CODE COMPLIANT UNITS . a checklist

Chicago Code Requirements & Assessment Guidance

Determine Your Building's Potential for a Safe & Sound Basement Unit

INTRODUCTION . code sources . safety intents

This chapter introduces and explains relevant Chicago zoning and building codes for the conversion of a basement unit. The Code Compliance Checklist walks through common regulations, technical experts to consult, and the codes themselves (via chapter numbers and links).

NAVIGATING THE COMPLIANCE CHECKLIST

A — CODE INTRODUCTION
The Sources & Safety Intent of Code
Zoning Codes & Building Codes
Code Compliance as Process
Inspections in Permitting & Construction

reading for general understanding

assessing your basement's conversion potential

B — SITE ASSESSMENT
The More You Know...
Research & Visual Examination
Site Plans for Notes & Annotation
Typical Units, Empty Basements
Blank Lots for Sketching

with notes for comparison

Compliance Checklist

Questions & Technical Expertise Required

1 — RESIDENTIAL ZONING
planning regulations
Does my zoning district permit an additional unit?

2 — EXISTING CONDITIONS
maintenance needs
Is my building structurally sound and maintained in good condition?

3 — STRUCTURE & LOADING
signs of decay & fatigue
Can you see structural problems in your basement ceiling or foundation walls?

4 — SLABS & MOISTURE
req. for stable, dry floors & walls
Is your basement adequately water or dampproofed? Can it support additional loading?

5 — UTILITY CONNECTIONS
req. for plumbing, heating, electric
Are your sewer, water, gas an electric lines able to sustain another unit or do you need additional connections?

6 — UNIT SIZE
height & area requirements
Is there enough space – headroom & area – for a basement unit?

7 — VENTILATION & LIGHT
air & natural light requirements
Are there enough operable windows for a basement living unit?

8 — EGRESS ROUTES
fire exit requirements
Can occupants safely exit from the unit in event of a fire?

9 — FIRE SAFETY ELEMENTS
detection & containment systems
Is the unit constructed to contain fires & alert occupants?

site / exterior observation · *examination of existing structure* · *existing & new/planned unit features*

LIST OF ISSUES TO ADDRESS, AREAS REQUIRING CONSULTATION
(see 'Mitigating Issues' for approaches, costs)

CHAPTER CONTENTS:

The 'Code Compliant Units' chapter helps you understand likely construction issues and challenges to safe inhabitation. The typical examples are based on the Two-Flat and Cottage conversions introduced in the prior chapter, with common lot sizes and Chicago construction details (i.e. brick) to anticipate issues.

In advance of the code checklist, the following pages introduce:

- **the origin and safety intent behind Chicago's Codes**, as well as pending updates
- **the process of inspection**, in determining code compliance, and
- **'template' drawings**, which you can use when observing your basement and site - taking measures, jotting down notes, tallying building aspects which require expert consultation

This section should enable you to identify issues with your existing building and planned basement unit that require technical expertise for assessment, mitigation, or design coordination. The 'Mitigating Issues' chapter will expand on the key factors behind different repairs required to meet code and provide basic budgets. Between the two sections, you should have enough information to either a) decide not to pursue a basement unit or b) start a focused and realistic conversation with an architect on designing and developing a basement unit.

CHICAGO'S CODES:

Any building within the City of Chicago is regulated under two sets of standards - the Municipal Zoning Ordinance and the Construction Codes - which establish the minimum requirements for land use and building construction. Their collaborative aim is the protection and promotion of public health, safety, and welfare.

The Zoning Ordinance, Chapter 17 of Chicago's Municipal Code, covers the zoning of land uses. It also establishes the number of units allowed per building, building height, building placement within a lot, and parking and open space requirements.

Code Updates - As of December 16, 2020, the 'Additional Dwelling Units Subsistute Ordinance' was adopted by City Council. Starting May 1, 2021 it allows for the creation of additional basement units in select pilot areas (thru May 31, 2024). This manual outlines a) the existing citywide zoning controls and b) the revised pilot rules and areas, so owner-occupants in either situation can determine basement unit potentials.

- **Get ADU ordinance and updates at:** www.chicago.gov/adu
- **Reference the Zoning Code (17) at:** bit.ly/Chicago-Zoning.

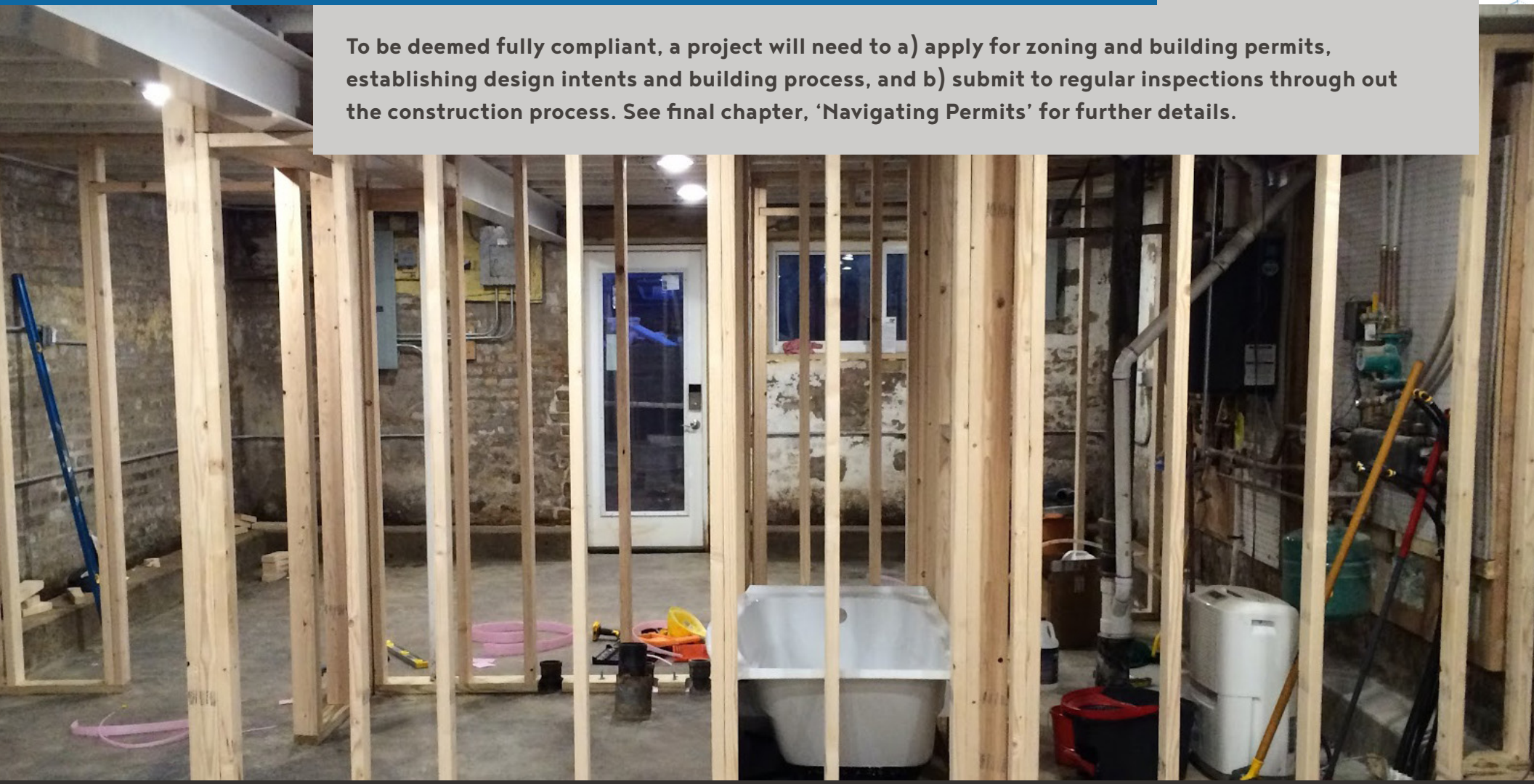
The Chicago Construction Codes, *Chapter 14A-X and 18 of the Municipal Code*, are a collection of codes that establish minimum standards for material and structural performance, interior finishes and fixtures, and fire safety requirements for structures and occupancy. Adapted from trade standards and the International Building Code, the full series regulates the construction, demolition, maintenance, rehabilitation, relocation, and use and occupancy of buildings, structures, and adjacent outdoor areas. The construction codes set minimum standards to protect occupants, visitors, and adjacent structures from the hazards of structural failure, fire, etc.

Code Updates - The Chicago Construction Codes were updated in 2019. As of August 1st 2020, all permits for new construction or alterations (without prior and ongoing phases) must be compliant with the new 2019 code. *This manual conforms to the 2019 regulations.*

- **Reference the building codes (14A-X) at ICC:** codes.iccsafe.org/codes/chicago.
- **See plumbing, mechanical (18) in the Municipal Code:** bit.ly/Chicago-Building-Infra.

INSPECTIONS . verifying construction . process . focus

To be deemed fully compliant, a project will need to a) apply for zoning and building permits, establishing design intents and building process, and b) submit to regular inspections through out the construction process. See final chapter, 'Navigating Permits' for further details.



CODE COMPLIANCE AND BUILDING INSPECTIONS

As you consider a basement project, keep in mind the larger inspection process:

Inspecting a building for code compliance doesn't happen in one swoop, but rather through a series of phased visits. Once you are granted a permit for work, you will be responsible to bring your entire building up to code. Inspectors will visit to verify that new systems have been built to code and review the condition of your existing building fabric. Multi-unit (four + flats) owners should expect annual safety inspections as well. If you take on a basement project, it is best to think of building inspection as a serial process. For instance, if you have to pour a new basement slab and update utility connections, you can expect the following visits (and more):

- Plumbing Inspection - sewage connections, trenching beneath slab (14A-5-502.6)
- Slab and Under-floor Inspection - drainage assembly, and reinforcement for slab (14A-5-502.3.2)
- Final Inspections - finished interior space (14A-5-502.3.3)

Each inspection will take place on different dates and at varying phases of project completion. For full list and timing, see 'Navigating Permits' pg 190.

In addition to the basement unit, all the common areas and units on your property need to be maintained up to code: stairways, entries, exterior finishes, and rental apartments. These areas' conditions are included in the Compliance Checklist, pg 65-67. Building inspectors have the right to access any 'public' spaces, including all rental units.

For building inspectors, minor issues can be seen as indicators of potential problems that threaten tenant health and safety, and can create bigger project management issues. Beyond incurring fines, citations from the building department can trigger additional inspections or construction permit revocation. The cost of maintenance lapses can be significant; $500 fines for violations include:

- overflowing garbage (14X-3-307.1)
- excessive weeds (14X-3-302.5)
- missing address numbers (14X-3-303.3)
- ripped or missing window screens (14X-3-303.16)
- weathering/decaying paint on exterior (14X-3-303.2)
- and *other violations of the existing structures' maintenance code* (14X-Chapter 3, Property Maintenance)

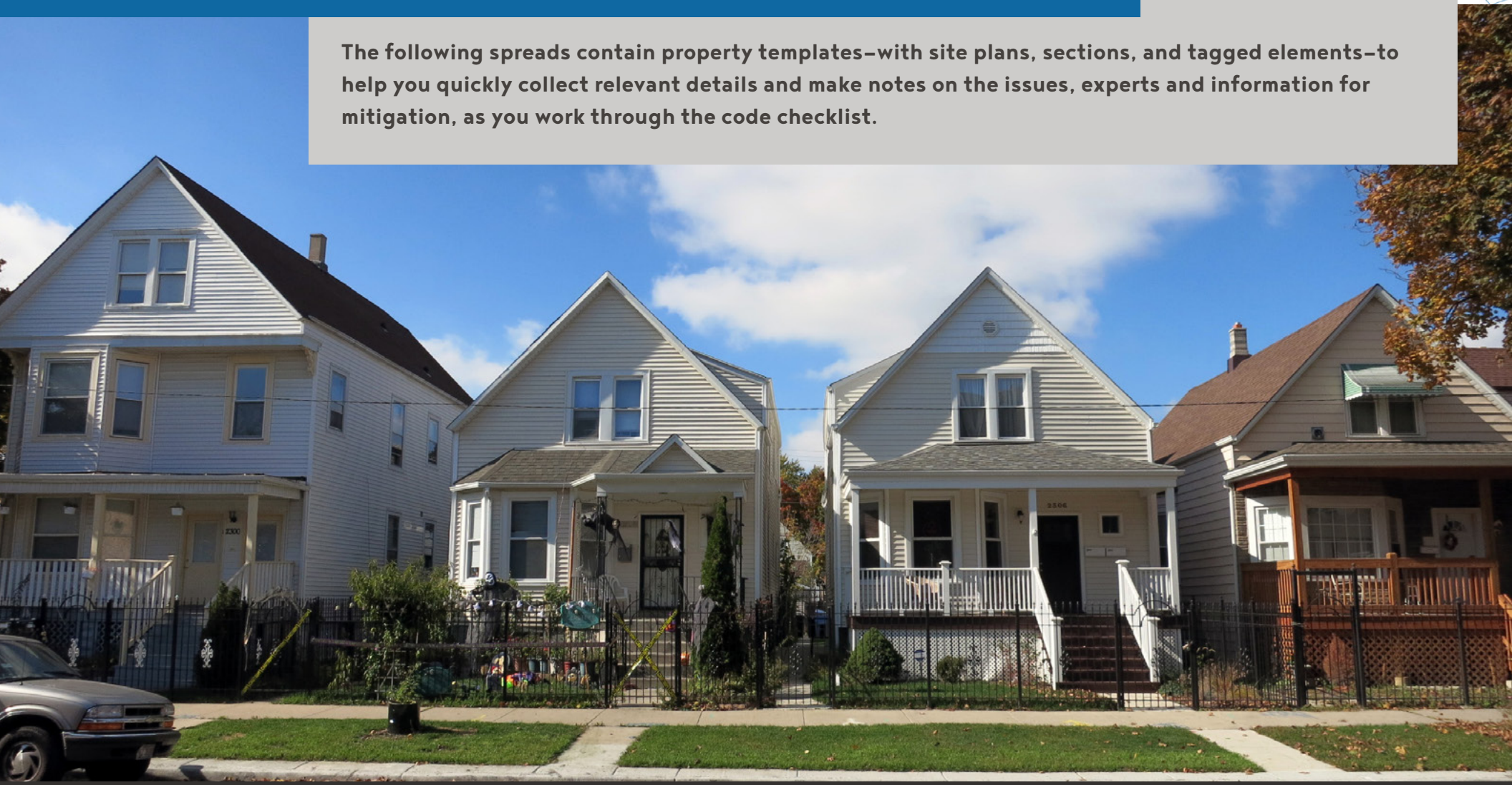
In addition, exterior issues that endanger tenants or passing pedestrians start with fines of $1,000, such as signs of foundation deterioration and structural fatigue (pg 65-67)**.** If an inspector notes exterior issues, they can file violations for 'unsafe conditions.' You would have 15 days to remedy the issue, after notice of violation, before needing to re-inspect the property to avoid fines. However, re-inspection costs ($100 each) can add up, given that 'each violation and each day that a violation continues is a separate and distinct offense.'

Broadly speaking, building inspectors will be looking for maintenance and general upkeep that demonstrate an owner's attention to building and inhabitant safety.

If you are uncomfortable with an inspection's scrutiny of existing building conditions, you should probably reconsider a basement project. **Ask yourself: would it make more sense to address existing maintenance demands (as a long term investment) than over-extend your finances in a larger alteration and conversion?**

CHECKLIST & ASSESSMENTS

The following spreads contain property templates–with site plans, sections, and tagged elements–to help you quickly collect relevant details and make notes on the issues, experts and information for mitigation, as you work through the code checklist.



PROPERTY ASSESSMENT: BACKGROUND INFORMATION

The more information you have on your building and your lot the more you will be able to anticipate conversion challenges. In addition to filling out the following templates, it would be useful to collect the following geographic and documentary information about your building:

- building age / approximate construction dates as confirmed on your property plat
- history of maintenance, renovations, and updates to building systems such as heating or plumbing
- location, in terms of: zoning districts, historic districts, transit corridors/transit-oriented development zones, Chicago's topography, flood risk zones (FEMA) or adjacent to historic stream, rivers, or marshlands
- current utility connections, capacity, and fees
- current tax assessments and historic appeals

CONSIDER THE FOLLOWING:

Building age, maintenance history, and current material condition will strongly influence whether you're facing a minor alteration or a massive construction project. Unfortunately, most homeowners have little to no written history on their property. The best way to establish basic renovation information is to look up:

- **recent tax assessments** (Cook Co. Assessor: www.cookcountyassessor.com/address-search),
- **construction permits** (Chicago Open Data: bit.ly/Chicago-Permit-Database), and
- **building footprints** (Chicago Open Data: bit.ly/Chicago-Footprints).

The first two documents will provide a record of sales, old propery liens, and recent, permitted work. The City's building footprints can be searched by address to find initial construction dates. For here, you can create a timeline of your building's construction and renovation lifespan.

Location and elevation can strongly influence the viability and ease of creating a dry basement unit, given Chicago's marshland history. In advance of geotechnical testing, you can determine if your building is flood prone by casual observation and locating it on:

- **flood insurance maps** (FEMA maps: msc.fema.gov),
- **Cook Co. Geological Atlas** (ISGS atlas: bit.ly/Cook-Geologic) and determining
- **site elevation** (Chicago Open Data: bit.ly/Chicago-Elevations).

In addition, you can determine whether your home sits atop historic marshes, stream-beds, or river banks by referencing:

- **historic quadrangles** (USGS maps: bit.ly/USGS-Chicago) and
- **old insurance maps** (Sanborn Maps: bit.ly/LOC-Sanborn-Chicago).

While different soil engineering strategies can divert water and affect drainage, sitting at a low elevation in any of these areas suggests that a project may require more intensive foundation drainage and/or waterproofing work.

Even armed with the above information, you will need to consult with technical experts. This guide is to help you ask questions and identify unknowns: can I visually confirm current conditions for estimation, or do I need a structural engineer, architect, or tradespeople? When facing particularly urgent issues for consultation and remediation (like potential structural failure or wall collapse), the text will indicate this need as follows:

This is urgent. Reach out to [specific technical expert] to assess conditions.

PROPERTY ASSESSMENT: SITE DOCUMENTATION

Adapt the generic site plans + building footprints on following pages to fit your building and assist in responding to the Code Compliance checklist.

This template-based site assessment moves from exterior to interior, from inhabited floors to basement level (with anticipated features in the proposed unit in yellow). Generally the site and building footprints are drawn at 1/8"=1' in plan, section, and elevation. The coding, on the list and in the drawings, links to the Compliance Checklist through abbreviated topic name and page number. This is to prompt you to establish locations for elements like basement exits or utility connections and take visual notes on your existing building. After the generic plans, a blank spread with 1/8" grids is provided for sketching additional details. The Compliance Checklist then elaborates on the specific relationships between observed site conditions and Chicago Code requirements.

Element Key, by Code Compliance section:

- Z# **Z = Zoning - pg 58-63**
- M# **M = Maintenance - pg 64-65**
- L# **L = Loading & Foundations - pg 66-69**
- W# **W = Waterproofing & Slabs - pg 70-71**
- U# **U = Utilities - pg 72-83**
- S# **S = Size & Height - pg 84-85**
- V# **V = Ventilation & Light - pg 86-87**
- E# **E = Egress & Fire Exits - pg 88-89**
- F# **F = Fire Detection & Containment - pg 90-91**

ELEMENTS TO DOCUMENT:

Site or lot:

All the following dimensions will be noted on your plat of survey. As you must submit a plat with any permit applications, order a copy for planning purposes.

Z1 Dimensions:

- width: typical lots range from 25 and 30 to 45 feet in residential areas, with larger sites where parcels have been combined
- depth: typical lots range from 100 and 125 to 175 feet but may vary given diagonal streets and irregular alleys

- Lot location: mid-block, corner or alley abutting location,
- Lot access: street front, alley access, existing curb-cuts or driveways, note all path dimensions and locations

General Building/Open Area Footprints:

Z2 Exterior building footprint - pull from city maps, plats, or hand measure

- Measurement and location of outdoor elements:

E1 exterior stairways or porch stairs (note: second exit from third story of occupied space is required)

Z3 building offsets from property lines and fences

Z4 parking, decks, patios, porches (general open space) and areaways

U1 visible utility connections on exterior (gas meters) or site drainage systems

Entry/First floor general plan and common spaces

E2 Hallways and stair measurements

- stairway width and landings width, depth
- railing locations, conditions, height
- individual steps: vertical rise, horizontal run, total count of steps per floor

E3 common hallway width, height, and clearance minus any doors (when fully opened against the wall)

- placement and condition of units' entry doors along hallways

L1 Approximate wall placement in first/entry level unit –

- locations, wall thicknesses for considering additional columns or joist repairs in basement
- identify wall materials if possible

M1 Any existing signs of structural deterioration and surface decay

- uneven trim with gaps at baseboards,
- non-plumb walls and plaster cracks
- discoloration from moisture, mold
- warped boards around areas of thermal expansion, etc.

F1 Existing smoke detectors (sprinklers if applicable)

Basement level – overall conditions

S1 Interior dimensions of existing space: width, length, clear height and variations in ceiling height with ductwork, radiators, etc.

L2 Foundation walls:

- thickness, estimate with measurements at windows
- material(s), location of change to materials in upper floors
- height from floor to ground level

W1 exterior water or dampproofing – visible just above ground level – & roof drainage

L3 Additional bearing columns, size, and footing size

- supported girders, size and span

L4 Ceiling assembly, if visible:

- joist sizes, spans, spacing and signs of deflection
- existing lath/plaster or wallboard coverings

W2 Condition of existing floor/slab – cracks, joints, settling, slopes, existing floor drains, radon exhaust lines

V1 Door and window locations, size, and operability

- any connected light wells, their dimensions

- Utility connections and areas

U2 quick diameter measurements per water, sewage line (+ total fixture counts/line) for estimating capacity

U3 any exhaust/venting systems and their location – for heating, sewage, radon, etc.

- appliances like heaters, water heaters, electrical breakers, etc. as well as existing pumps or subsoil drainage access

Proposed Unit (hypothetical)

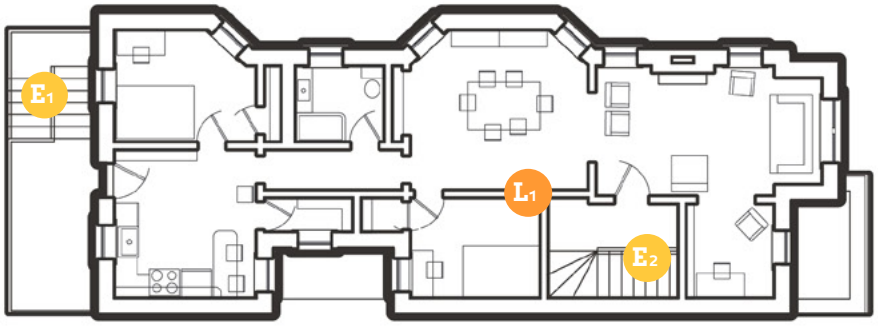
S2 General interior dimensions/layout and wall locations

E4 Zones to be left in common: utility rooms, access to utilities, shared exit and entry paths, other units' storage

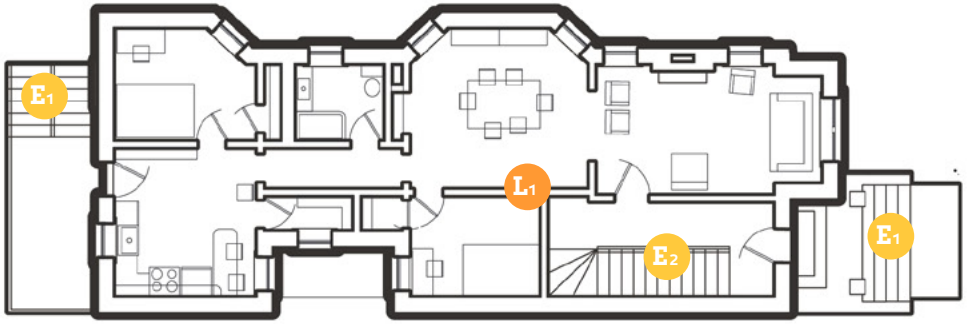
V2 Any new door/window openings

U4 Anticipated utility or drainage connections for kitchens, baths

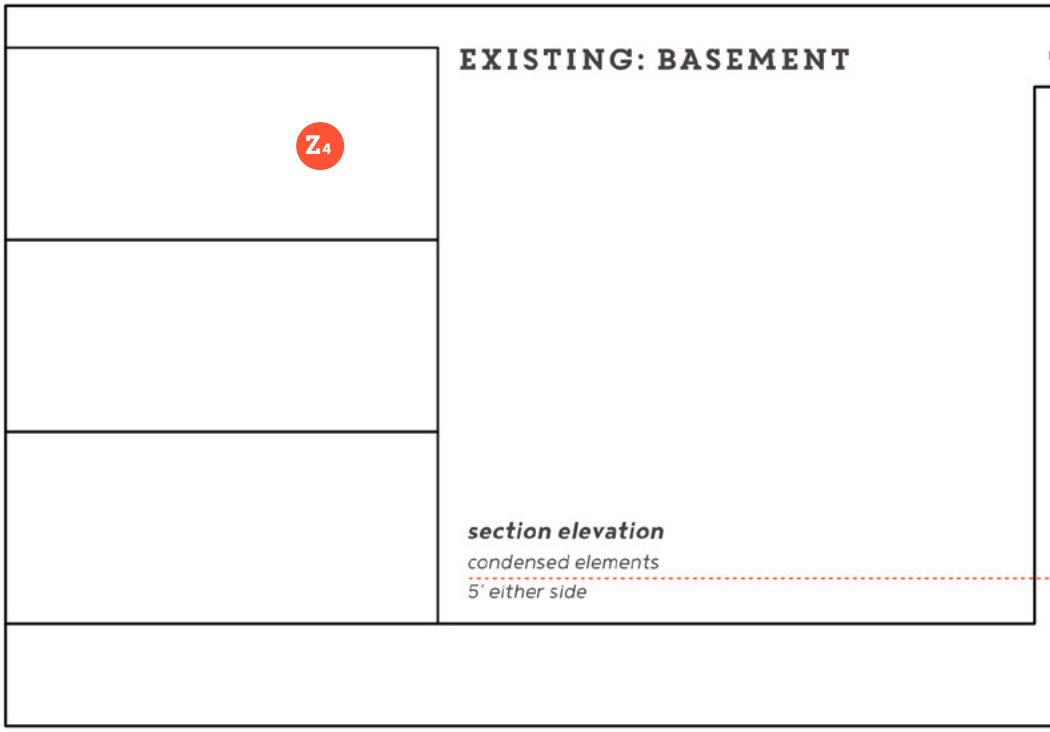
1:16 EXISTING: SECOND FLOOR APT



EXISTING: FIRST FLOOR APT



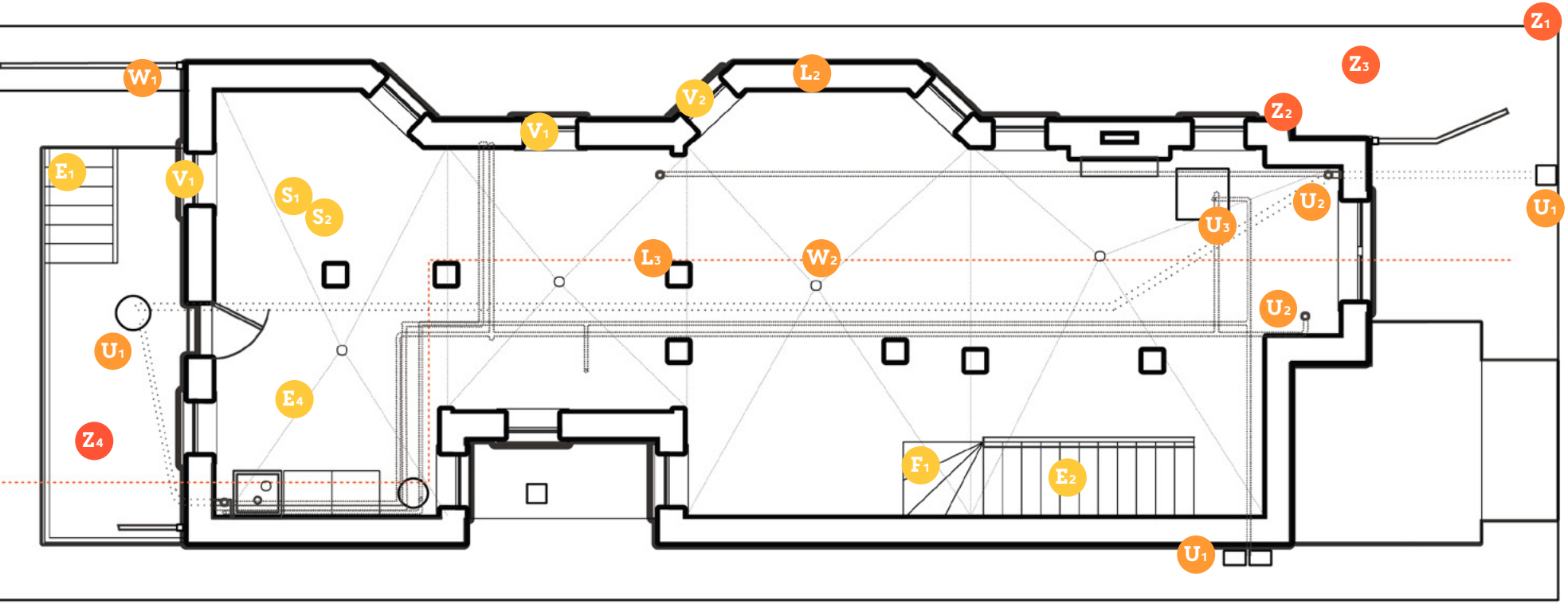
EXISTING: BASEMENT

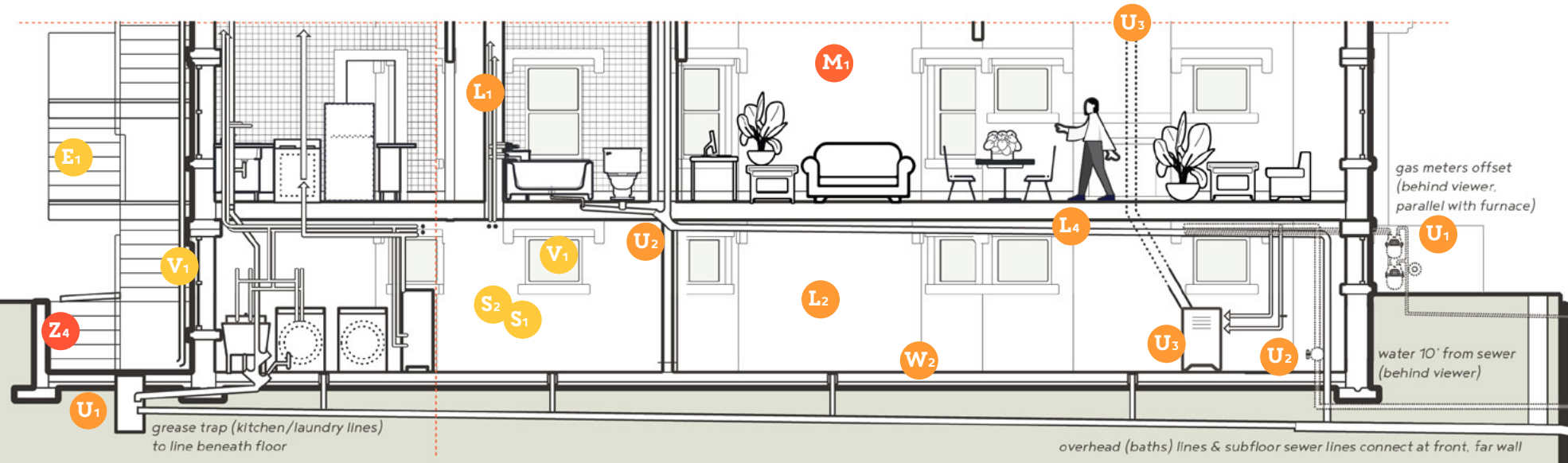


1:64

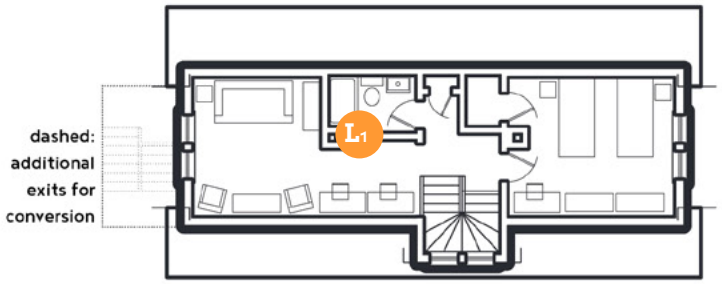
1:8

TWO-FLAT EXAMPLE
MID-SIZED LOT

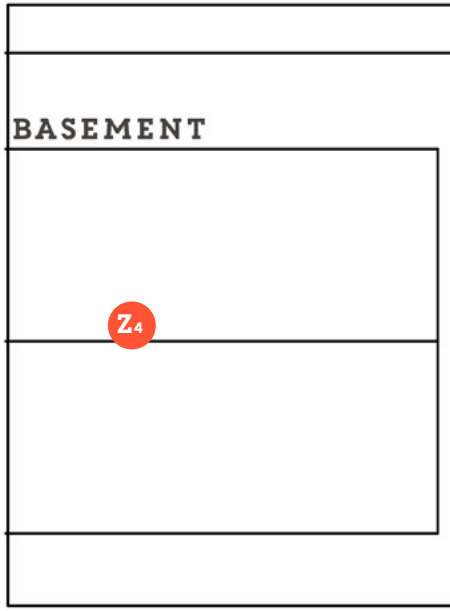

W1
V1
V2
L2
Z1
Z3
Z2
E1
V1
S1
S2
L3
W2
U2
U3
U1
U1
U2
E4
Z4
F1
E2
U1


U3
M1
L1
E1
gas meters offset
(behind viewer,
parallel with furnace)
L4
U1
V1
U2
V1
S2
S1
L2
Z4
W2
U3
U2
water 10' from sewer
(behind viewer)
U1
grease trap (kitchen/laundry lines)
to line beneath floor
overhead (baths) lines & subfloor sewer lines connect at front, far wall

1:16 EXISTING: SECOND FLOOR OF SINGLE-FAMILY HOUSE

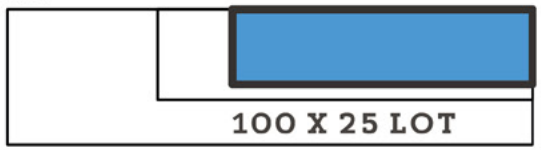


EXISTING: BASEMENT

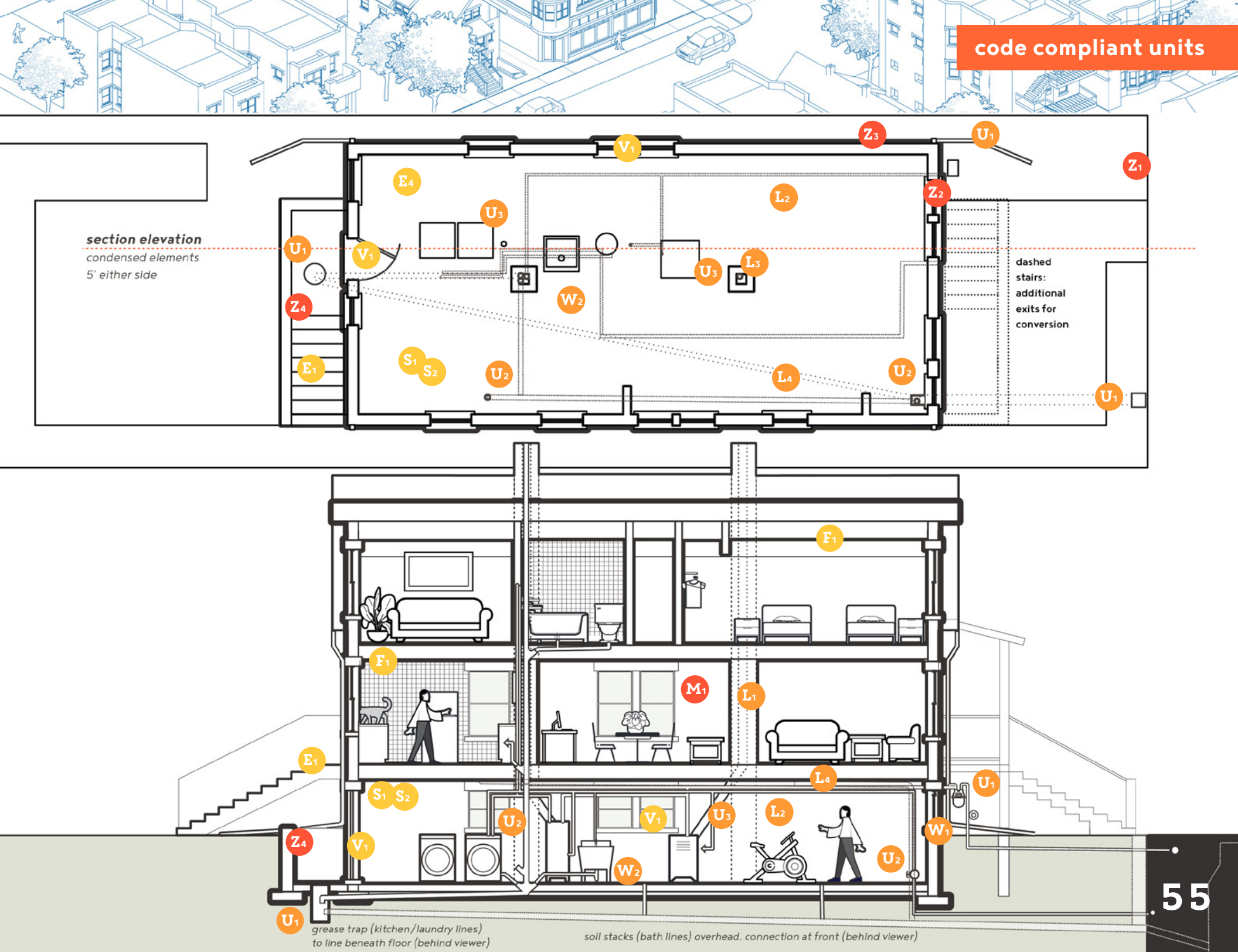


EXISTING: FIRST FLOOR OF SINGLE-FAMILY HOUSE

1:64



1:8


section elevation
condensed elements
5' either side
dashed stairs: additional exits for conversion
grease trap (kitchen/laundry lines) to line beneath floor (behind viewer)
soil stacks (bath lines) overhead, connection at front (behind viewer)

property assessment continued

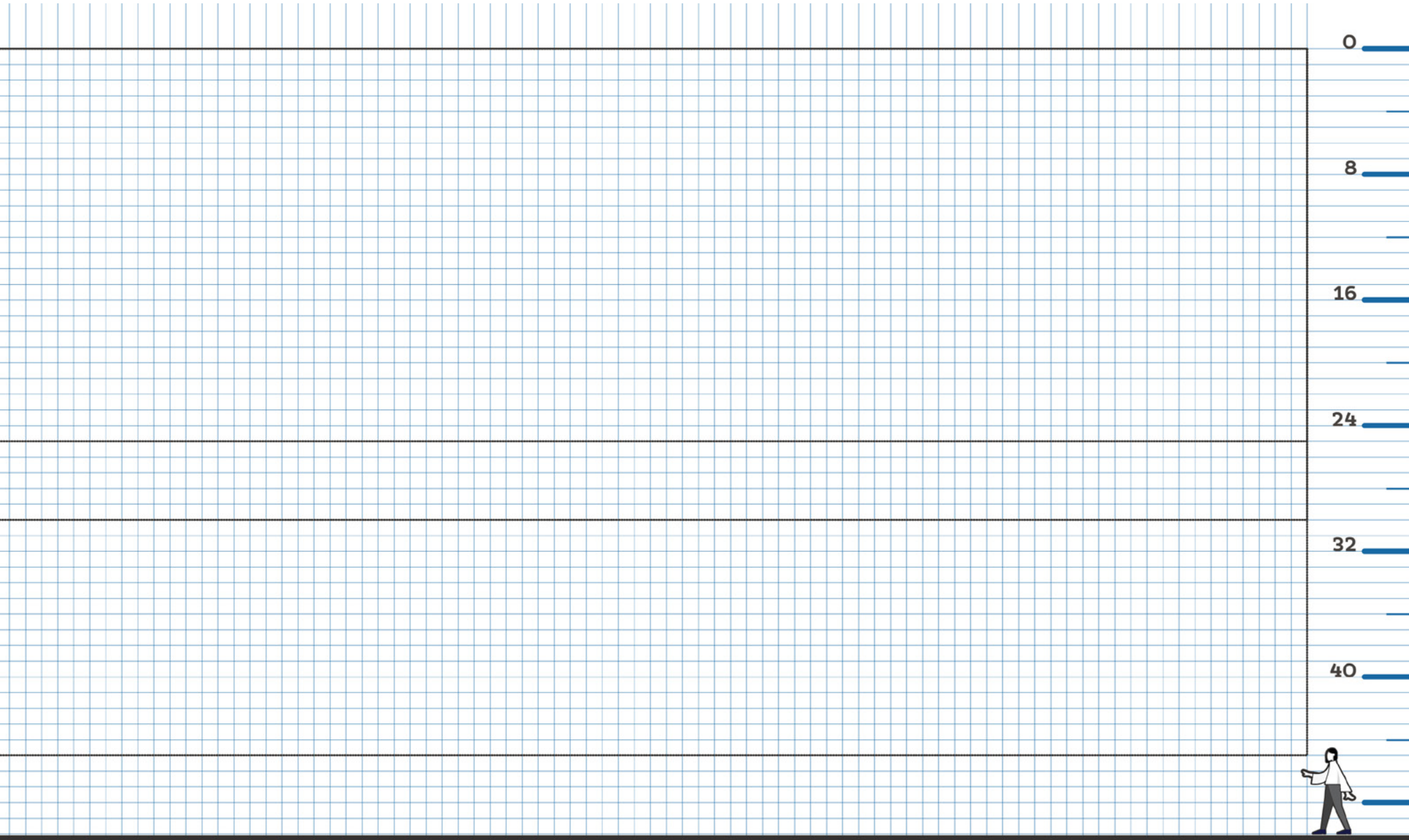
1:8

175 X 45 LOT *(truncated)*

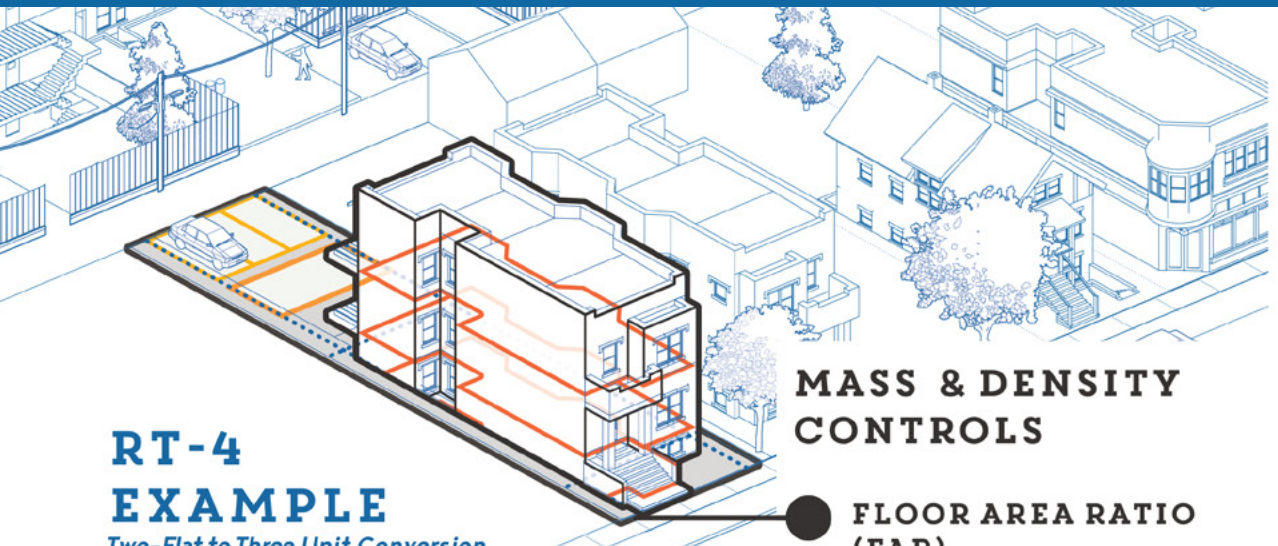
125 X 30 LOT

100 X 25 LOT

code compliant units



RESIDENTIAL ZONES . density . open space . parking



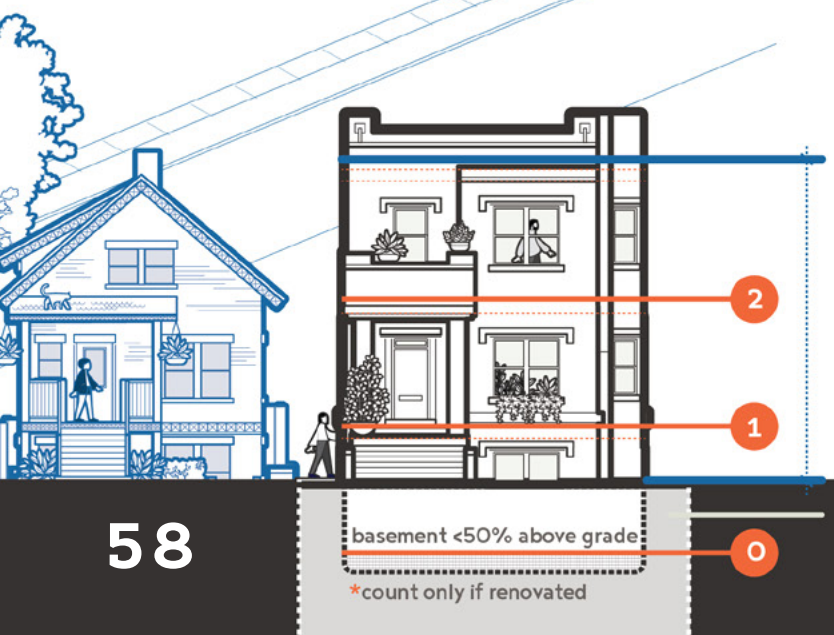
RT-4 EXAMPLE

Two-Flat to Three Unit Conversion

MASS & DENSITY CONTROLS

FLOOR AREA RATIO (FAR)

building areas sum
—————
total lot area



BUILDING HEIGHT

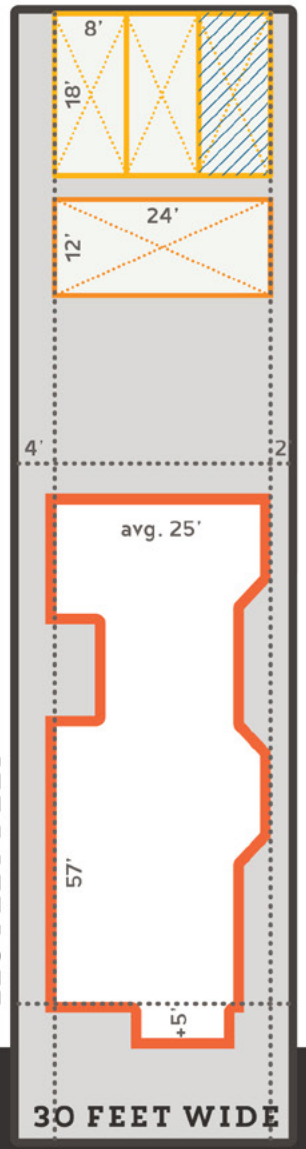
ground level to avg. roof surface

BUILDING AREA

sum horizontal areas (+ attics over 6' 9") include all stories*

LOT AREA

area of property



PRESCRIBED RELATIONSHIPS

RT-4 ratios, *lot measures in italics*

/// * = not necessary in pilot ADU areas

PARKING

1 space/unit in RT-4 citywide
***no space req. for pilot unit**
432 sq feet total

OPEN SPACE

larger value: 65 feet/unit or 6.5% of lot; 12 feet min/side
***no space req. for pilot unit**
243 req. 288 sq feet shown

OFF-SETS/BULK

- 50 feet at rear, or 33%
- 15 feet or adjacent avg. at front
- 20% or 2 feet per side

4 feet + 2 feet

BUILDING & LOT AREA

1000 sq feet lot/unit
***no lot minimums/pilot unit**
1330 sq feet/unit or floor
3990 sq feet building total

3990 sq feet / *3750 sq feet* = **1.064 FAR**

1.2 FAR allowed

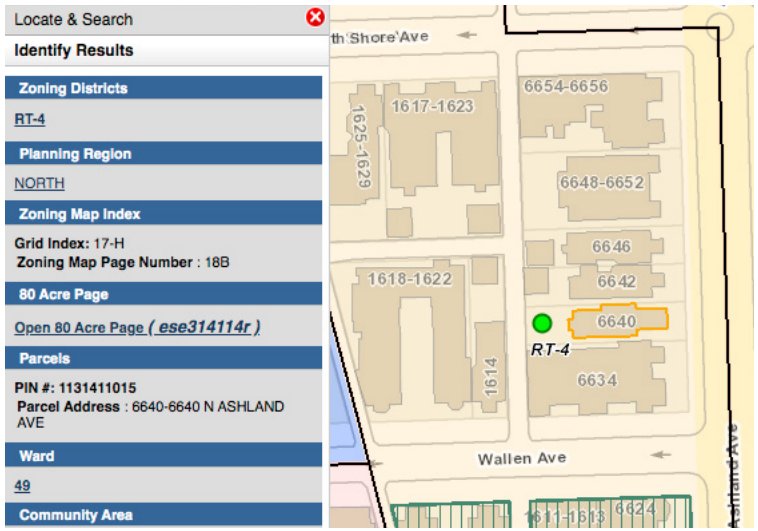
LOT AREA

1650 sq feet min
3750 sq feet

THE PRINCIPLES OF ZONING:

Chicago's initial zoning ordinance was established in 1923 and significantly revised in 1957, aiming to separate incompatible uses and direct neighborhood development. At the scale of your property, zoning regulates a) use: how many units you can have within your building, b) density: how much lot area, parking and open space (lawn, patio) each unit should have, and c) bulk: how far from the lot lines (i.e. offsets) you can build new elements. You'll need to determine your zoning district (directions below) to make sure you're able to add another unit to your building. If a unit exceeds allowed use, density, or bulk standards, you can apply to the Department of Planning and Development for an administrative adjustment (see 'Navigating Permits,' pg 182).

A **zoning district** is an area geographically demarcated by the City and coded for allowable uses. To find your district, go to the **Chicago Zoning Map** – gisapps.chicago.gov/ZoningMapWeb – and search by your address. Once you have the district code, you can confirm the uses



Lot identification on the Chicago Zoning Map

intended by the City (see tables next page). To calculate the density of units allowed on your lot – the Floor Area Ratio – you'll need to know the sum of inhabited areas in your building (left, Building Area) and divide it by area of your lot.

Your zoning designation is defined by a combination of letters (Use Group) and numbers (Use Type). The example at left is in an 'RT-4' district. Use Group R covers all residential uses; your building is most likely in an RS (detached housing) or RT (Two-Flat, Townhouse and Multi-Unit) district. Use Type ascends from 1 to 6.5 and signifies allowable density. RS-3 , RT-3.5, and RT 4 allow for two or more flats per property. The zoning tables (next page) then specify additional characteristics. For an RT-4 property, this includes a maximum Floor Area Ratio of 1.2 and minimum lot area of 1650 sq feet, with 1000 sq feet of lot per unit, with additional open space, offsets, and parking requirements, as diagrammed in Prescribed Relationships.

Effective May 1, 2021, in pilot areas' zoned RS-2 +, the Additional Dwelling Unit ordinance allows for a residential property to add a 'conversion' basement unit by right. This applies to buildings over 20 years in age but cannot be built on a property with a carriage house. See pg 62.

DOCUMENTS FOR ASSESSING ZONING:

- **Zoning for your Lot:** The Chicago Zoning Map
- **Zoning Ordinance (**17-2, 17-10**) + Additional Dwelling Units substitute Ordinance (**Amendment**)** (summarized in drawings)
- **General dimensions of your lot & building floors as** a) lot areas: overall, parking spaces, and open areas, b) distances from your building to lot edges, alleys, and public sidewalks; and c) the gross area of each occupied floor + anticipated basement unit.

IS YOUR UNIT ALLOWED UNDER CHICAGO'S ZONING?

Hypothetical answers, in blue outlines, are based on RT-4 classification and the Two-Flat + basement conversion on last spread. Colors key to example; low saturation = lower density areas (less likely to allow additional units).

Use your site measurements and district classification to see if you can add another unit.

Under current zoning, single family homeowners in areas RS-3 or higher can add a unit to become a two-flat building. Given the small size of many RS-3 Chicago lots, the owners will likely need to get an administrative adjustment from the Department of Building and Planning to accomodate variances in density, parking, and open space requirements.

Likewise by 'use', Two-Flat owners in areas RT-3.5 and higher can add an extra unit to become a multi-unit building of three + flats. Again, Chicago's small lot sizes mean you may also need an administrative adjustment for bulk and density issues.

The tables on this page apply citywide, outside the ADU pilot areas. For those locations and the revised pilot rules, see the following pages, 62 and 63.

1. Does your zoning district permit multiple units or Two-Flats? (17-2-0207)

17-2-0207 Use Table and Standards.

USE GROUP		Zoning Districts									
Use Category		RS	RS	RS	RT	RT	RM	RM	RM	Use Standard	Parking Standard
	Specific Use Type	1	2	3	3.5	4	4.5	5-5.5	6-6.5		
P= permitted by-right S = special use approval req'd PD = planned development approval req'd - = Not allowed											
RESIDENTIAL											
A. Household Living											
1.	Detached House	P	P	P	P	P	P	P	P		§ 17-10-0207-A
2.	Elderly Housing	-	-	-	P	P	P	P	P		§ 17-10-0207-A
3.	Two-Flat	-	-	P	P	P	P	P	P		§ 17-10-0207-A
4.	Townhouse	-	-	-	P	P	P	P	P	§ 17-2-0500	§ 17-10-0207-A
5.	Multi-Unit (3+ units) Residential	-	-	-	P	P	P	P	P		§ 17-10-0207-C
6.	Single-Room Occupancy	-	-	-	-	P	P	P	P		§ 17-10-0207-B

2. Can you meet the district's minimum Open Space Requirements with a new unit? (17-2-0307)

District	Minimum Rear Yard Open Space (square feet per dwelling unit/% of lot area, whichever is greater)	Minimum Dimension on Any Side (feet)
RS1	400/6.5	20
RS2	400/6.5	20
RS3	225/6.5	15
RT3.5	100/6.5	12
RT4	65/6.5	12
RT4A	65/6.5	12
RM4.5	50/6.5	10
RM5	36/5.25	10

3. Does your building meet the district's Minimum Lot Area per Unit with an additional unit? (17-2-0303)

District	Minimum Lot Area per Unit* (square feet)
RS1	6,250
RS2	5,000
RS3	2,500, except as expressly allowed in Sec. 17-2-0303-B
RT3.5	1,250
RT4	Dwelling units: 1,000 Efficiency units: 1,000 SRO units: 500
RM4.5	Dwelling units: 700 Efficiency units: 700 SRO units: 500
RM5	Dwelling units: 400 Efficiency units: 400 SRO units: 200
RM5.5	Dwelling units: 400 Efficiency units: 400 SRO units: 200
RM6	Dwelling units: 300 Efficiency units: 135 SRO units: 135
RM6.5	Dwelling units: 300 Efficiency units: 135 SRO units: 135

4. Is your building below the district's revised maximum Floor Area Ratio (FAR) with an additional unit? (17-2-0304)

District	Maximum Floor Area Ratio*
RS1	0.50
RS2	0.65
RS3	0.90
RT3.5	1.05
RT4	1.20 (See accessible dwelling unit exceptions, Sec. 17-2-0304-B)
RT4A	1.50 for multi-unit buildings that contain no more than 19 dwelling units and in which at least 33% of the units are accessible dwelling units 1.2 for all other buildings
RM4.5	1.70
RM5	2.00
RM5.5	2.50
RM6	4.40; premium may apply - See Sec. 17-2-0304-C
RM6.5	6.60; premium may apply - See Sec. 17-2-0304-C

5. Can you meet the district's minimum Parking Requirements with an additional unit (count the new unit)? (17-10-0207, 17-10-1000*)
If not, are you in an area designated for transit-oriented reductions (17-10-0102)**, or could you meet a 50% reduced requirement, by administrative adjustments, to preserve open-space as noted below?**

District	Minimum Automobile Parking Ratio (per unit or gross floor area)	Minimum Bike
17-10-0207-A Parking Group A. (Detached Houses, Two-flat, Townhouses)		
RS1 and RS2	2 spaces per unit, provided that off-street parking is not required for detached houses on lots of records that are 33 feet or less in width if the subject lot does not have access to an improved alley and provided further that the Zoning Administrator is authorized to approve an administrative adjustment allowing a minimum of 1 parking space per unit if such reduction will result in more useable open space on the lot (See Sec. 17-13-1003-CC); 1 space per unit for government-subsidized units	None
RS3	2 spaces per unit for detached houses and 1.5 spaces per unit for two-flats, provided that off-street parking is not required for detached houses or two-flats on lots of records that are 33 feet or less in width if the subject lot does not have access to an improved alley and provided further that the Zoning Administrator is authorized to approve an administrative adjustment allowing a minimum of 1 parking space per unit if such reduction will result in more useable open space on the lot (See Sec. 17-13-1003-CC); 1 space per unit for government-subsidized units	None
All other districts	1 space per unit, provided that off-street parking is not required for detached houses or two-flats on lots of records that are 33 feet or less in width if the subject lot does not have access to an improved alley; 1 space per unit for government-subsidized detached houses and two-flats	None

OTHER CONSIDERATIONS:

- **Site Setbacks:** While older buildings maybe non-compliant for set-backs (and authorized as such), it is important to consider how much your lot must accomodate for construction and new elements for a basement unit.(17-2-0305) See foundations (pg 67) and site drainage (pg 71), window wells (pg 87), and egress (pg 89) for elements with potential set-back conflicts.
- **Non-Residential Zones:** This checklist only addresses residential use in residential districts. It does not cover live/work units or flats in Business or Commercial zones.

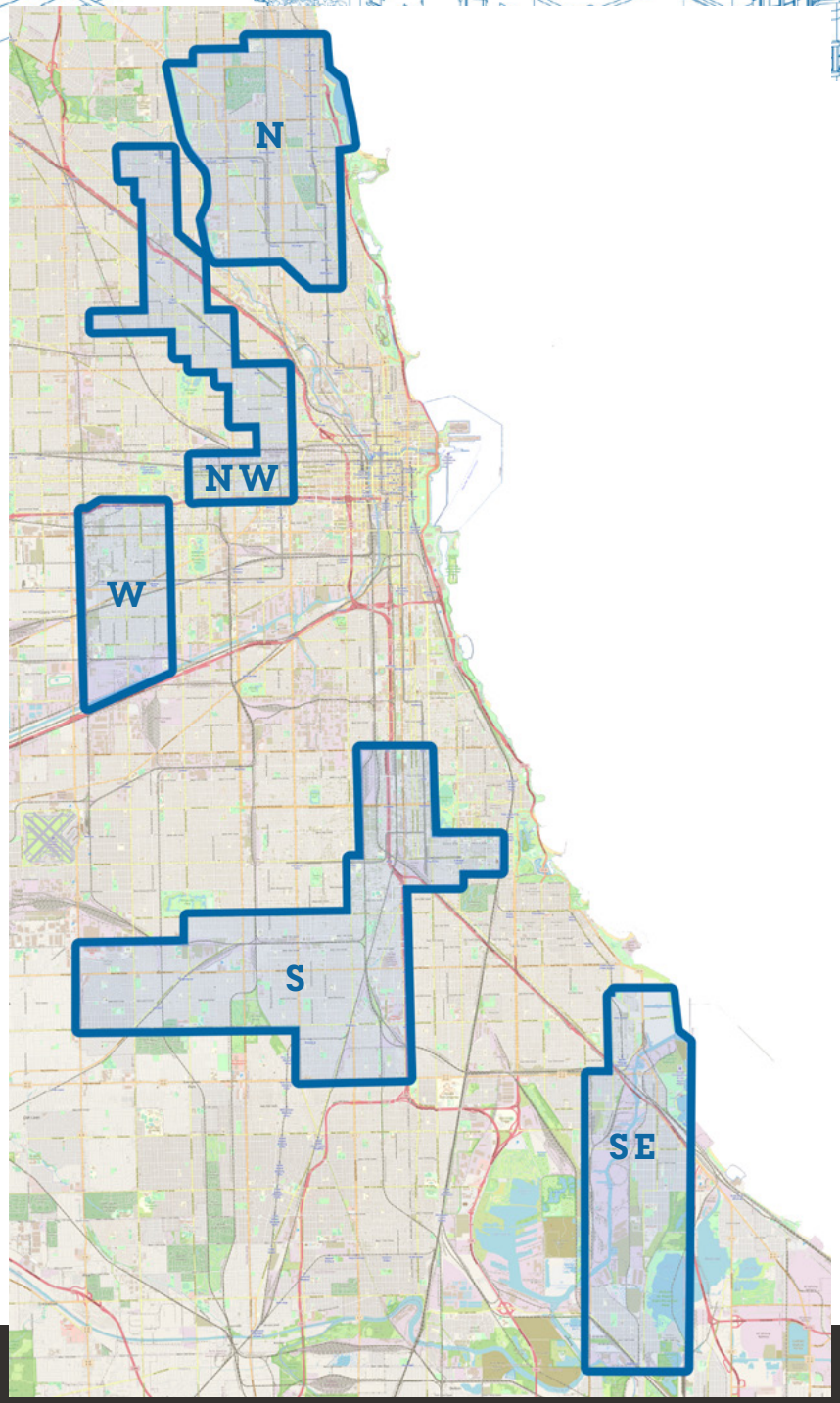
IS YOUR UNIT ALLOWED UNDER THE ADU PILOT PROGRAM?

Hypothetical answers, in blue outlines, are based on RT-4.

Use your district classification and location to see if you can add another unit. In pilot areas, conversion units can be added by right, Allowable number of units and loosened restrictions are listed on next page.

1. Are you in a pilot area? (ADU Ordinance, p11) (Grey diagonal lines = ADU area on Chicago Zoning Map) Ordinance and additional tools available on **ADU microsite:** www.chicago.gov/adu.

- **North Zone** is bounded by Devon, the lakefront, Lawrence, Clarendon, Halsted, Diversey, Lincoln, Belmont, the North Branch of the Chicago River, the North Shore Channel, Peterson, California, Granville, and Seeley.
- **Northwest Zone** is bounded by the Eisenhower Expressway, Sacramento, Fulton, Damen, Chicago, Western, Hirsch, Rockwell, North, Sacramento, Bloomingdale, Kedzie, Palmer, Kostner, Fullerton, Central Park, Belle Plaine, Lawndale, Montrose, Harding, Lawrence, Kedzie, Elston, California. Fullerton, Western, North, and Ashland.
- **West Zone** is bounded by the Eisenhower Expressway, Homan, the South Branch of the Chicago River, and 4600 West.
- **South Zone** is bounded by Cicero, 7500 South, Kedzie, 71st St., Halsted, 63rd St., 600 West 47th St., King. 60th St., Dorchester, 65th St., Cottage Grove, 67th St., the Dan Ryan Expressway, 95th St., Ashland, and 87th St.
- **Southeast Zone** is bounded by 8300 South, the city limits, Torrence, 95th St., Commercial. 83rd Pl., and Houston.



2. West, South, and Southeast Zones: (ADU Ordinance, p13) Are you an owner-occupant of the new unit's building? This is required for building with less than four units.

Have less than two other ADU's been permitted on your block in the current calendar year? Only two, per year, per block are allowed to limit rapid development and adverse rent impacts.

3. Does your zoning district permit multiple units, Two-Flats, or conversion units? (ADU Ordinance, p9)

USE GROUP		Zoning Districts								Use Standard	Parking Standard
Use Category		RS	RS	RS	RT	RT	RM	RM	RM		
	Specific Use Type	1	2	3	3.5	4	4.5	5-5.5	6-6.5		
P = permitted by right S = special use approval req'd PD = planned development approval req'd - = not allowed											
RESIDENTIAL											
A. Household Living											
1.	Detached House	P	P	P	P	P	P	P	P		17-10-0207-A
2.	Elderly Housing	-	-	-	P	P	P	P	P		17-10-0207-A
3.	Two-Flats	-	-	P	P	P	P	P	P	17-2-0303-B	17-10-0207-A
4.	Townhouse	-	-	-	P	P	P	P	P	17-2-0500	17-10-0207-A
5.	Multi-Unit (3+ units) Residential	-	-	-	P	P	P	P	P		17-10-0207-C
6.	Single-Room Occupancy	-	-	-	-	P	P	P	P		17-10-0207-B
7.	Conversion Unit within Additional Dwelling Unit-Allowed Areas	-	P	P	P	P	P	P	P	17-2-0303-C & 17-9-0131	
8.	Coach House within Additional Dwelling Unit-Allowed Areas	-	P	P	P	P	P	P	P	17-9-0201-F	

ADU ORDINANCE DEFINITIONS 17-2-0303-C CONVERSION UNIT:

Within Additional Dwelling Unit-Allowed Areas, in the case of building permit applications for the repair, remodeling, or alteration of **residential buildings that are located in any RS2, RS3, RT or RM zoning district and that have been in lawful existence for 20 or more years**, the **density of such residential buildings may be increased in accordance with Section 17-9-0131 by 33% of the number of lawfully established dwellings units, other than conversion units**, that have been in existence in the residential building for 20 or more years; provided, however, that **if such residential building contains a single dwelling unit, the density of such residential buildings may be increased by one dwelling unit.**

If this 33% calculation results in a fractional number, any fractional result of 0.5 or more must be rounded up to the next consecutive whole number.

UNITS ARE NOT SUBJECT TO:

- **a) minimum lot area restrictions (#3, pg 61),**
- **b) open space requirements (#2, pg 60),**
- **c) accessory parking requirements (#5, pg 61),** but
- d) cannot be on the same lot as a carriage house or used for short-term rentals (airbnb, etc.).

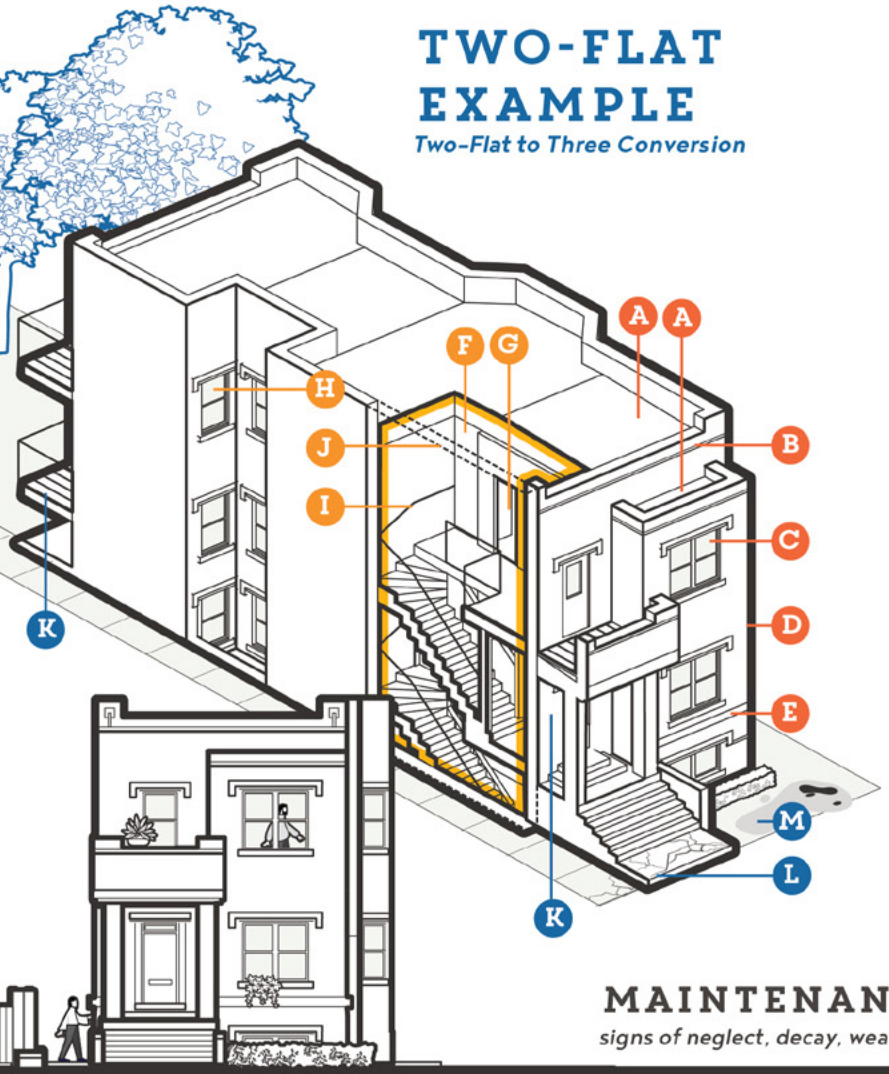
ADDITIONS ALLOWED (RS-2 +):

- **Single Family + 1 unit = 2 units total**
- **Two-Flat + 1 unit = 3 units total**
- **Three-Flat + 1 unit = 4 units total**
- **Four-Flat + 1 unit = 5 units total**
- **Five-Flat + 2 units (1 affordable) = 7 units total**
- **Six-Flat + 2 units (1 affordable) = 8 units total**

MAINTENANCE . grounds . exterior . common areas

TWO-FLAT EXAMPLE

Two-Flat to Three Conversion



BUILDING EXTERIOR

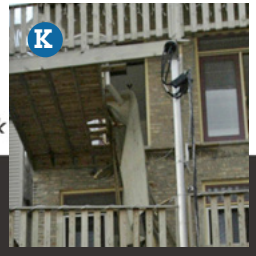
- A Gutters
- B Parapets
- C Windows
- D Walls
- E Trim

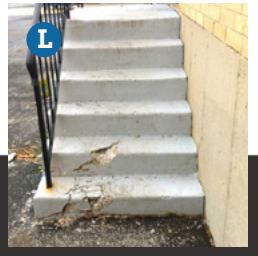
COMMON CORRIDORS

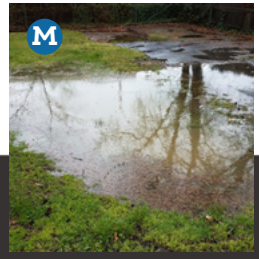
- F Smoke alarms
- G Doors
- H Windows
- I Stairs
- J Mold, Stains

GROUNDS

- K Porch
- L Paths
- M Open Areas







MAINTENANCE ISSUES

signs of neglect, decay, weathering, and deferred work

EXISTING CONDITIONS AND BUILDING MAINTENANCE:

You should be aware that any alteration of a structure that builds out a new unit must comply with the code for new construction. In addition, any existing structures that are visible to inspectors must meet the 'Minimum Requirements for Existing Structures.' That means that all the elements marked (left, Maintenance Issues) are required by code to be 'structurally sound and in good repair'.

As shown in the photographs**, structural deficiencies** can manifest as cracks (loading fatigue), the pulling apart of surfaces (inadequate anchoring), and deteriorating siding, masonry, roofs, and stairs. Even decaying paint and trim, which seems minor, can be an indicator of problems like termite infestations and structural decay (see next page).

All of these conditions would qualify as potentially unsafe. If you see similar deterioration on your building, you should hire an architect to evaluate the structure's soundness.

Whether or not you decide to add a basement unit, your building should be maintained in safe and sound condition. Tenants, neighbors, or strangers can report visible issues to the Department of Buildings, triggering a code violation and required building inspection.

WHAT YOU NEED TO ASSESS MAINTENANCE COMPLIANCE:

- **The Chicago Construction Code – Minimum Requirements for Existing Structures (**14-X**)** (summarized in drawings)
- **Visual observation –** walk around your site and any common spaces – hallways, stairs, the units exterior doors – document issues to repair and/or discuss with consulting architect
- **Architect to create an 'existing conditions' report if 'unsafe conditions' are found by inspectors.**

DOES YOUR BUILDING HAVE UNSAFE CONDITIONS:

potential structural problems in parenthesis ( )

Homeowners can visually inspect their buildings prior to beginning any construction project, looking for the following:

Do you have visibly unsafe exterior conditions? (14X-3-303**)**

- Clogged gutters or downspouts *(roof/wall saturation and accelerated decay)*
- Decaying mortar or bricks on parapets or chimneys *(wall collapse and falling materials)*
- Non-weather resistant siding and masonry joints with windows or doors *(wall saturation and accelerated decay)*
- Exterior walls and foundations that are not anchored, plumb, or free of holes and cracks, windows or frames are not square or operable, floors slope *(material failures facing building weight)*
- Unpainted or peeling decorative trim *(rot and infestation)*

Are units and common spaces adequately secure, with safe exits? (14X-4-304**)**

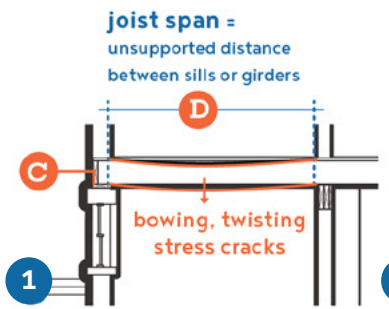
- Common stairwells lack smoke alarms, have missing treads, handrails, and irregular risers, are < 36" wide (*see Egress, pg 89*)
- Building Entrances lack locks or Unit Doors are missing locks, view holes (*basic violation of tenant's rights*)
- Inoperable windows or windows lacking screens and panes. (*violation of tenant's safety rights; see Ventilation, pg 87*)
- Water-stained walls and signs of mold (*saturation and decay*)

Do you have unsafe conditions on your grounds? (14X-3-302**)**

- Decking, pathways, or exterior stairs show fatigue and decay (*material stress and structural failure*)
- Open areas have standing water (*water management failures, see Slab and Waterproofing, pg 71*)
- Unruly vegetation/untidy garbage areas (*infestations potential*)

STRUCTURE . loading . building supports . foundations

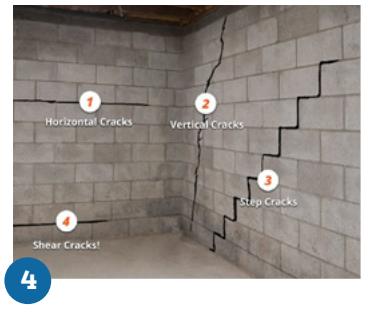
JOIST DEFLECTIONS
bowing, twisting under loads



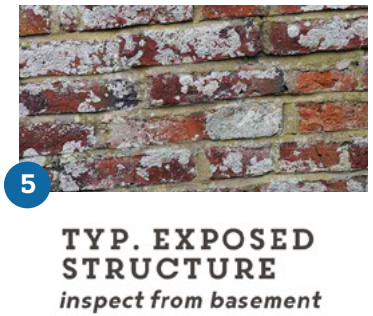
WATER/PESTS
age + other joist/joint failures

BOWING WALLS
lateral shear, overturning

WALL CRACKS
uneven settlement, soils



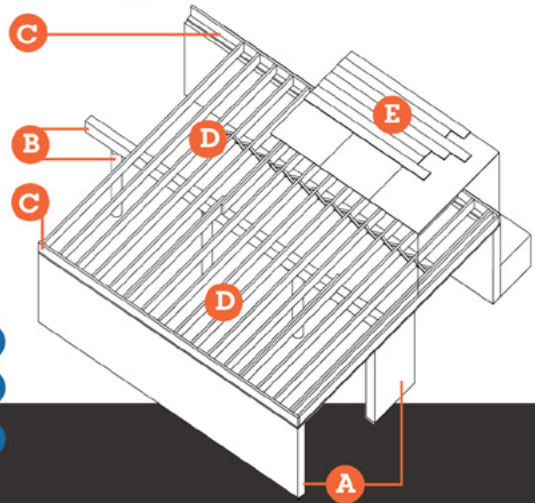
MATERIAL DECAY
mortar erosion, brick crumbling



VISIBLE STRUCTURAL ISSUES

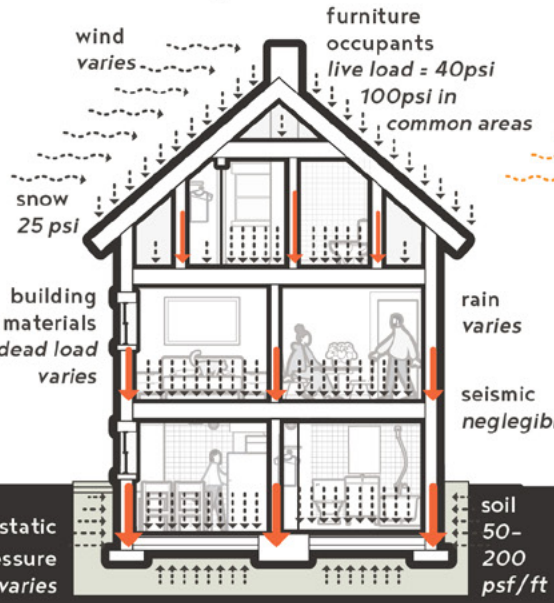
TYP. EXPOSED STRUCTURE
inspect from basement

- A Foundation walls
- B Columns & Girders
- C Sills & Headers
- D Joists 16" o.c., Bracing
- E Subfloor & floor above

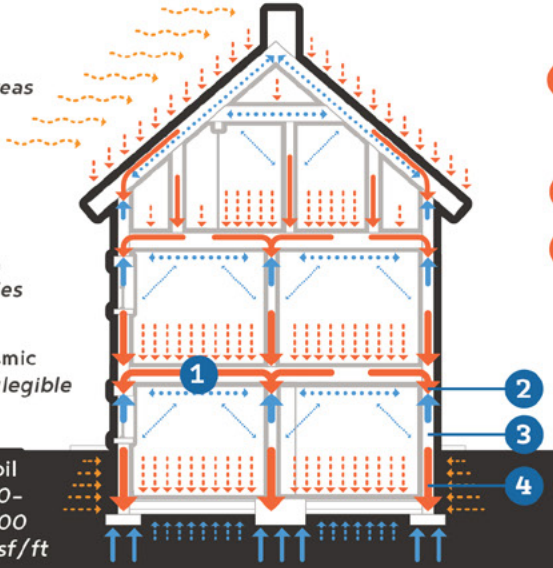


COTTAGE EXAMPLE
Cottage to Two Unit Conversion

BUILDING LOADING
forces acting on a structure



FORCE DISTRIBUTION
point & distributed loading/resistance



BASIC PRINCIPLES

GENERAL PRINCIPLES FOR LOADING AND FOUNDATIONS:

Building assemblies work together to transfer loads - like the weight of materials (dead load) or the weight of furniture and occupants (live load) - **down to the foundation and, beneath it, the ground.** Materials themselves, like soil, resist loading with compressive strength (left, Force Distribution). In addition to gravity, buildings face loading from all directions: wind, pressure exerted by soils and groundwater, and seismic tremors (left, Building Loading). Thus, a stable and safe structure requires multiple types of bracing, so joints and materials can transfer loads without twisting.

From your basement you can likely see much of the structure that is supporting your upper stories, carrying the load from floors, walls, and furniture above (left, Typ. Exposure Structure, A-E). Knowing where the first floor walls sit, you can anticipate where your basement joists are carrying greater dead loads. And, by measuring your foundations, through existing openings, you can estimate whether they are adequately sized to carry typical residential loads.

Before you add a ceiling or interior finishes, **you should thus examine the overhead joists, foundation walls and any columns or load-bearing interior walls.** Look for stains, strains, and signs of stresses (explored in the following questions) that indicate larger structural problems and material decay. ***In fact, if you see any of the defects pictured and discussed you should consult a structural engineer or architect to assess potential failures.***

WHAT YOU NEED TO CONSIDER STRUCTURAL STRESS:

- **Chicago Building Code - Chapter 16 -** Structural Design, **Rehab Chapter 4 -** Structural Repairs**, Chapter 18 -** Soils and Foundations (summarized in drawings)
- **Visual observation -** walk around your basement and examine walls, columns, joists, and floor above - note spans, cracks, signs of bowing and decay - record issues to discuss with your structural engineer or architect
- **Architect and/or Structural Engineer** to verify found issues - joist deflection, foundation wall cracks and overturning - and identify loading sources and mitigation options

DOES YOUR BASEMENT SHOW SIGNS OF STRUCTURAL FATIGUE:

SPANNING / BASEMENT CEILING ELEMENTS

Are there signs of excess loading on your joists or girders ? Are your sills and upper walls anchored to your foundation? (14B-16-1604.3, 2308.4.2.1 new construction)(14R-4-405 structural repairs)

- Do your joists exhibit visible bowing and vertical deflection or twisting laterally (left, Joist Deflections) ? Any visible bending or diagonal cracks (2, shear) are a sign of excess loading, misaligned joints or deteriorating structure.
- Are your joists spanning large distances and bowing? Long distances and excess spacing can mean each joist is carrying too much load. (14R-4-405.2.4)
- If your basement includes structural columns and girders, do the horizontal pieces show signs of deflection or cracking? Do the columns have decay? (14R-4-405.2.4)
- Are your sills and headers anchored to the foundation (C) to prevent uplift, lateral sliding, and transfer load to the foundation?

FOUNDATION WALLS

Are there signs of excess pressure from soils, site loads, or uneven settlement beneath the foundation?

- **3 – Do your foundation walls either tilt or bow inward?** This is a sign that the wall and its footer are failing to resist lateral soil pressure and are at risk of over-turning and collapse. This can be exacerbated by parking machinery near the foundation during construction. It can signal undersized footers, too-thin walls or inadequate anchoring between them.
- **4 – Do your foundation walls have any cracks?** These also show that the wall is failing to resist soil pressures, or point pressure from tree roots or sodden areas. Cracks may be long forming or introduced by specific events. Take note of the distribution of cracks: uneven settling will likely have cracks down a wall, across your slab and up the opposite side. Areas of point pressure, like roots or equipment over-loading, will show crack spidering around the area of impact.
- **4.1 – Horizontal cracks,** where one area juts into the center of the basement, are signs that specific vertical layers of backfilled soil are exerting uneven, excessive pressure, perhaps from undrained water or compaction.
- **4.2–3 – Vertical cracks** are signs of uneven settlement of the foundation and underlying soils. One section is adequately supported, while the other area has sunk, with cracks forming between.
- **4.4 – Shear cracks** are signs of shifting soils, along the wall surface, which are dragging blocks or bricks with them through friction.

All of these foundation cracks indicate unstable or active soils (to right, Soils: 1 or 5) potentially impacted by ground water and freeze-thaw dynamics. They could also indicate undersized or under-reinforced foundation walls. Consult with an architect or structural engineer for assessment and soil testing.

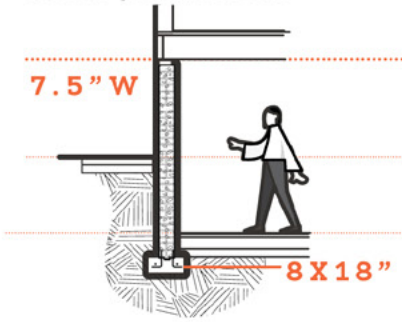
WALL & MORTAR WEATHERING

Are there signs of brick efflorescence? Are there areas of missing or cracked and crumbling mortar or spalling foundation materials (brick, concrete masonry, or stone)?

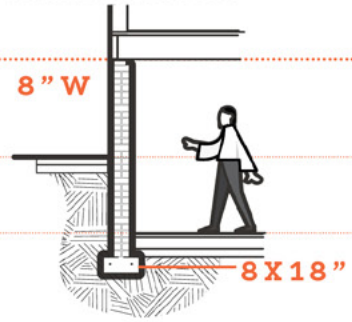
- Crumbly mortar and efflorescence both indicate that your walls are saturated with water. In brick, what you're seeing are the salts leaching out of the bricks as moisture evaporates. Sand-like mortar shows that water was unable to evaporate and broke down the inner adhesion of the materials. Both are often seen next to spalling or cracking brick and block, as those materials absorb moisture, which then expands and contracts based on thermal fluctuations.

This form of decay is just as serious as foundation cracks as it also indicates groundwater and freeze-thaw dynamics. Consult with an architect or structural engineer for assessment and soil testing. (^ in diagrams = conditions confirmed through soil testing)

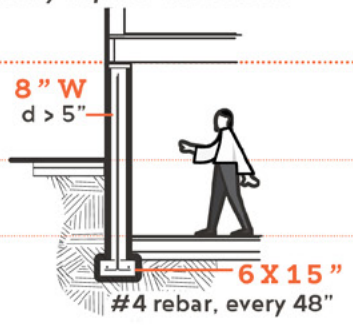
PLAIN CONCRETE
cast-in-place, no rebar



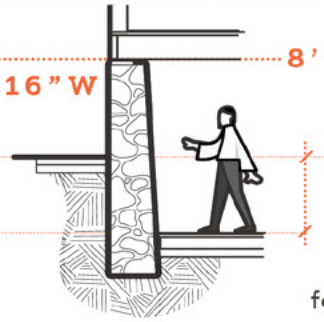
MASONRY / BRICK
with concrete footer



CMU BLOCKS
likely in post-war houses



FIELD STONE
most archaic/rare material



PRESCRIPTIVE FOUNDATIONS

quick min. measurements to pair with visual assessment of existing structure (see last spread on loading)*

D 3.5' *assumes lateral support at top and bottom

footer range shown, not calculated

COTTAGE EXAMPLE

Cottage to Two Unit Conversion

SOIL MEASURES & CONCEPTS

*measures to be aware of for foundation**

- **A Min. Foundation Footer depth** = frostline = 42" deep min. to avoid heaving
- **B Water/Sewer Connections** – typ. 60" min. depth, to avoid frost & footers
- **C Water Table^** – subsurface soil investigation required to determine if ground water is within 5' of lowest finished floor, impacts stability, pressure, & waterproofing options
- **D Unbalanced Backfill** – height from ground level to floor *(approx. soil pressure)*
- **E Surface Slopes** = 2% slope, away from building, to promote run-off (vs. absorption)
- **F Soil Tests** – ^ = test pits/cores required, alt. full geotech survey if excavating 8' +

SOIL CONDITIONS

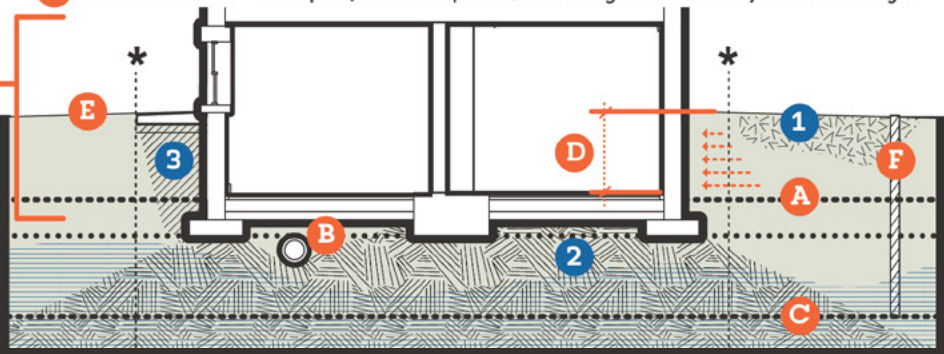
confirm soils with geotech report

1. **Urban fill^** – mixed, unstable (<500 psi)
2. **Undisturbed** – best for foundations
3. **Engineered** – designed, compacted

SOIL TYPES

4. **Gravel/Sand** – drains, desired (3,000 psi)
5. **Clays** – holds water, unstable (1,500 psi)

BASIC SOIL PRINCIPLES



* lots with tight offsets have limited areas to excavate or alter soils to address drainage or lateral soil loads

WATERPROOFING . slab structure . water control

TWO-FLAT EXAMPLE

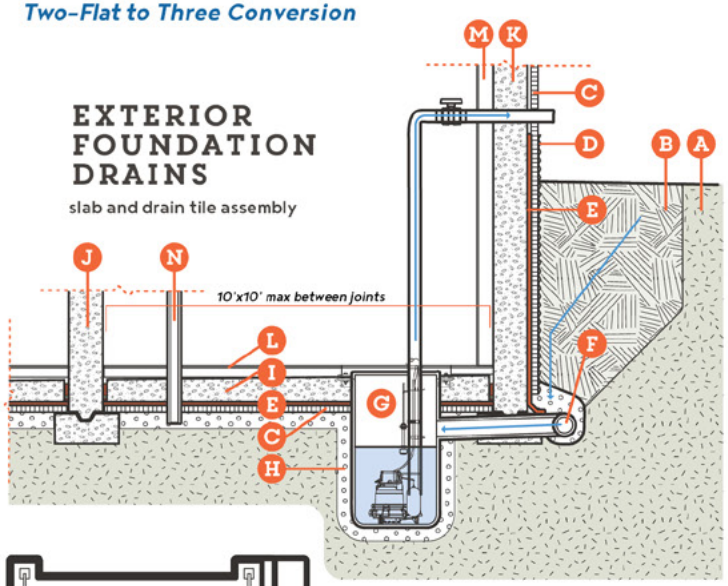
Two-Flat to Three Conversion

SLAB STRUCTURE

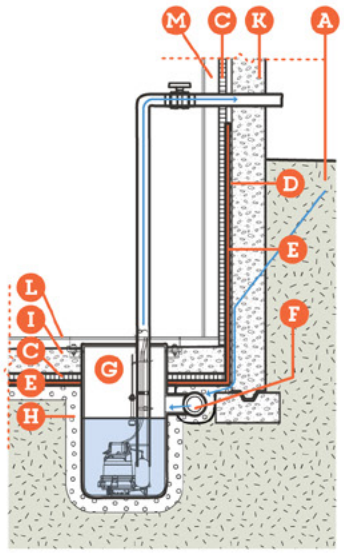
minimum elements + interior & exterior damproofing

EXTERIOR FOUNDATION DRAINS

slab and drain tile assembly



INTERIOR



- **A** undisturbed soil (2% + slope)
- **B** backfilled soil (avoid downspouts to area, 2% + slope)
- **C** 3" rigid foam insulation (exterior drains & under slab); 2" open cell foam or exposed walls (interior drain foundation walls)
- **D** grooves or drainage board to channel moisture to drain tiles
- **E** vapor-barrier (under slab), dampproofing membrane (slab, walls)
- **F** drain tiles: perforated 4" pvc in gravel wrapped w/ filter fabrics, slopes to drain, with connection to sump pit
- **G** sump pit and pump assembly, with air-tight cover (radon), outlet connects to storm system or permeable site area
- **H** 4" crushed stone or gravel beneath slab/around sump for drainage
- **I** 3.5" min concrete slab with joints for curing, loading (at columns), and thermal stress, max 10'x10' panels with 1:1.5 ratio pieces at edges
- **J** columns with footer (isolation joint with slab all around)
- **K** foundation wall and footer
- **L** floor assembly of rigid insulation, sleepers, and subflooring
- **M** wall assembly: 2x4 frame, moisture-resistant gypsum or exposed
- **N** exhaust pipe to allow radon release from soil (passive or mech fan)

DRY BASEMENT ASSEMBLIES

WATERPROOFED

basement set in ground water **1**

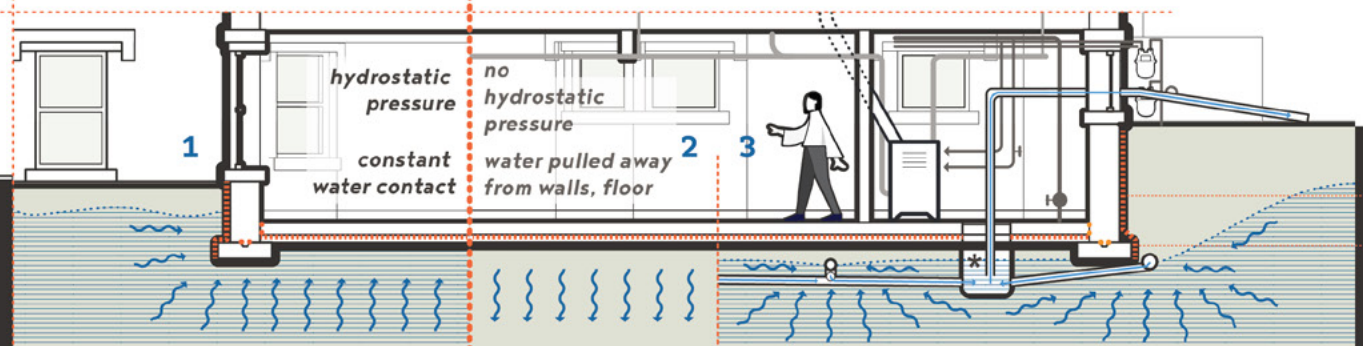
membranes ····· water-stops at joints ····

DAMPPROOFED

basement with well-draining sandy soils **2**
or water control/perimenter drainage (standard) **3**

SUMP PUMPS*

exterior foundation drains to sump pump and out to site (shown) or sewer



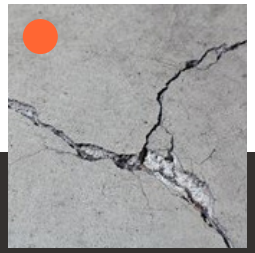
GENERAL PRINCIPLES FOR DRY, SOUND BASEMENTS:

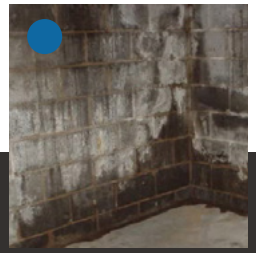
As you examine your basement, note the condition of the floors and any lingering moisture. Look for cracks, caving, and wear in the slab (below, red)**.** Often residential concrete slabs are poured as thin surfaces; they will not support new walls or furniture loads. See code-compliant slab sections, left, and replacement details, in 'Mitigating Issues,' associated with adding height (pg 136), foundation drains (pg 140), plumbing (pg 148), and radon exhaust (pg 144).

On the floors or walls, are surfaces clammy? Can you see condensation on walls or efflorescence on bricks (below, blue)? Are there leaks, in any weather, snaking toward the floor drains? If you 'finish' a unit despite these symptoms, this moisture is trapped in the walls and floors, accelerating rot and mold growth. To be safe for inhabitation, your basement unit should be either a) waterproofed or b) dampproofed.

Waterproofed basements are lined with thick, impermeable membranes (Waterproofed: #1; Slab Structure: B) that wrap the foundation walls and the concrete-slab for continuous enclosure. This is required when the basement sits within groundwater and has hydrostatic pressure on the foundations.

Dampproofed basements are lined with thinner materials, which often double as vapor-barriers, because they sit 'above' groundwater. This can be the result of natural drainage (Dampproofed: #2). Alternately, the foundations may have a tile drain system (exterior or interior) to intercept water, drain immediate soils and thermally isolate the interior (Dampproofed: #3, Slab Structure).





WHAT YOU NEED TO ASSESS YOUR BASEMENT SLABS & DRAINAGE:

- **Chicago Building Code – Chp 18 –** Soils and Foundations**, Chp 19 –** Concrete (summarized in drawings)
- **Visual observation –** examine basement walls and slab for water, cracks, and wear. Record issues to discuss with technical experts.
- **Architect or Structural Engineer** to verify found issues and to calculate anticipated slab loads, structure
- **Plumber** to confirm existing drainage for adaptation; depth, path (straight or with bends), sizes of sewer connections to mains.

IS YOUR BASEMENT SOUND, DRY, AND RADON FREE:

Is your slab intact and adequate for new loads (Slab Structure I)**?** (14B-19-1907)

- Does it have joints to allow for settling?
- Are there changes – in drainage, loading – requiring replacement?

Does your slab have a vapor-barrier beneath (Slab Structure E, N)**?**

- Are there venting pipes to exhaust radon away from occupants? (To learn more about the carcinogenic risks of radon and exhaust systems, see 'Mitigating issues' pg 144) (14B-19-1907)

Is your basement visibility dry or are there stains or high-water marks from flooding? Is there damp or waterproofing in place (left, Waterproofed; Dampproofed)**?** (14B-18-1805)

- Creating a dry basement will depend on soils, elevation, and geotechnical testing to confirm groundwater control options. See 'Mitigating Issues' (pg 140) for how interior and exterior drainage integrates with sump pumps and site grading.

UTILITIES

BUILDING SYSTEMS

typ. lines, notes on sizing

Plumbing*
- hot water
- cold water
- sewage/storm

Heating
- gas
- steam / ductwork
- exhaust

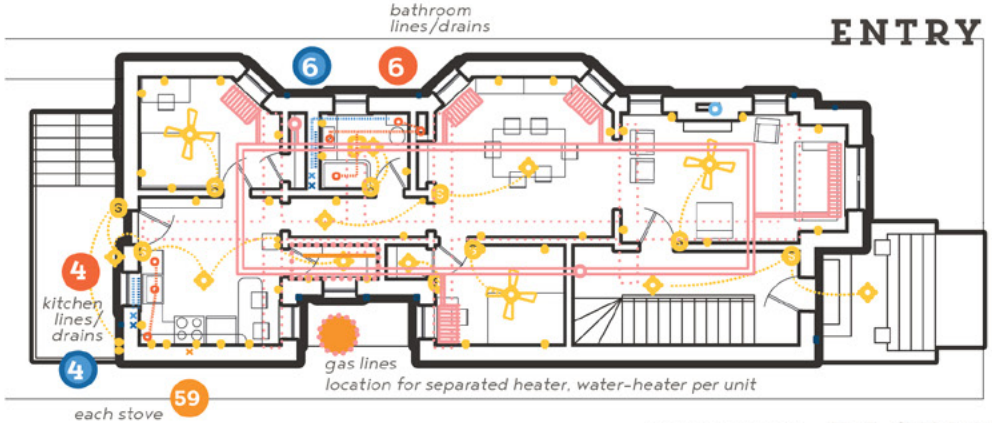
Electric*
- lights/fans
- outlets/switches
- breaker boxes
- light-switch connections

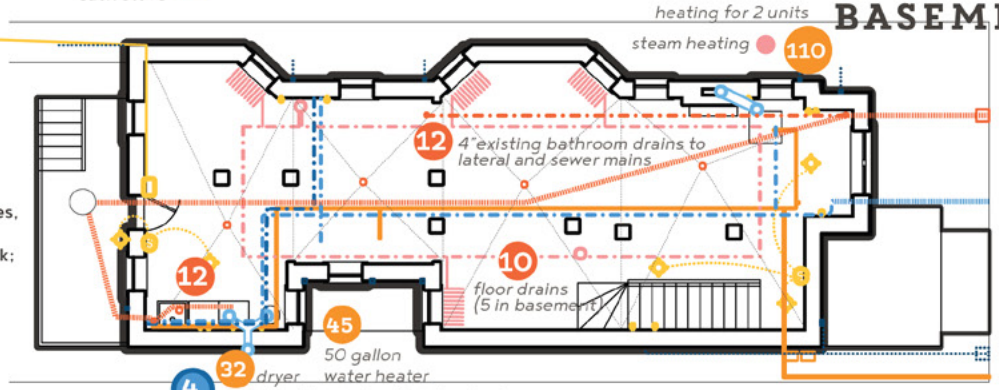
Load by fixtures
- drainage value #
- fixture value #
- ft3/hr gas use #

Location
- wall cavity ✕ *(vertical)*
- exposed
- buried
- overhead

*plumbing: each unit requires, a bathroom sink, toilet, shower/tub, and kitchen sink; laundry per building

*electric: unit requires its own meter + public meter for shared areas



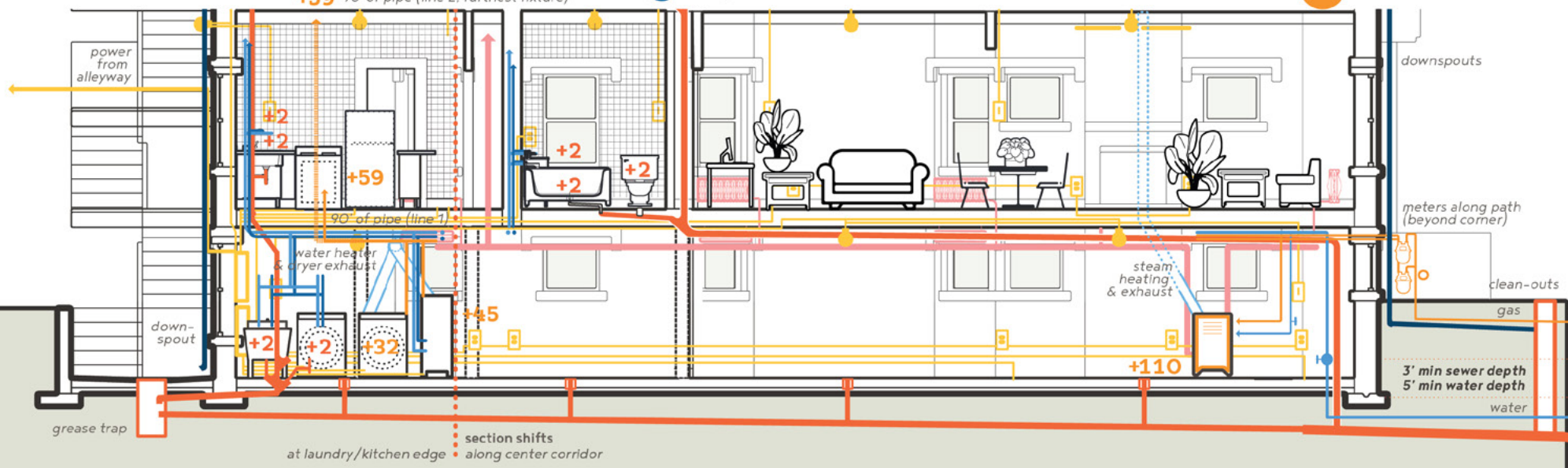


34 total building sewer drainage value (4" drains, at 1/8 slope)

24 water connection = drainage minus floor drains (1.5–1.75" service line, given 100' steel or copper interior lines)

6" downspouts to storm/sewer system and yard where possible

305 at 100' = min service of 1 ¼"

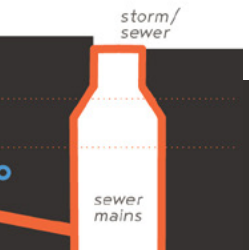


PRINCIPLES FOR UTILITY CONNECTIONS & SERVICES:

A basement unit needs working plumbing, an adequate number of outlets and lights, and thorough heating to maintain a comfortable environment of 68F (at -7F outdoors). Building systems like heating, plumbing, sewage, and electricity should be considered spatially–what can/can't be appended efficiently–and in terms of load or capacity–number of fixtures enabled by size or volume of supply. You'll want to minimize the impact to existing units, so be prepared to work around vertical drainage and potentially align sewer additions along existing overhead lines.

Older buildings are more likely to have **inadequate capacity and will require additional lines or resizing sewer/water connections to City utilities** (see 'Mitigating Issues', pg 148). You'll want to incorporate the costs of adding additional meters and lines into your overall estimate ($15,000-$20,000). Segregating systems and/or supplementing existing systems can help avoid underpayment, enable tenants to use utility subsidy programs, and meet livability codes. That said, old buildings often have steam heat or similar systems designed to service all units. Consider how to add supplemental systems to meet code and separate lines, like adding a forced-air heater in the basement, without disturbing the upper stories of existing steam distribution.

It's also important to understand **the elevation and location of sewer lines**–either overhead (runs across the basement ceiling) or below the slab (beneath the basement floor). If your sewer connections are overhead, you will need an ejector pump to meet your existing sewage connections. For either system, you'll need to vent any new connections to release sewer gas and provide maintenance access, like clean-outs and traps (see ejector pump and access details in 'Mitigating Issues,' pg 148). Your other drainage lines–roof downspouts, areaway drains, and foundation drains–will need a sump pump to lift and carry water away from your foundations (see details in 'Mitigating Issues,' pg 140).



WHAT YOU NEED TO ASSESS UTILITY LINES AND LOADS:

- **Chicago Building Code – Chp 12 –** Interiors**, Chicago Electrical Code – 14E, Chicago – Building Infrastructures Code – Chp 18 –** Plumbing and Mechanical Codes
- **Visual observation –** Note the location of utility connections, meters, and size of any exposed pipes. Determine location and capacity of any heating, electric, or plumbing appliances and fixtures.
- **Architect and/or Contractor in coordination with plumber/electrician/heating specialist** to assess existing systems and potential for adaptation.

As a building owner you can do rough estimates by noting existing connections, meters, fixtures, and lines, as shown in the plumbing, electric, and heating diagrams and tables on the following pages. You will need an architect to consult with plumbers, electricians, and heating specialists to fully assess the condition of your existing systems and develop an integrated strategy for additional loading and utility connections.

WHAT CAPACITY/ CONNECTIONS DO YOU NEED FOR A NEW UNIT:

Have you consulted with an electrician about needed capacity? (diagram next page)

- Anticipate connecting kitchen appliances and two-four sets of outlets and lights in all rooms, with GFCI outlets in wet areas.
- Given any new layout, occupants will need to access their meters and breakers for maintenance.

utility connections . electric

ELECTRIC

typ. lines, notes on sizing

Electric*

- lights
- fans (F)
- outlets
- breaker boxes
- switches (S)
- light-switch connections

*each unit requires:
its own meter +
public meter for shared areas

Public
*2 exterior lights, 1 hall light,
2 exterior outlets, all smoke/gas detectors*

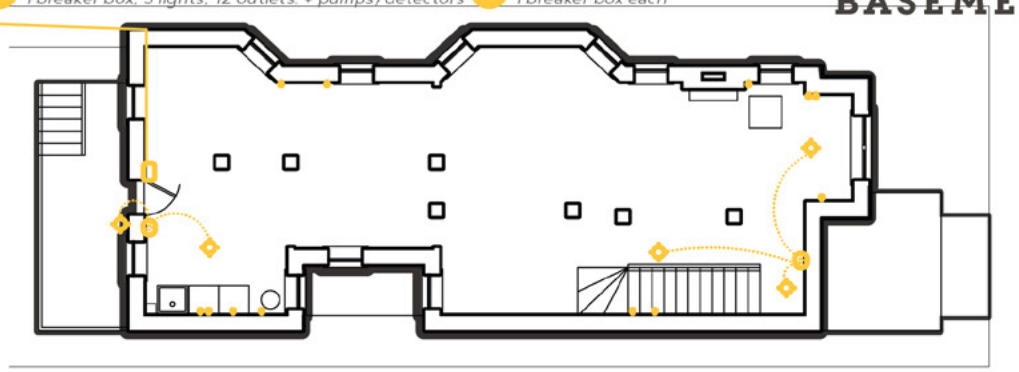
Unit
*3 ceiling fans, 1 bath fan,
9 overhead lights, 3-6 outlets/room*

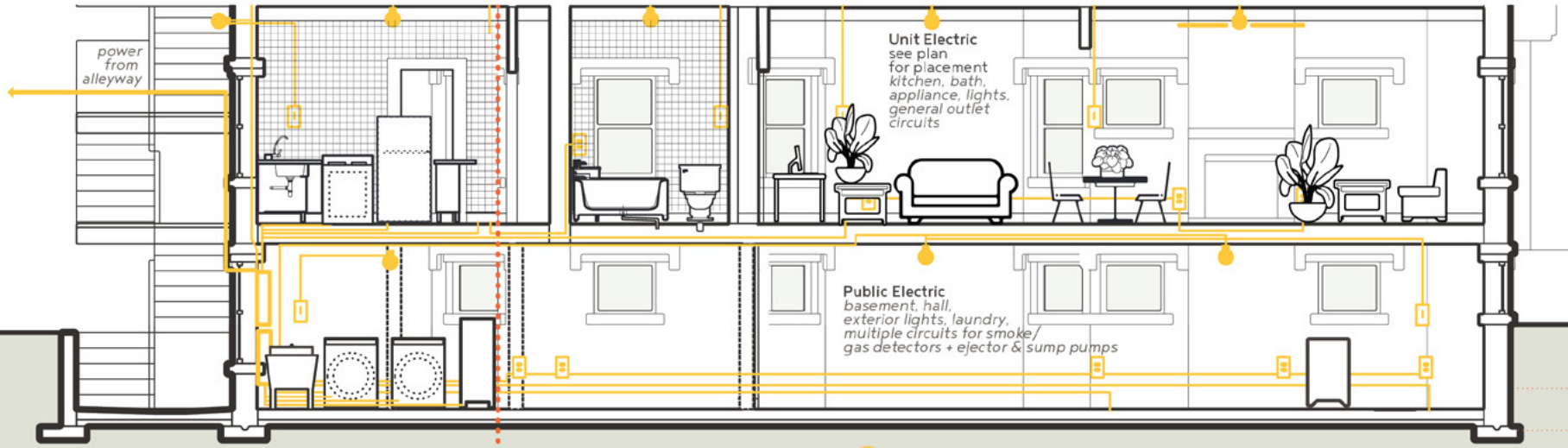
ENTRY

Public
1 breaker box, 5 lights, 12 outlets, + pumps/detectors

Units
1 breaker box each

BASEMENT





section shifts
at laundry/kitchen edge • along center corridor

Not an Electric Schematic
*Diagram only to show separation of unit & public lines,
emphasize need for multiple circuits*

- For any multi-unit building, you will need one metered electric service for each unit and one for the public areas - hallways, laundry, stairwells, and fire-escapes.
- With old buildings that lack separated electric, it's common to replace the entire building's wiring. Tracing and disentangling old wiring is time consuming and oft confirms the need for replacement. See 'Mitigating Issues' for new line options (pg 152).

Have you consulted with a plumber about the capacity and location of the sewer system? (diagram next page)

- Given an additional kitchen sink, dishwasher, and bathroom fixtures, do you know the current height and diameter of your sewer connections, to anticipate capacity and the need for pumps (18-29-710, 18-29-712)?
- Will your new unit incorporate additional clean-outs, backflow valves, and access panels to facilitate system maintenance and avoid sewage overflows in the lowest level (18-29-708, 18-29-715)?
- Confirm the location, elevation, and direction of your lateral connection - from your basement lines to the sewer main. Any extra elbows in the pipe can act as obstacles.

Have you consulted with a plumber about the capacity and location of the water system (diagram next page)?

- Because a new unit requires a full kitchen and bath, you will need an additional or enlarged water connection. This likely won't be flagged on your permits. Make sure to incorporate line (and meter) addition to avoid belated installation (with all the implied site, slab, and finishing work). *See the fixture and pipe sizing calculation at the end of this section.*
- Older, single family homes may not be metered. You will want to add meters to new units, but, as with sewage, you can use this method to anticipate the bills/loading for each unit. See the Municipal Code 11-12, Water Supply and Service (11-12-260).

Does the plan for your basement unit account for the interconnection of different building infrastructure/services?
Most building systems involve multiple connections and negotation with walls and structure. Consider the following examples:

- Fossil-fuel burning heaters (water heaters, forced-air units) require intakes, exhausts, and heat distribution systems.(See ventilation in 'Mitigating Issues', pg 147 C)
- Drainage pumps typically connect to your storm/sewer mains but also require two power circuits, which act as fail-safes (18-29-712). (See drainage and plumbing in 'Mitigating Issues', pg 140/144)

Because of such interconnections, planning a new unit should be done with professionals, given their assessment of existing building systems. *The sample 'Two-Flat' system diagrams as well as the system sizing tables (next page) are meant to help you feel comfortable integrating existing details and calculations, in order to actively engage your plumber, contractor, or heating specialist. Fully calculating the system sizing, esp. for water, will need to take into account additional details like pipe types (for friction), the highest fixture elevation, and total system length for estimating pressure.*

ELECTRIC LOADS:

In an electric system, current flows from a power source through a circuit–with appliances and lights that use that power–to a neutral line which carries residual current to the ground. Switches and breakers serve to break circuits and stop electric flow to specific elements or entire lines. Each electric meter tracks the watts pulled in for your unit.

Akin to sizing plumbing or gas loads (on the following pages), your electric system is sized to support a set number of appliances per circuit (each rated for wattage). The flow of electric current (in amperes, per circuit breaker) * the differential power (120 or 240V) = total power wattage available per circuit. For safety, most circuits use 60-80% (max) of the available wattage and are properly grounded. Your electrician will calculate the power drawn and used when adding metered service and circuits. See 'Mitigating Issues' for an example circuit calculation, pg 154.

utility connections . plumbing

PLUMBING

typ. lines, notes on sizing

Plumbing*

- hot water
- cold water
- sewage
- foundation/storm
- alt (found. drains)
- catch-basins/ pump-to-storm lines

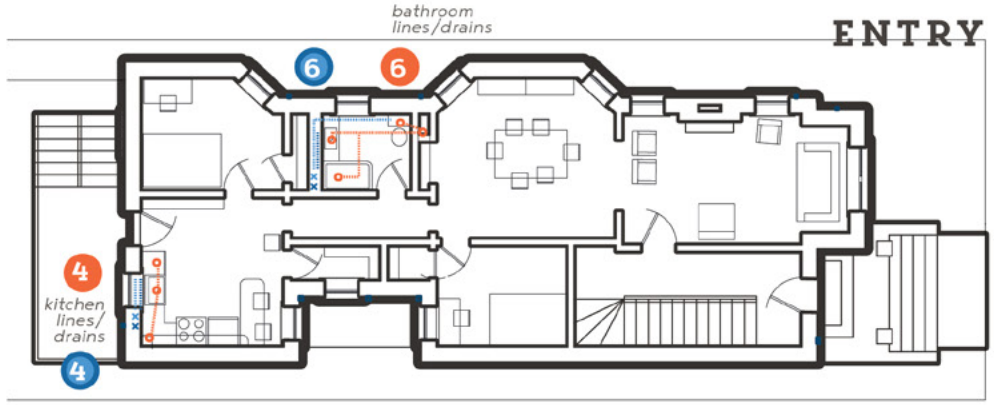
- drainage value #
- fixture value #

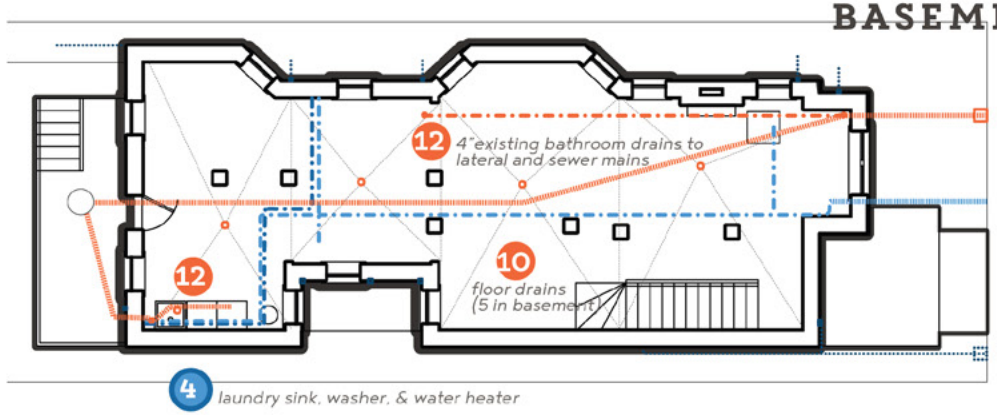
Location

- wall cavity × *(vertical)*
- exposed
- buried
- overhead

*each unit requires:
a bathroom sink,
a toilet,
a shower/tub, and
kitchen sink;

laundry per building

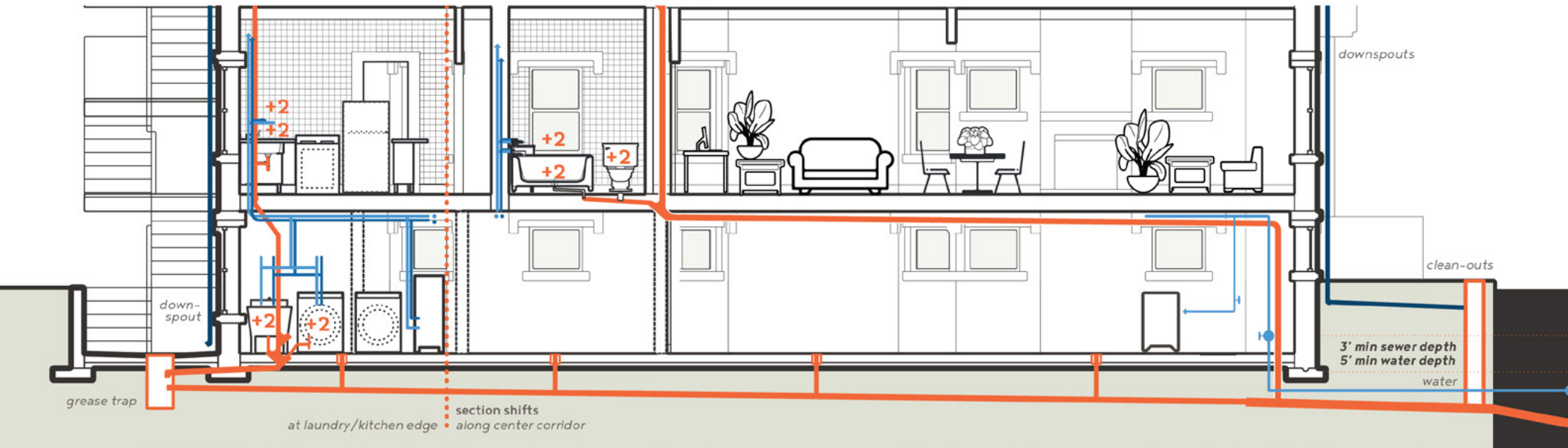




34 *total building sewer drainage value (4" drains, at 1/8 slope)*

24 *water connection = drainage minus floor drains (1.5-1.75" service line, given 100' steel or copper interior lines)*

6" downspouts to storm/sewer system and yard where possible



PLUMBING LOADS:

You can make an informal tally of plumbing capacity. Make a rough count of all the plumbing fixtures (tubs, toilets, sinks) attached to each of your major vertical drainage pipes and find their drainage values on Table 18-29-709.1 (sewage) or Table 18-29-604.10.1 (water) on this page.

- **For sewers**, measure the pipe size and confirm capacity estimates on Table 18-29-710 A and B, next page. Could you install additional fixtures, given allowed unit values and required 4" pipe beneath ground? Add roof drainage (18-29-1108.1) to get a rough sense of your needed drainage capacity (table next page).

- **For water**, turn to page 79 to tally your fixture total and convert the value into demand (in gallons per minute) on Table 18-29-604.10.2. Find the connection size equivalent for a 100' system (for steel or copper pipes). As with the zoning example, highlights match the proposed Two-Flat conversion. (*Detailed instruction can be found in Chicago Plumbing Code 18-29, Appendix A:* bit.ly/Chicago-Water-Calc.)

WATER FIXTURE LOADS

Table 18-29-604.10.1

Fixture Type	Occupancy Use	Valve Type	Fixture Units
Water closet	Private	Flush tank	3
Lavatory	Private	Faucet	1
Bathtub	Private	Faucet	2
Shower head	Private	Mixing valve	2
Bathroom group	Private	Flush valve for closet	8
Bathroom group	Private	Flush tank for closet	4
Separate shower 109	Private	Mixing valve	2
Kitchen sink	Private	Faucet	2
Laundry trays (1 to 3)	Private	Faucet	2
Combination fixture	Private	Faucet	3
Laundry washer	Private	Faucet	2
Bidet	Private	Faucet	2
Dishwasher	–	–	2
Drinking fountain	–	–	1/2
Laundry washer	Public	8 lbs	3
Laundry washer	Public	15 lbs	4

SEWER FIXTURE LOADS

Table 18-29-709.1

Fixture Type	Drainage Fixture Unit Value as Load Factors	Minimum Size of Trap (inches)
Automatic clothes washers, commercial a	3	2
Automatic clothes washers, residential	2	2
Bathroom group consisting of water closet, lavatory, bidet and bathtub or shower	6	–
Bathroom b (with or without overhead shower or whirlpool attachments)	2	1 1/2
Bidet	2	1 1/4
Combination sink and tray	2	1 1/2
Dental lavatory	1	1 1/4
Dental unit or cuspidor	1	1 1/4
Dishwashing machine, c domestic	2	1 1/2
Drinking fountains	1/2	1 1/4
Emergency floor drain	0	2
Floor drains	2	2
Kitchen sink, domestic	2	1 1/2
Kitchen sink, domestic with food waste grinder and/or dishwasher	2	1 1/2
Laundry tray (1 or 2 compartments)	2	1 1/2
Lavatory	1	1 1/4
Shower compartment, domestic	2	2
Sink	2	1 1/2
Urinal	4	Footnote d
Urinal, 1 gallon per flush or less	2 e	Footnote d
Wash sink, (circular or multiple) each set of faucets	2	1 1/2
Water closet, flushometer tank, public or private	4 e	Footnote d
Water closet private installation	4	Footnote d
Water closet public installation	6	Footnote d

For SI: 1 inch = 25.4 mm, 1 gallon = 3.785 L.

a For traps larger than 3 inches, use Table 709.2.

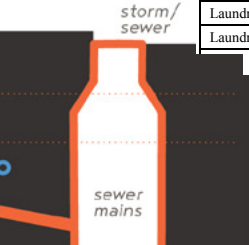
b A showerhead over a bathtub or whirlpool bathtub attachments does not increase the drainage fixture unit value.

c See Section 709.2 for methods of computing unit value of fixtures not listed in Table 709.1 or for rating of devices with intermittent flows.

FIXTURES: WATER =

FIXTURES: SEWER =

CALCULATED SIZES/VALUES =



LOAD PER ANY BRANCH

Table 18-29-710A

Diameter of Pipe (inches)	Maximum Number of Drainage Fixture Units Connected to any Portion of the Building Drain or the Building Sewer, Including Branches of the Building Drain[a]			
	Slope per Foot			
	1/6 inch	1/8 inch	1/4 inch	1/2 inch
1 1/4	–	–	1	1
1 1/2	–	–	3	3
2	–	–	21	26
2 1/2	–	–	24	31
3	–	36	42	50
4	–	180	216	250
5	–	390	480	575
6	–	700	840	1,000
8	1,400	1,600	1,920	2,300
10	2,500	2,900	3,500	4,200
12	2,900	4,600	5,600	6,700
15	7,000	8,300	10,000	12,000

*new & old sizing for Two-Flat capacity (34, 44)

For SI: 1 inch = 25.4 mm, 1 inch per foot = 0.0833 mm/m.

a The minimum size of any building drain serving a water closet shall be 3 inches.

LOAD PER HORIZONTAL BRANCHES

Diameter of Pipe (inches)	Any Horizontal Fixture Branch	Maximum Number of Fixture Units that may be Connected to:		
		One Stack of 3 Stories in Height or 3 Intervals	More than 3 Stories in Height	
			Total for Stack	Total at One Story or Branch Interval
1 1/2	3	4	8	2
2	6	10	24	6
2 1/2	12	20	42	9
3	20	30	60	16
4	160	240	500	90
5	360	540	1,100	200
6	620	960	1,900	350
8	1,400	2,200	3,600	600
10	2,500	3,800	5,600	1,000
12	3,900	6,000	8,400	1,500
15	7,000	–	–	–

*bath and kitchen horizontals (2"), new & old stacks for 3 Story Two-Flat capacity (34, 44)

For SI: 1 inch = 25.4 mm.

a Does not include branches of house drain.

STORM DRAINAGE EQUIVALENCE*

Table 18-29-1108.1

No. of Fixture Units	Equivalent Area (sq. ft.)	No. of Fixture Units	Equivalent Area (sq. ft.)*
1	165	31	2,820
2	325	32	2,870
3	475	34	2,955
5	750	38	3,125
6	875	40	3,200
7	1,000	42	3,270
8	1,115	44	3,340
9	1,225	46	3,400
10	1,330	48	3,465
11	1,435	50	3,350
12	1,530	55	3,530
13	1,620	60	3,790
14	1,710	65	3,900
15	1,800	70	4,000
16	1,880	75	4,090
17	1,960	80	4,175
18	2,040	85	4,250
19	2,110	90	4,320
20	2,180	95	4,390
21	2,250	100	4,450
22	2,310	105	4,500
23	2,360	110	4,550
24	2,440	115	4,600
25	2,500	120	4,645
26	2,550	125	4,690
27	2,600	130	4,725
28	2,660	140	4,800
29	2,710	145	4,830
30	2,770	150	4,850

* may direct to yard or storm/sewer system, confirm drainage connections

FIXTURES: SEWER =

CALCULATED SIZES/VALUES =

WATER: LOAD TO DEMAND CONVERSION

Table 18-29-604.10.2

	For Systems Predominantly Flush Tanks		For Systems Predominantly for Flush Valves	
	Load	Demand	Load	Demand
	1	1.5	1	–
	2	2.5	2	–
	3	3.3	3	–
	4	4.0	4	–
	5	4.8	5	15.0
	6	5.5	6	17.5
	7	5.7	7	19.7
	8	6.9	8	22.2
	9	7.5	9	24.5
	10	8.2	10	27.0
	11	8.8	11	27.8
	12	9.5	12	28.5
	13	10.1	13	29.5
	14	10.8	14	30.1
	15	11.4	15	31.0
	16	12.0	16	31.8
	17	12.5	17	32.6
	18	13.0	18	33.5
	19	13.5	19	34.2
	20	14.2	20	35.0
old	25	17.0	25	38.2
	30	19.4	30	41.5
new	35	21.8	35	43.6
	40	24.3	40	46.0
	45	26.8	45	48.2
	50	29.0	50	50.5

FIXTURES: WATER =

CALCULATED SIZES=

WATER: 100' SYSTEM (SAMPLE)

Pipe Sizing Criteria Schedule 40 Steel S-40 Steel

Design: 3'/100' PD , 10 fps max vel High: 5'/100' PD , 12 fps max vel Maxim: 7'/100' PD , 15 fps max v

Nominal	Outside	Wall	Inside		Design			High			Maxim	
Pipe	Diameter	hickness	Diameter	P.D. per	Velocity	Flow	P.D. per	Velocity	Flow	P.D. per	Velocity	Flow
Size	(in)	(in)	(in)	100 ft	(ft/sec)	(gpm)	100 ft	(ft/sec)	(gpm)	100 ft	(ft/sec)	(gpm)
0.38	0.675	0.091	0.493	3.0	0.9	0.5	5.0	1.7	1	7.0	2.5	1.5
0.50	0.840	0.109	0.622	3.0	1.6	1.5	5.0	2.1	2	7.0	2.6	2.5
0.75	1.050	0.113	0.824	3.0	2.1	3.5	5.0	2.7	4.5	7.0	3.3	5.5
1.00	1.315	0.133	1.049	3.0	2.4	6.5	5.0	3.2	8.5	7.0	3.7	10
1.25	1.660	0.140	1.380	3.0	2.6	12	5.0	3.7	17	7.0	4.5	21
1.50	1.900	0.145	1.610	3.0	3.2	20	5.0	4.3	27	7.0	5.1	32
2.00	2.375	0.154	2.067	3.0	3.8	40	5.0	4.8	50	7.0	5.7	60
2.50	2.875	0.203	2.469	3.0	4.3	65	5.0	5.7	85	7.0	6.5	97
3.00	3.500	0.216	3.068	3.0	4.8	110	5.0	6.3	145	7.0	7.6	175
3.50	4.000	0.226	3.548	3.0	5.3	160	5.0	7.0	200	7.0	8.5	250
4.00	4.500	0.237	4.026	3.0	5.8	230	5.0	7.6	300	7.0	8.8	350
5.00	5.563	0.258	5.047	3.0	6.4	400	5.0	8.3	520	7.0	10.3	640
6.00	6.625	0.280	6.065	3.0	7.7	690	5.0	10.0	900	7.0	12.2	1,100

old
new

Nominal	Type K Copper		Type L Copper		Type M Copper		Pipe Sizing Criteria		
Pipe Size	Diameter (Ins)		Diameter (Ins)		Diameter (Ins)		Velocity	Loss in	Flow
(Ins)	Outside	Inside	Outside	Inside	Outside	Inside	Ft/sec	PD'/100'	GPM
0.25	0.375	0.305	0.375	0.315					
0.38	0.5	0.402	0.5	0.43	0.5	0.45	1.0	3	0.5
0.50	0.625	0.527	0.625	0.545	0.625	0.569	1.5	3	1
0.75	0.875	0.745	0.875	0.785	0.875	0.811	2.0	3	3
1.00	1.125	0.995	1.125	1.025	1.125	1.055	2.5	3	7
1.25	1.375	1.245	1.375	1.265	1.375	1.291	3.0	3	12
1.50	1.625	1.481	1.625	1.505	1.625	1.527	3.5	3	17
2.00	2.125	1.959	2.125	1.985	2.125	2.009	4.0	3	35
2.50	2.625	2.435	2.625	2.465	2.625	2.495	4.5	3	70
3.00	3.125	2.907	3.125	2.945	3.125	2.981	5.0	3	110
3.50	3.625	3.385	3.625	3.425	3.625	3.459	5.5	3	160
4.00	4.125	3.857	4.125	3.905	4.125	3.935	6.0	2.5	225
5.00	5.125	4.805	5.125	4.875	5.125	4.907	6.5	2.5	380
6.00	6.125	5.741	6.125	5.845	6.125	5.881	7.0	2.2	575

old
new*

*1.75 would be adequate

utility connections . heat . gas

HEATING

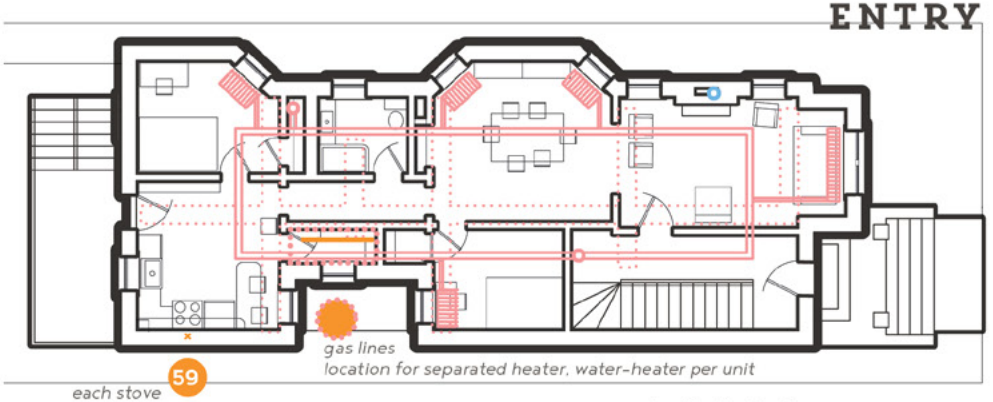
typ. lines, notes on sizing

Heating*
- gas lines
- exhaust
- steam lines
- alt. placements
- alt. ducts (per unit)

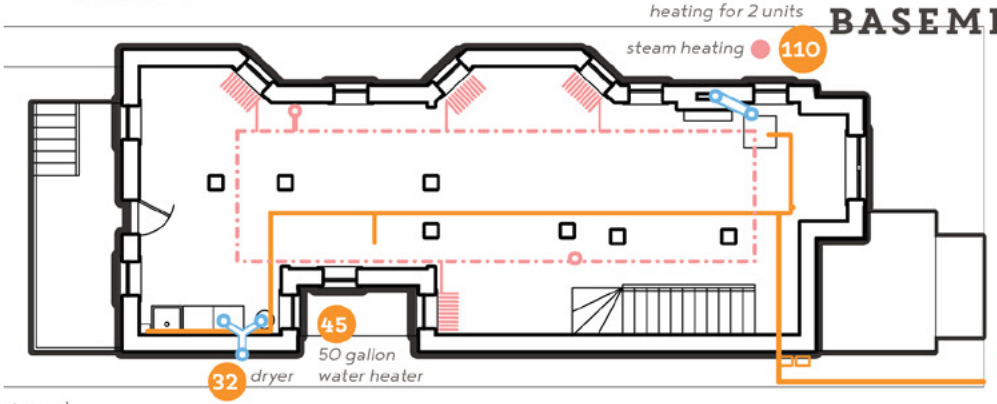
Load by fixtures
- ft3/hr gas use (#)

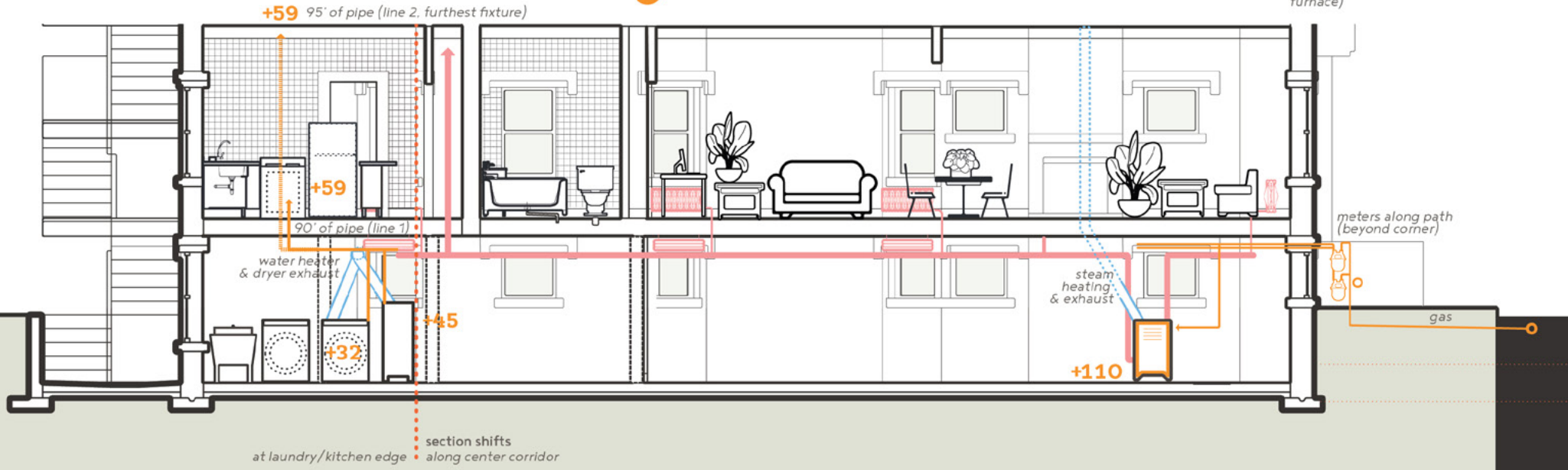
Location
- wall cavity ✕ *(vertical)*
- fixture & in floor
- overhead

ENTRY



BASEMENT





GAS LOADS:

Akin to plumbing, gas is distributed through a series of pressurized pipes, as diagrammed on pg 80. Broadly speaking, gas lines step down in size. A larger capacity and diameter pipe supplies the meters. This splits to serve distinct unit lines and branches internally, with each new section serving fewer appliances, thus requiring less fuel and smaller diameter piping.

As with water flow, you can estimate existing gas flow and current pipes' capacity to support extra appliances. Make a rough count of your gas appliances (range, dryer, etc.) and find their typical fuel usage in cubic feet, on **Table Appliance Fuel Usage.** Sum these values to estimate current gas usage, in cubic feet. To calculate the necessary connection size, measure the distance from your meter to the furthest gas appliance. In the example, this would be the second floor gas range which is approximately 95' from the meter. Find this length on the **Table Gas Pipe Capacity** (round up as necessary) and find the column, moving right, that matches or just exceeds the usage sum (305 ft^3/hr in the example). At the top of the column is your estimated gas connection size, at the meter.

If your current piping matches the nominal pipe size and your fixture usage sum is less, you likely have capacity for heating upgrades or new appliances. Use the **Table Appliance Fuel Usage** to estimate viable additions. (Tables and detailed instructions available at: bit.ly/Gas-Calc)

GAS PIPE CAPACITY

				PIPE SIZE (inch)					
NOMINAL:	½	¾	1	1¼	1½	2	2½	3	4
ACTUAL ID:	0.622	0.824	1.049	1.380	1.610	2.067	2.469	3.068	4.026
LENGTH (feet)	CAPACITY IN CUBIC FEET OF GAS P								
10	172	360	678	1390	2090	4020	6400	11 300	23 100
20	118	247	466	957	1430	2760	4400	7780	15 900
30	95	199	374	768	1150	2220	3530	6250	12 700
40	81	170	320	657	985	1900	3020	5350	10 900
50	72	151	284	583	873	1680	2680	4740	9660
60	65	137	257	528	791	1520	2430	4290	8760
70	60	126	237	486	728	1400	2230	3950	8050
80	56	117	220	452	677	1300	2080	3670	7490
90	52	110	207	424	635	1220	1950	3450	7030
100	50	104	195	400	600	1160	1840	3260	6640
125	44	92	173	355	532	1020	1630	2890	5890
150	40	83	157	322	482	928	1480	2610	5330
175	37	77	144	296	443	854	1360	2410	4910
200	34	71	134	275	412	794	1270	2240	4560
250	30	63	119	244	366	704	1120	1980	4050
300	27	57	108	221	331	638	1020	1800	3670

APPLIANCE FUEL USAGE

APPLIANCE	INPUT Btu/h. (Approx.)	Cubic Feet of Gas Per Hour	
Space Heating Units			
Warm air furnaces:			
Single family	100,000	91	
Multifamily, per unit	60,000	55	
Hydronic boilers:			
Single family	100,000	91	
Multifamily, per unit	60,000	55	x 2
Water-Heating Appliances			
Water heater, automatic:			
Storage 30 to 40 gal. tank	35,000	32	
Water heater, automatic Storage 50 gal. tank	50,000	45	
Water heater, automatic instantaneous:			
Capacity at 2 gal./minute	142,800	130	
Capacity at 4 gal./minute	285,000	259	
Capacity at 6 gal./minute	428,400	389	
Water heater, domestic			
Circulation or side-arm	35,000	32	
Cooking Appliances			
Range, freestanding, domestic	65,000	59	x 2
Built-in oven/ broiler, domestic	25,000	23	
Built-in counter-top range, domestic	40,000	36	
Other Appliances			
Clothes dryer, domestic	35,000	32	
Gas fireplace – direct vent	40,000	36	
Gas log unit	80,000	73	

ADDITIONS

BUILDING SYSTEMS

typ. lines, notes on sizing

Plumbing*
- hot water
- cold water
- sewage/storm

Heating
- gas
- steam / ductwork
- exhaust

Electric*
- lights/fans
- outlets/switches
- breaker boxes
- light-switch connections

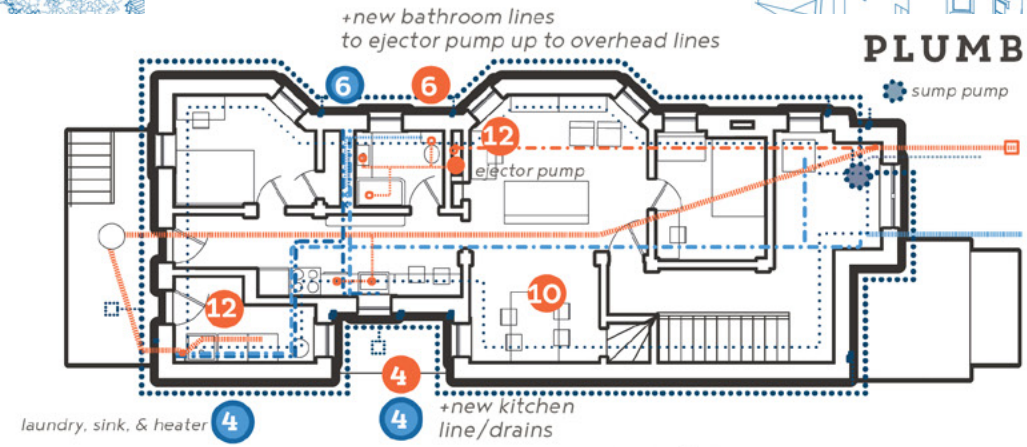
Load by fixtures
- drainage value #
- fixture value #
- ft3/hr gas use #

Location
- wall cavity × *(vertical)*
- exposed
- buried
- overhead

*plumbing: each unit requires, a bathroom sink, toilet, shower/tub, and kitchen sink; laundry per building

*electric: unit requires its own meter + public meter for shared areas

PLUMBING ADDITIONS

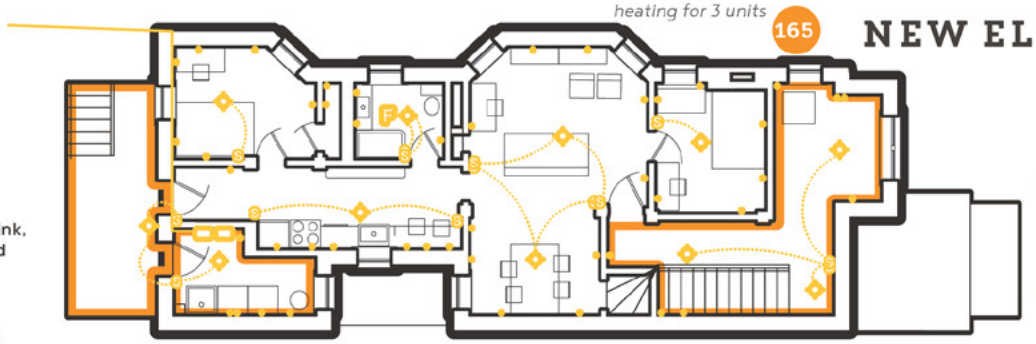


44 *total building sewer drainage value (4" drains, at 1/8 slope)*

34 *water connection (1.75"-2" service with steel or copper pipe)*

6" downspouts to 4" foundation drains, sump pump to storm/ sewer system

NEW ELECTRIC



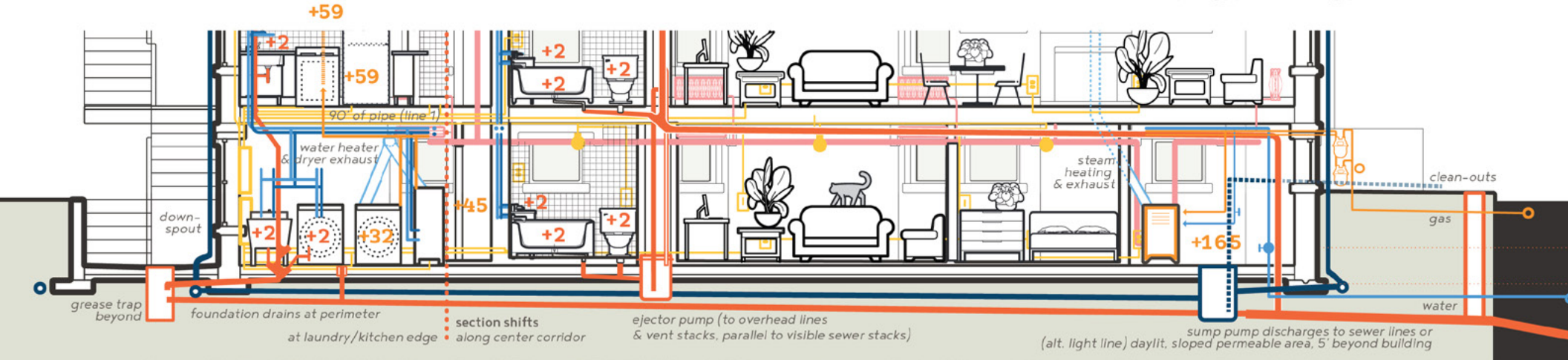
New Unit
1 bath fan, 6 overhead lights, 3-6 outlets/room

Public Areas
4 breaker boxes, 5 lights, 12 outlets, + pumps/detectors

Not an Electric Schematic
Diagrams only to show separation of unit & public lines. Emphasis on need for multiple circuits

HEATING UPDATES

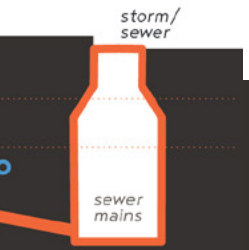
360 *1 ¼" gas supply pipe has capacity for enlarged, shared furnace (alternate option without replacing pipe: add unit range)*



Reminder: All rough utility estimates should be followed by strenuous professional assessments to confirm capacity and work required for a new unit.

SAMPLE NEW UNIT, UTILITIES ADJUSTMENTS:

Building upon the existing systems, this spread suggests likely adaptations and interventions in a Two-Flat basement. As much as possible, placement of new plumbing fixtures have aligned with existing water and sewer lines for service, drainage, and exhausting sewage gas. Assuming separated service between public spaces, first, and second floor units, the existing basement electric circuit is kept for public use and a new system is added for the basement unit interior. Heating connections are left as is, with overhead steam-lines and radiators, which are common in older, multi-flat units.



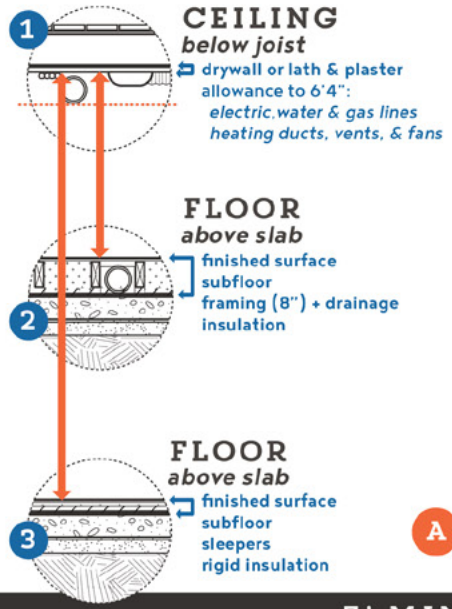
UNIT SIZING . height requirements . room areas

COTTAGE EXAMPLE

Cottage to Two Unit Conversion

MEASURING ROOM HEIGHT

finished floor to underside of ceiling



CEILING
below joist
drywall or lath & plaster
allowance to 6'4":
electric, water & gas lines
heating ducts, vents, & fans

FLOOR
above slab
finished surface
subfloor
framing (8") + drainage
insulation

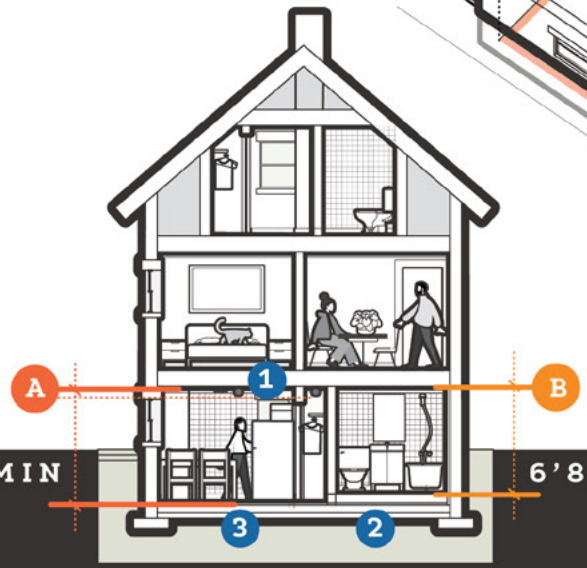
FLOOR
above slab
finished surface
subfloor
sleepers
rigid insulation

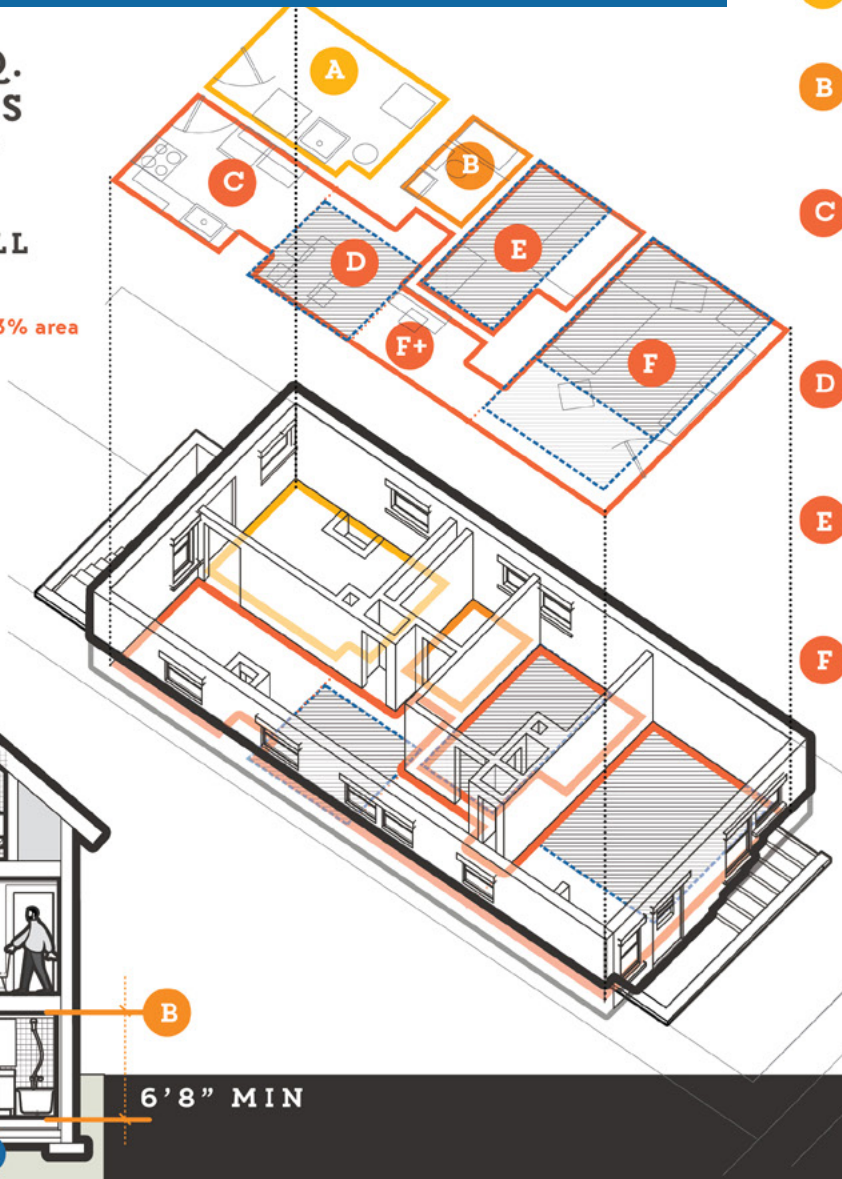
MINIMUM REQ. ROOM HEIGHTS

typical clearance and allowances

A BASEMENT UNIT OVERALL
7' ceiling height
6'4" for pipes on < 33% area
6' 8" egress paths

B BATHROOM ALLOWANCE
6'8" ceiling height
assumes raised floor





MIN. ROOM AREAS (SQ FT)

A EGRESS/EXITS
3 feet clear pathways

B BATHROOM
no area min.
35 sqft shown

C KITCHEN
2.5–3 feet min
corridor at counters
100 sqft shown

D DINING
60 sqft area min.
70 sqft shown

E BED/LIVING
70 sqft area min.
107 sqft shown

F LARGEST ROOM
120 sqft area min.
or
180 with dining
206 sqft living room
+ 50 sqft study area
shown

PRINCIPLES BEHIND HEIGHT AND SIZE REQUIREMENTS:

It is critical to make sure your basement has enough height and area for a decent and legal apartment. The required dimensions are minimums meant to avoid overcrowding.

Unfinished basement height should be nearly 8 feet, on average, to allow for upright posture, accommodate building materials, and avoid pipes acting as obstacles to movement (Minimum Req. Room Heights). As you measure, leave a foot margin for insulation and finishing on floors and ceilings (Measuring Room Heights). (14B-12-1207)

Room areas should be between 60-120 square feet (min.), ideally fitting between existing, load-bearing structures like columns and walls. Make sure to leave common areas, for access to breaker boxes, meters, and laundry, as you carve out space. (14B-12-1207)

For comparison, measure your existing units to understand room sizes. On your slab, use chalk to 'draw' out walls (~6" thick), doors, and typical furniture; can you navigate comfortably in these imagined spaces? Ultimately your architect will work to refine and develop any new unit's layout and coordinate building systems updates.

WHAT YOU NEED TO ASSESS SIZING:

- **Chicago Building Code - Chp 12 -** Interiors
- **Measurements -** current basement size, with interior dimensions wall to wall, floor to ceiling
- **Sketch of new unit with room designations -** see also air/light, egress, utility connections, and structure, which may impact layout
- **Architect** to ultimately draw and stamp the final plans for your new unit, in order to apply for construction permits

DO YOU HAVE THE SPACE FOR A NEW UNIT:

Does your basement have adequate ceiling heights for a new unit (Minimum Req. Room Heights)**?** (14B-12-1207.2 - exception 1)

Does your planned kitchen have decent workspace at the counters (Min. Room Areas: C) **?**(14B-12-1207.1)

- If accessibility is a concern, 30-36" workspaces should include lower cabinets, grab bars, and wheelchair turning radii. See Accessibility Code for Dwelling Units (14B-11-1107).
- The kitchen (or living) may also include the 60 sqft dining area.

Are your main living, sleeping, and dining rooms adequate to meet the minimal area standards at left (Min. Room Areas: D, E, F)**?** (14B-12-1207.3)

- The required bathroom fixtures - a sink, toilet, shower/tub - will determine the minimal areas in a bathroom. (Min. Room Areas: B)

LIGHT + AIR . illumination minimums . ventilation options

COTTAGE EXAMPLE

Cottage to Two Unit Conversion

LIGHT EXPOSURE:

$$\text{Direct} = \frac{\text{sum}(X)}{Z_1} = 8\%$$

$$\text{Indirect} = \frac{\text{sum}(X)}{(Z_1 + Z_2)} = 8\% \text{ avg.}$$

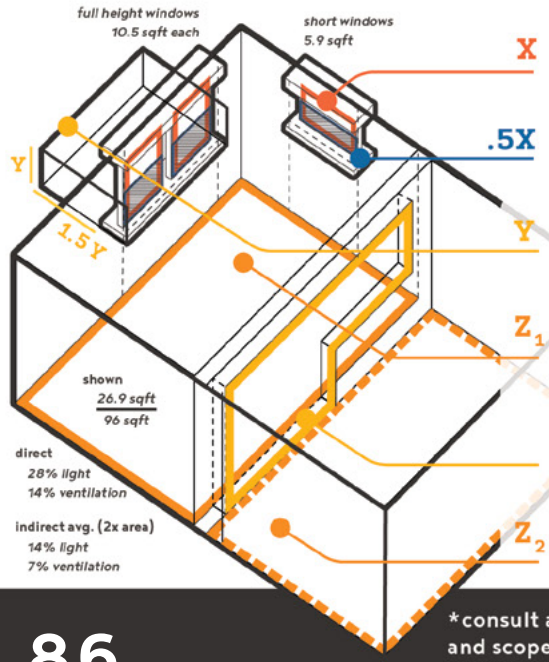
VENTILATION:

$$\text{Direct} = \frac{\text{sum}(.5X)}{Z_1} = 4\%$$

$$\text{Indirect} = \frac{\text{sum}(.5X)}{(Z_1 + Z_2)} = 4\% \text{ avg.}$$

NATURAL AIR & LIGHT EXPOSURES

*supplement w/ mechanical or electric**



MEASUREMENTS:

light area: X
100% window area
glazed surface

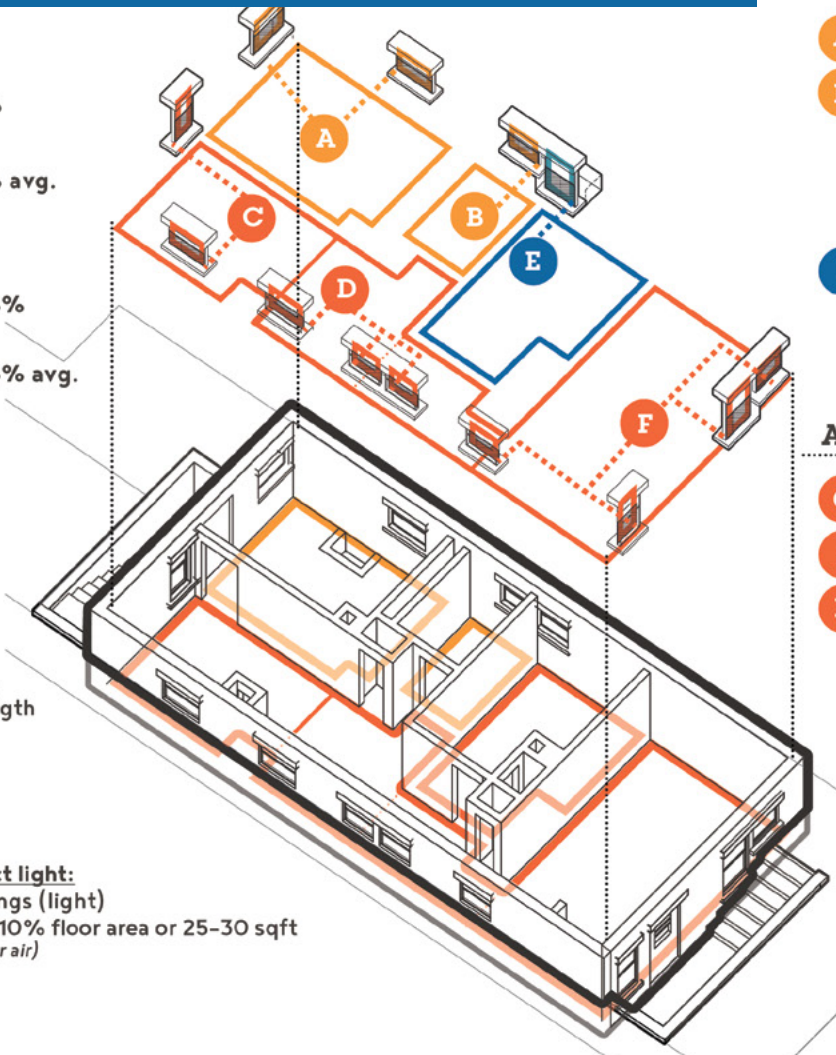
ventilation area: .5X
50% window area
open casements

exterior light wells: Y
1 Y height : 1.5 Y length
sunken area

directly lit room: Z_1
100% floor area
floor

openings for indirect light:
must have 9'6" ceilings (light)
opening must be 8–10% floor area or 25–30 sqft
open or louvred areas (for air)

indirectly lit room: Z_2
100% floor area
floor



MIN. LIGHT (L) & AIR (V) REQ.

% area per room

A LAUNDRY/ B BATHROOM
mechanical vents req.
1.5% area to exhaust by fan
16% (L) shown in bath
17% (L) shown in laundry

E BEDROOMS
8%(L), 4%(V) req.
9.8% (L) shown
requires light well

ALL OTHER AREAS

C KITCHEN, LIVING, F DINING + STUDY D
8%(L), 4%(V) req.
per room or adj. avg.
15% (L) shown in kitchen
14% (L) shown in living
15% (L) avg in dining +

*consult a heating & ventilation professional to measure air changes per hour (5 changes min) and scope mechanical ventilation system.

PRINCIPLES BEHIND LIGHT AND VENTILATION REQUIREMENTS:

It is imperative that any new basement unit meets or exceeds the code's ventilation and lighting requirements (left, Min. Light & Air). Sheltered at/below grade, basements often have small windows, poor air circulation, and excess humidity. Combined, these factors foster condensation and mold. Adequate ventilation and light combats mold and mildew, and improves quality of life. Your architect will confirm air and light calculations and coordinate with specialists. That said, you can anticipate potential issues and estimate for compliance by making a few measurements using the metrics noted below.

Natural light is easy to estimate. (left, Calculating Air & Light Exposure) Measure the area of windows currently in your basement and pair them with anticipated room sizes. For adequate daylight, the area of windows in any room must be at least 8% of the floor area (note indirect light/adjacent room options for high ceiling areas)(14B-12-1204.2.4). An electrician can estimate artificial light levels for access stairwells and new rooms.

To estimate **natural ventilation**, imagine all the measured windows open (50% area for air flow) and calculate as you did above (14B-12-1202.5). Do you have 4% of air-flow area per each room area? To informally check for excess humidity, tape tinfoil to the walls (all edges) and, after two days, check for water. Moisture on the wall indicates waterproofing issues; moisture on the exposed side shows condensation. As air movement, condensation, and evaporation rely on cross-ventilation (facing windows) and air-pressure dynamics, you should hire a ventilation professional to confirm the rate of **passive air change**–how long it takes for all new air to enter a space with windows closed–and advise on mechanical ventilation and dehumidification.

See openings section, in 'Mitigating Issues' for constraints in adding foundation windows (pg 156).

WHAT YOU NEED TO ASSESS AIR, LIGHT:

- **Chicago Building Code – Chp 12 –** Interior Environment
- **Measurements and layout used for sizing +** measurement of ground level and offsets, as limits window well sizes
- **Mechanical/Heating professional** to perform blower tests (14B-12-1202.1 exception 1) and install vents, **Electrician** to assess artificial light levels
- **Architect** to confirm calculations, coordinate w/ tech.professionals

DO YOU HAVE AIR AND LIGHT FOR A NEW UNIT:

Does your basement have adequate natural light for residential use (Min. Light & Air)**?** (14B-12-1204.2.4)

- 8% for all rooms, or 8% average if counting indirect lighting

Have you confirmed adequate artificial light with an electrician? (14B-12-1204.3)

- Room lights must provide 10 footcandles, at 30" h
- Stairwell lights must provide 1 footcandle on treads

Does your basement have adequate natural ventilation, in all seasons (Min. Light & Air)**?** (14B-12-1202.5)

- 4% for all areas, calculated by room or averages
- 5 air-changes per hour by infiltration

Do your new bathroom(s), kitchen, and laundry rooms have mechanical ventilation? (14B-12-1202.1)

- Fans must have openings of 1.5% * area of the room they ventilate.

If you need to increase window areas, do you have space for window wells (Exterior Light Wells)**?** (14B-12-1204.2.6)

- Can you add light wells (1.5:1 ratio) within your lot?

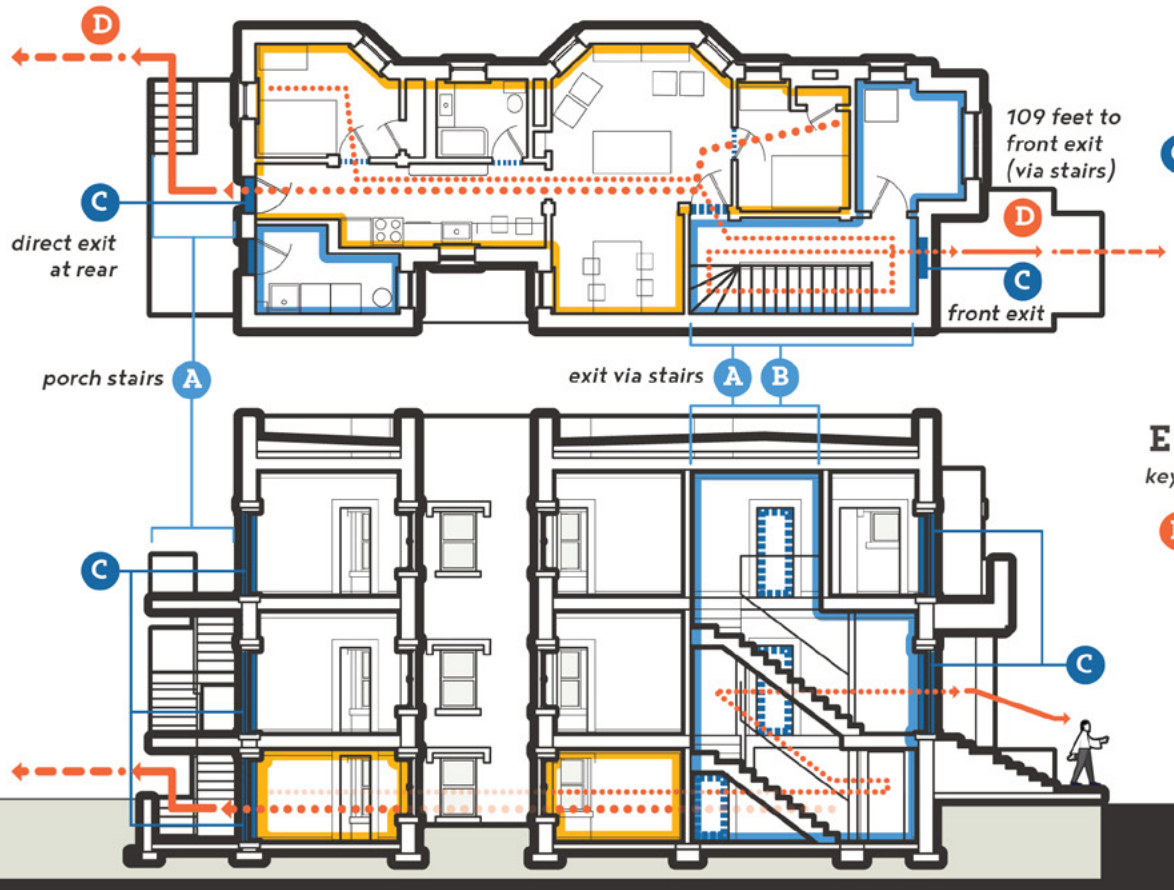
EGRESS ELEMENTS . fire safety . paths . exits . discharge

TWO-FLAT EXAMPLE

Two-Flat to Three Conversion

TRAVEL PATHS & MAX DISTANCES

travel paths, common areas, basement unit



EGRESS ROUTES MEASURING & SIZING

Dimensions for clear passage (R-5 residential buildings)

A STAIRS

interior + exterior

- **passage:** *36" wide*
- **handrails:** *one + side, 34-36" high*
- **step rise:** *8" max,* **run:** *9" min*
- **landings:** *36" x36" min, 42" rail*

B CORRIDORS

width + clearance

- **passage:** *36" wide (44" pref.)*
- **height:** *6' 8" min. clear 27" to ceiling*
- **openings:** *min. 4' between doors or sequential thresholds*

C DOORS

openings direction of swing not specified for R-5 residential

EGRESS COMPONENTS

key elements (annotated below section, below plan)

D EGRESS ROUTES

1 travel path must ≤ 60 feet*, from furthest corner to exterior
Paths cannot pass through bedrooms or baths, given locking doors
*without sprinklers (75 feet with sprinklers)

EXIT

Door to exterior & path to ground level, at opposite unit ends
1 exit per unit, if unit < 800 sqft & has exterior exit door
otherwise 2 exits/occupied level, by stairs or direct exits

DISCHARGE

from exit path at ground level to sidewalk/alley property exit
gates must be non-locking in egress direction

GENERAL PRINCIPLES OF EGRESS (I.E. FIRE EXIT) SYSTEMS:

Fire safety is a key aspect of building code. As you layout your new unit, you'll want to make sure all rooms allow for egress, i.e that all occupants can efficiently leave the building in an emergency. Broadly, the code requires paths within halls or stairs that are a) built of fire resistant materials (see next page) and b) facilitate the unobstructed movement of occupants outward.

As noted in **'Egress Components,'** an egress system has three parts to consider:

- **Egress routes:** pathways to an exit from within a building, passing through units, common areas, and stairs. The code specifies 'travel distance' as the longest distance allowed between the opposite corner of a unit to an exterior exit, as a human would walk.
- **Exits:** building exits are located on the exterior walls and release occupants to the outside. Exits can include exterior stairs, which connect with the ground, or 'horizontal' exits that release occupants at grade.
- **Discharge:** pathways from an exit to the street or alley at the edges of a property. Residential discharge paths can have locking gates at the edges of a property.

WHAT YOU NEED TO ASSESS EGRESS:

- **Chicago Building Code – Chp 10 –** Means of Egress (summarized in drawings)
- **Measurements and layout used for sizing** to determine egress pathways and travel distances (see also air/light, utility connections, and structure as those elements may impact paths and hallway placement)

DO YOU HAVE NEEDED FIRE EXITS:

Does your basement unit have a direct exit, from within the unit, or two exits via common hallways? (14B-10-1006.2.1, 14B-10-1006.3.2, 14B-10-1006.3.3)

- If planning additional exit doors, they are required to be at opposite ends of residential buildings.
- The same physical concerns apply to adding doors to foundations, as when adding windows (with 3' exit landings in place of window well requirements).

Is at least one route of travel under 60' (no sprinklers) or 75' (with sprinklers):

- Measure the distance of travel from the furthest corner of the furthest room opposite the exit.
- For paths on stairs, measure on a diagonal, parallel to the steps, along the staircase center.
- Routes of egress can not cut through bedrooms or bathrooms from other rooms (as those rooms typically have locking doors).

Are all the passages and doors along your egress route adequately sized – both within unit and in common spaces (Egress Route Sizing)**?** (14B-10-1003.3.1, 14B-10-1003.5)

- If space does not permit, you may retain older, steeper stairs but with adequate railings and clear space.
- If your basement is lower than adjacent exits and areaways, it is permissable to have two steps up (max) to exit a story.

As you consider the impacts, beyond a single unit, ask yourself the following:

- Are the egress systems in your building adequate for all residental units?
- Have you considered how new, exterior exit doors might integrate with your foundation walls and site?

FIRE SAFETY . smoke & gas detection . fire-resistant materials

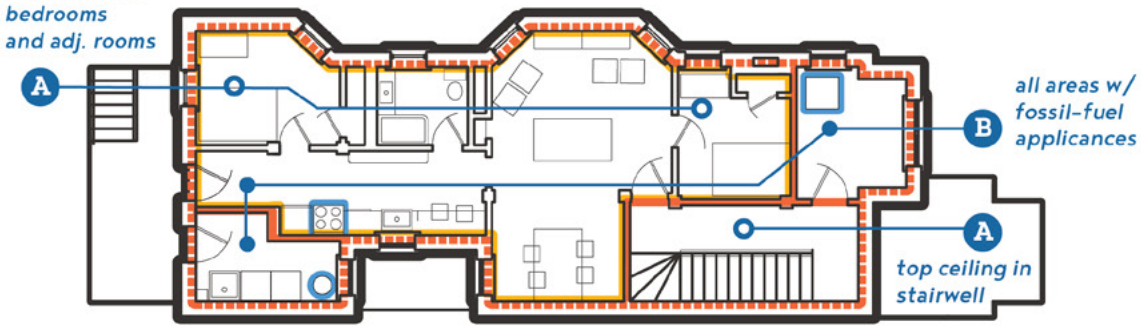
TWO-FLAT EXAMPLE

Two-Flat to Three Conversion

FIRE PARTITIONS & SMOKE DETECTORS

partitions, furnace/water heater , unit*

smoke only
smoke, carbon monoxide



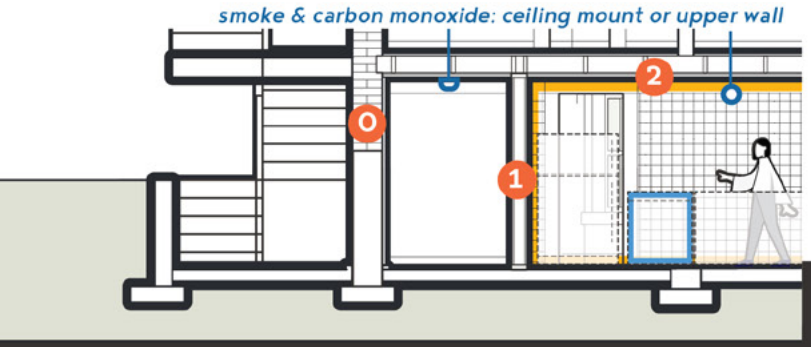
ionization alarm:
10' or 20' from cooking appliances

photo-electric alarm:
6' from cooking appliances

carbon monoxide (integrated w/ smoke):

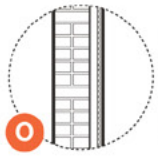
PARTITION FIRE RESISTANCE TO SLOW FIRE SPREAD

typ. materials + primer/paint finish (your walls may vary)



EXTERIOR WALLS

horizontal containment



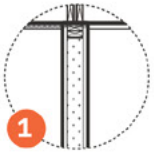
assuming old walls:
2 brick courses^ in american bond
shallow wood frame
lath with 1/2" plaster
^exceeds 2hr

2 HR *fire resistance*
<3' lot off-sets

1 HR *fire resistance*
3'-30' lot off-sets

OUTER WALLS BASEMENT UNIT

horizontal fire partition

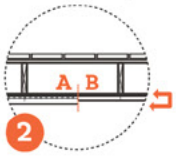


assuming new walls:
2 layers 5/8" gypsum* (2hr) or 2 layers 3/8" gypsum (1hr)
2x4 wood studs
repeat gypsum*

1 HR *fire resistance*

CEILING BASEMENT UNIT

vertical fire partition



w/ double wood floor above joists:
A – *existing ceiling*
3/8" lath*, 1/2" plaster
B – *new construction*
1/2" gypsum*
**Type X fire resistant*

1 HR *fire resistance*

MATERIAL ELEMENTS AND ALARMS FOR FIRE SAFETY:

In addition to egress, the building code also addresses fire hazards through containment, suppression, and detection systems – 'fire walls', sprinklers, and alarms. As you consider a new unit, you'll want to incorporate, at minimum, containment and detection systems. *Small multi-unit residences and Two-Flats are not required to have sprinkler systems.*

Containment consists of dividing the building into different zones and building walls or partitions to slow the spread of fire. The partitions are classified by their fire resistance, recorded in 'burn-time' or the duration it takes for materials to fail in a fire. In principle, the one or two-hour rated partitions–required between units, ceilings, and surrounding egress corridors–allow time for occupants to hear fire alarms and safely exit.

Fire detection takes the form of smoke detectors. These must be incorporated in your new unit and basement utility areas. While detector placement is fairly simple, alarms should be wired into the building electrical system and connected–if one sounds, they all sound–with placement near the ceiling. If absent, detectors should be added to the existing apartments and stairwells and connected together.

Carbon monoxide alarms should be added near fossil-fuel appliances, such as furnaces, water heaters, and gas stoves. Inefficient or blocked exhaust can put your family at risk for carbon monoxide (CO) poisoning. Carbon monoxide detectors are either stand-alone units or incorporated with smoke detectors and should be installed at ceiling or upper wall height.

WHAT YOU NEED TO ASSESS FIRE SAFETY:

- **Chicago Building Code – Chp 7 –** Fire and Smoke Protection, **Chp 8 –** Interior Finishes, **Chp 9 –** Fire Protection and Life Safety Systems (summarized in drawings)
- **Measurements and layout used for sizing,** to determine detector placements and verify adequate space for fire partitions
- **Architect** to confirm anticipated fire partition assemblies and create drawings to apply for construction permits

IS YOUR NEW UNIT DESIGNED TO DETECT AND CONTAIN FIRE:

Does your new unit contain integrated smoke alarms at specified distances from/in bedrooms, bathrooms, and shared stairways (Fire Partitions & Smoke Detectors) **?** (14B-9-907.2.10.2)

Note the three types of smoke detectors–heat, smoke, optical–and req. distances from kitchen areas. Does your unit plan accommodate this? (14B-9-907.2.10.3)

Does your new unit contain integrated alarms near fuel-burning appliances (Fire Partitions & Smoke Detectors) **?** (14B-9-915, 916)

- This includes carbon-monoxide alarms for gas ovens, furnaces, and water heaters.

Are all the doors and walls along your egress route adequately sized – 5-6" thick for one or two-hour fire partitions? Have you incorporated partition sizing into the calculation of the unit's exterior walls and ceiling, esp. regarding unit height (Partition Fire Resistance) **?** (14B-7-708 partitions, 721 - prescriptive assemblies)

- See prescriptive fire assemblies at 14B-7-721, table 721.1(2)