

78, 105, 131, 175, 220, 244, 314

175 unprotected – FRR 96 min.

175 w/ GWB – FRR 124 min

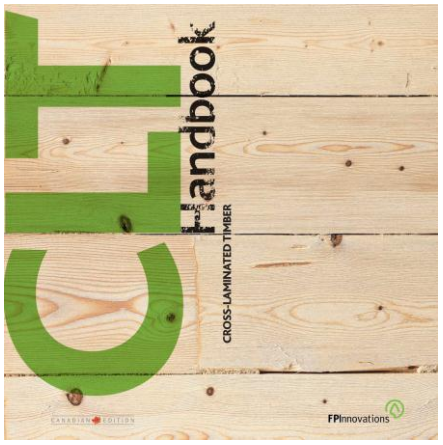
245 unprotected – FRR 178 min.

Structurlam

99, 169, 239, 309

Vibration controlled span

3.5m, 4.9m, 6.2m, 7.4m.



Basic Framing Types

LIGHT WOOD FRAMING — < 3” (75mm)
- PLYWOOD / T&G
- JOISTS
- THIN (SAWN, I-JOIST, LVL, LSL)

BEAMS — STUDS

HEAVY TIMBER FRAMING — > 4” / 6” (100mm/150mm)
- BEAMS
- COLUMNS (SAWN, GLULAM, PSL)

MASS TIMBER — SOLID PLANKS
- DECKING
- WALLS (SAWN, LSL, LVL, CLT)

HYBRID CONSTRUCTION — w/
- STEEL, CONCRETE OR MASONRY

Comparison of Wood Products

Table 1 Comparison of Various Wood Products

	Dim. lumber No.1/No.2 stud, SPF	Dim. lumber SS, D.Fir.	Glulam douglas fir 24F-E	LVL 2.0E	LSL 1.55E	PSL D.Fir 2.2E	CLT wall 5-Ply
Compression stress parallel to grain, f_c (MPa)	11.5	19.0	30.2	35.2	22.5	31.9	11.6 (long) 5.4 (trans)[1]
Compression stress perpendicular to grain, f_{cp} (MPa)	5.3	7.0	7	9.4 (beam) 6.9 (plank)	10.0 (beam) 6.1 (plank)	9.4 (beam) 6.0 (plank)	5.3[2]
Longitudinal shear, f_v (MPa)	1.5	1.9	2	3.7 (beam) 1.8 (plank)	5.2 (beam) 2.0 (plank)	3.7 (beam) 2.7 (plank)	2.2[3]
Bending at extreme fibre, f_b (MPa)	11.8	16.5	30.6	37.6 (beam) 37.6 (plank)	29.6 (beam) 33.3 (plank)	37.0 (beam) 35.7 (plank)	N/A[4]

[1] The longitudinal plies are assumed to have f_c of 19.5MPa (M50 timber), and the transverse plies are assumed to have f_c of

Fire Ratings
&
Architectural Coordination

ONE-HOUR FLOOR/CEILING, ROOF/CEILING ASSEMBLIES

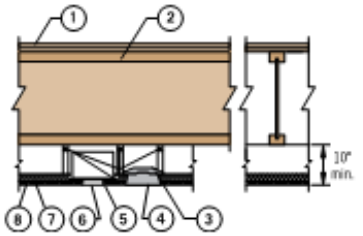
Lightweight concrete or approved gypsum concrete topping with appropriate sheathing can be substituted for the decking material shown in any of these assemblies.

Assembly A

Intertek
WNR FCA 60-11

ICC-ES ESR-1153

1. Double wood floor
2. TJI® joist with minimum 1½" flange depth (see **TJI® Joist Specifications** table on page 16 for flange sizes)
3. Fixture protection
4. 24" x 48" recessed light fixture
5. Cold-rolled channels
6. 12" air diffuser
7. Minimum 1"-thick (4 pcf minimum) mineral wool blankets
8. ⅝" acoustical panels, 24" x 24" or 24" x 48", supported by an approved exposed fire-rated suspension system



Assembly B

Intertek
WNR FCA 60-01
WNR FCA 60-03

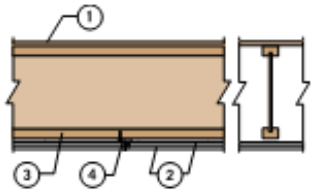
PFS FA-1

ICC-ES ESR-1153

1. 48/24 tongue-and-groove, span-rated sheathing (Exposure 1)
2. Two layers ⅝" Type X gypsum board
3. TJI® joist
4. Resilient channels (optional)*

Optional: Minimum 3½"-thick glass fiber insulation or non-combustible insulation, rated R-30 or less.*

***Resilient channels are required when insulation is used.**

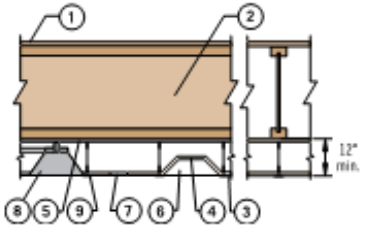


Assembly C

ICC-ES ESR-1153

1. 48/24 tongue-and-groove, span-rated sheathing (Exposure 1)
2. TJI® joist
3. ⅝" ceiling panels, 24" x 24"
4. Fixture protection
5. ½" Type C gypsum board or ⅝" Type X gypsum board
6. 24" x 48" recessed light fixture
7. 6" x 12" opening for return air
8. 12" diameter diffuser opening
9. Steel suspension grid

Note: Additional restrictions apply to Intertek's version of this listing. Refer to WNR FCA 60-08 for additional information.



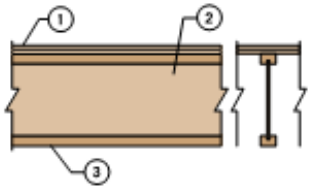
ONE-HOUR FLOOR/CEILING, ROOF/CEILING ASSEMBLIES

Lightweight concrete or approved gypsum concrete topping with appropriate sheathing can be substituted for the decking material shown in any of these assemblies.

Assembly E

ICC-ES ESR-1153

1. Double wood floor or single layer of 48/24 tongue-and-groove span-rated sheathing (Exposure 1)
2. TJI® joist
3. An approved ceiling system that will provide a 40-minute finish rating

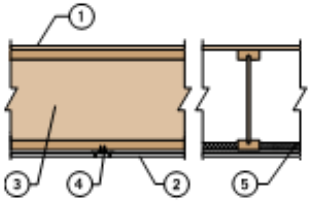


Assembly F

Intertek
WNR FCA 60-07

ICC-ES ESR-1153

1. 48/24 tongue-and-groove, span-rated sheathing (Exposure 1)
2. ⅝" Type C gypsum board
3. TJI® joist with a minimum depth of 11⅞" and a minimum flange size of 1½" thick x 3½" wide (see **TJI® Joist Specifications** table on page 16 for flange sizes). Joists spaced at 24" on-center, maximum.
4. Resilient channel at 16" on-center
5. Minimum 11/2"-thick (2.5 pcf minimum) mineral wool batts



Typical detail for butt joints perpendicular to framing members

TWO-HOUR FLOOR/CEILING, ROOF/CEILING ASSEMBLY

Lightweight concrete or approved gypsum concrete topping with appropriate sheathing can be substituted for the decking material shown in any of these assemblies.

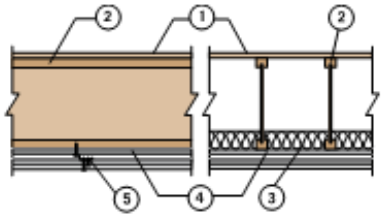
Assembly G

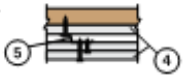
Intertek
WNR FCA 120-3

ICC-ES ESR-1153

Assembly G is typically used for garage/living unit separation

1. 48/24 tongue-and-groove, span-rated sheathing (Exposure 1)
2. TJI® joist, 24" on-center maximum
3. Optional glass fiber insulation, unfaced batts, 3½" thick in plenum, supported by stay wires 12" on-center and centered on joist bottom flanges
4. Three layers of ⅝" Type C gypsum board
5. Resilient channels at 16" on-center located between first and second layers of gypsum board

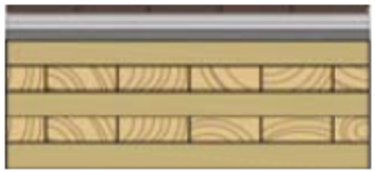




Typical resilient channel and gypsum board attachment

NORDIC'S CLT FRR

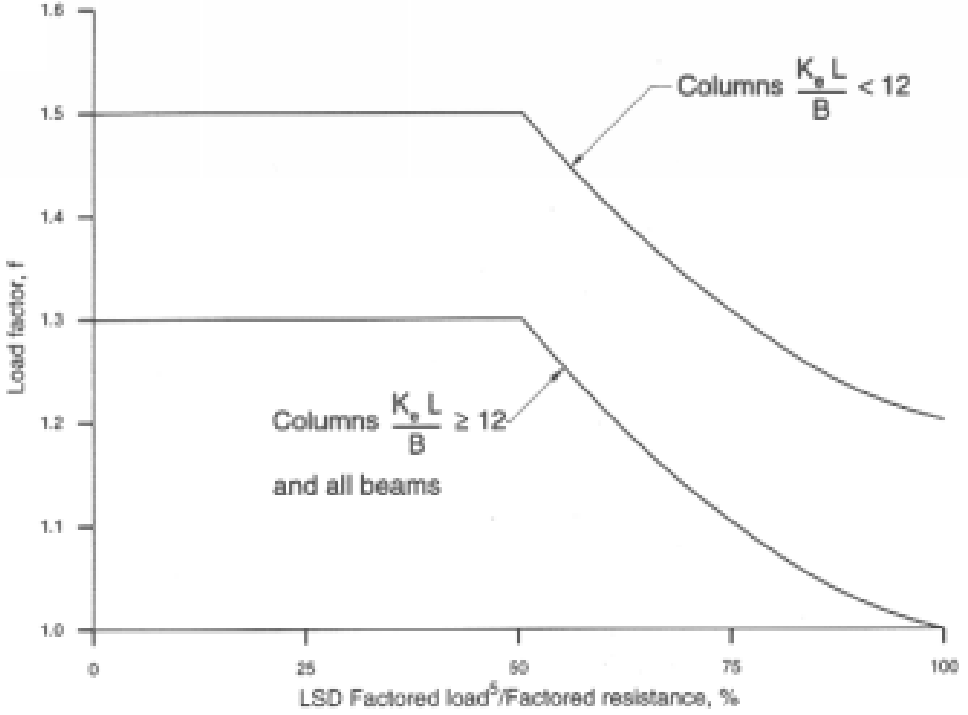
P2	- carpet or floating flooring, about 2/5 in. - resilient underlayment (rubber mat or textured felt), 0.12 in. - at least 15.6 lb/ft^2 wet topping (concrete, gypcrete, gypsum) - resilient underlayment (2/5 in. rubber mat, 3/4 in. textured felt, or 1/2 in. low density wood fiberboard) - cross-laminated timber 6-7/8 in.	1,5 h	> 53[4]
P2.1	+ 1 layer 5/8 in. Type X gypsum board	2 h	> 53[4]



P3	- carpet or floating flooring, about 2/5 in. - resilient underlayment (rubber mat or textured felt), 0.12 in. - at least 25 kg/m^2 dry topping (20 mm Fermacell, cement fibreboard, or Fibrerock) - resilient underlayment (2/5 in. rubber mat, 3/4 in. textured felt, or 1/2 in. low density wood fiberboard) - cross-laminated timber 6-7/8 in.	1,5 h	> 48[4]
P3.1	+ 1 layer 5/8 in. Type X gypsum board	2 h	> 48[4]

P4	- cross-laminated timber 6-7/8 in.	1,5 h	39[5]
P4.1	- cross-laminated timber 6-7/8 in. - sound insulation clips of 4 in. high - metal hat channels, at min. 16 in. o.c. - sound insulation material, 4 in. - 2 layers 1/2 in. Type X gypsum board	2 h	64

Fire Rating of Glulam



1hr FRR

Beam – 175x304

Column – 315 x 304

$$FRR = 0.1fB\left[4-2\frac{B}{D}\right]$$

for beams exposed to fire on 4 sides,

$$FRR = 0.1fB\left[4-\frac{B}{D}\right]$$

for beams exposed to fire on 3 sides,

$$FRR = 0.1fB\left[3-\frac{B}{D}\right]$$

for columns exposed to fire on 4 sides,

$$FRR = 0.1fB\left[3-\frac{B}{2D}\right]$$

for columns exposed to fire on 3 sides,

The case of Timber vs Steel for fire performance.

During a fire a room temperature rises from 70 °F (21 °C) to 1100 °F (600 °C).

The Brentwood Story

The case of a 0 hr Fire Rated Roof.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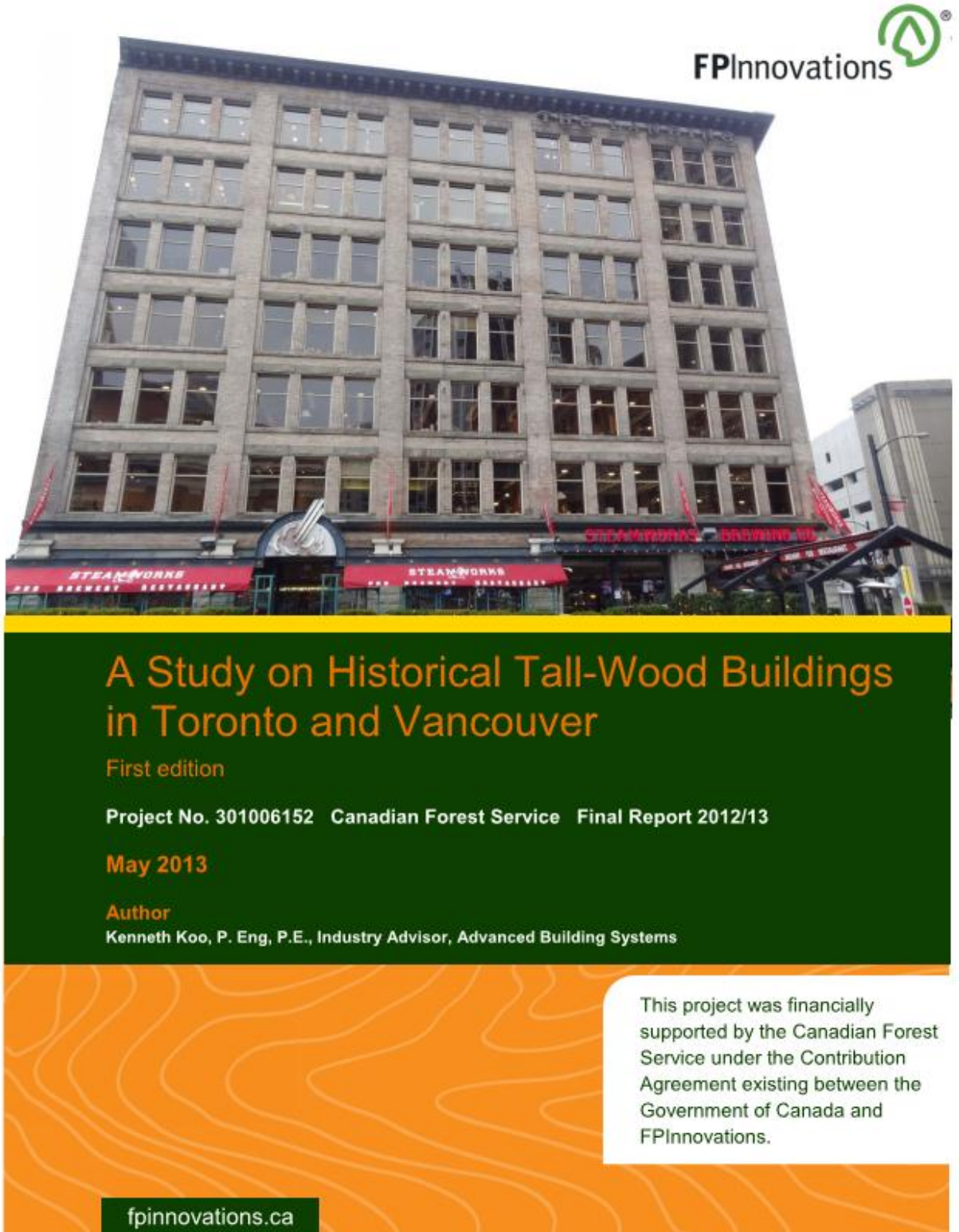
DANGER
DUE TO
ATTENTION
CONSTRUCTION
DELIVERIES AND
CONSTRUCTION
PERSONEL ONLY

Inspiration from Historic Mid-Rise Buildings

A case study in Vancouver & Toronto

In Toronto

- 128 Buildings: 2 – 8 Storeys
- 43 Buildings: 5+
- 19 Buildings: 7+
- Max. Height: 30m (100 ft)
- Max. Floor Space:
- 20,440 sm (220,000 sf)
- Years of Construction:
- 1859 to 1941




176
NO PARKING IN FRONT OF DRIVEWAY ANY TIME


TULA
LEASE


40


Spadina


Garden
FURS


KING ST. E.
200


TORONTO
CARPET MFG. CO. LIMITED.
music
CANADA


JACK
ASTOR'S
NO ENTRY

http://digital.library.mcgill.ca/cab/search/browse_frameset.htm

the advisability of relieving at least to a certain extent the glaring monotony of all white floors and walls.

WAREHOUSE BUILDINGS.

In building a modern warehouse attention must be paid to the three classes of construction, commonly known as "ordinary," "mill" and "slow-burning" construction. All are intended to safely sustain a load of 100 pounds per square foot of floor space, although this capacity may be indefinitely increased as the purposes for which the building is intended vary.

The term "ordinary construction" is defined in the revised Toronto building by-law as meaning "a building with wood joists and wood or iron posts, columns and beams, which are not protected with fire-resisting coverings, but having the external and party walls constructed of brick, stone or some other incombustible material, the roof of such buildings being covered with tin, iron, copper, slate, tile, felt and gravel or other material of an incombustible nature."

On the other hand, "mill construction" is defined as meaning a "building in which all the wooden girders and joists, supporting floors and roof, have a sec-

Where planks are set on edge and are not over two inches thick, with a matched wearing floor above, the tongue and groove or splice may be omitted; in such cases the planks shall be well spiked at intervals of 15 inches with spikes of sufficient length to penetrate two-thirds the thickness of the adjoining plank.

The term "slow-burning construction," according to the by-law, "shall apply to all buildings in which mill construction is used and in which the structural members, which carry the loads and strains which come upon the floors and roofs thereof, are entirely enveloped in incombustible material. This class of building shall have double floors and roof, with one thickness of asbestos paper, weighing not less than 14 pounds each per 100 square feet, between the upper and lower thicknesses of floors and roof. The under side of all floors shall be protected in the same manner as the wood structural members.

Ordinarily the two latter classes of construction are regarded as practically the same, distinction being generally made between the first two only. The joists in all cases have a span of 20 feet from one bearing to the other and in ordinary construction are 3 x 12 inches, spaced 12 inches centre to centre, while those

ORDINARY CONSTRUCTION

- WOOD JOISTS
- FLOORS NOT FRR PROTECTED
- EXTERIOR & PARTYWALLS ARE NON-COMBUSTIBLE.

MILL CONSTRUCTION

- WOOD GIRDERS AND JOISTS
- FLOOR > 2" THICK.
- IF NO T&G, WELL SPIKED

SLOW-BURNING CONSTRUCTION

- SAME AS MILL
- FLOOR & ROOFS ENTIRELY ENVELOPED IN NON-COMBUSTIBLE MATERIAL

Hybrid Construction

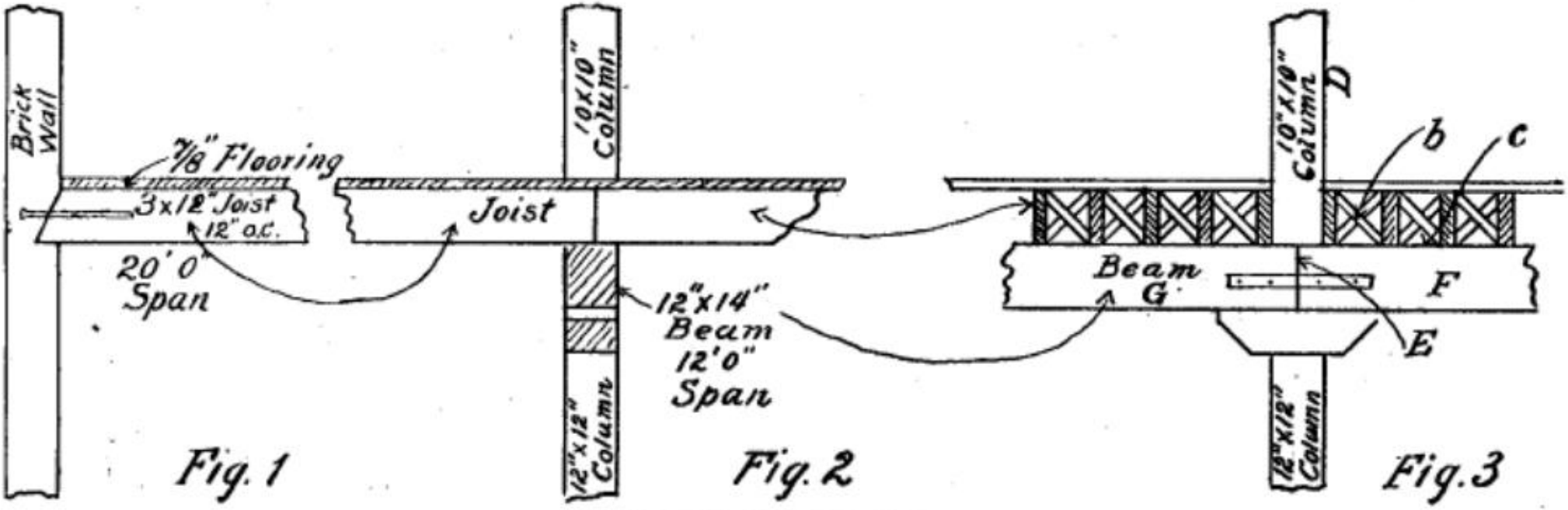


Fig. 1 Fig. 2 Fig. 3

ORDINARY CONSTRUCTION.

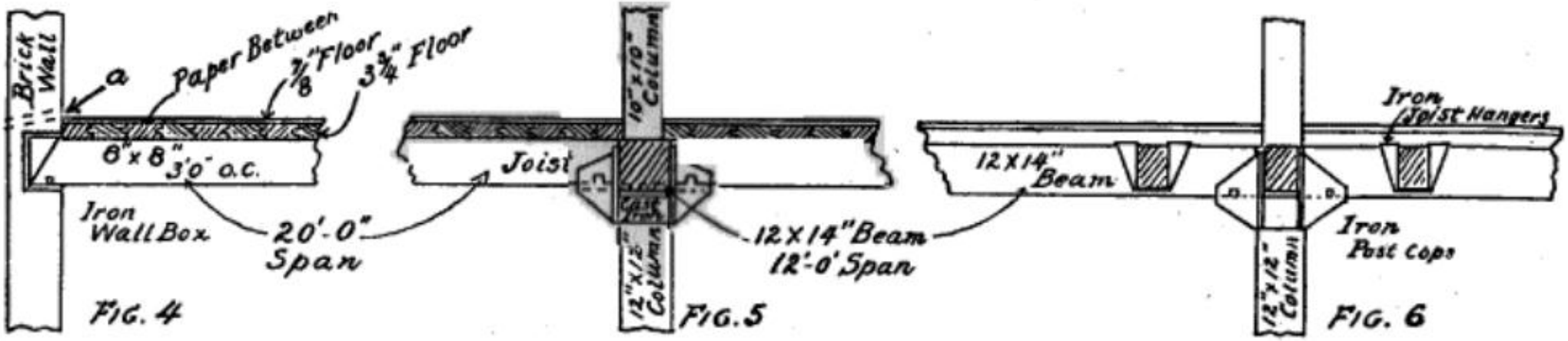
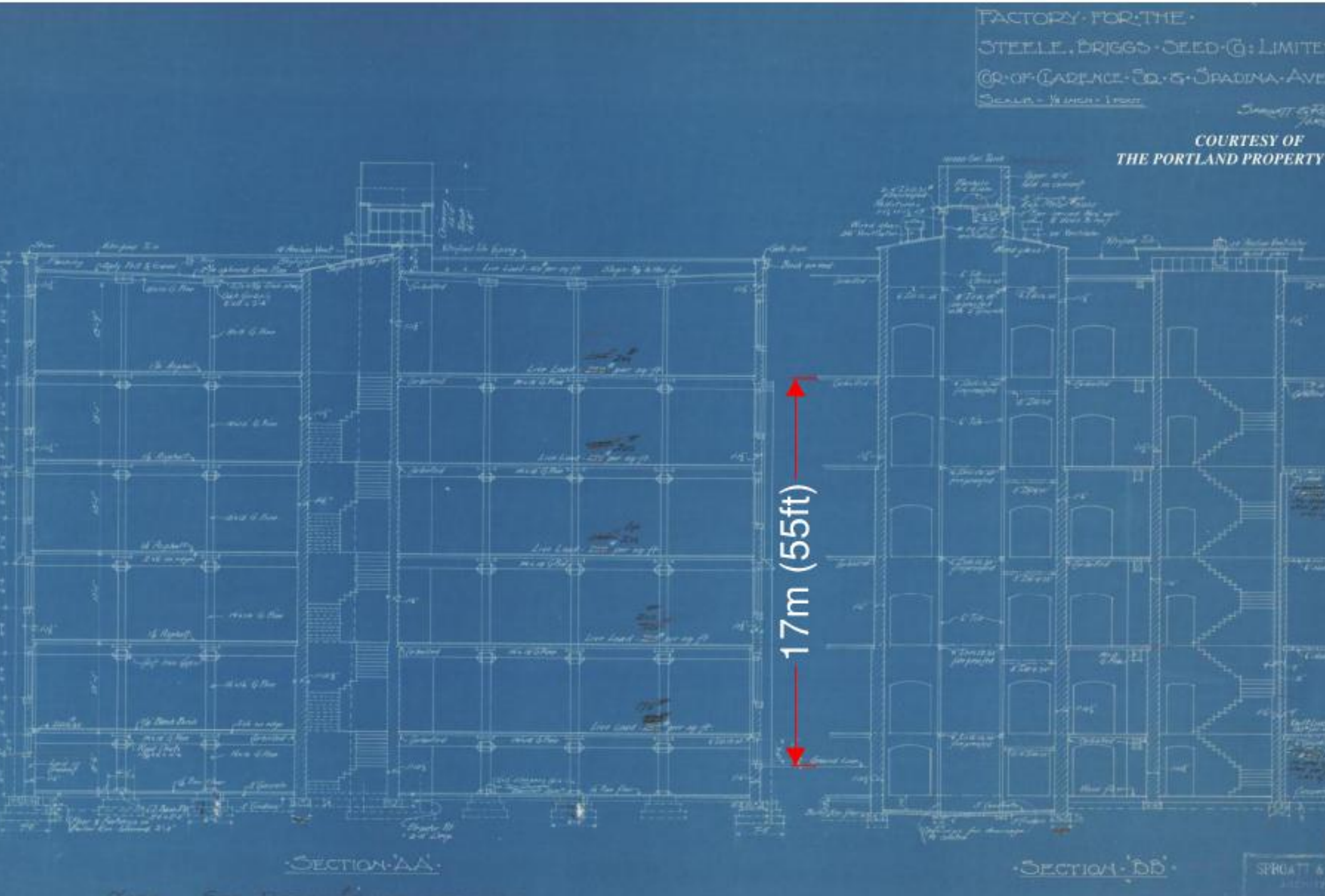
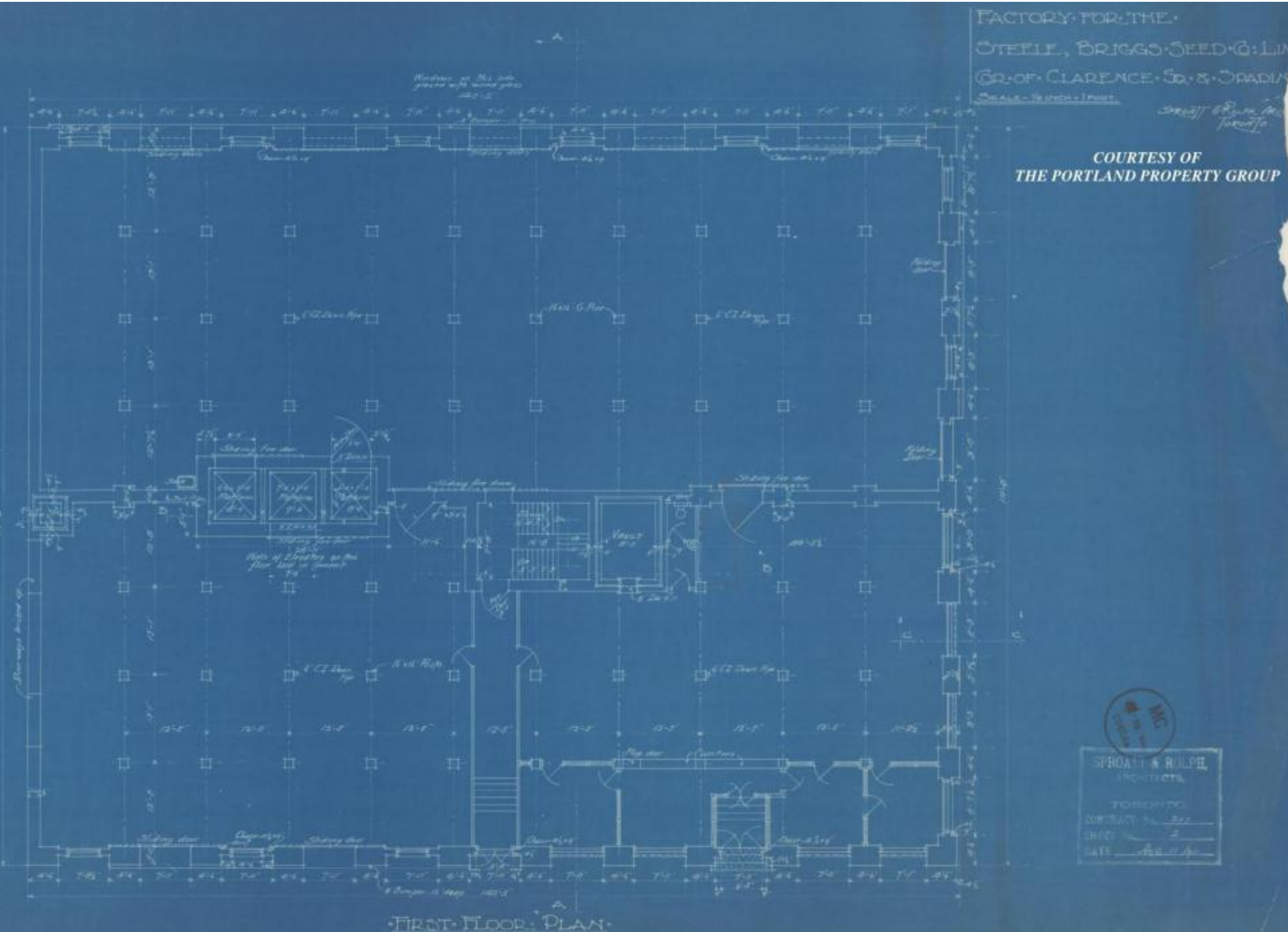
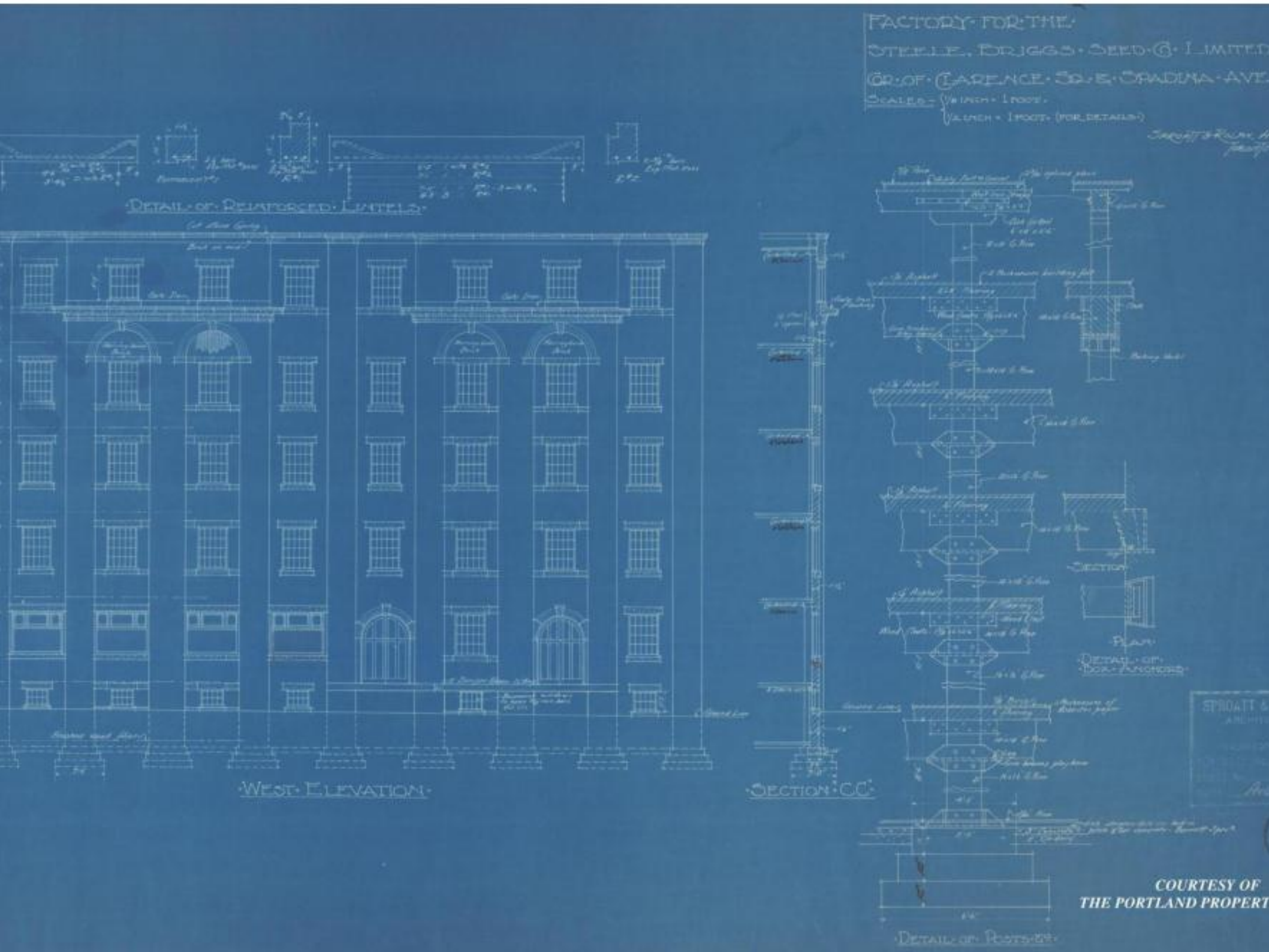


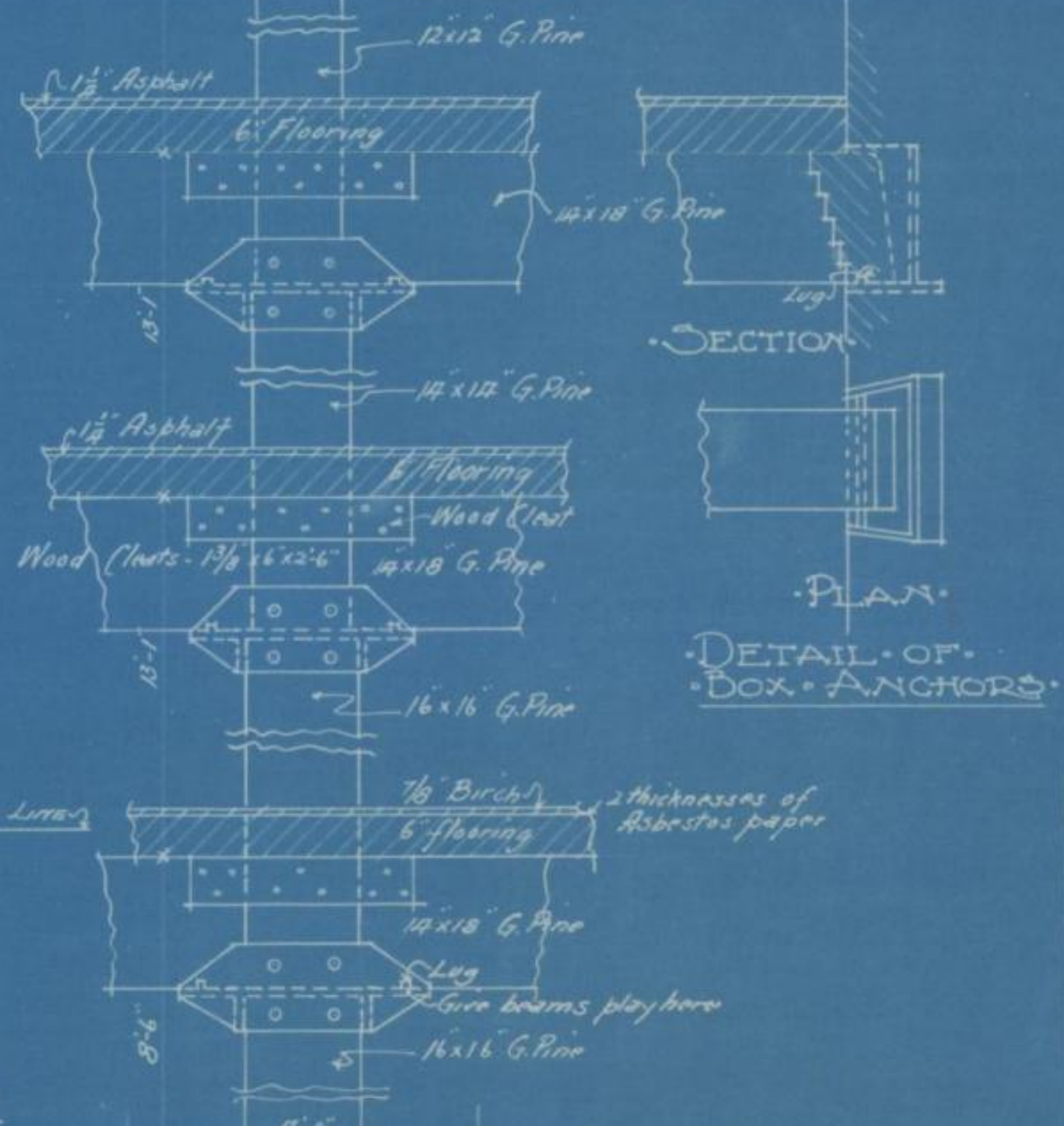
FIG. 4 FIG. 5 FIG. 6

MILL OR SLOW-BURNING CONSTRUCTION


FACTORY · FOR · THE ·
STEELE, BRIGGS · SEED · CO · LIMITE
COR · OF · CADENCE · SQ · & · SPADINA · AVE
SCALE · - ⅛ INCH · 1 FOOT
COURTESY OF
THE PORTLAND PROPERTY
17m (55ft)
SECTION · AA ·
SECTION · BB ·

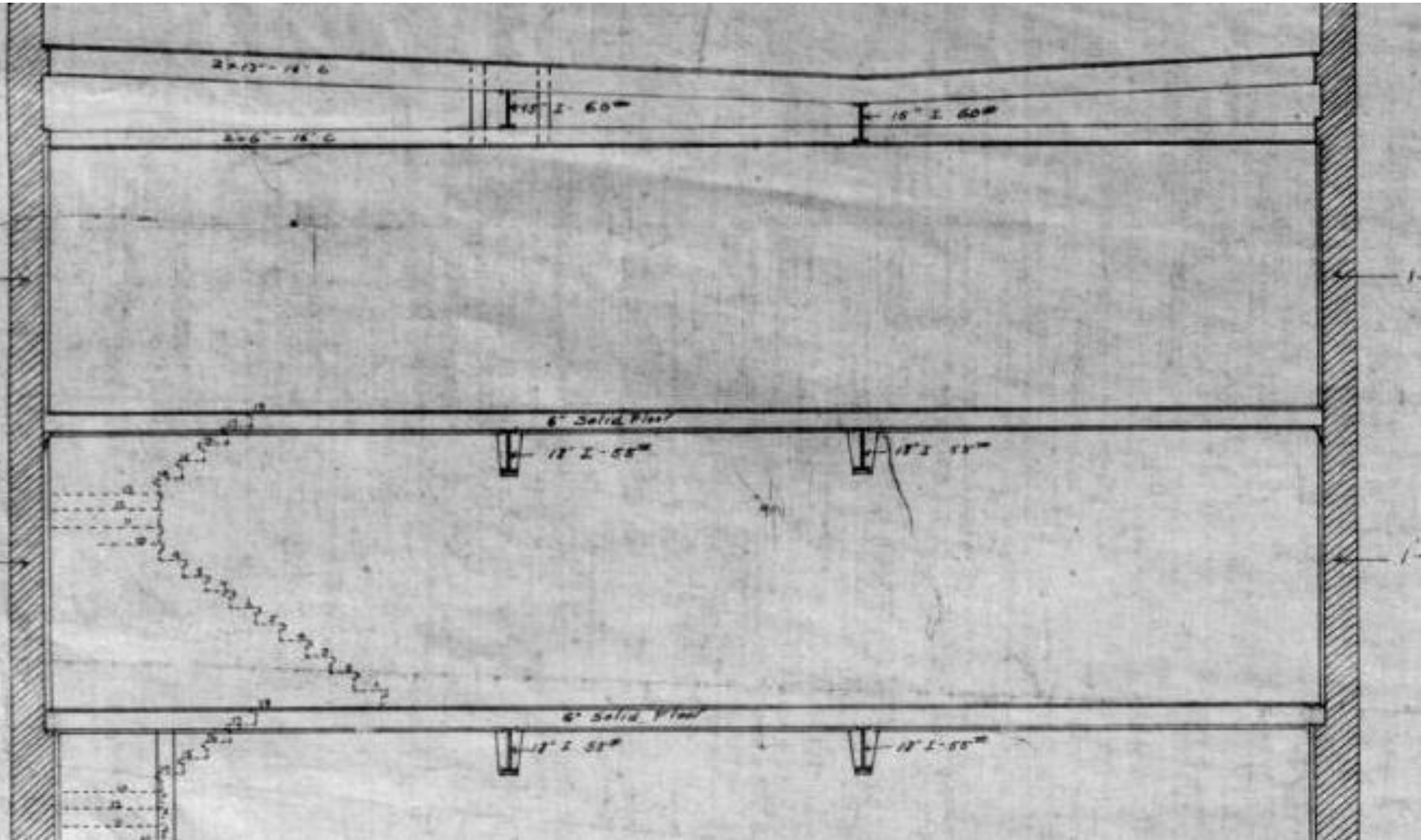






SPROATT & ROLPH,
ARCHITECTS,
TORONTO.
CONTRACT No. 207.
SHEET No. 9.
DATE Aug. 11/1911.

Mass Timber on Steel



The Code Changed

Yeah! 6-storey?

Oh wait: 18m (59ft)

Made in Ontario ☹

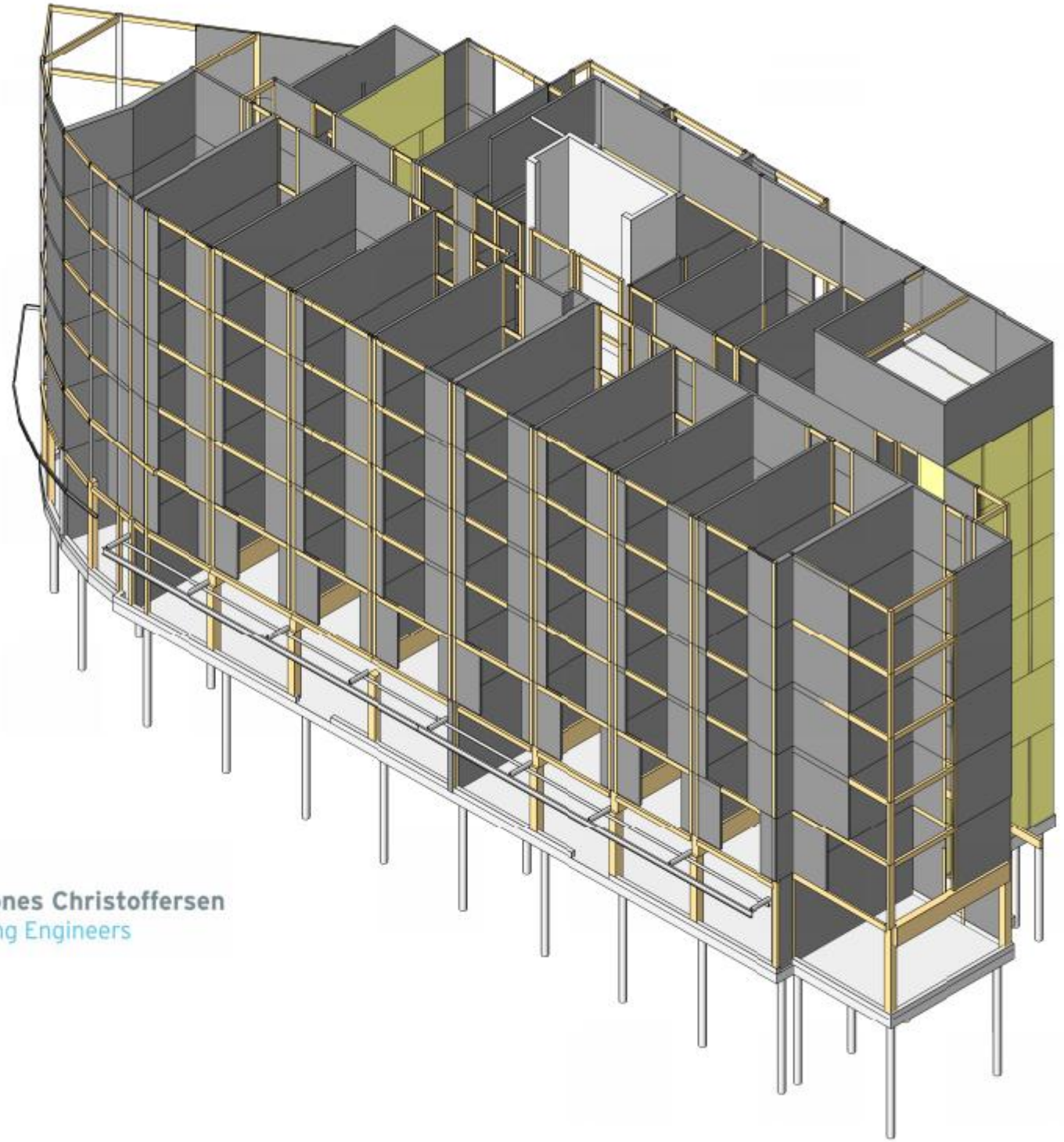
Non-combustible Egress Exits

Mid-rise Construction in British Columbia

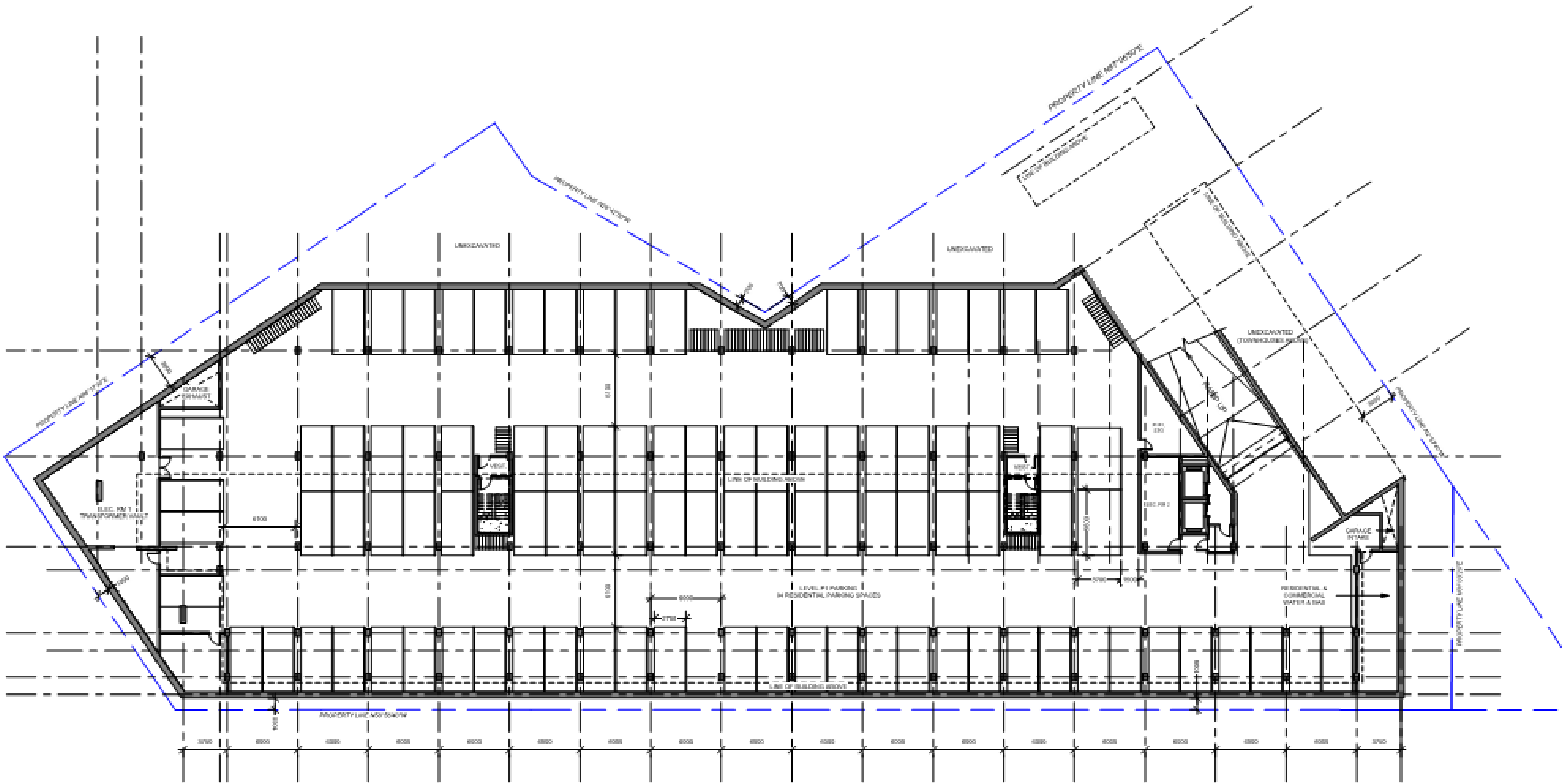
A CASE STUDY BASED ON THE REMY PROJECT IN RICHMOND, BC

woodWORKS!
Project of the Canadian Wood Council

Canadian Wood Council
Conseil canadien du bois



Read Jones Christoffersen
Consulting Engineers



UNEXCAVATED
UNEXCAVATED
UNEXCAVATED
(TOWNHOUSES ABOVE)
LINE OF BUILDING ABOVE
GARAGE
EXHAUST
ELEC. RM 1
TRANSFORMER VAULT
VEST.
VEST.
ELEC. RM 2
RAMP UP
LEVEL P1 PARKING
GARAGE
INTAKE
RESIDENTIAL &
COMMERCIAL
WATER & GAS
3750
6000

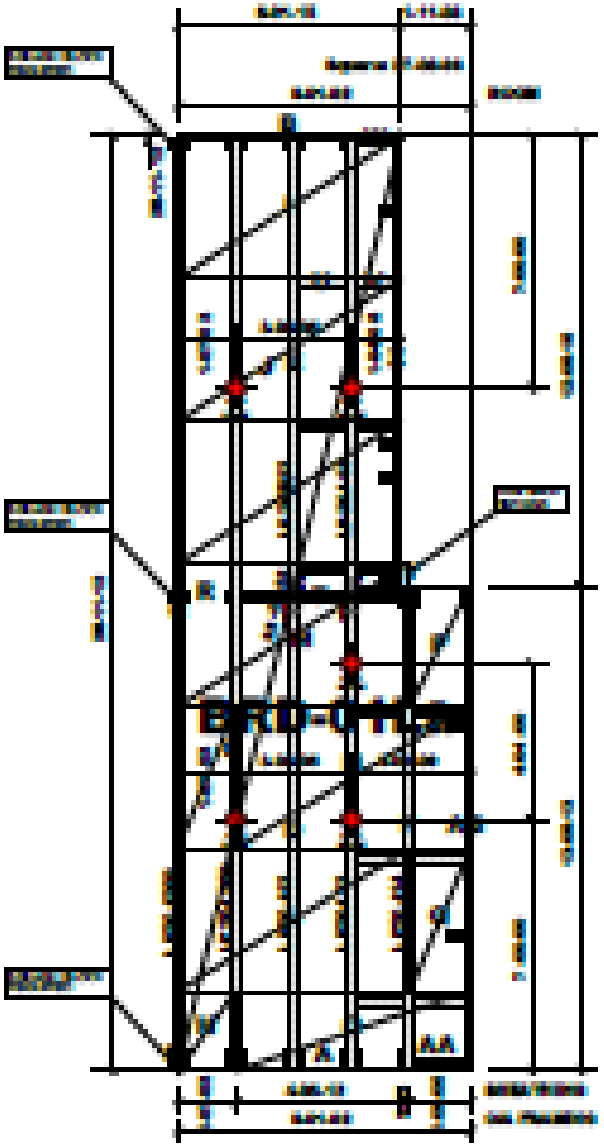
Lessons from 4-story Condos

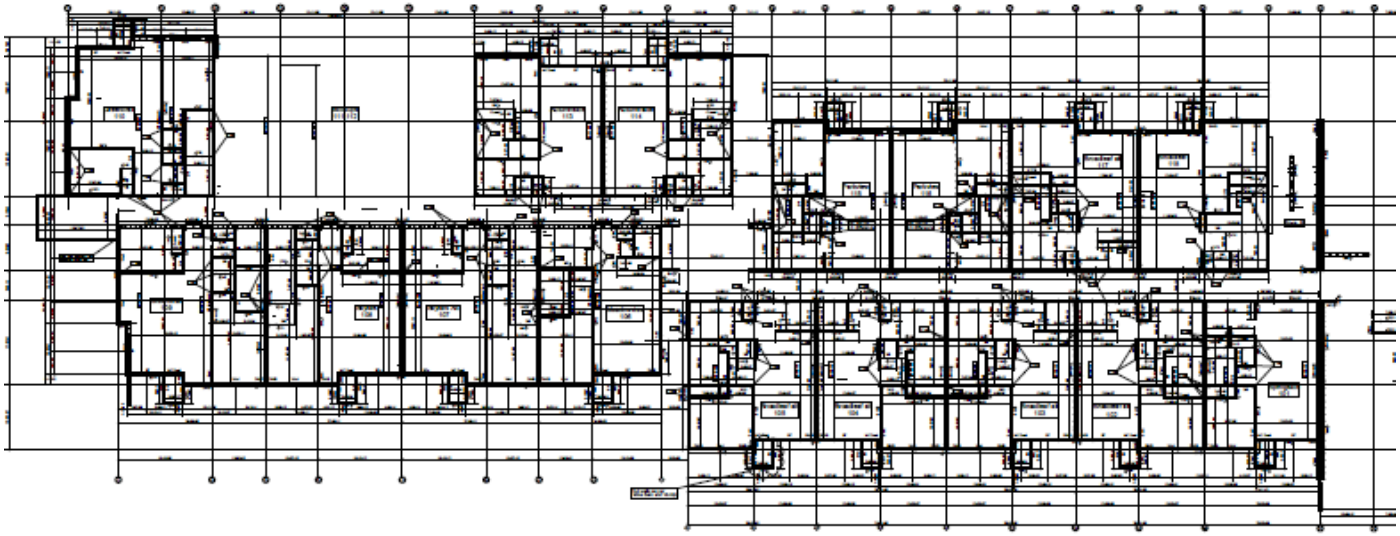

PM12:51 NOV/25/2014

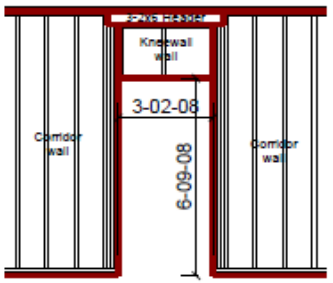

VANDYK 30
MELO
PM12:34 NOV/25/

BROCKPORT
HOME SYSTEMS LTD.

Panelize (Floors & Walls)







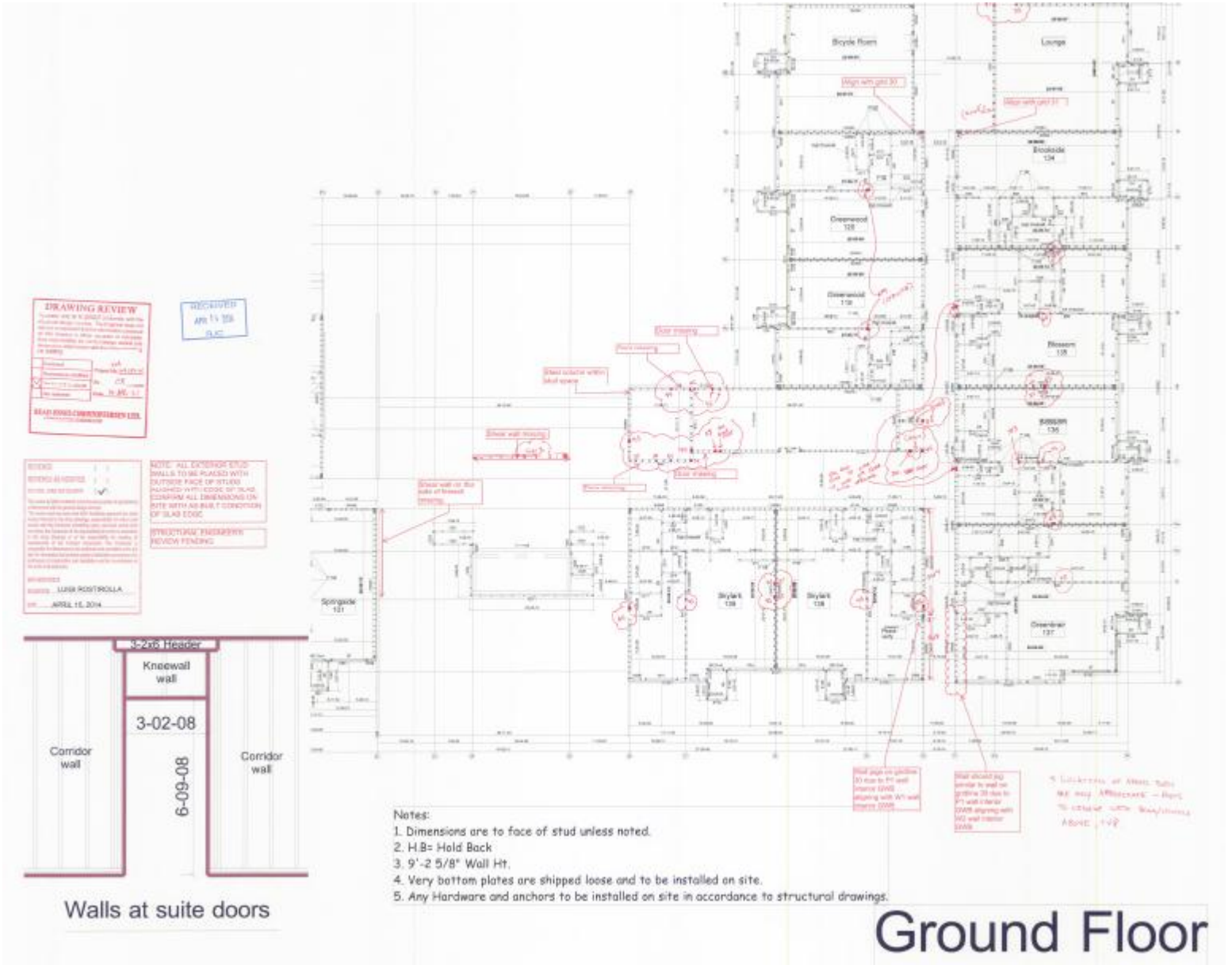
Walls at suite doors

Notes:
1. Dimensions are to face of stud unless noted.
2. H.B= Hold Back
3. 9'-2 5/8" Wall Ht.
4. Very bottom plates are shipped loose and to be installed on site.
5. Any Hardware and anchors to be installed on site in accordance to structural drawings.
6. ● - Indicates arnchor locations.

Ground Floor

Phase 1

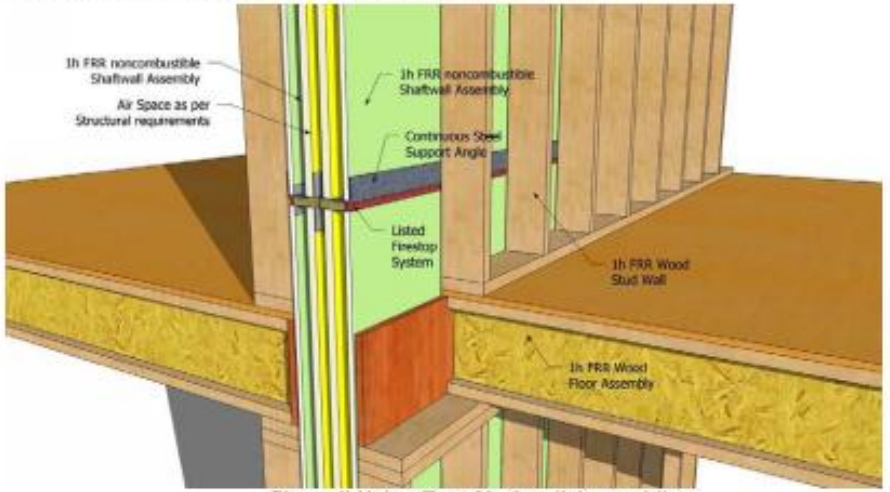
Coordination



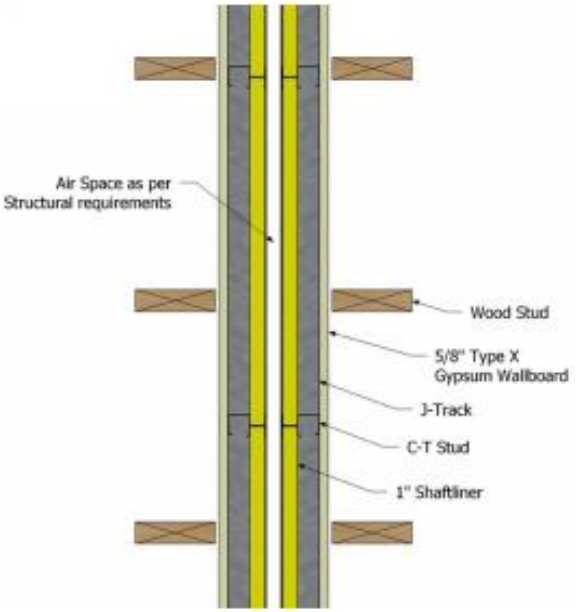
Fire-wall

To separate into two buildings.

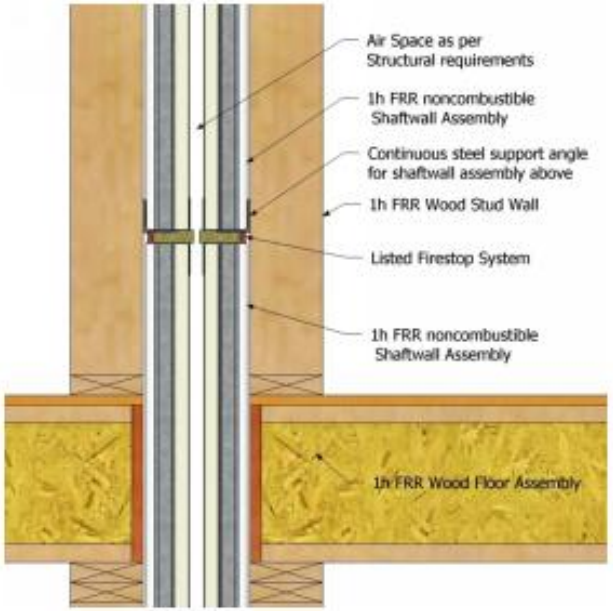
APPENDIX F: NON-COMBUSTIBLE WALL ASSESSMBLIES



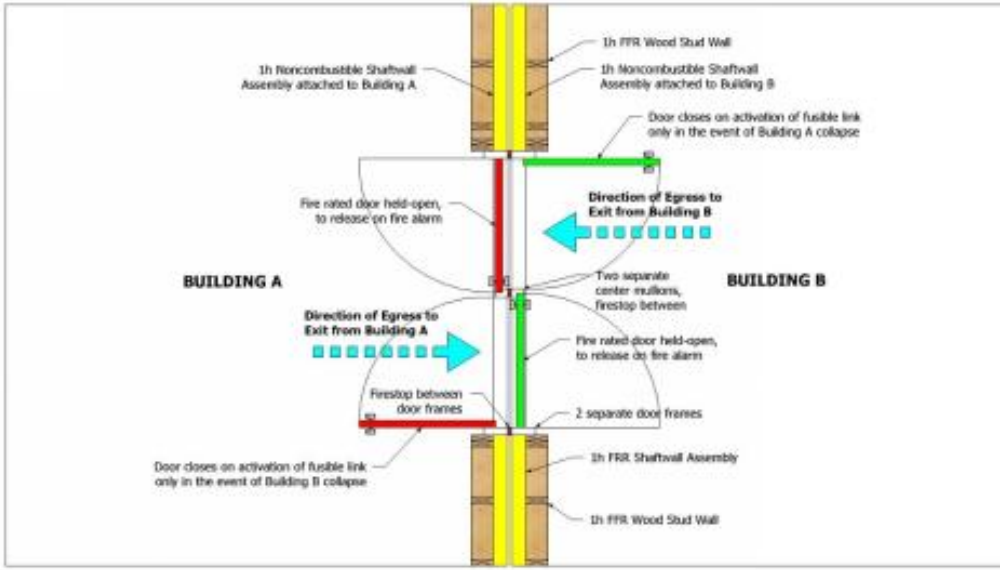
Firewall Using Two Shaftwall Assemblies
Perspective View



Firewall Using Two Shaftwall Assemblies
Plan View / Horizontal Section

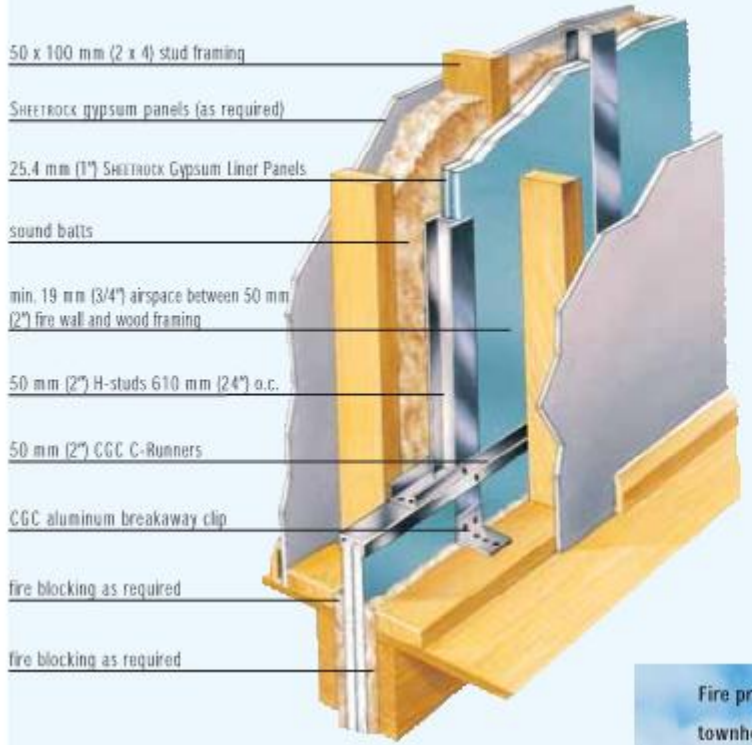


Firewall Using Two Shaftwall Assemblies
Side View / Vertical Section



Door Arrangement at Firewall
Using Two Shaftwall Assemblies

APEGBC Technical and Practice Bulletin

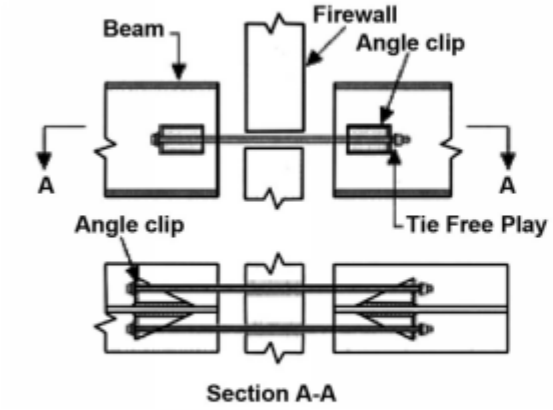

50 x 100 mm (2 x 4) stud framing
SHEETROCK gypsum panels (as required)
25.4 mm (1") SHEETROCK Gypsum Liner Panels
sound batts
min. 19 mm (3/4") airspace between 50 mm (2") fire wall and wood framing
50 mm (2") H-studs 610 mm (24") o.c.
50 mm (2") CGC C-Runners
CGC aluminum breakaway clip
fire blocking as required
fire blocking as required


Fire protection for
townhouses that share
a common wall
CGC
A USG COMPANY
Gypsum Fire Wall
Systems
SA-925

ing frame and the unexposed frame. This can be achieved by using solid wall sections, as illustrated in Figures 5A.8 and 5A.9.

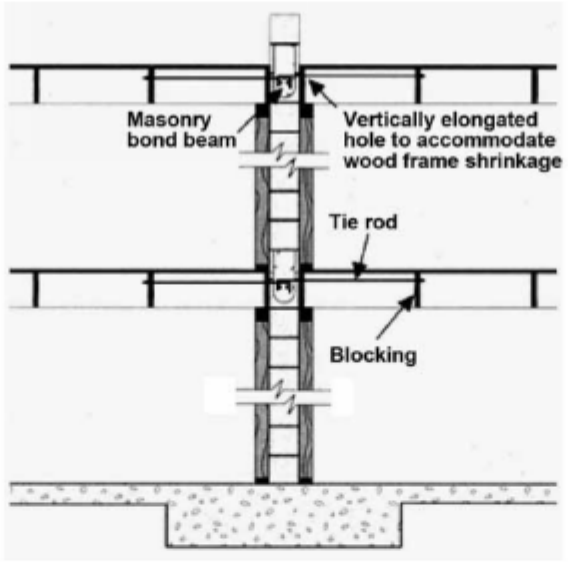
7. Where tied firewalls encase steel columns, expansion of the steel framing members on the fire side of the wall will be resisted by the framing on the unexposed side of the wall. The connection of the columns to the wall should allow for movements which would occur in the protected frame when resisting the sagging force exerted by the fire-exposed frame. This can be achieved by using flexible masonry anchors or by using concrete block units that loosely key into the re-entrant space of the column.
8. In all cases, the firewall itself must be designed to withstand the lateral loads specified in NBCC-10 Article 4.1.5.17.

Figure 5A.20: *Through-Wall Tie, Primary Steel Perpendicular to Tied Firewall*



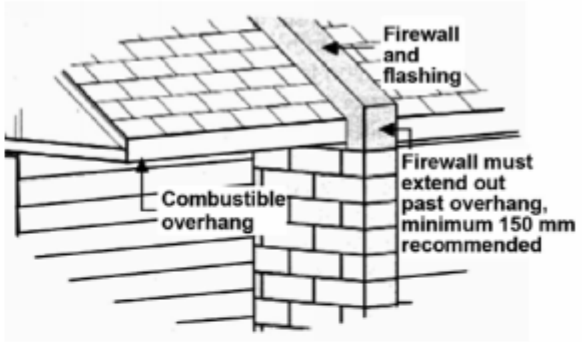
act as a weak link in accordance with Paragraph 15 of Commentary "C" of *"User's Guide—NBC 2010, Structural Commentaries (Part 4 of Division B)"*. The firewall itself must be reinforced and detailed in accordance with Paragraphs 8, 9, 14 and 15 of Commentary "C". This form of construction is typically used in wood frame multi-unit residential buildings where firewalls are used to separate dwelling units or building sections.

Figure 5A.21: *Weak Link Connection Firewall*



An alterative form of the weak link connection can be used where wood floor joists run perpendicular to, and are supported on, the firewall. The ends of the joist should be fire cut as shown in Figure 5A.22. This will enable the floor framing exposed to the fire to disen-

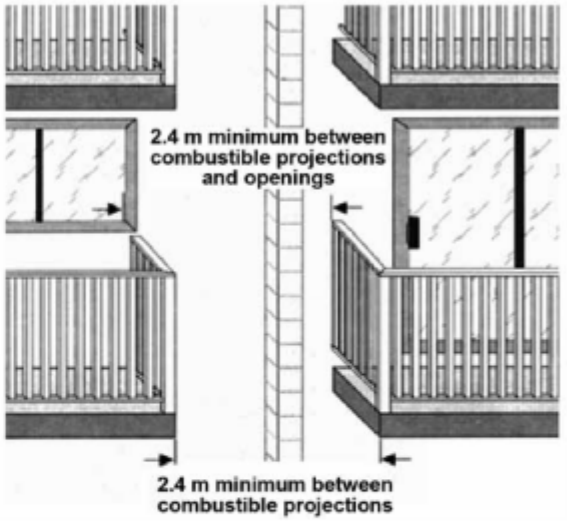
Figure 5A.27d: *Firewall Extension Past Eave*



5A.5.7 Combustible Projections

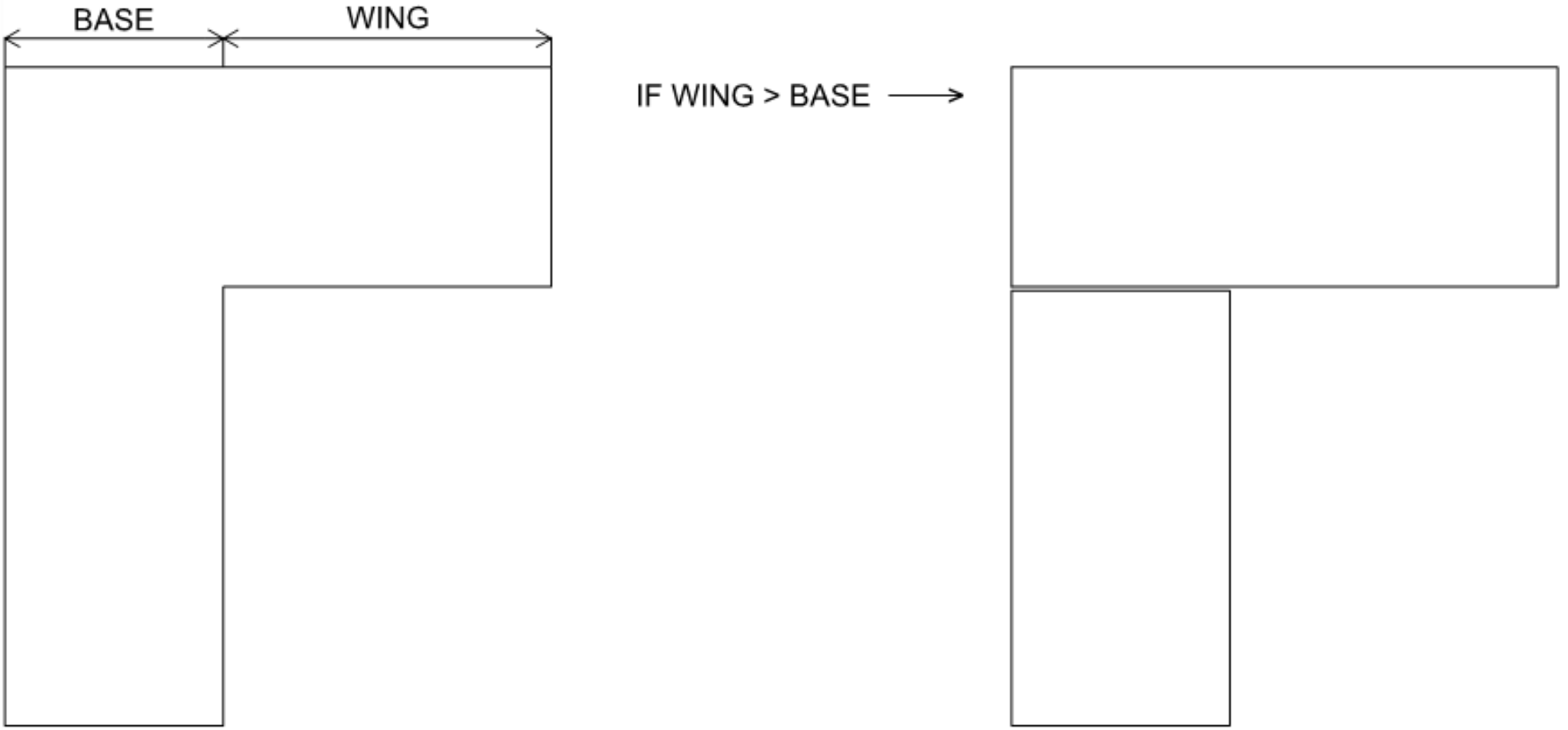
Combustible projections such as balconies, platforms, stairs and eaves that are located near a firewall can also be ignited by flames or heat that pass around the end of a firewall. Therefore, combustible projections are not permitted within 2.4 m of similar combustible projections, or window or door openings, placed on the opposite side of the firewall. This distance should provide adequate separation to prevent ignition of combustibles [3.1.10.7.(2), NBCC-10] (Figure 5A.28).

Figure 5A.28: *Combustible Projections*



Firewalls

By Gary Sturgeon, B.Eng., MSc., P.Eng.
Technical Services Engineer, CCMPA



Plan layout where the wing has a length greater than the base width

APEGBC Technical and Practice Bulletin

Party-wall (Shear walls)

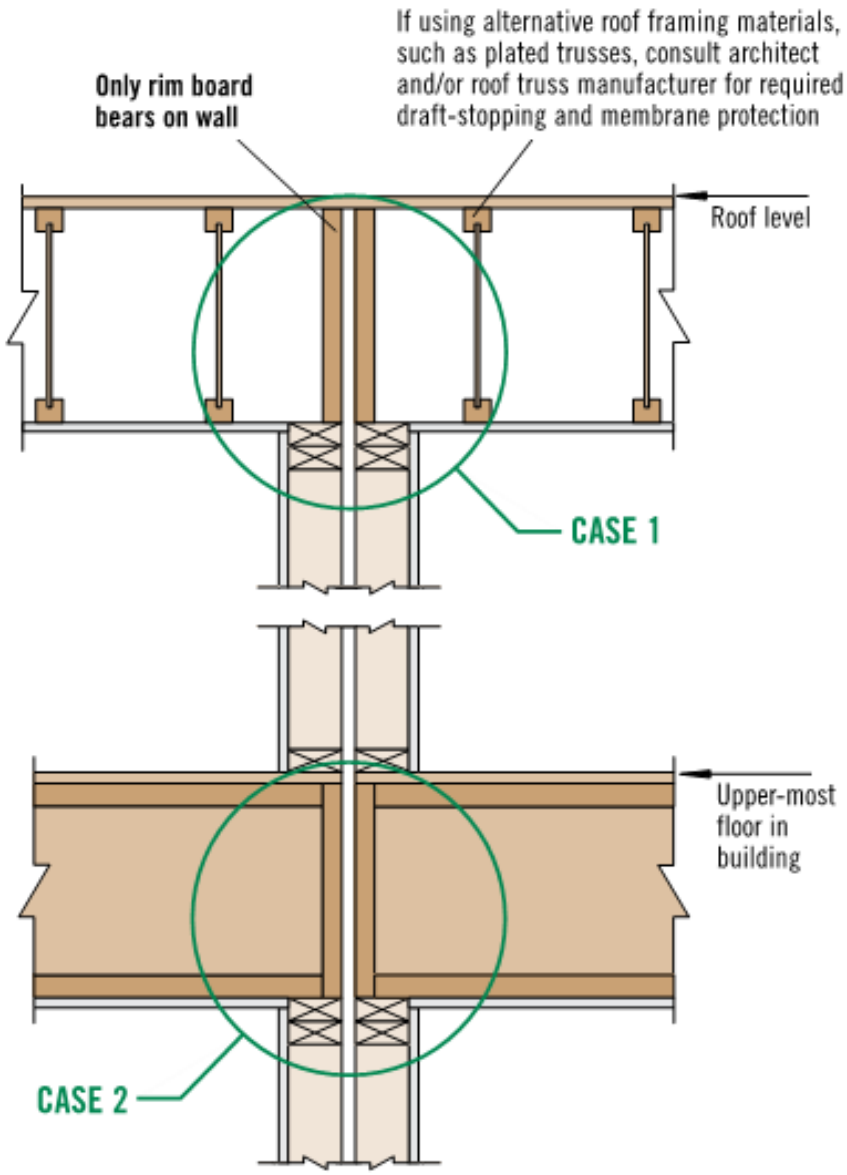
Between Suites

(Fire & Acoustics)

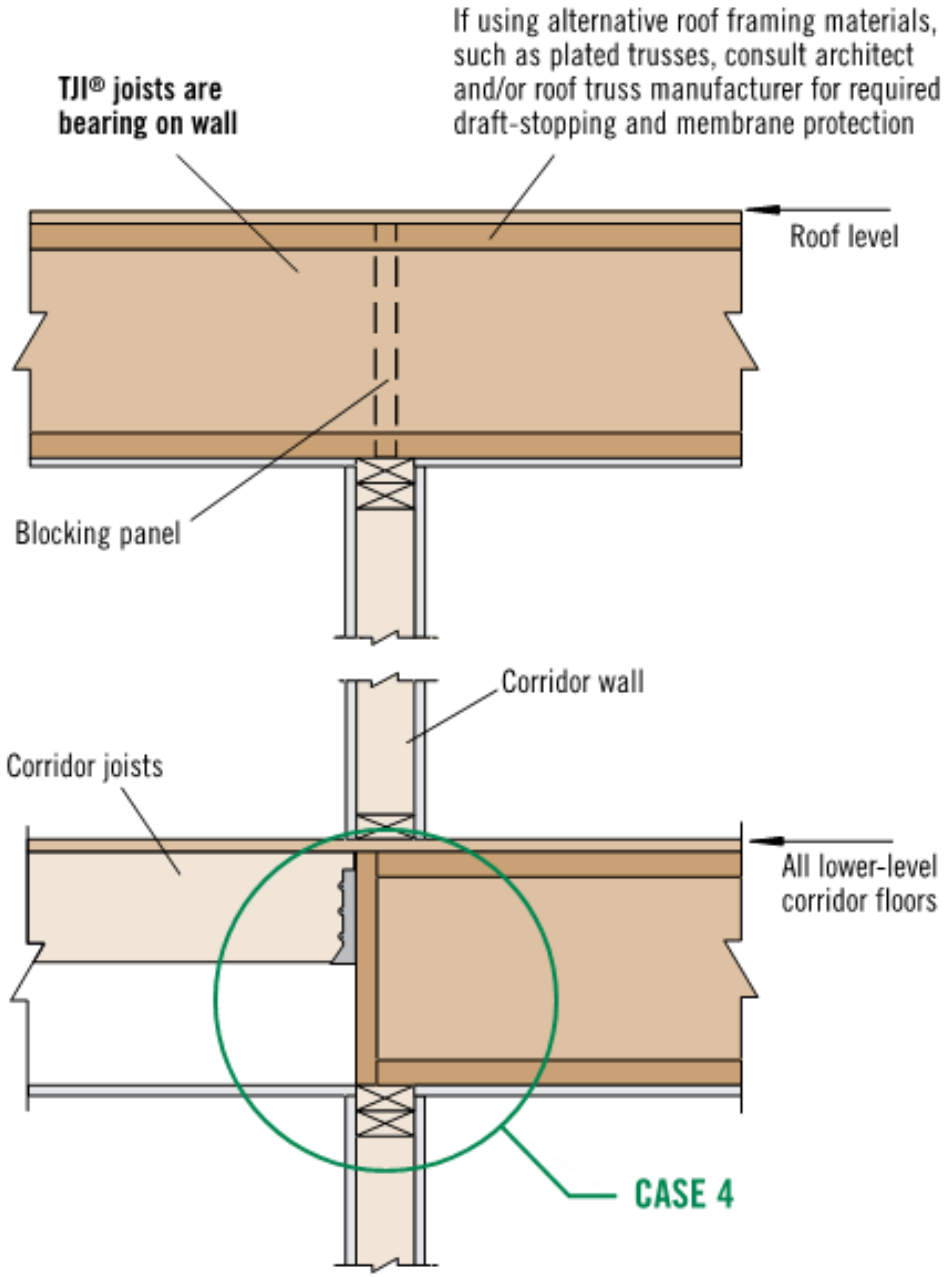
Must be aligned vertically, in plan.

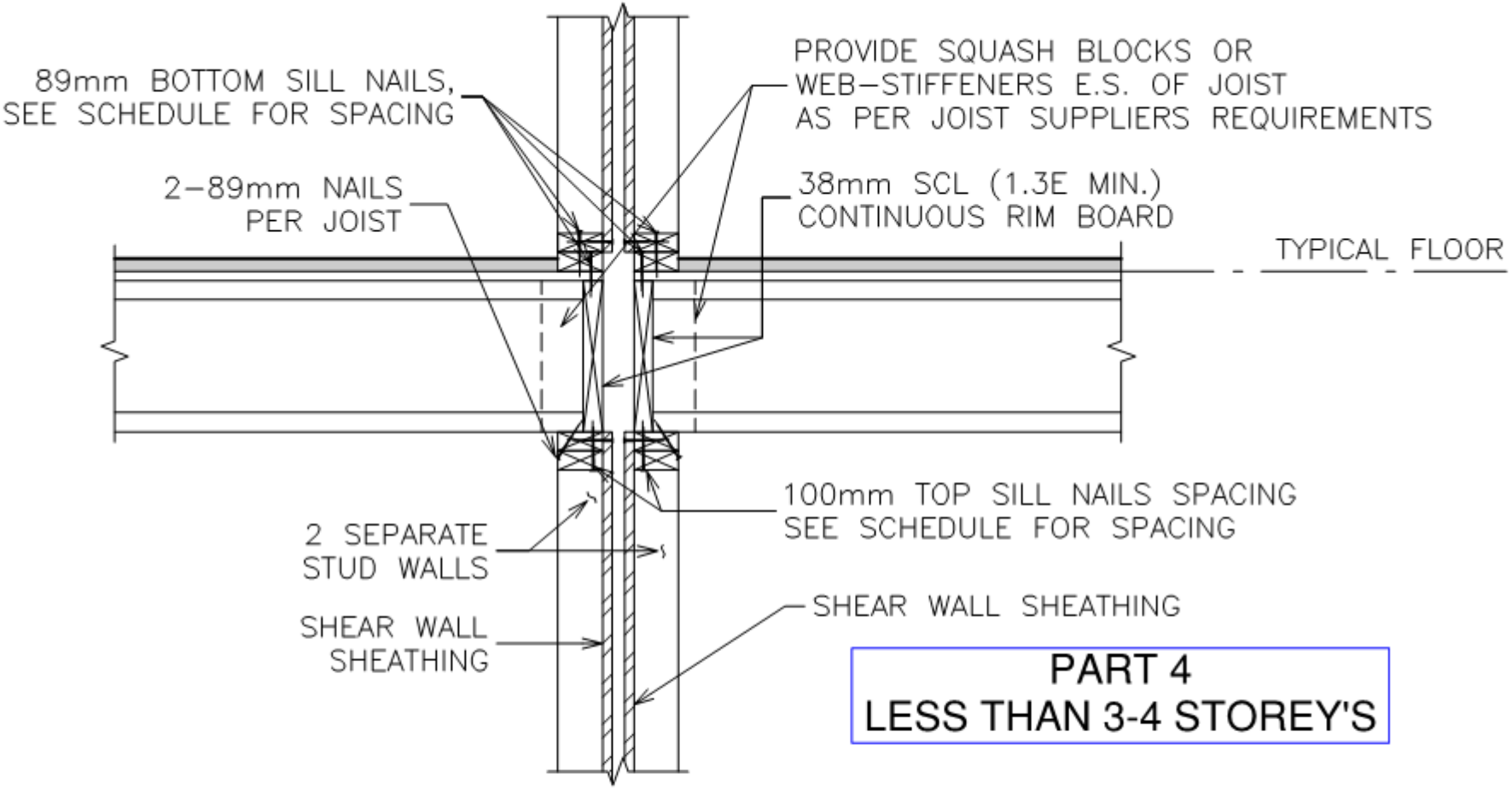
Must be continuous from Fdn to Roof.

TJI® Roof Joists Parallel to Wall



TJI® Joists at Corridor Walls





PART 4
LESS THAN 3-4 STOREY'S

11
S401

TYPICAL AT PARTY WALL

1:20

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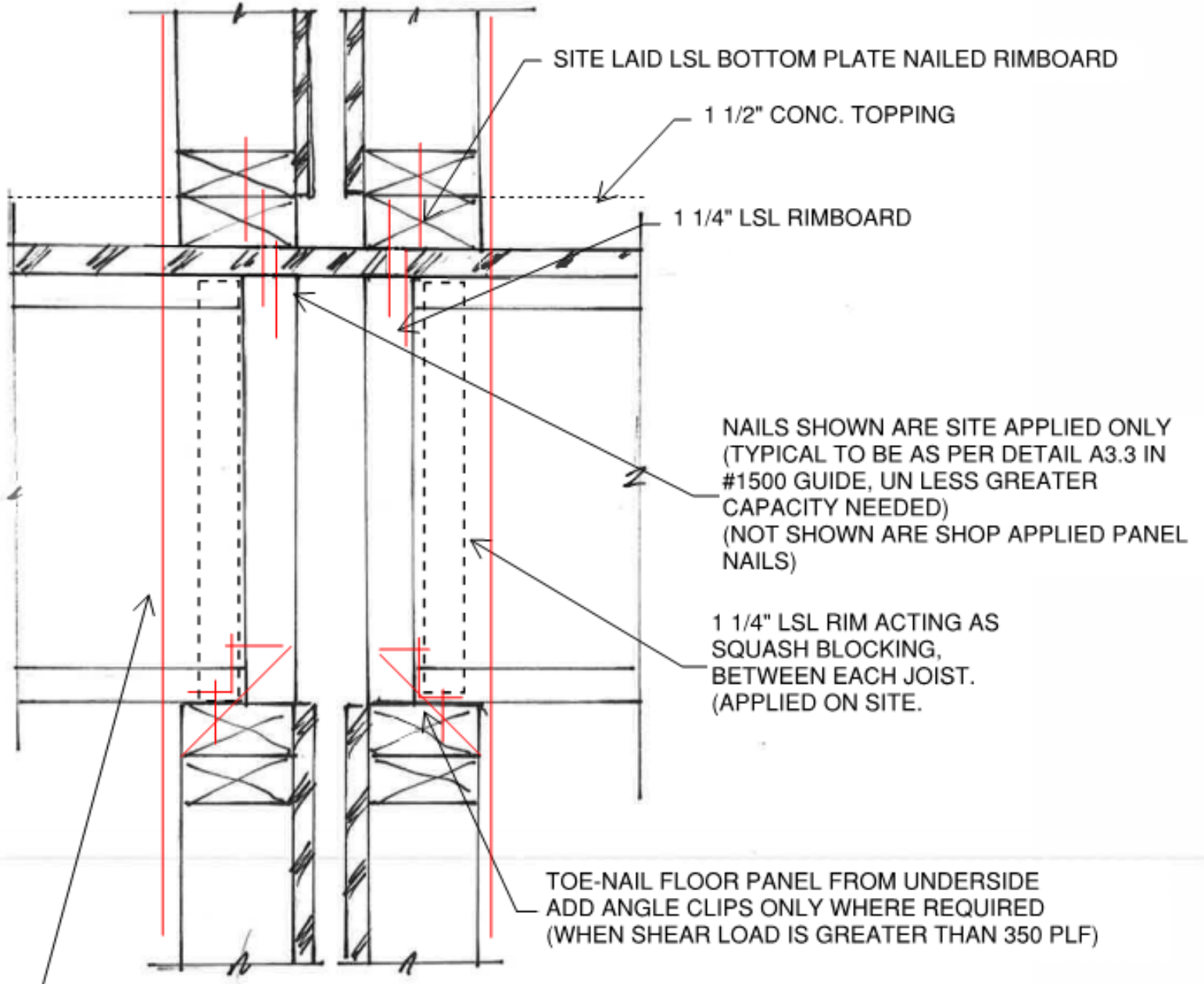
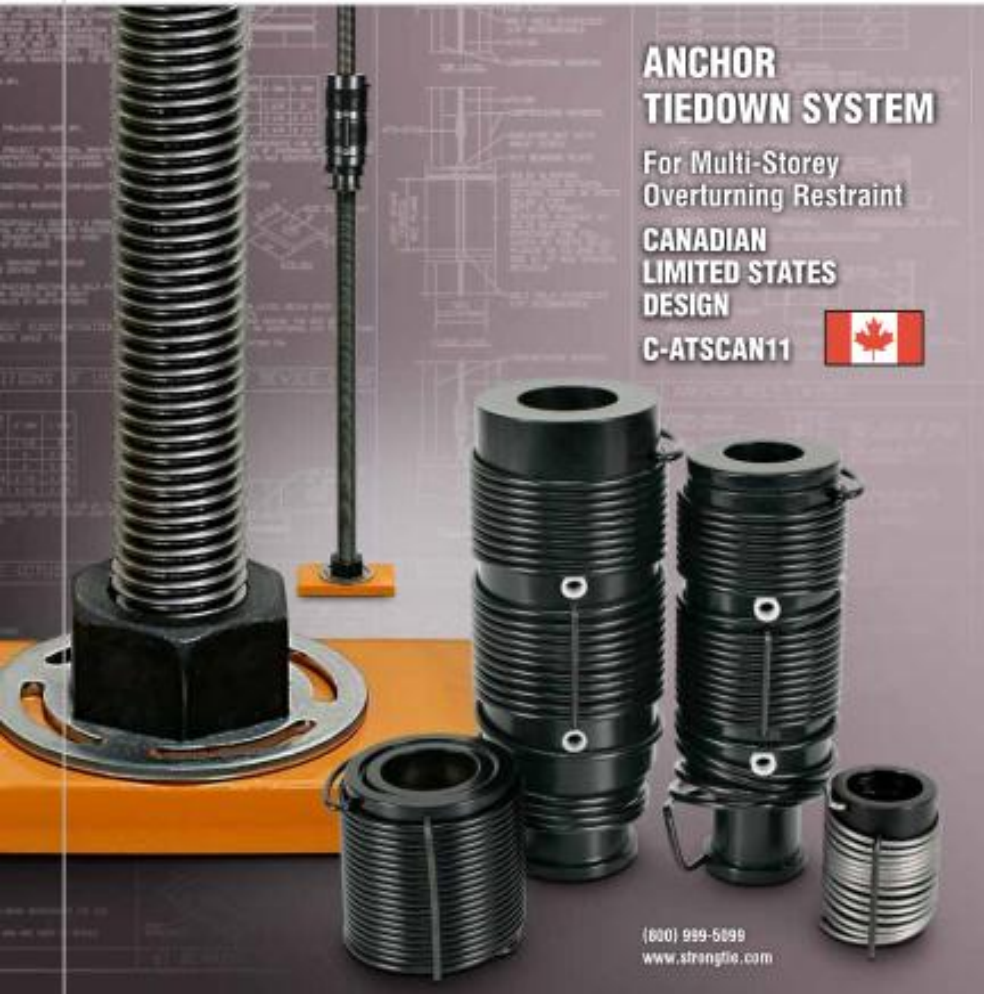
Consulting Engineers

TYPICAL PARTY WALL DETAIL



SIMPSON Strong-Tie



ANCHOR TIEDOWN SYSTEM

For Multi-Storey Overturning Restraint

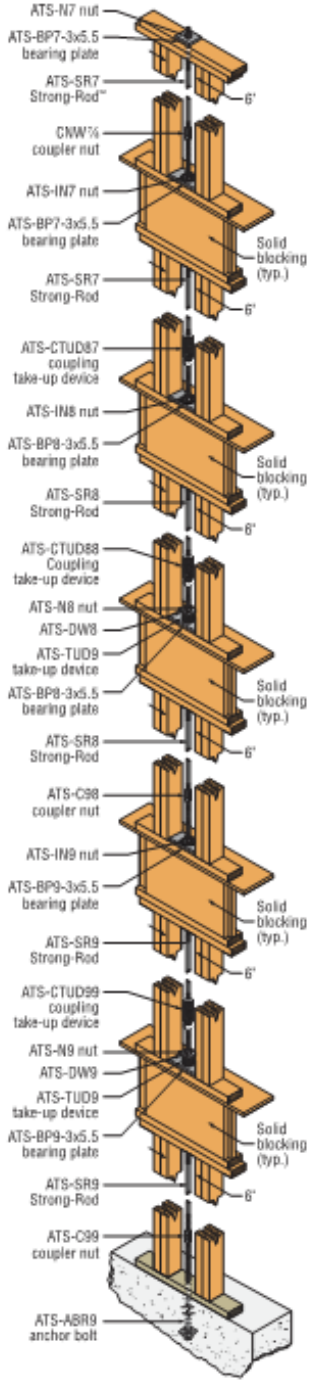
CANADIAN LIMITED STATES DESIGN

C-ATSCAN11

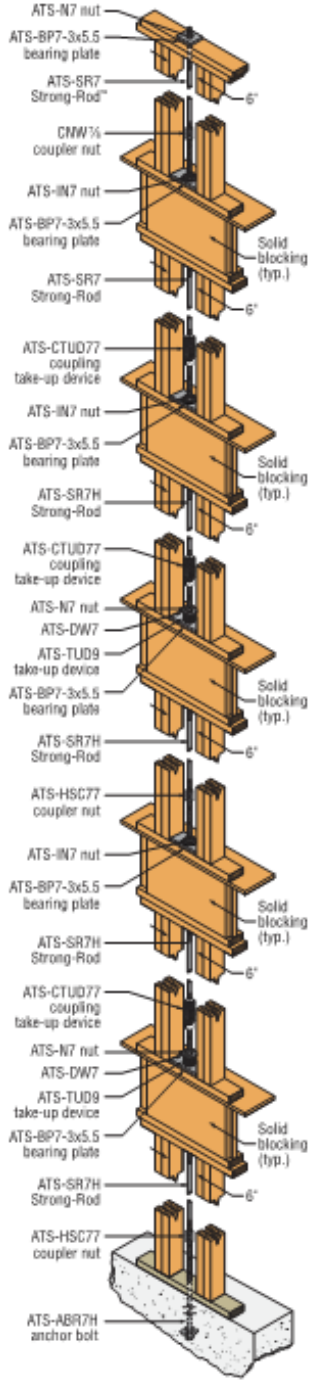
(800) 999-5099
www.strongtie.com

SIX-STOREY SYSTEMS

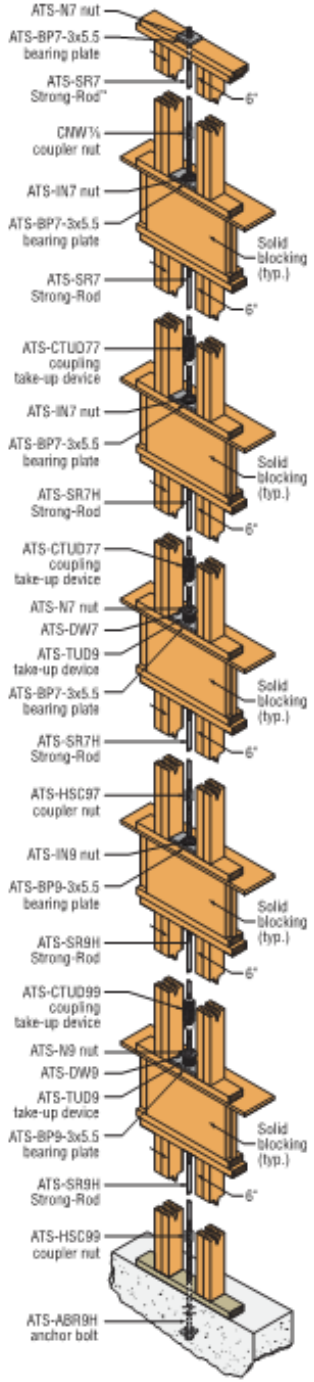
SIMPSON Strong-Tie



CTDS6-1 1/8



CTDS6-7/8H



CTDS6-1 1/8H

Anchorage-to-concrete and foundation design by Designer.

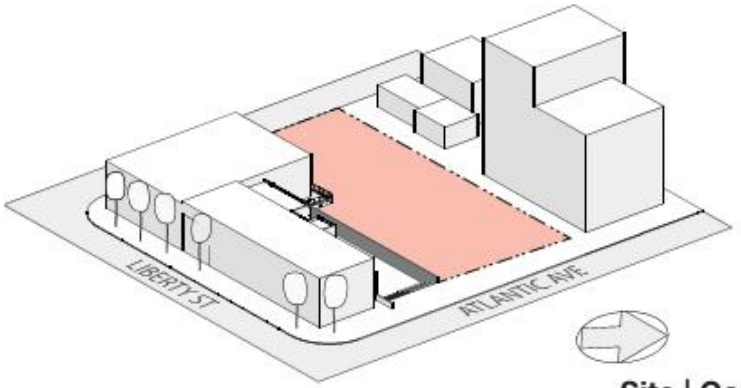
Urban Office Space

Mass/Heavy Timber

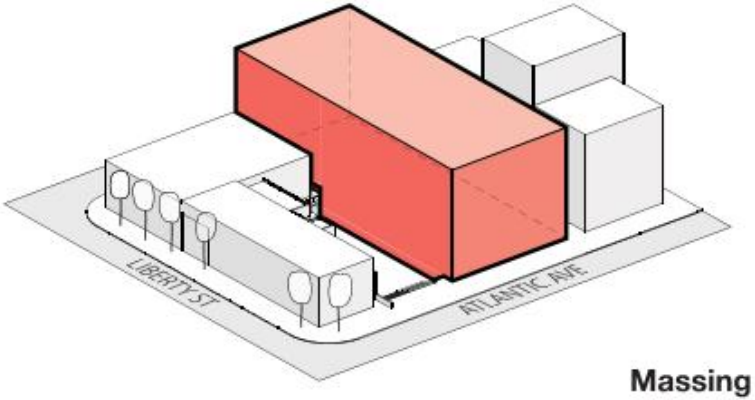
on

Concrete Podium & Parking

Site



Site | Context



Massing

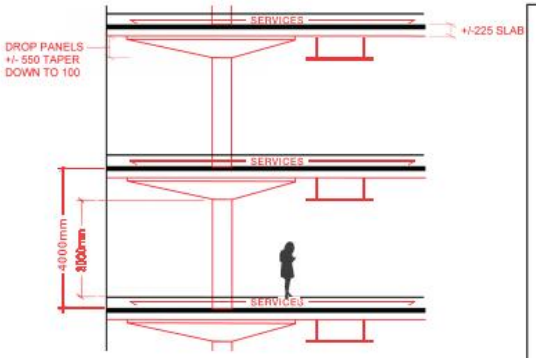
Concept / Preliminary Design

5 or 8 stories?

Conceptual Structural Options

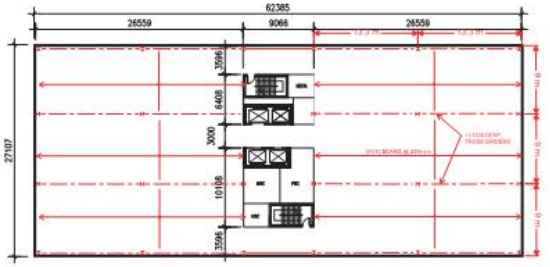
1. Reinf. Conc. Cant. Slab

1a. Reinforced Concrete Cantilevered Slab

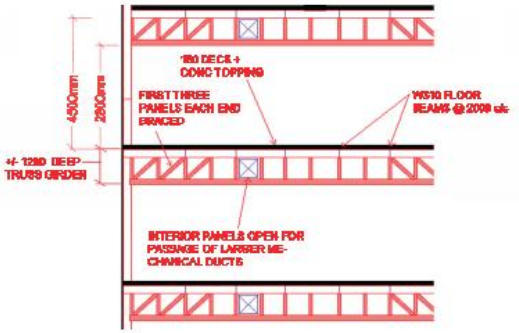


1b. Reinforced Concrete Cantilevered Slab

2. Steel Truss Girders



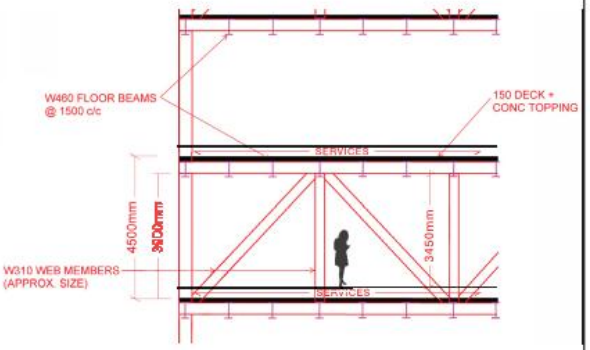
2a. Steel Truss Girders



2b. Steel Truss Girders

3. Full Storey Truss

3a. Full Storey Truss

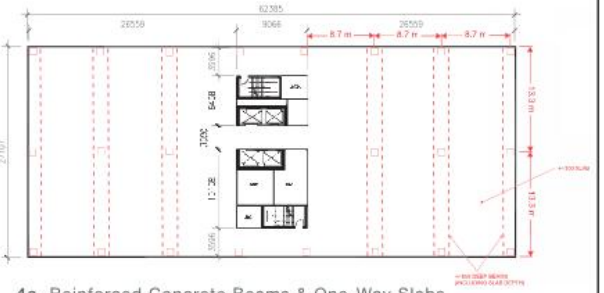


3b. Full Storey Truss

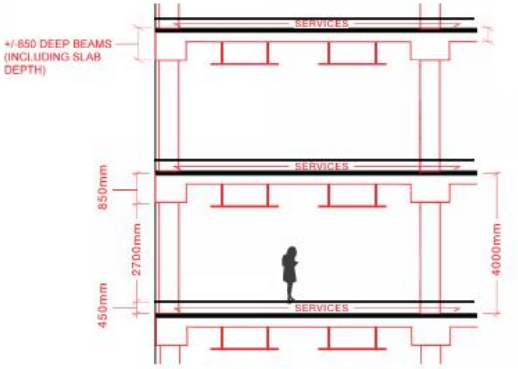
Content Provided By RJC Consulting Engineers

building studies | options

4. Reinforced Concrete Beams & One-Way Slabs



4a. Reinforced Concrete Beams & One-Way Slabs



4b. Reinforced Concrete Beams & One-Way Slabs

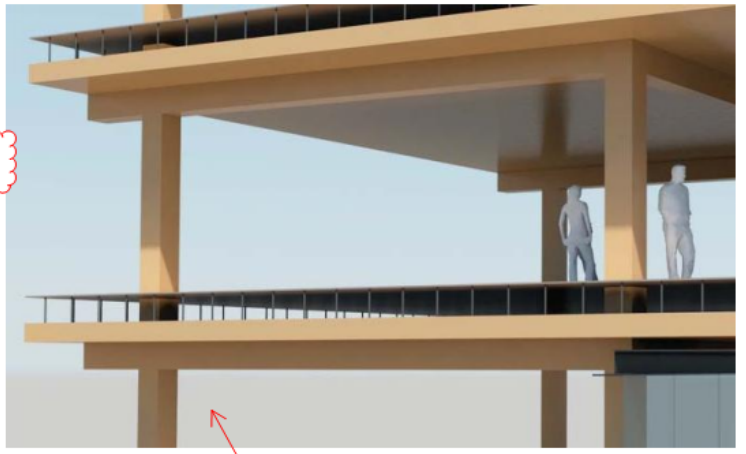
Selected Option

ISSUED FOR
STRUCTURAL WOOD
BUDGET PRICING
& DISCUSSION

ROOF (GREEN ROOF)
(PRICE SAME AS TYPICAL FLOOR)

3 TYPICAL OFFICE FLOORS OF CLT / GLULAM
(1 HR FRR - ALL CONNECTORS STEEL HIDDEN)

4 LEVELS OF
GLULAM COLUMNS



UNDER SIDE OF EXPOSED TO VIEW
TOP SIDE (CONCRETE TOPPING)

MAX. WOOD BLDG. FLR. HEIGHT
MAY. (18.0m / 59 ft)

TYP. F.F. TO F.F.

4300

450

2ND FLOOR
CONCRETE PODIUM SLAB

CAST IN PLACE CONCRETE

Reg'd 4m loading clearance

ATLANTIC AVE.

87.90

COURTYARD ELEV.

85.95

1950

SERVICES

P1
3500mm
Floor to Floor

P2
3000mm
Floor to Floor

OPTION 2b.

(4300 Floor to Floor)

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Consulting Engineers

Date 23 FEB, 2015

Designer CB/MR

Page PSK-2

ISSUED FOR
STRUCTURAL WOOD
BUDGET PRICING
& DISCUSSION

PURLINS:
365x874 D. FIR 24f-E GLULAM

CENTRAL GIRDERS:
530x874 D. FIR GLULAM
(DOUBLE 265x874)

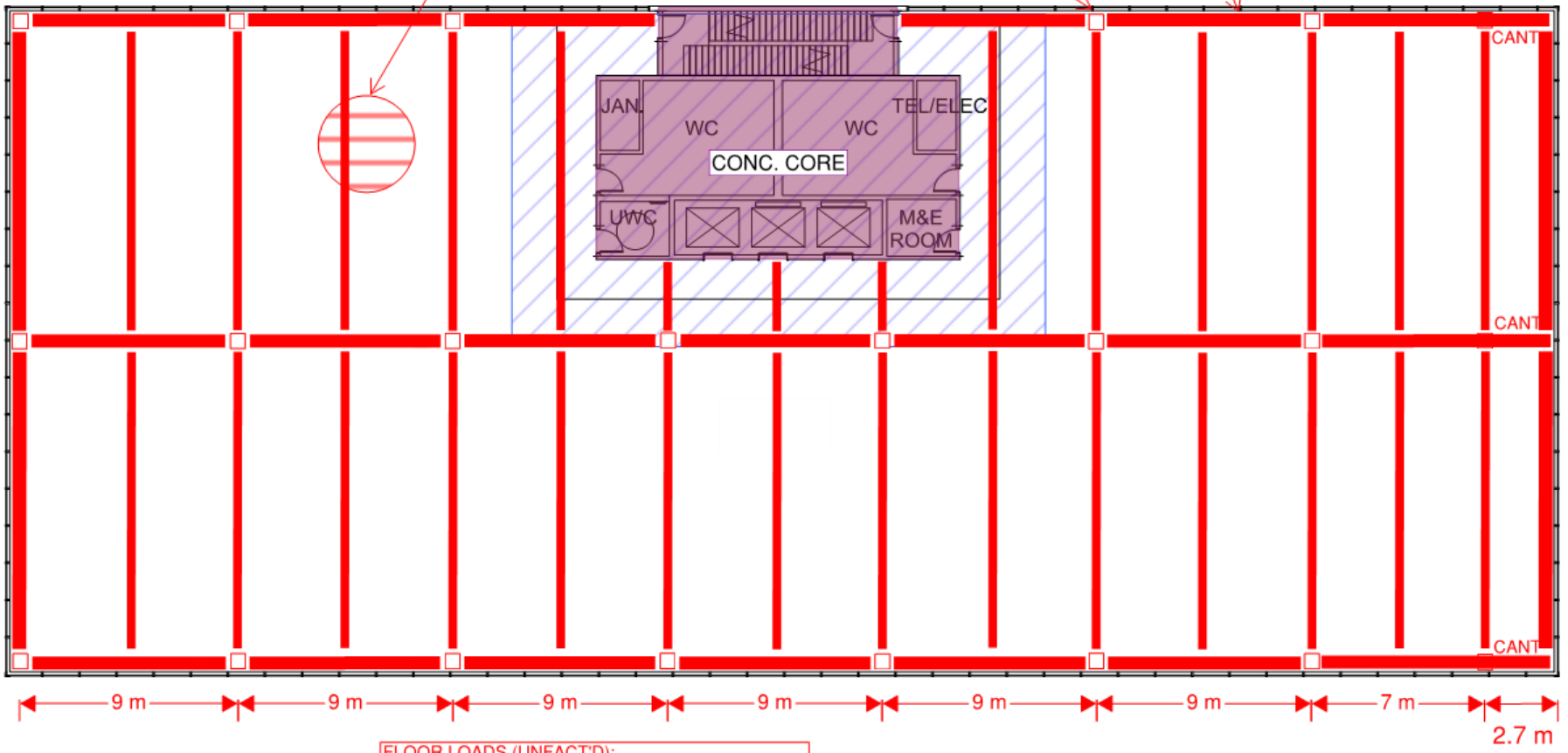
+/-162 DP. CLT PANELS
w/ 38 mm CEMENTITIOUS TOPPING

PERIMETER GIRDERS:
530x874 D. FIR GLULAM
(DOUBLE 265x874)

TYP. COLUMNS:
530x532 D. FIR GLULAM

OPTION 1

N



FLOOR LOADS (UNFACT'D):

SDL = 3.0 kPa (INCLUDES 38 mm CONC. TOPPING)
LL = 3.85 kPa TYP. AT OFFICE,
= 4.8 kPa AT CORRIDOR, NOTED THUS:

CLADDING LOADS (UNFACT'D):
(PRELIMINARY, TO BE VERIFIED)
WEST, NORTH & EAST ELEVATIONS: 17.5 kN/m
SOUTH ELEVATION: 5.5 kN/m

rjc Read Jones Christofferser
Consulting Engineers

Project	
Date	23 FEB, 2015
Designer	CB/MR
Page	PSK-3

1:200

ISSUED FOR
STRUCTURAL WOOD
BUDGET PRICING
& DISCUSSION

MAIN BEAMS:
630x1216 D. FIR GLULAM
(DOUBLE 315x1216)

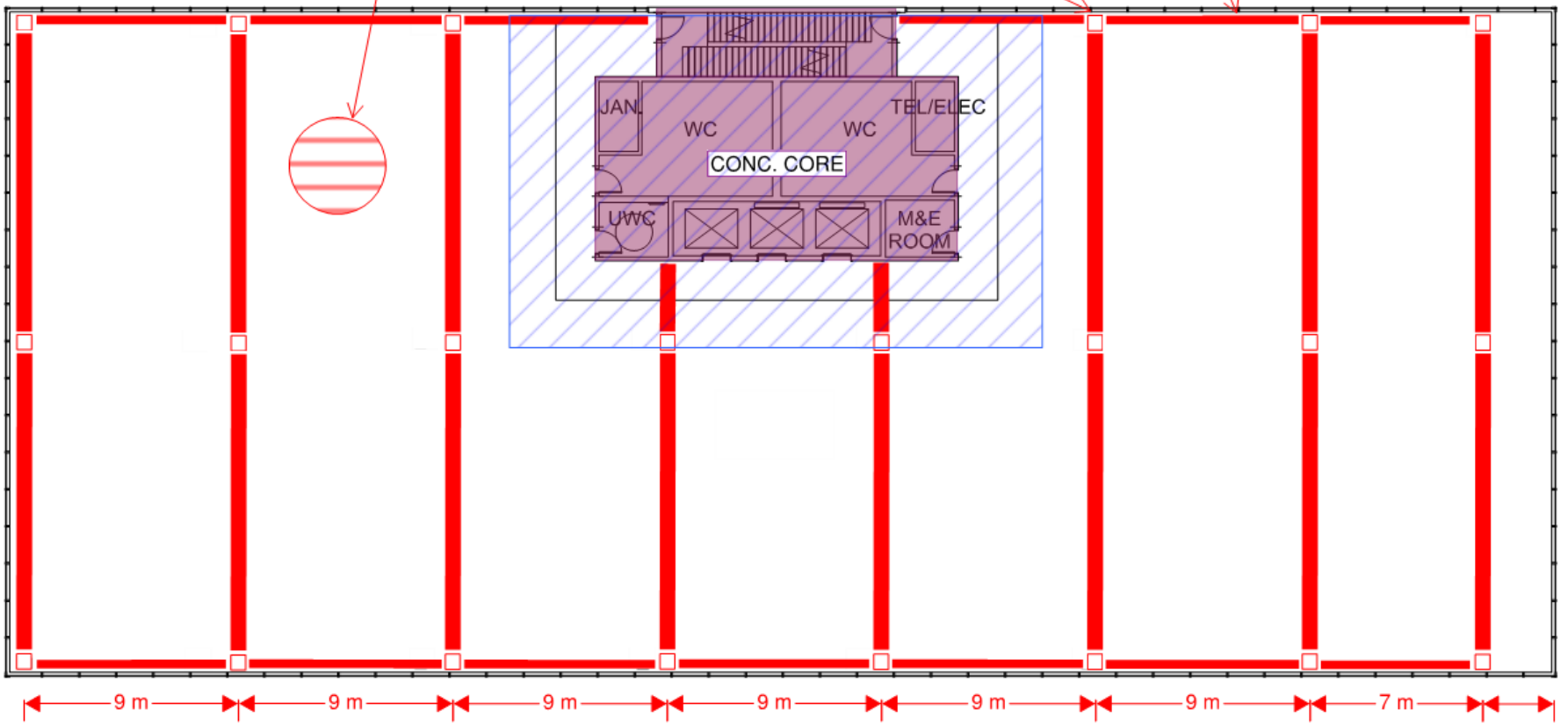
CLADDING SUPPORT BEAMS:
265x418 D. FIR GLULAM

+/-300 DP. CLT PANELS
w/ MIN 100 mm COMPOSITE
CONCRETE TOPPING

TYP. COLUMNS:
630x608 D. FIR GLULAM

OPTION 2

N



CLT CANT = 2.7 m

FLOOR LOADS (UNFACT'D):

SDL = 2.0 kPa (NOT INCLUDING CONC. TOPPING)
LL = 3.85 kPa TYP. AT OFFICE,
= 4.8 kPa AT CORRIDOR, NOTED THUS:

CLADDING LOADS (UNFACT'D):
(PRELIMINARY, TO BE VERIFIED)
WEST, NORTH & EAST ELEVATIONS: 17.5 kN/m
SOUTH ELEVATION: 5.5 kN/m

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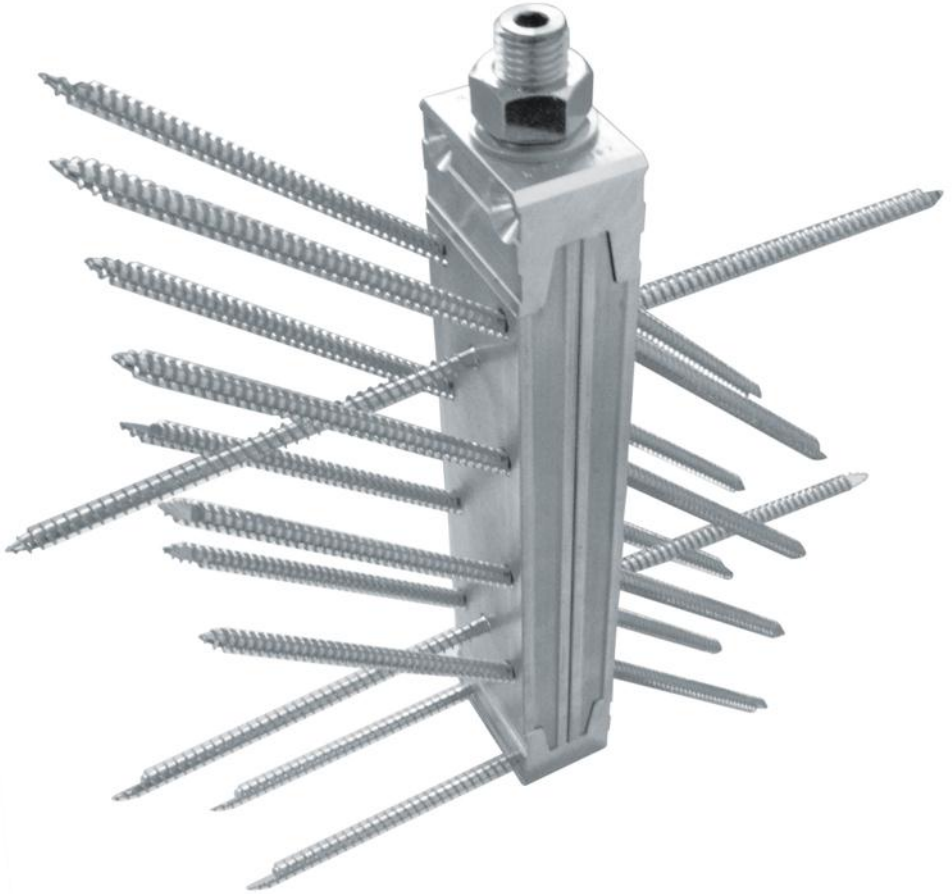
Project	
Date	23 FEB, 2015
Page	PSK-4
Designer	CB/MR

1:200

www.my-ti-con.com



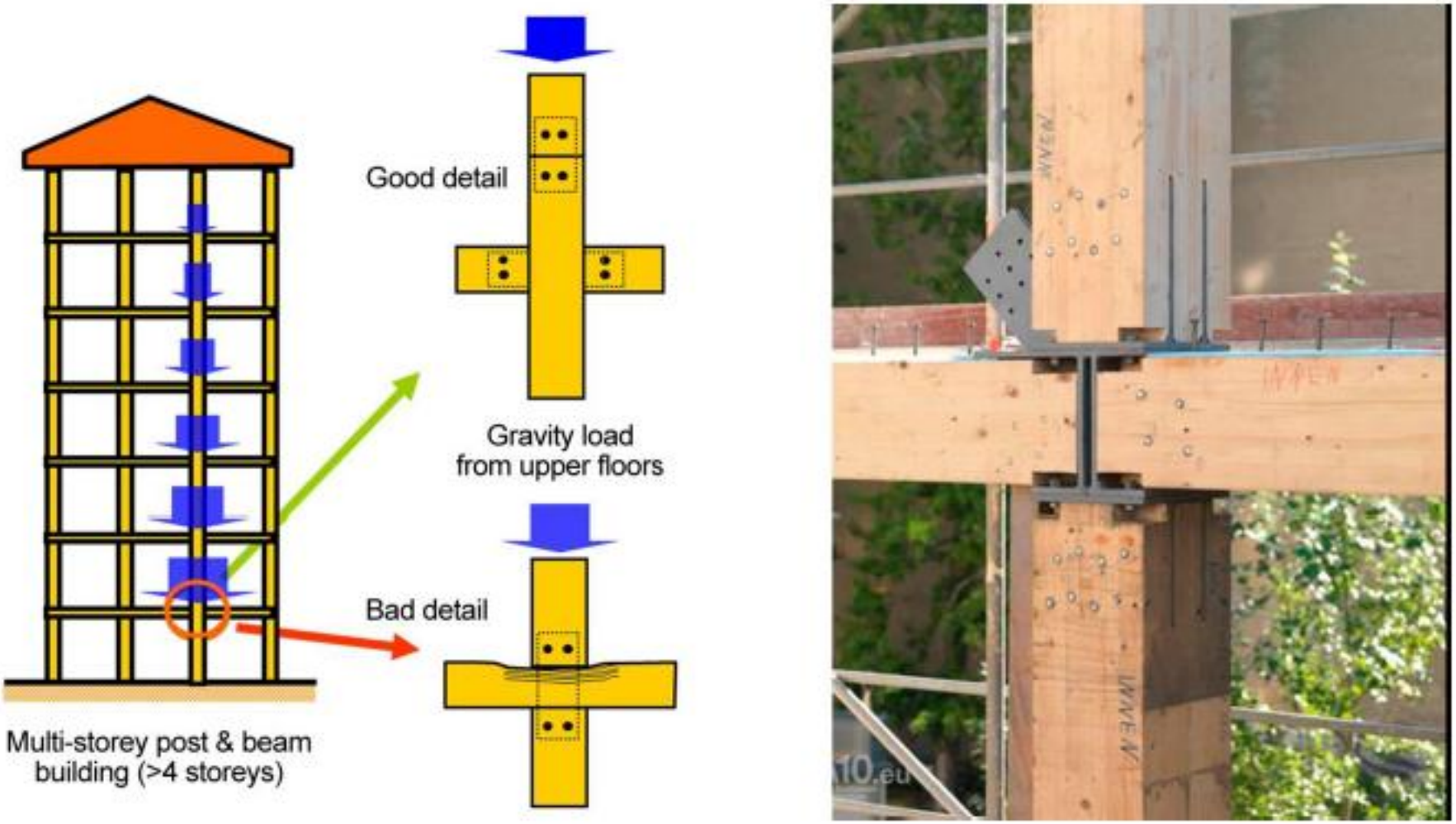


Figure 2 Post to beam connection details for avoiding excessive compression perpendicular to grain due to gravity loads

Bullitt Center, Seattle

Largest Gulam

60 ft long x 7ft tall


CB HOLE
SHAWFIELD
3 PEC 1/2 PLT.
17'4x7"


SKYJACK
KEEP CLEAR

Recommendations

- Concept Design Phase (SPA)
- Semi-Prefabrication (DD)
- Economy comes from Simplicity
- Attention to the Details
- Coordination between all trades
- Commercial Project

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Consulting Engineers

Let’s Discuss!

Thank You.

Read Jones Christoffersen
Consulting Engineers

Link to a New Promotional Material