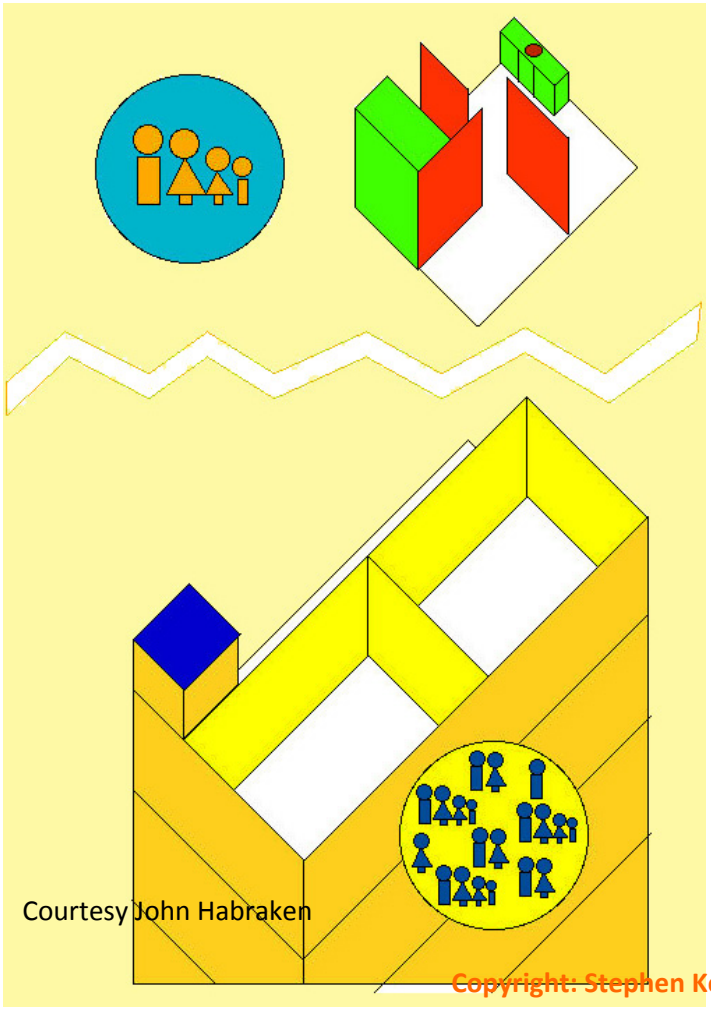
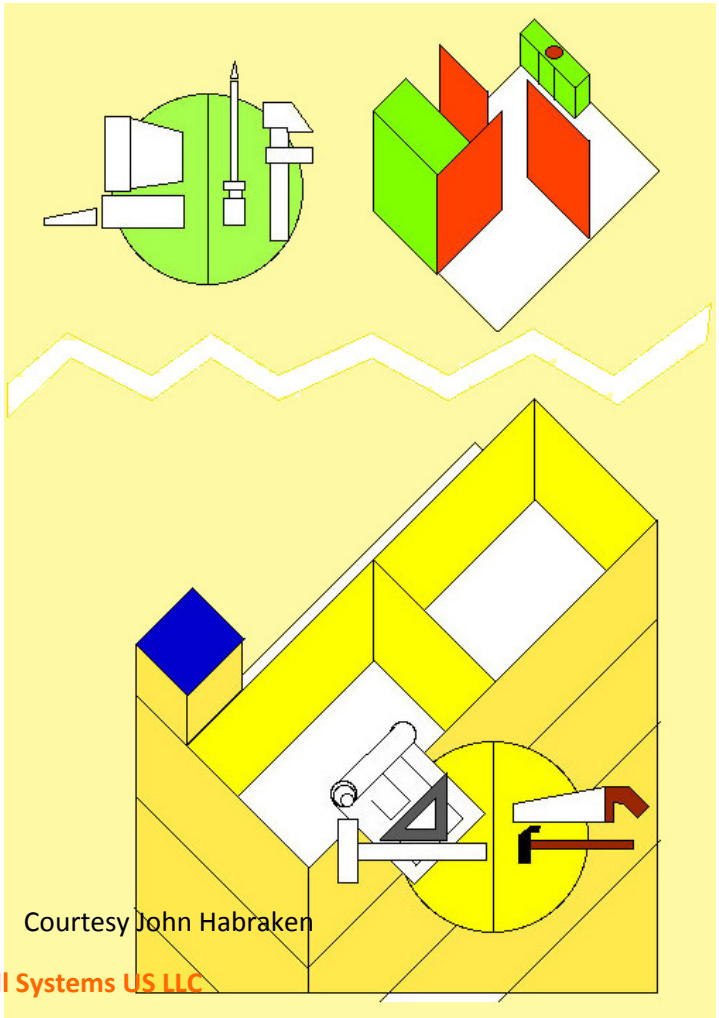
AN INFILL INDUSTRY and its PRODUCTS

Steve Kendall, PhD (MIT'90) | Infill Systems US LLC



Courtesy John Habraken

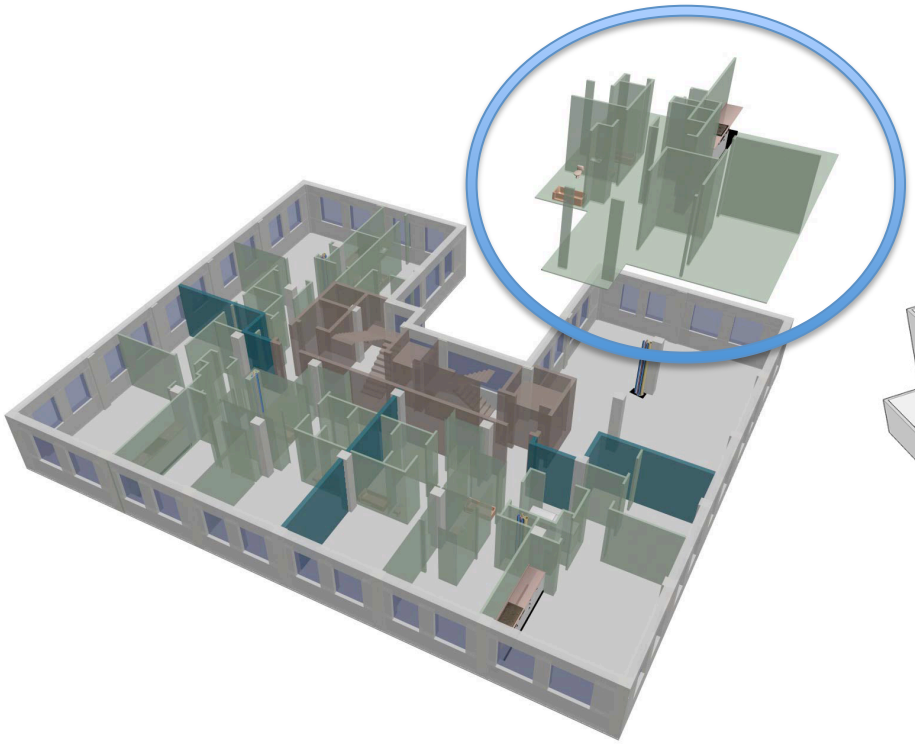


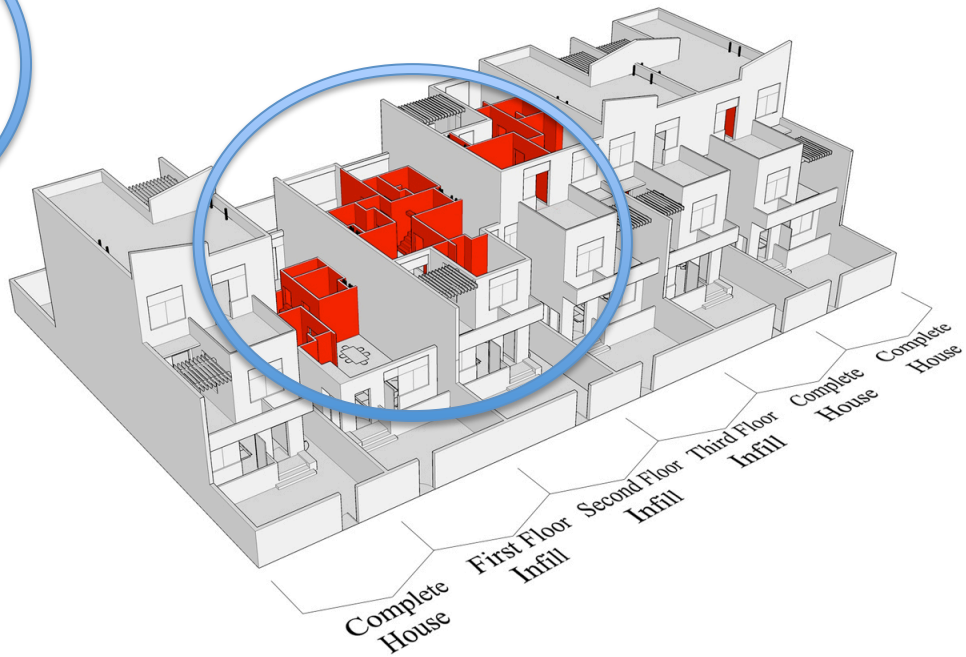
Courtesy John Habraken

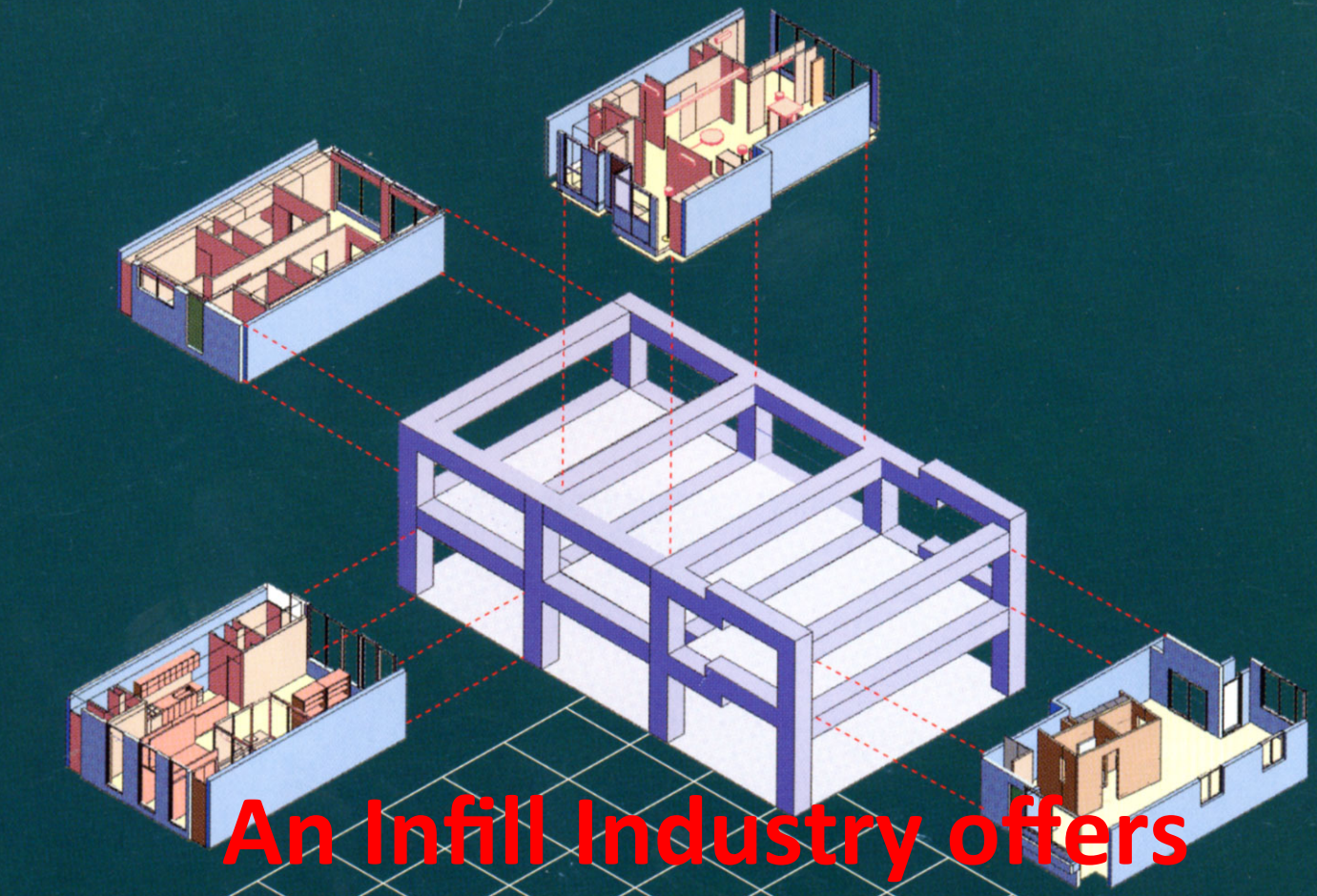
LOOKING TO THE FUTURE

....disintermediation, supported by the internet and automation

to help us address sustainability





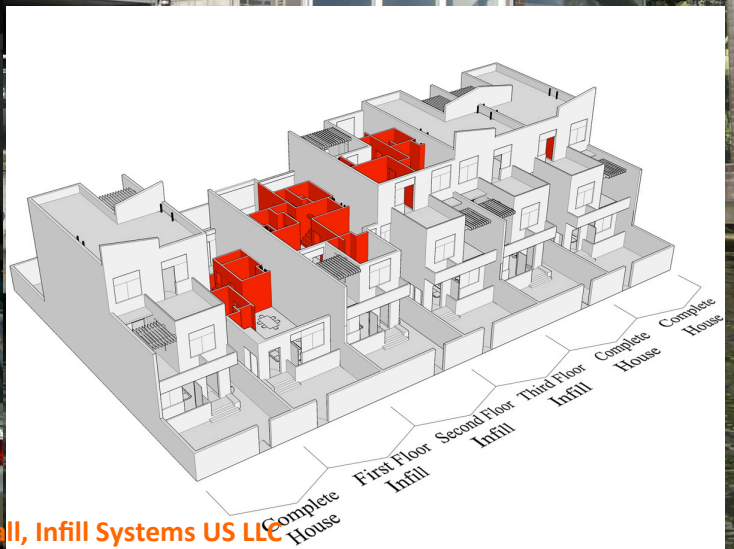


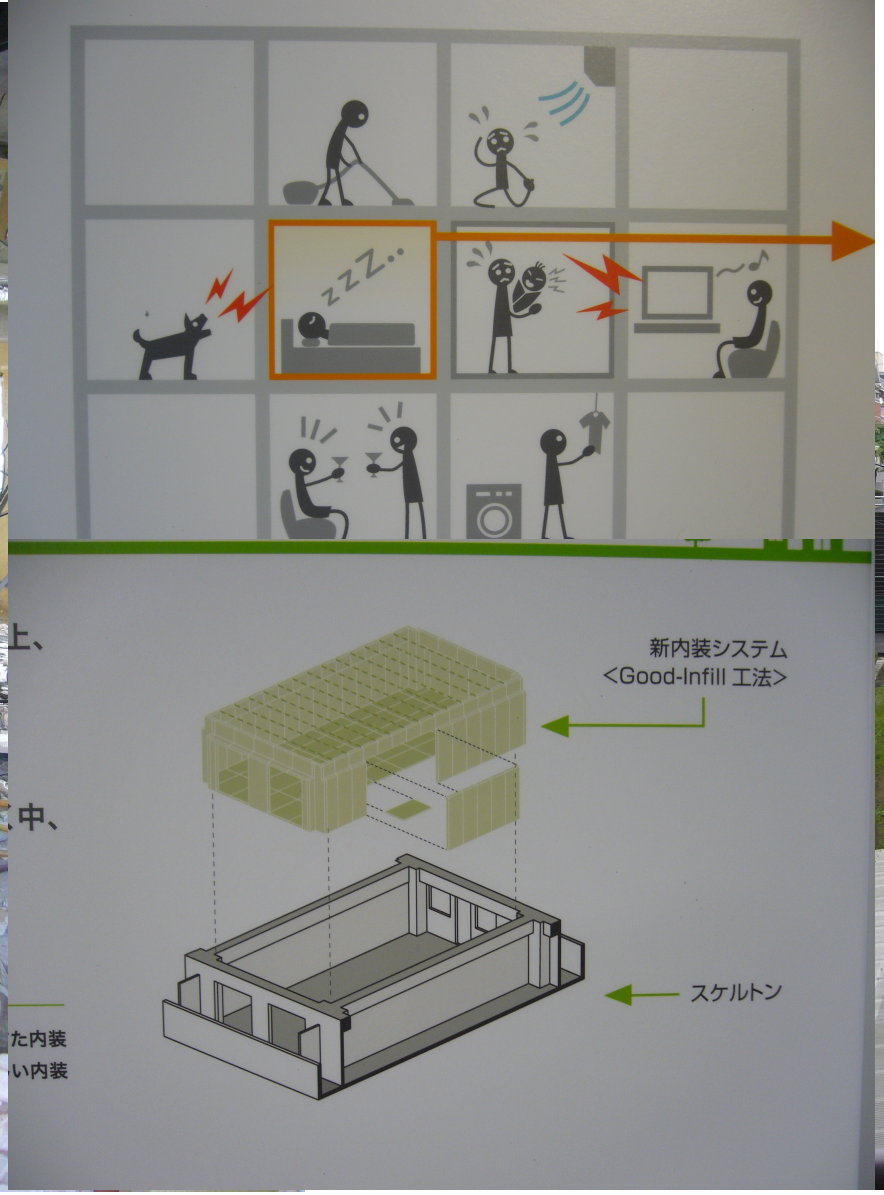
An Infill Industry offers

- decision flexibility to developers
- choice to users
- adaptability later

THUS - a long-lasting real estate asset

In new construction





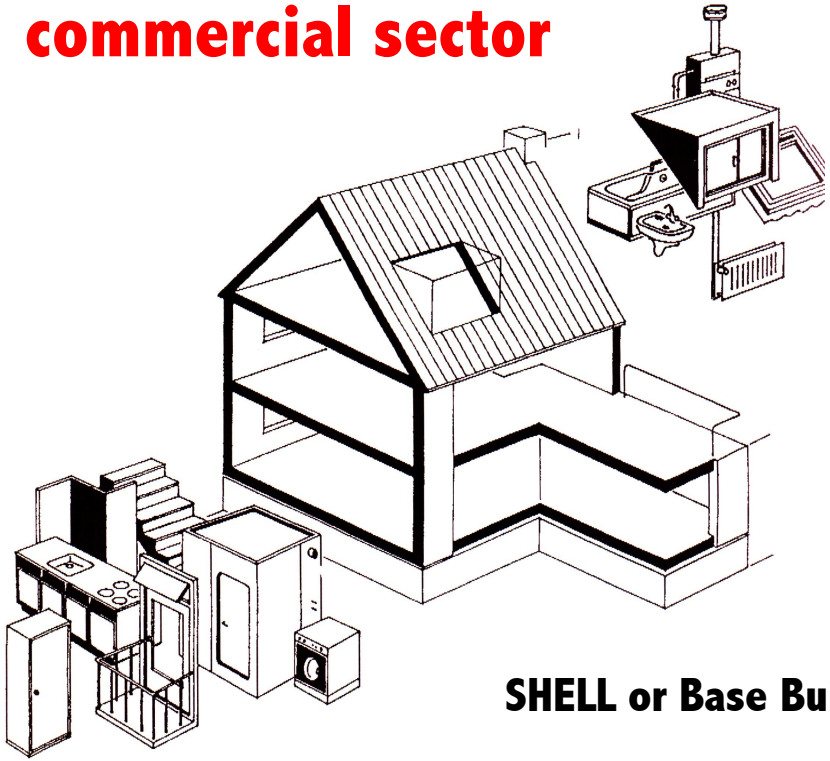
…and in upgrading the existing building stock

The **fit-out** is the part of the whole building relating to the individual dwelling unit.

It matches the basic social unit of society, in all its variety.

A starting point:

Divided construction costs is familiar in the commercial sector



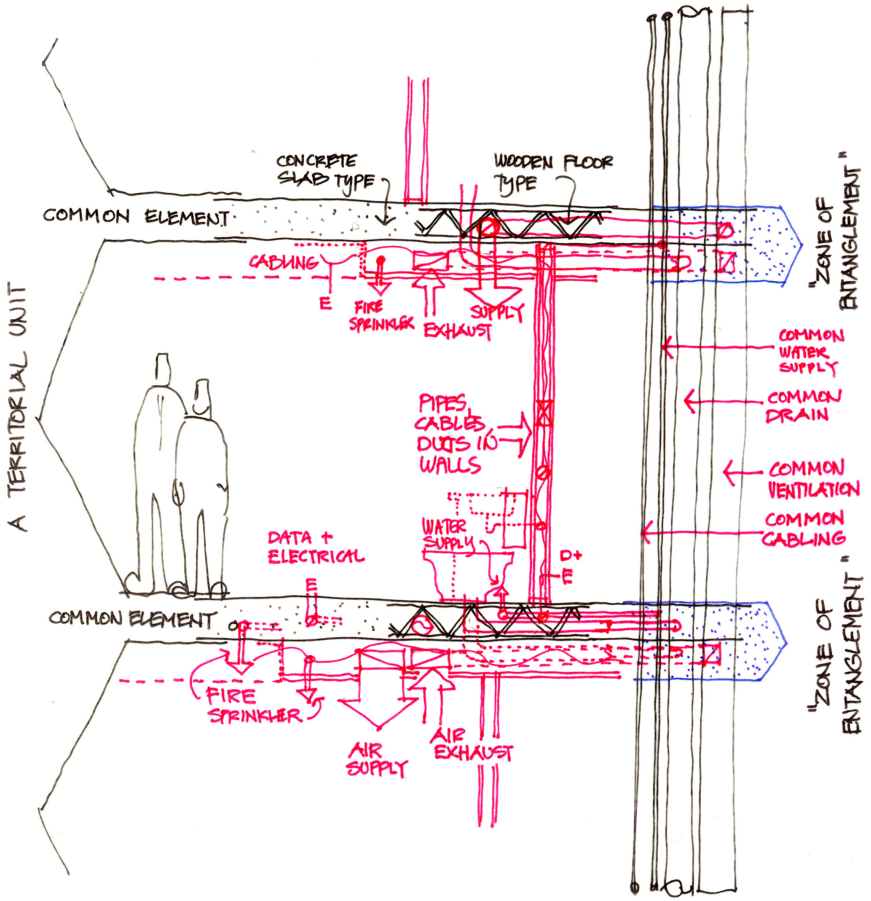
Divided Construction Costs

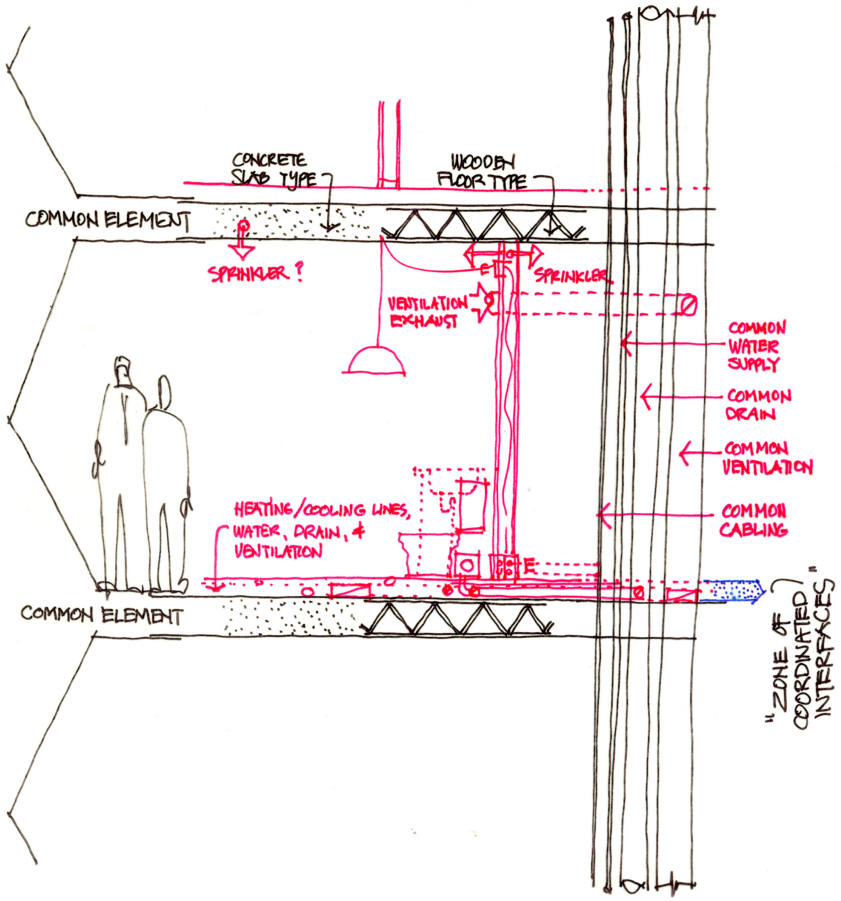
Base Building and Fit-out

		Base Building	Fit-Out
Preliminaries	BB+FO	.5%	.5%
Foundation		10.2%	
Rough Structure		16.6%	
Full Enclosure		15.1%	
Finishing Trades	BB+FO	3.0%	9.8%
Flooring	FO		7.0%
Interior Trim Carpentry	FO		3.0%
Interior Doors	FO		1.6%
Ceramic Tile	FO		.7%
Cabinets and Vanities	FO		4.2%
Appliances	FO		1.7%
Rough and Finish Plumbing	BB+FO	1.2%	5.0%
Rough and Finish Electrical	BB+FO	1.3%	2.3%
Lighting Fixtures	FO		1.0%
Completion		4.8%	
Specialties	BB+FO	3.6%	3.2%
Other	BB+FO	1.1%	1.0%
TOTALS		57.4%	42.6%

SHELL or Base Building

FIT-OUT

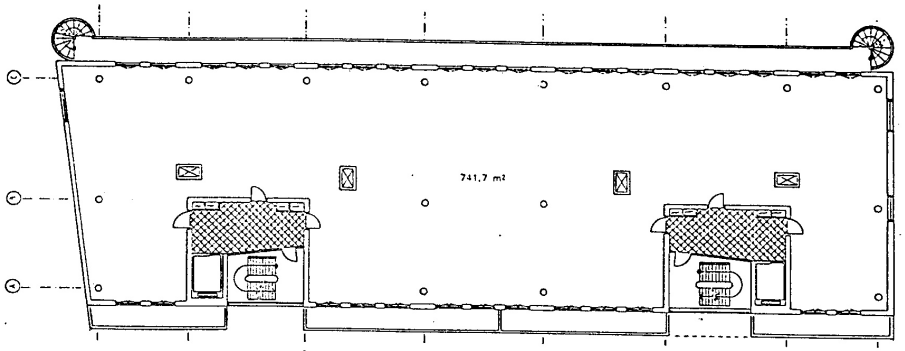




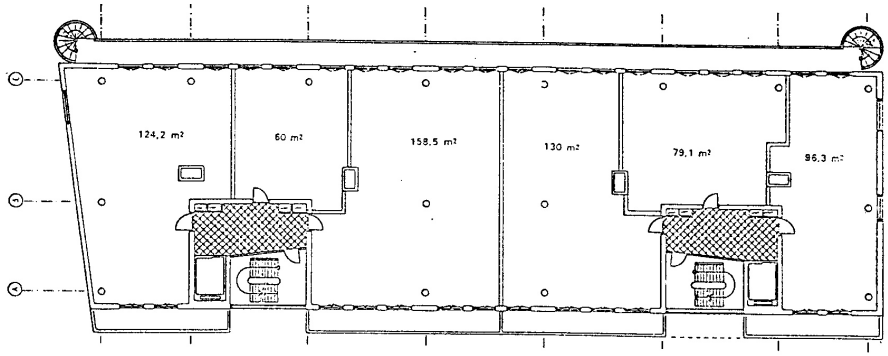
...we are moving from messy entanglement to smart disentanglement...

Open Building Requires Capacity

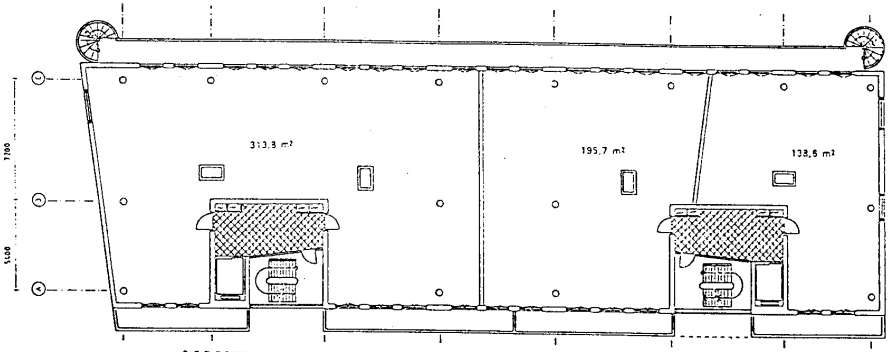
SELLING SUPPORT PER M2



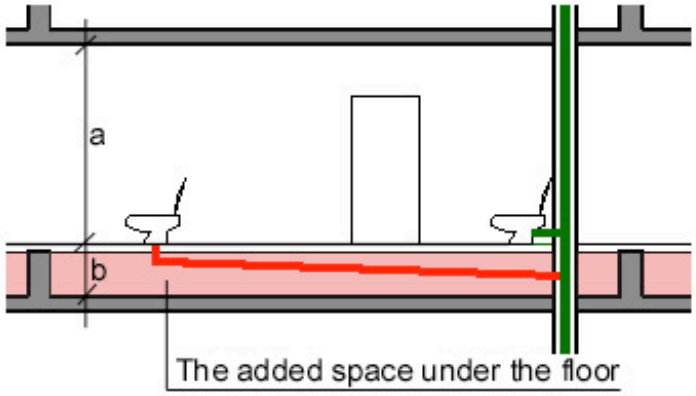
THE EMPTY SUPPORT WITH CAREFULLY POSITIONED STAIR-LANDINGS and VERTCAL MAINS



UNIT ALLOCATION VARIANT WITH 6 UNITS



UNIT ALLOCATION VARIANT WITH 3 UNITS



Thicker floors
(affects building height)

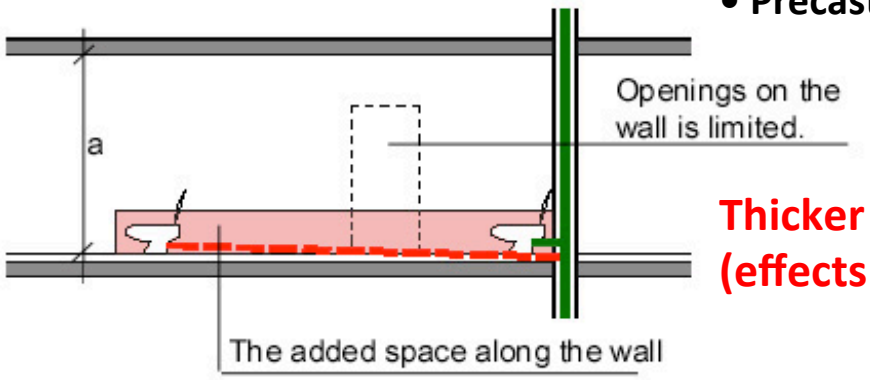
- **"floor layer"**

(e.g. the Matrix Tile System)

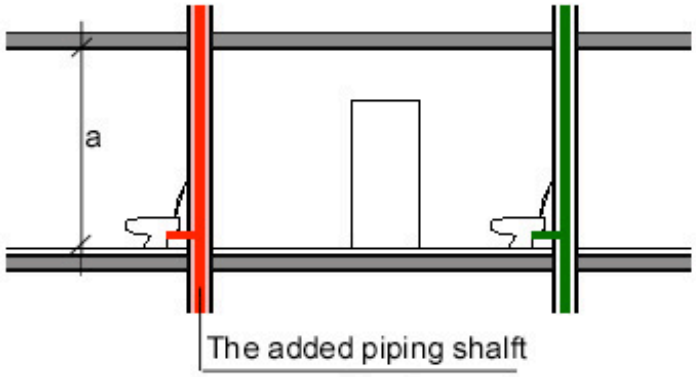
- **"raised floor"**

(e.g. S/I housing

- **"floor trenches"**
- **"upside-down floor"**
- **Precast slab w/removable top**



Thicker walls
(effects floor area)



More vertical pipe shafts (effects floor area)

Courtesy Liu Peng, BIAD

There are trade-offs:

To let us decide floor plans later, we must choose between several ways to organize pipes:

- **vertical (common parts)**
- **horizontal (belonging to each dwelling unit)**

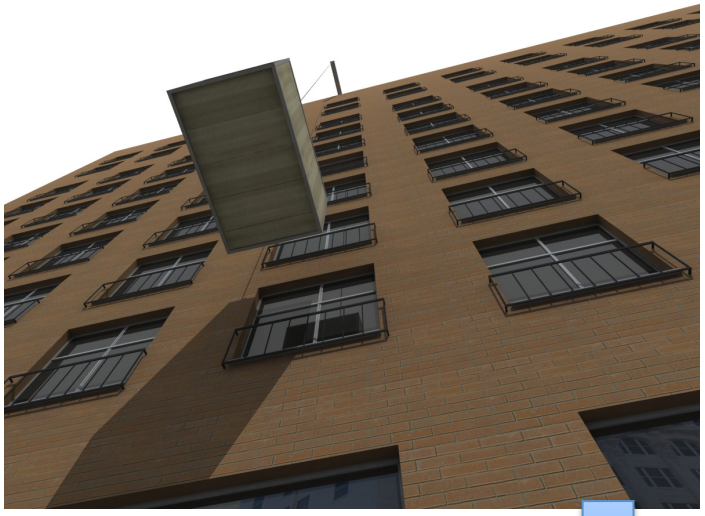
How INFILL companies work

Company showroom
providing design services

Consolidation and fabrication

Loading containers per dwelling unit

Delivery of containers in the sequence needed for JIT fit-out



Hoisting to the unit

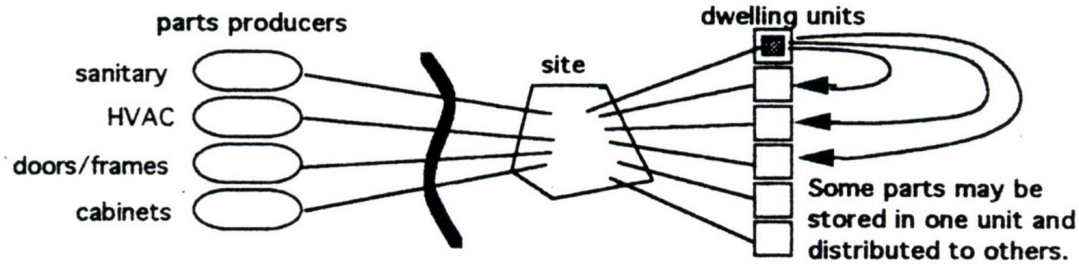
Container temporarily located

(Or the parts can be delivered using the building's freight elevator)

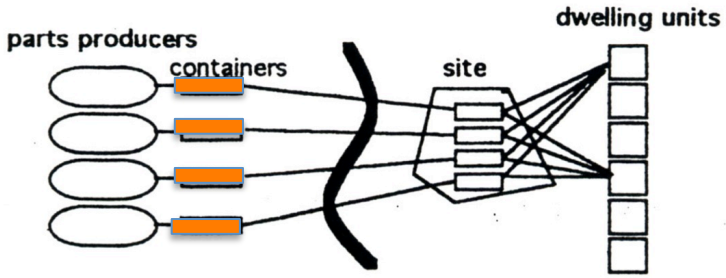
A multi-skilled installation team works inside the space

Each unit is a separate project, budgeted independently

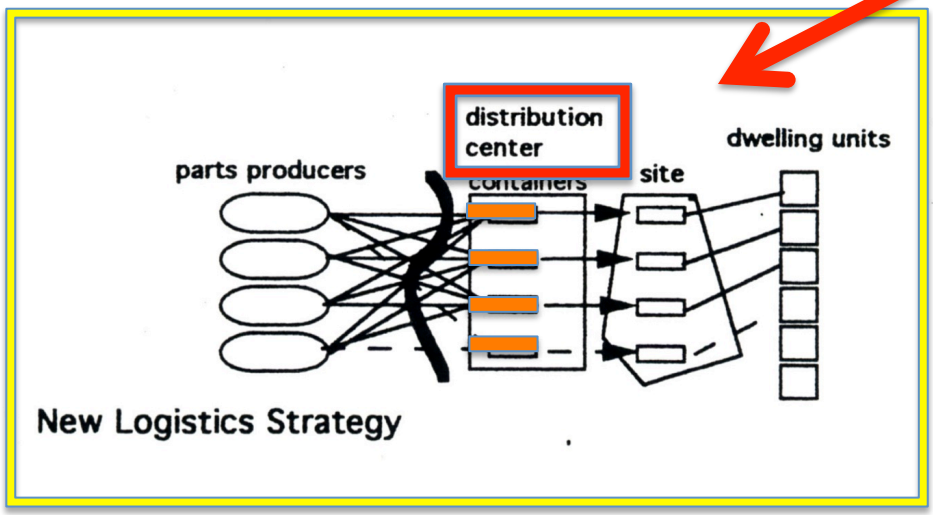
Each individual unit fit-out is completed within one month of its purchase



The Traditional Supply and Logistics Chain



Intermediate Strategy

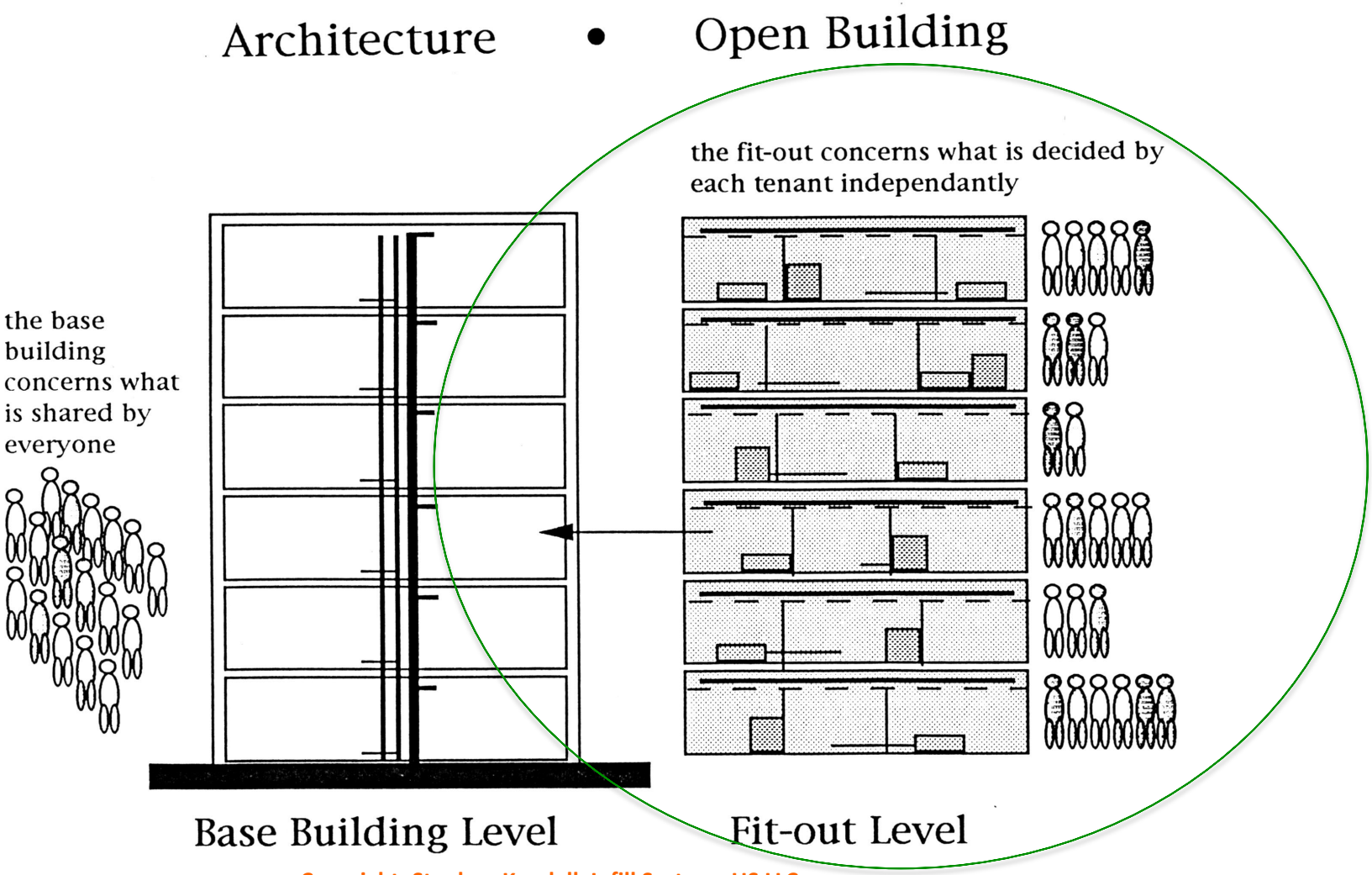


New Logistics Strategy

Infill companies provide:

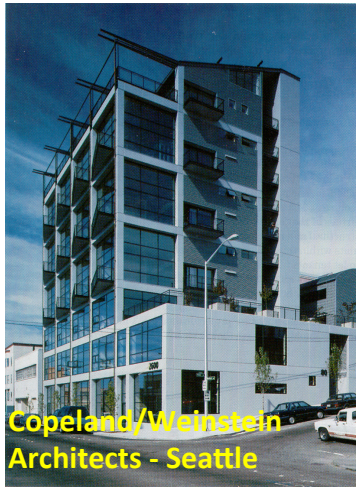
- design
- fabrication
- consolidation and
- installation services
- *and possibly financing*

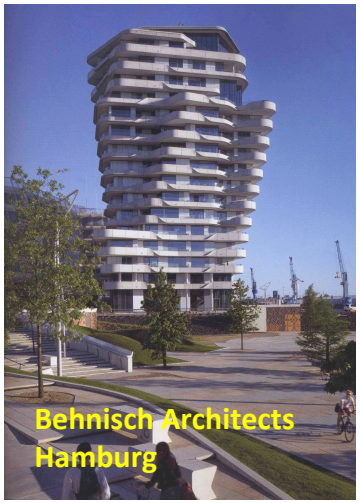
Infill companies operate in the second phase of 2-step decision-making processes

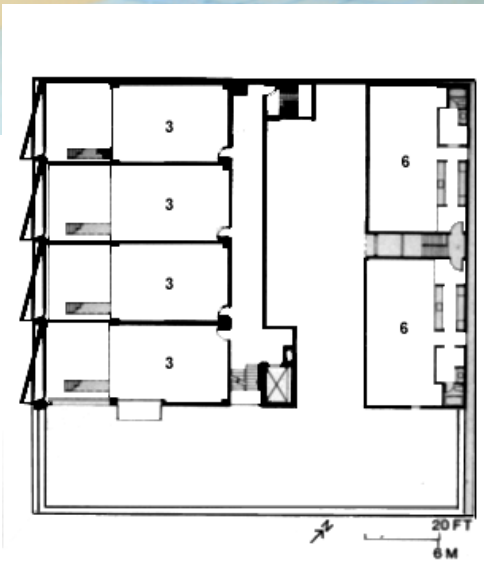


Residential Open Building

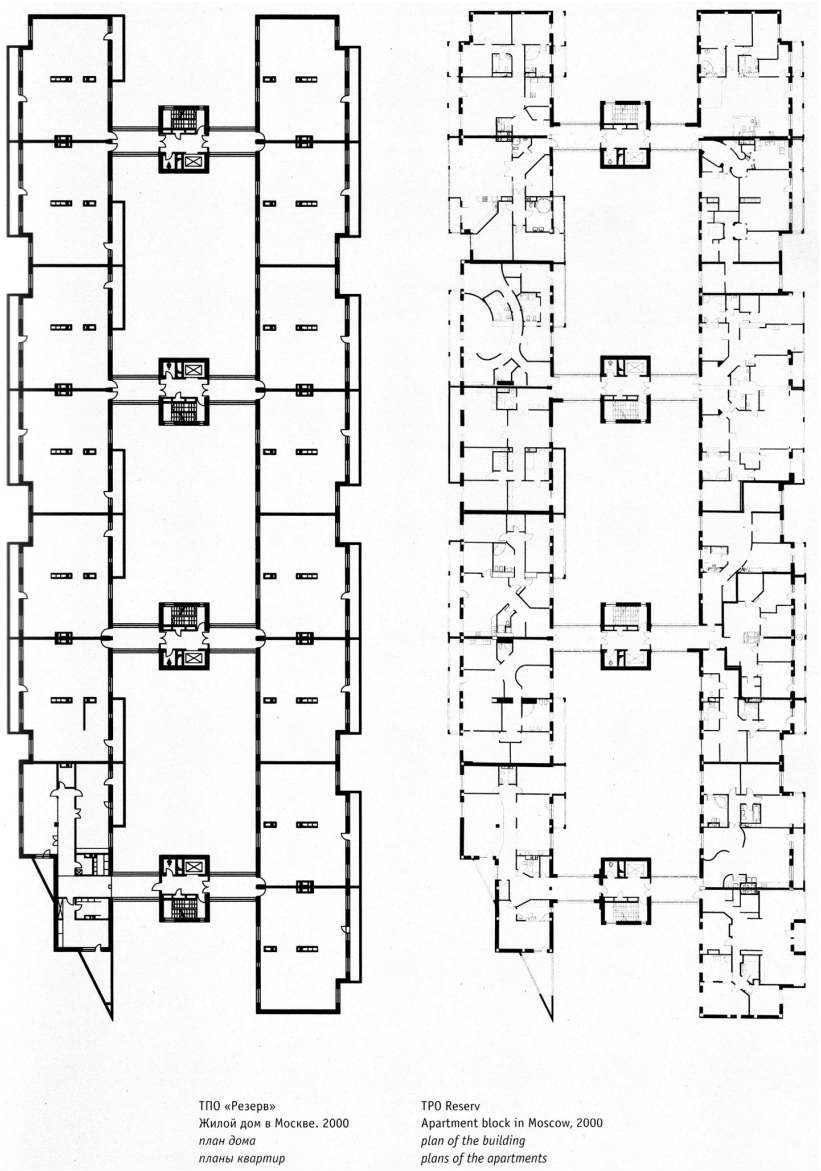
(designed for gradual customization)







Banner Building, Seattle
Architect: Weinstein Assoc.
Developer: Koryn Rolstad

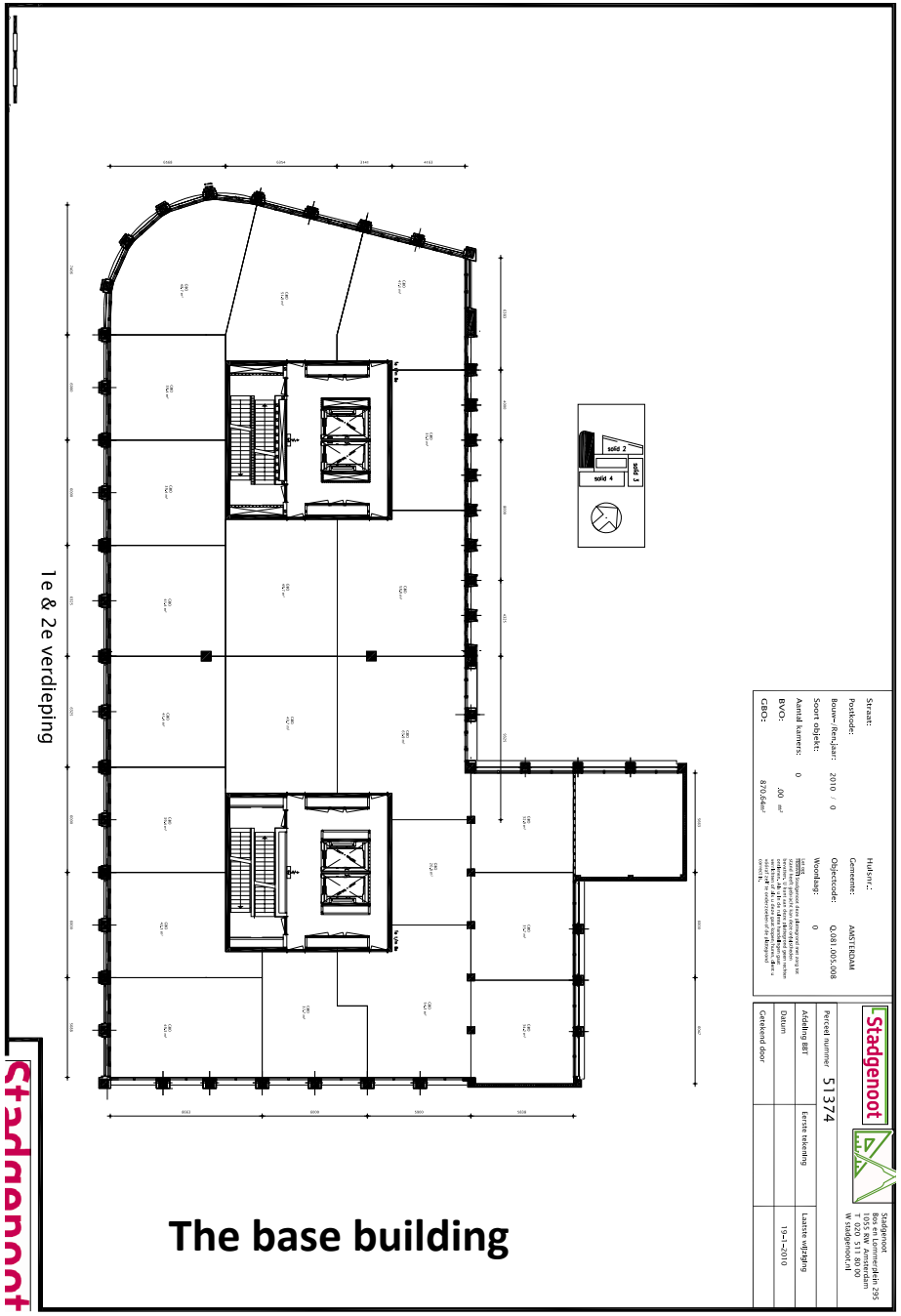


ТПО «Резерв»
Жилой дом в Москве. 2000
план дома
планы квартир

TPO Reserv
Apartment block in Moscow, 2000
plan of the building
plans of the apartments

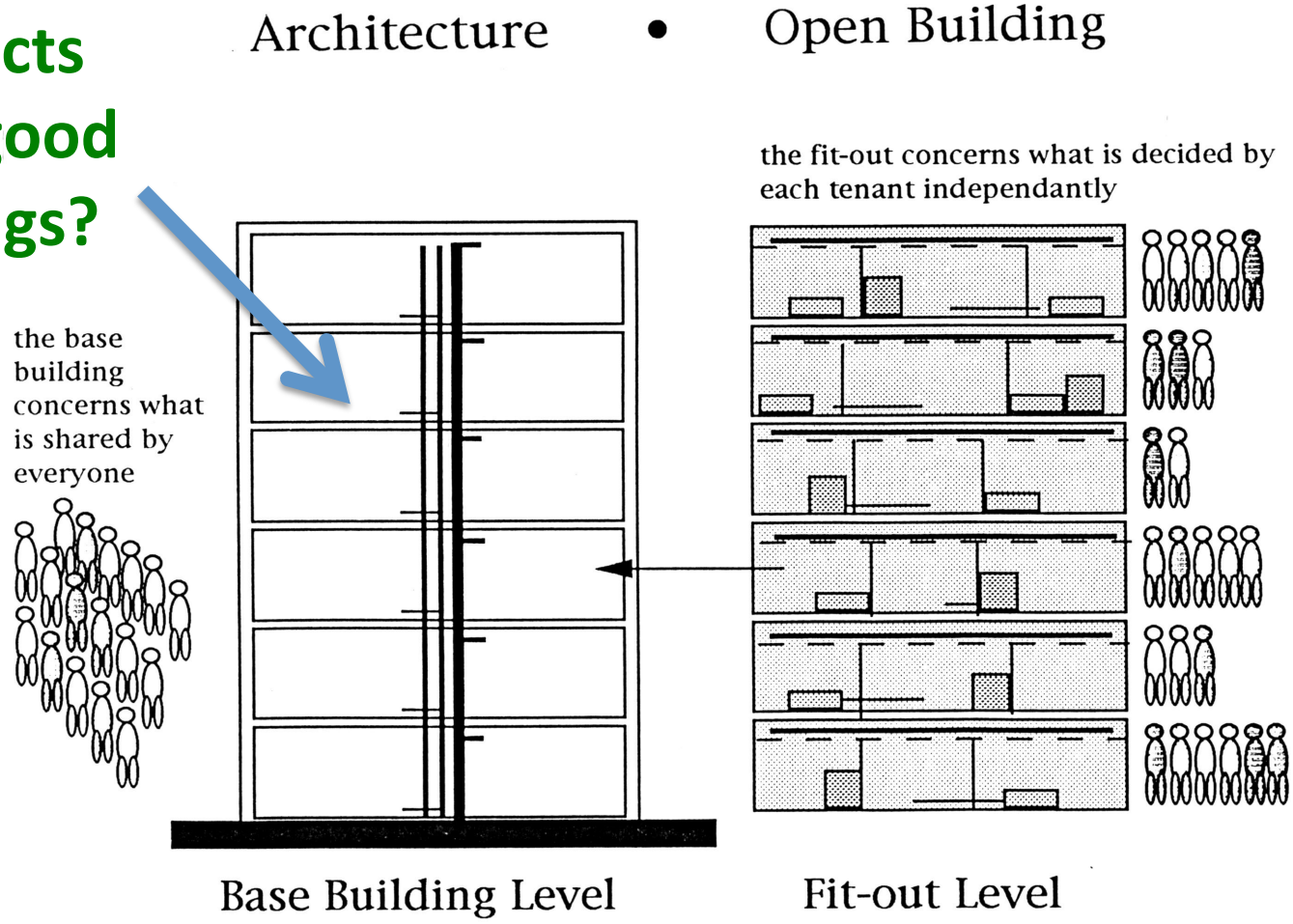
Catamaran House in Moscow
Reserve Architects / Vladimir Plotkin

Townhome Project
Zaltbommel, the Netherlands
Architect: Jan vandenbrink



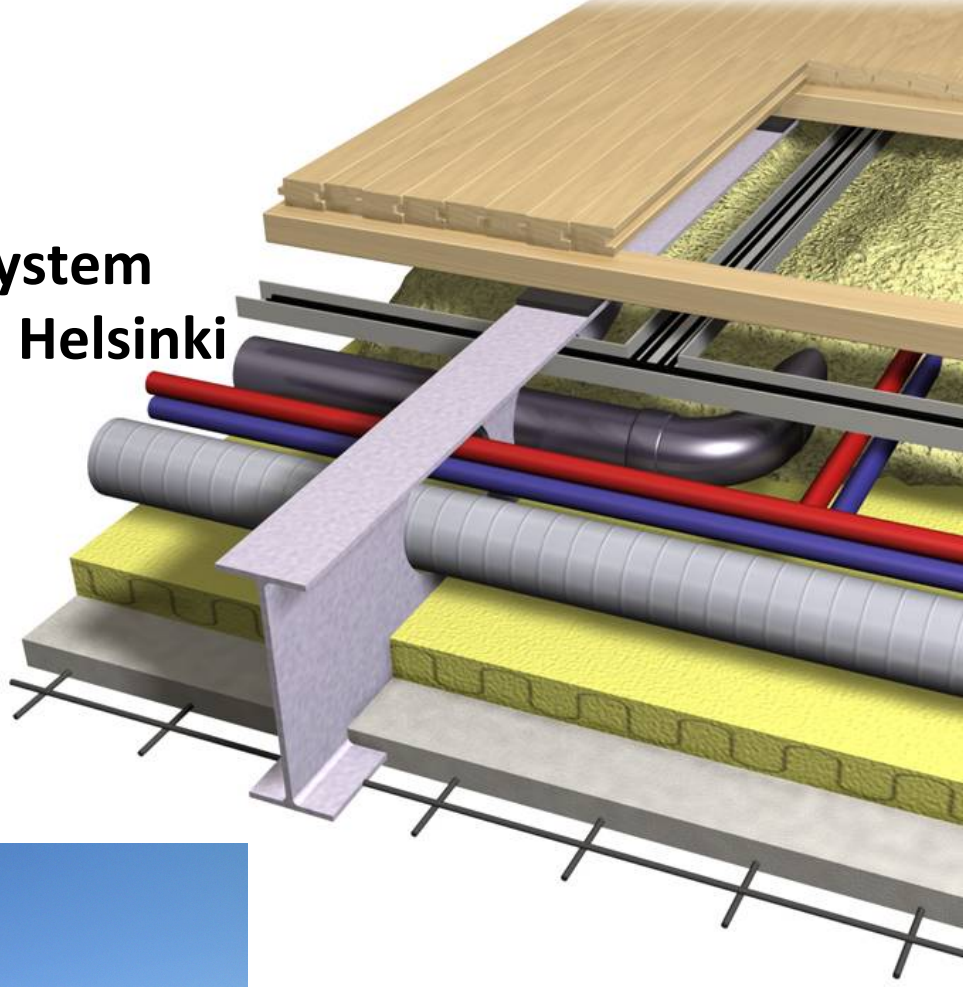
Making good base buildings

What products help make good base buildings?



Structure

Steel wall and floor system
Architect: Esko Kahri, Helsinki

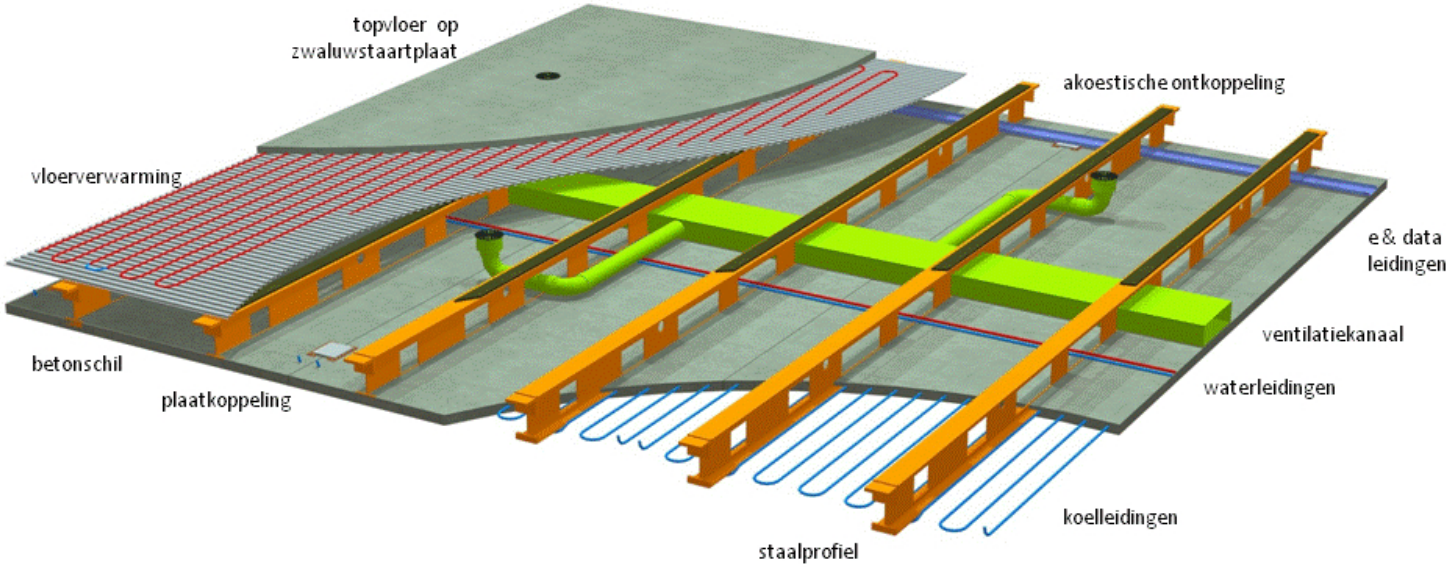


Structure

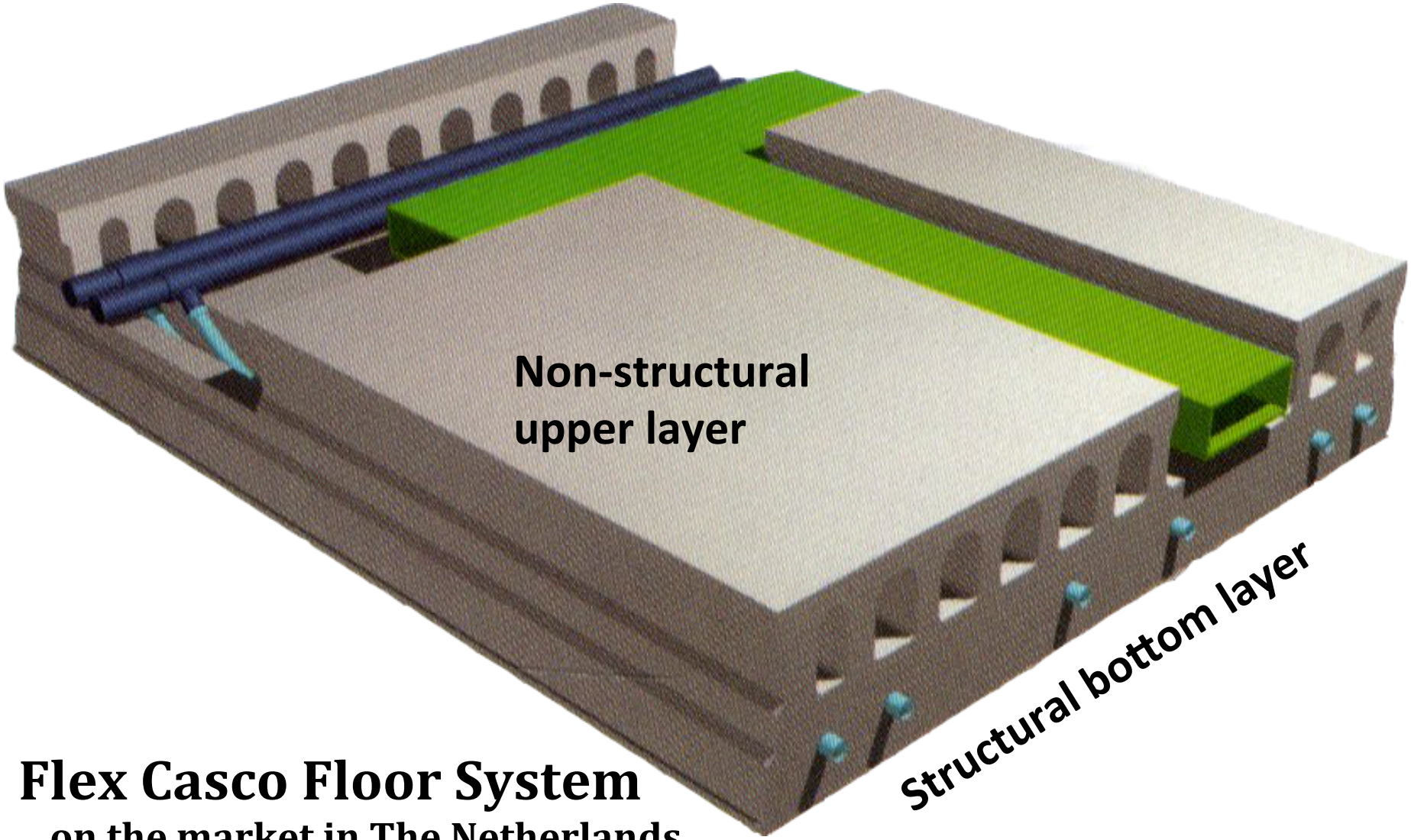
Slimline Floor System

On the market in the Netherlands

SLIMLINE BUILDINGS



Structure

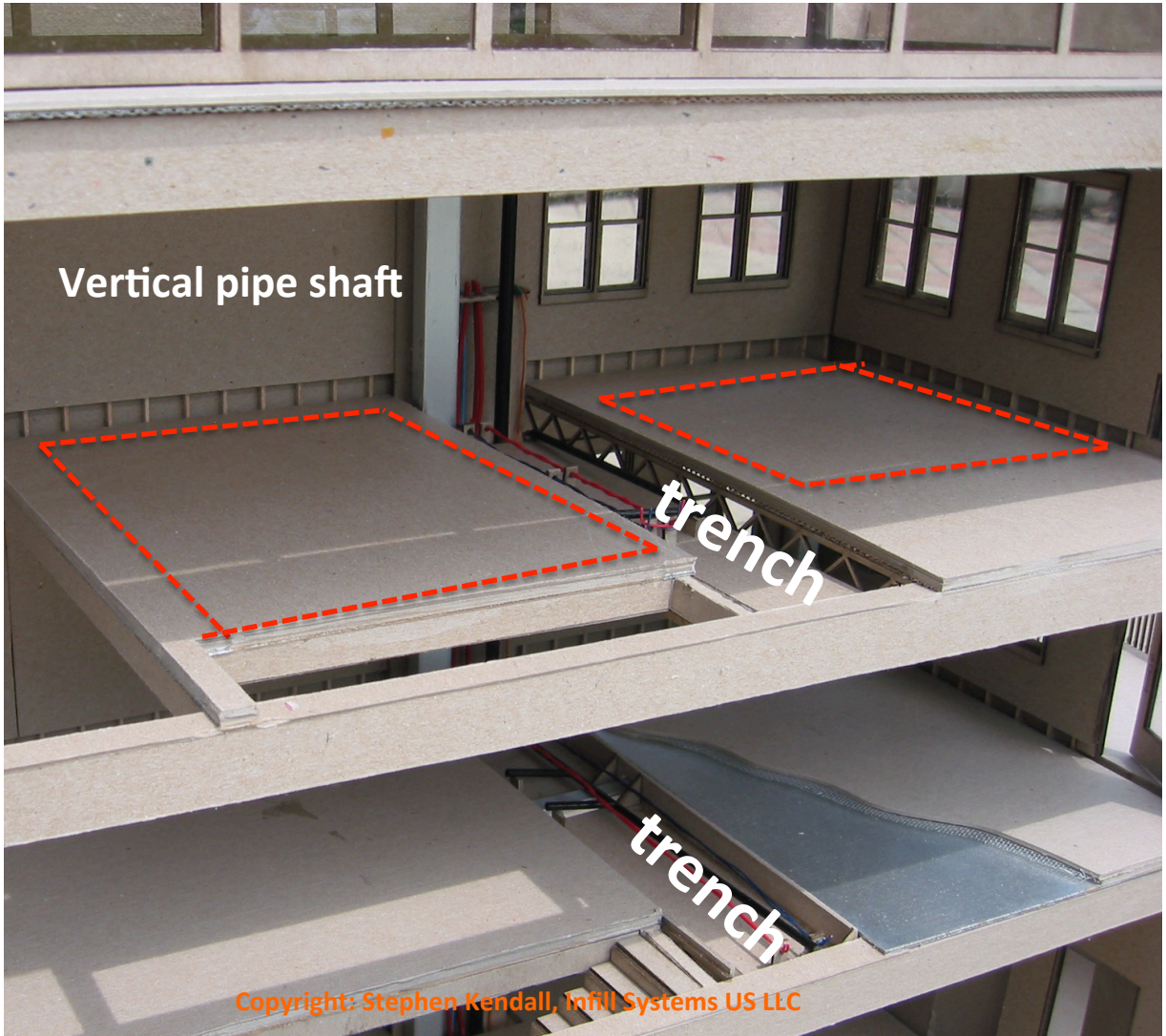


Flex Casco Floor System

...on the market in The Netherlands

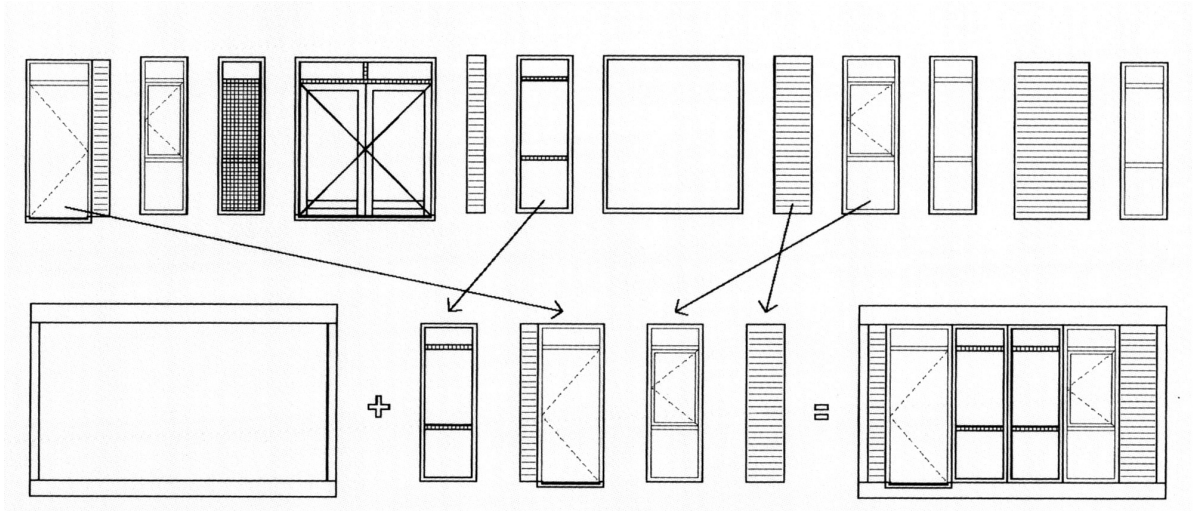
Structure

Conventional construction with a “trench” for variable floor plans



Facades

Menu System

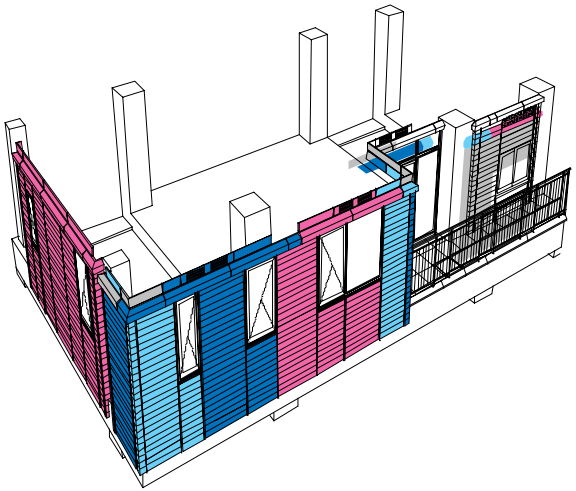


V

Cladding

Pre-modification

Post-modification



Fixed

Moved

Moved (modified)

Newly installed/ not used

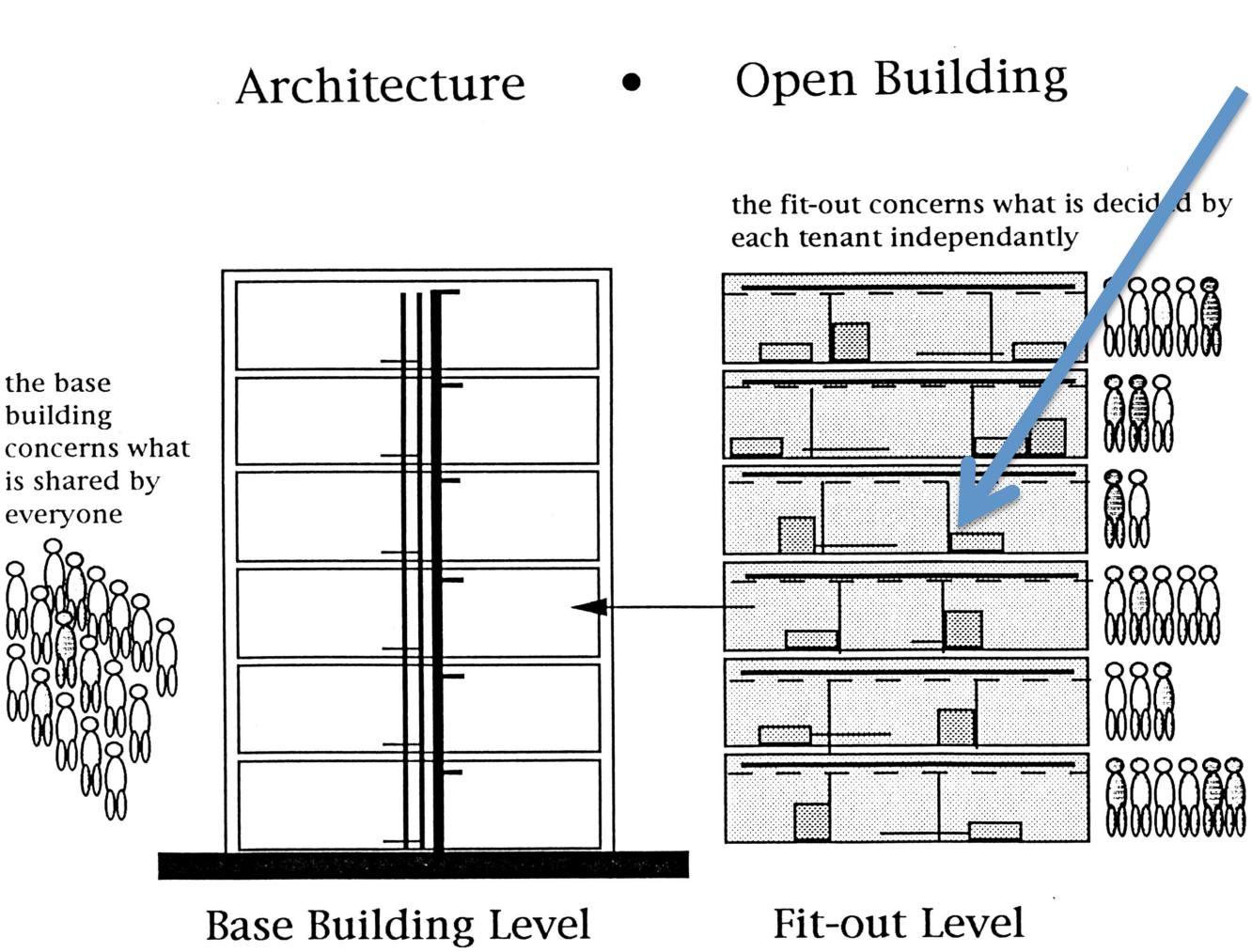
Next 21 /Osaka

..but facades can be fixed, too

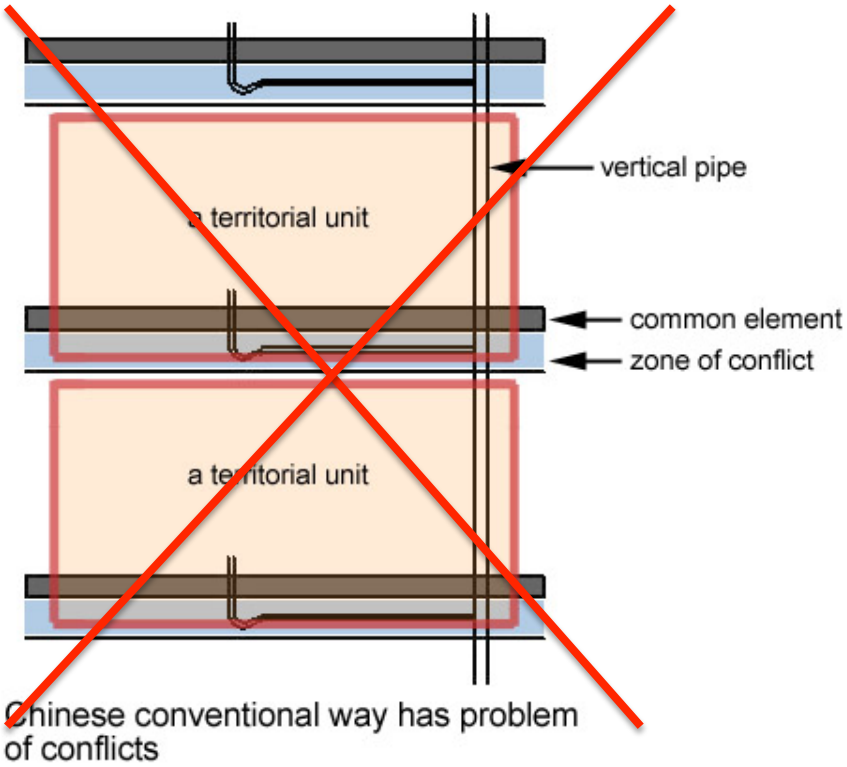
The SOLIDS / Amsterdam

The Banner Building / Seattle

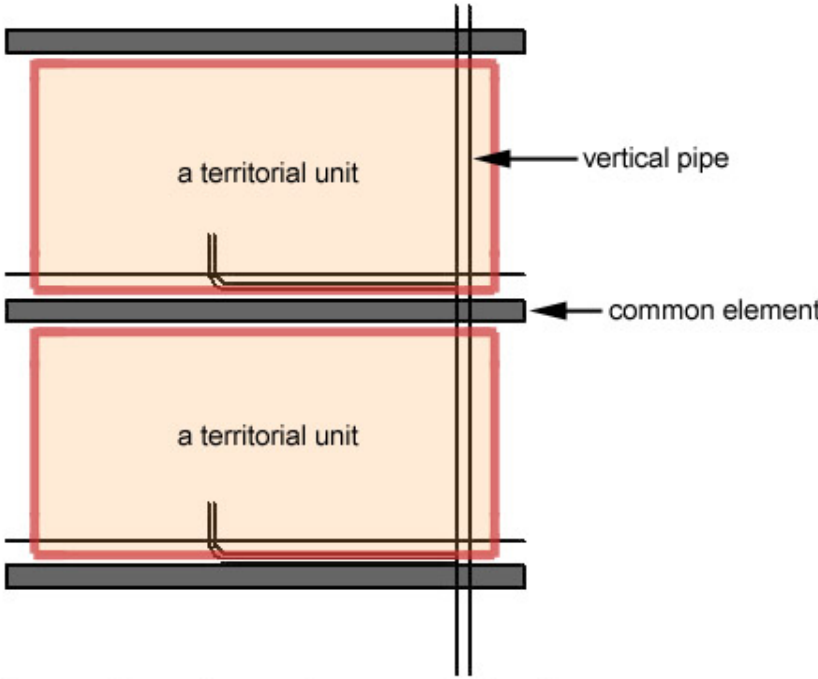
Infill system products



Utility Systems Principle



Chinese conventional way has problem of conflicts



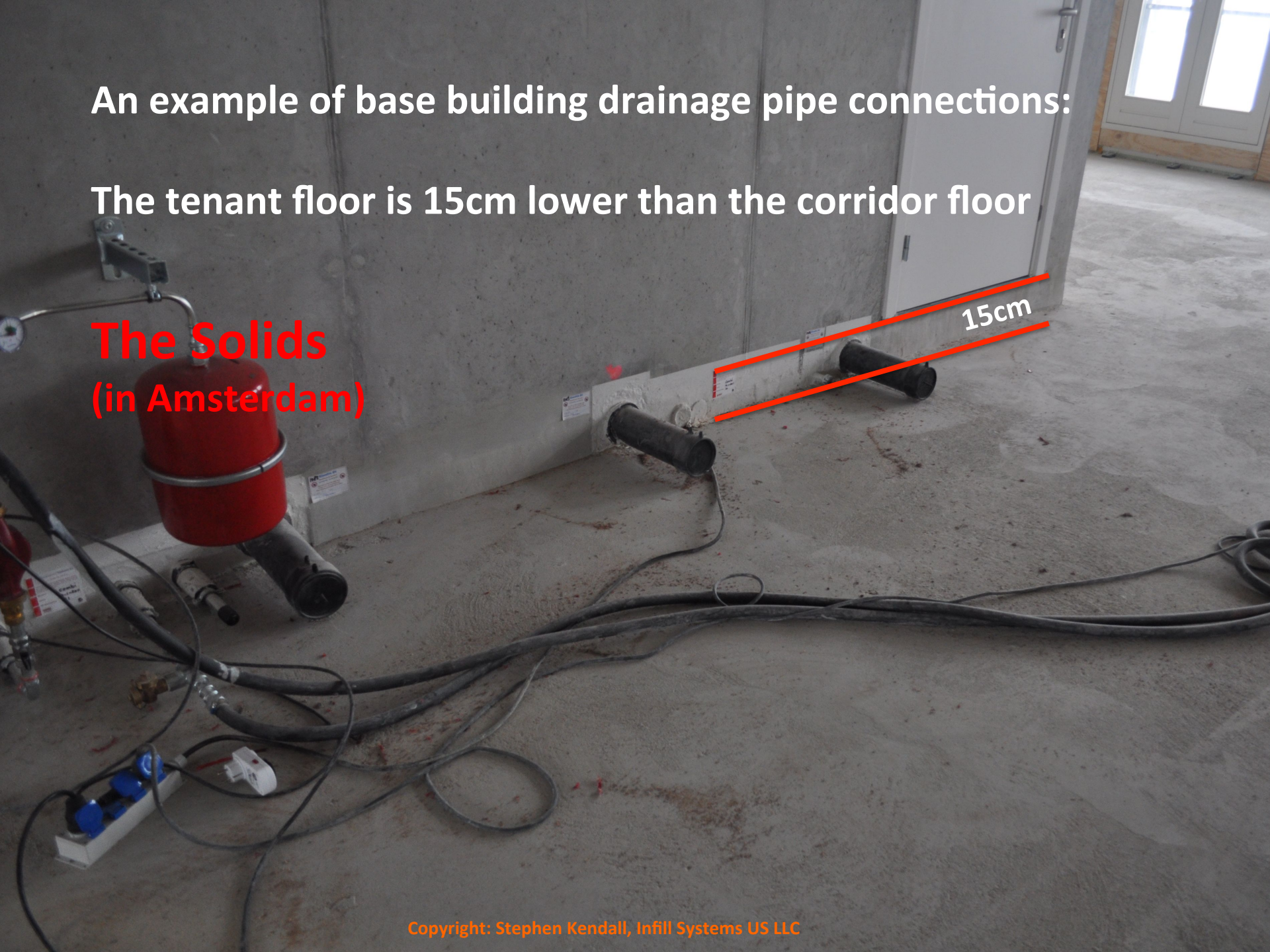
OB way offers clean autonomy of dwelling unit decisions that avoids conflict

Diagram courtesy Dr. Qiong Huang, Tianjin University

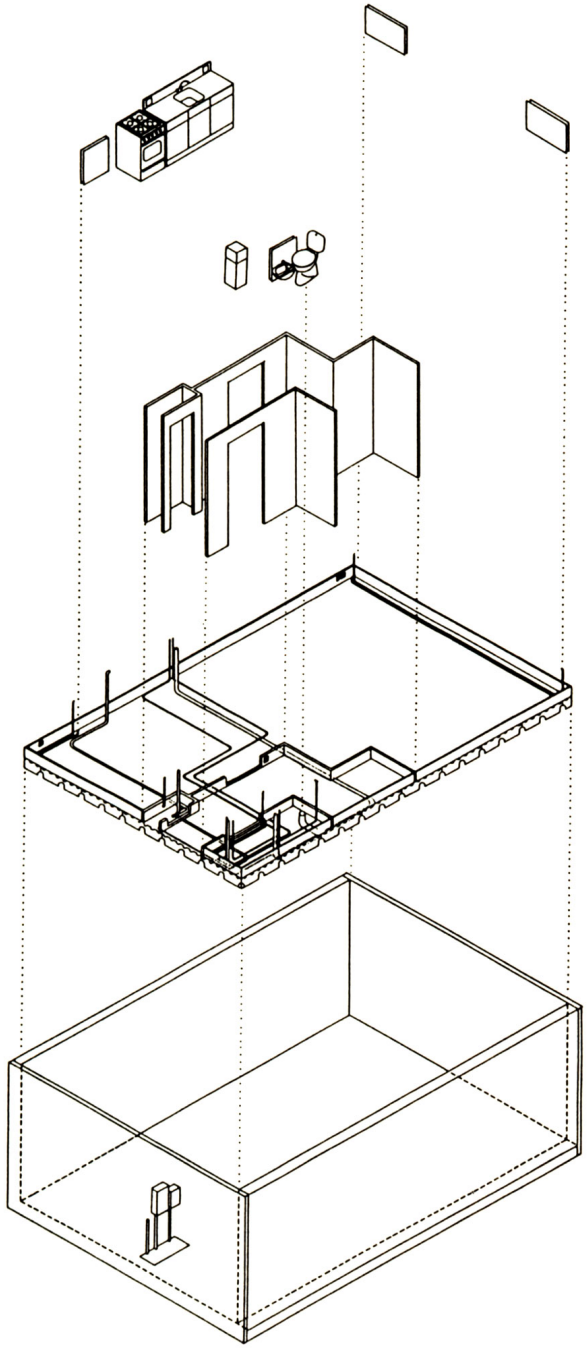
A basic principle of open building: drainage and other utility systems are accessible from the space they serve, not entering another owners' space

An example of base building drainage pipe connections:

The tenant floor is 15cm lower than the corridor floor



The Solids
(in Amsterdam)



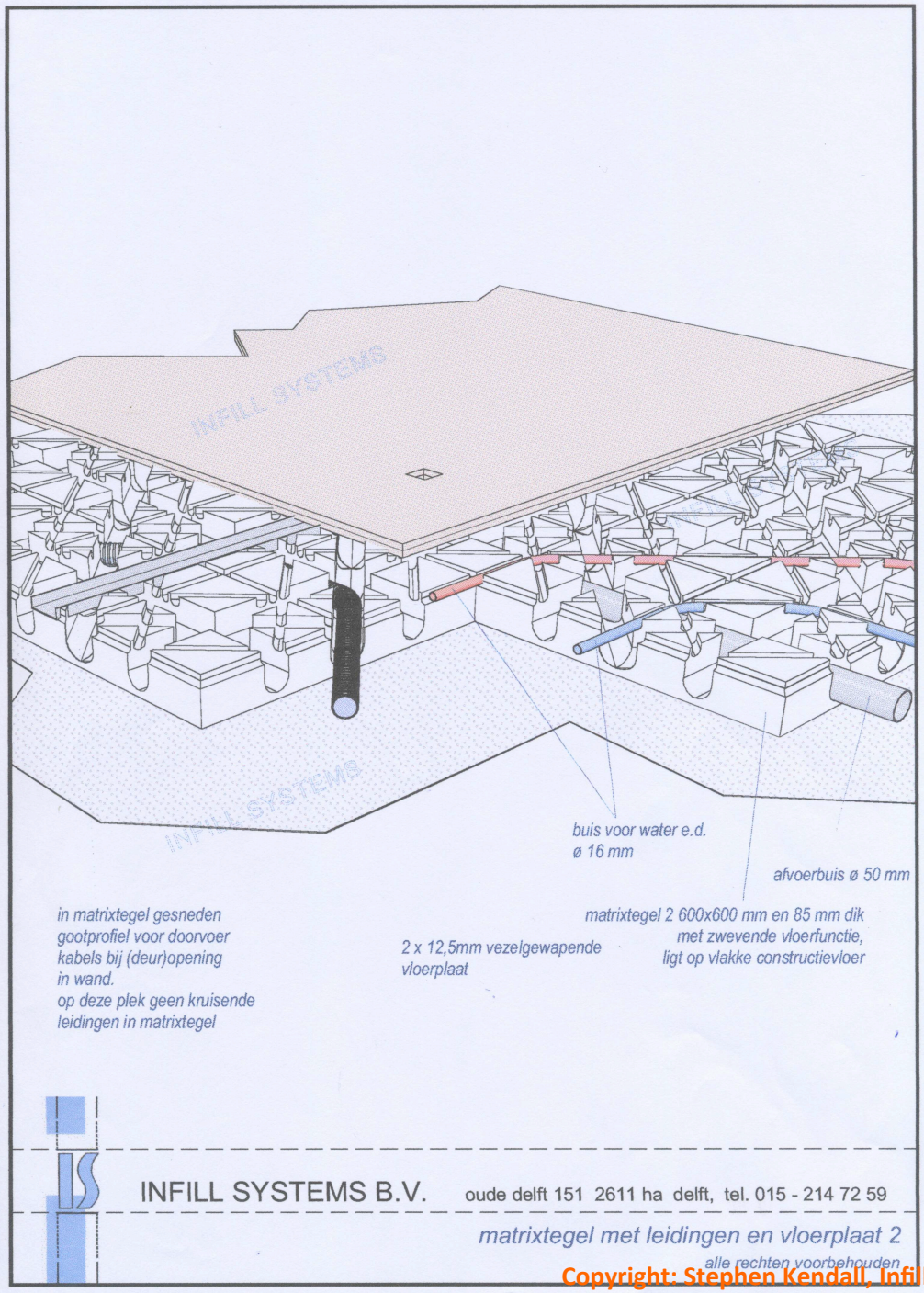
The “upper system” of consumer products

The “lower system” solving the piping/ducts

A serviced open space

Technical solutions to an Infill System

Matrix Tile System

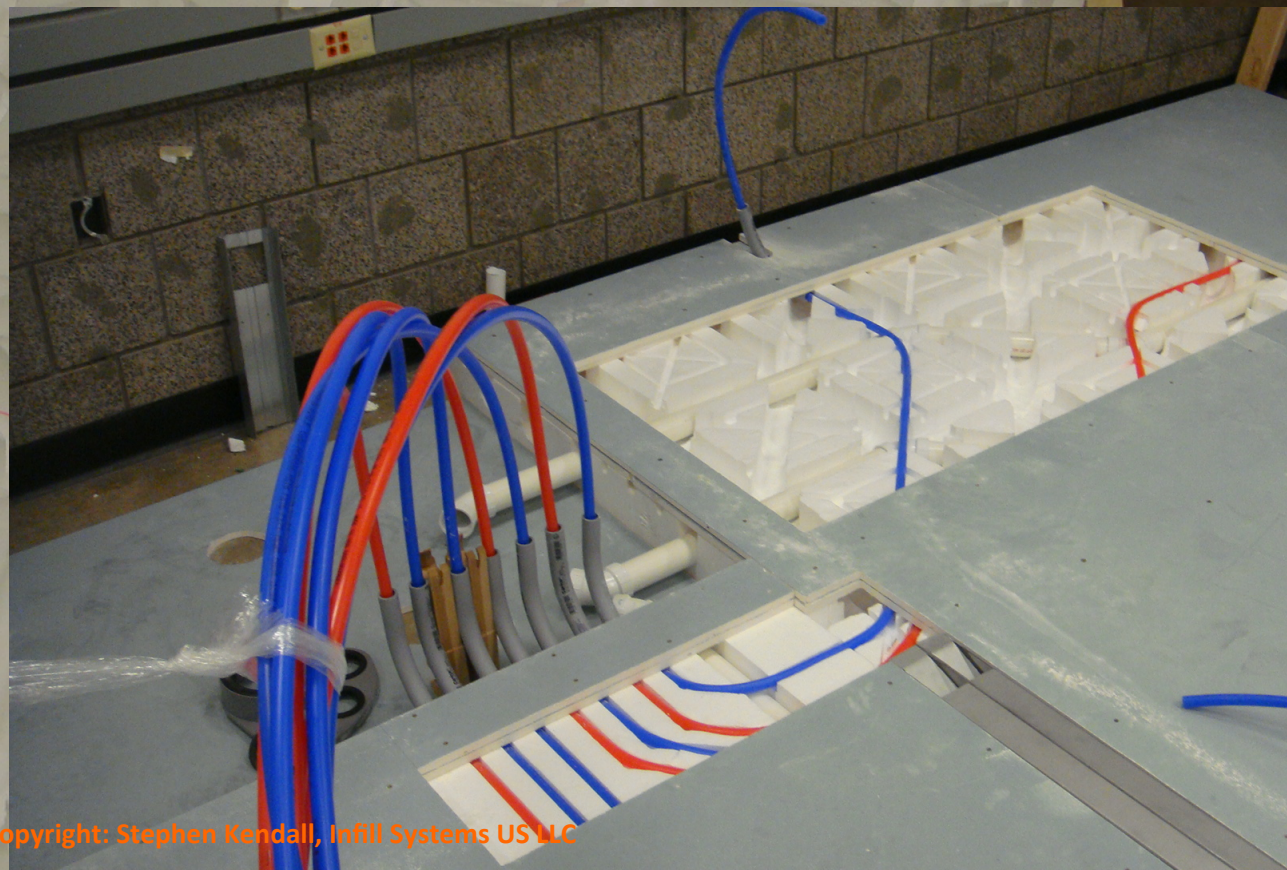


Matrix Tile System
Infill Systems BV / The Netherlands

Marketed in North America by Infill Systems US LLC

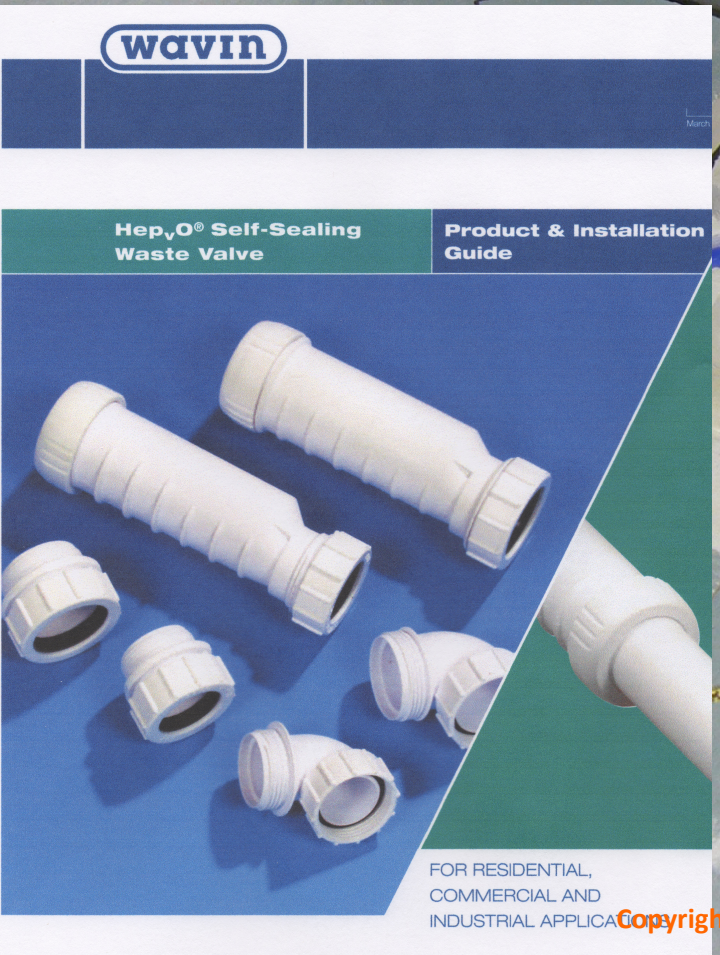
Matrix Tile System

Matrix tiles, "home-run" water piping, 0-slope gray water drain lines, and fireproof floor covering in place.



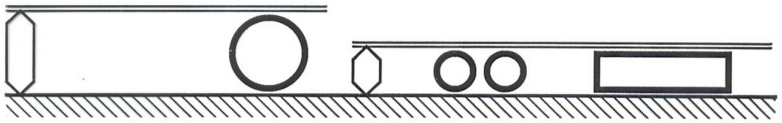
HEPvO in the Matrix Tile

HEPvO waterless waste valve requires no secondary venting



New principles of utility systems

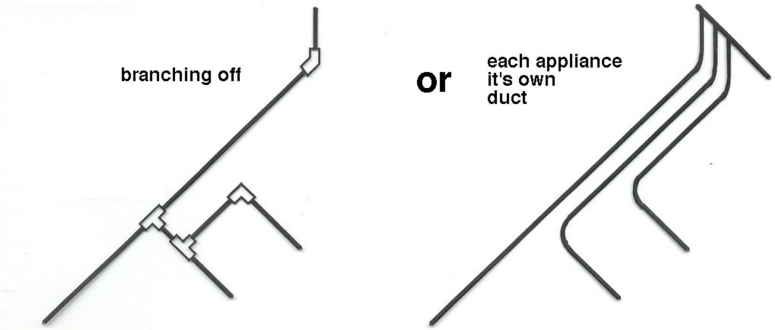
Space-requirement



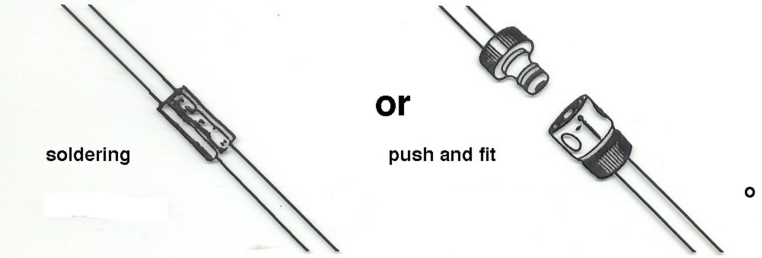
height of channel, raised floor or suspended ceiling

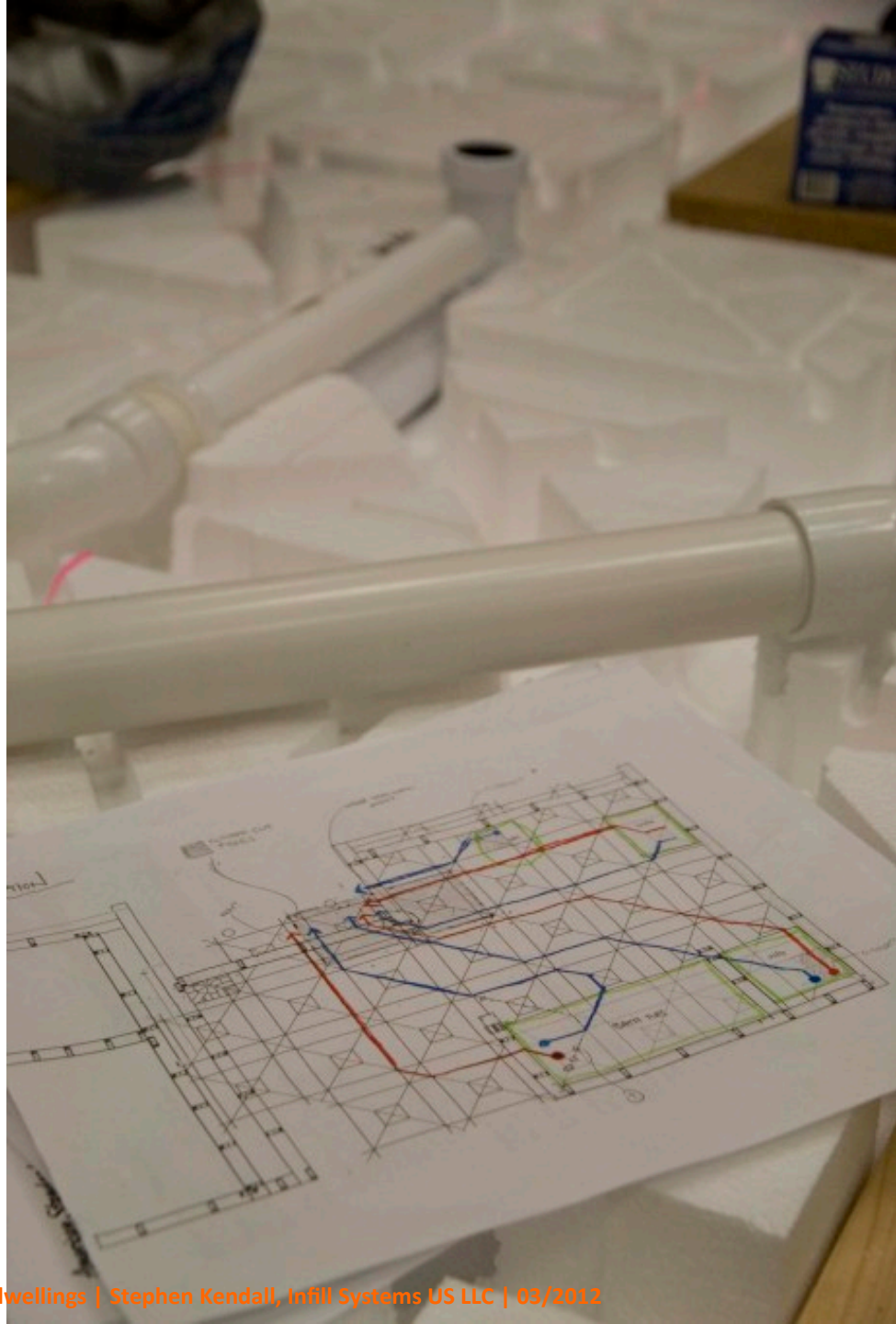
either or

Flexible fitting



New fitting techniques





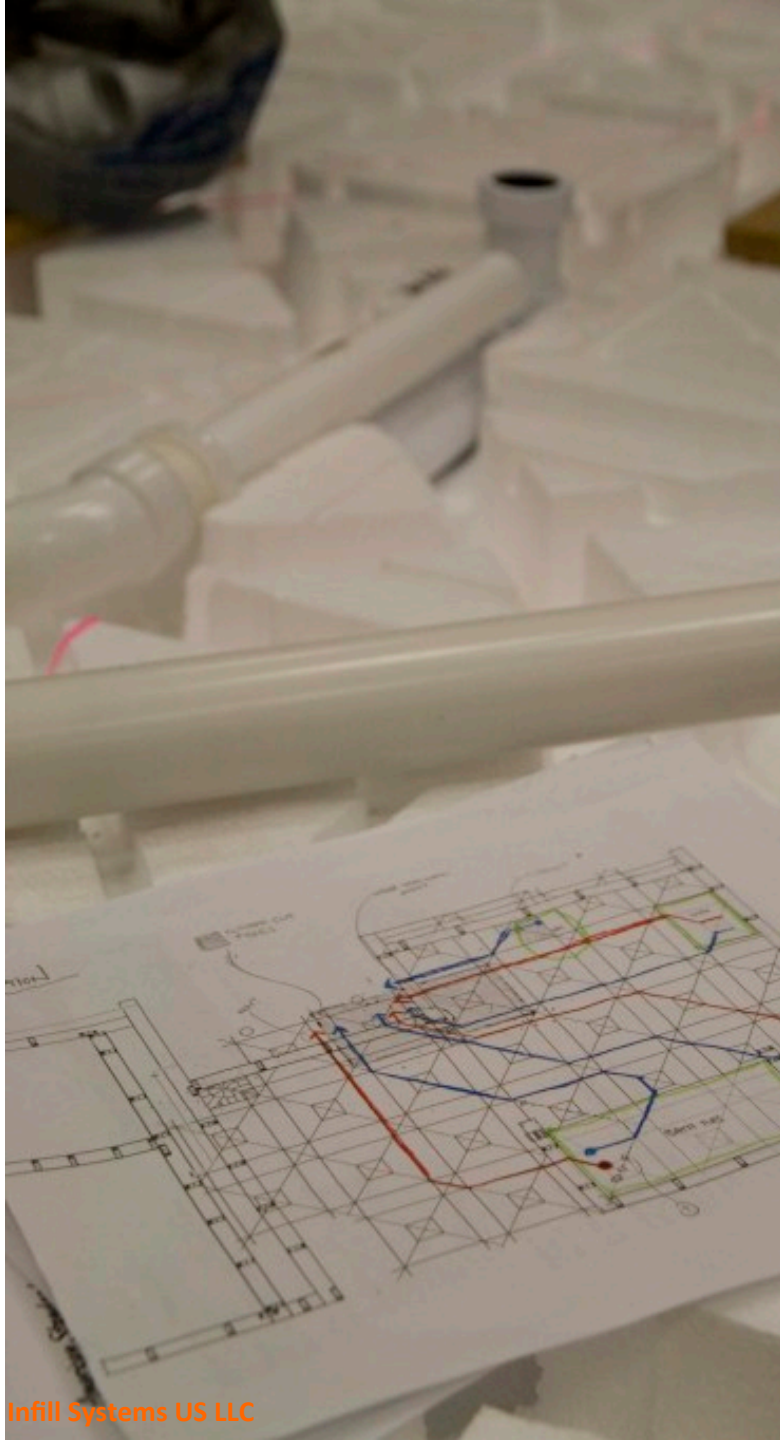
ADVANTAGES

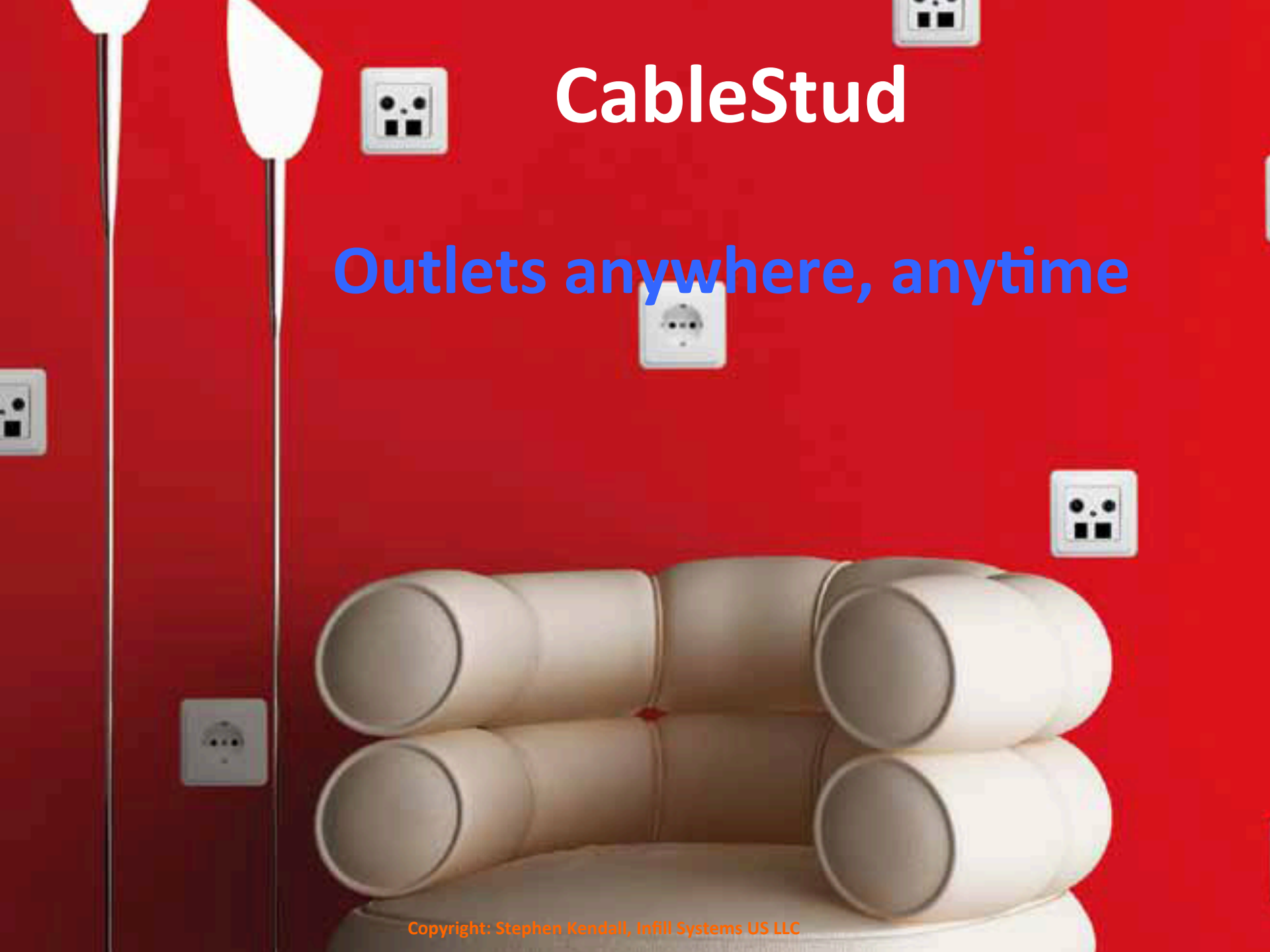
- *for DEVELOPERS*

1. Decision flexibility on floor plans and equipment
2. Reduced cost and time for customization
3. One-unit-at-a-time rehab
4. Improved sound isolation between floors

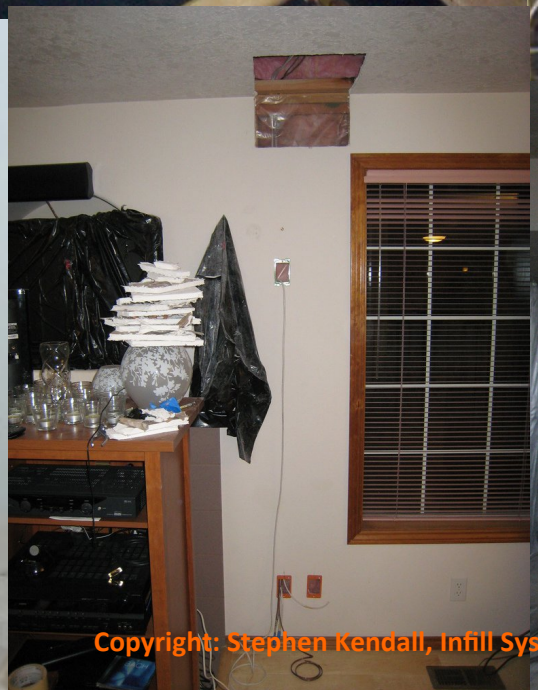
- *for BUILDERS*

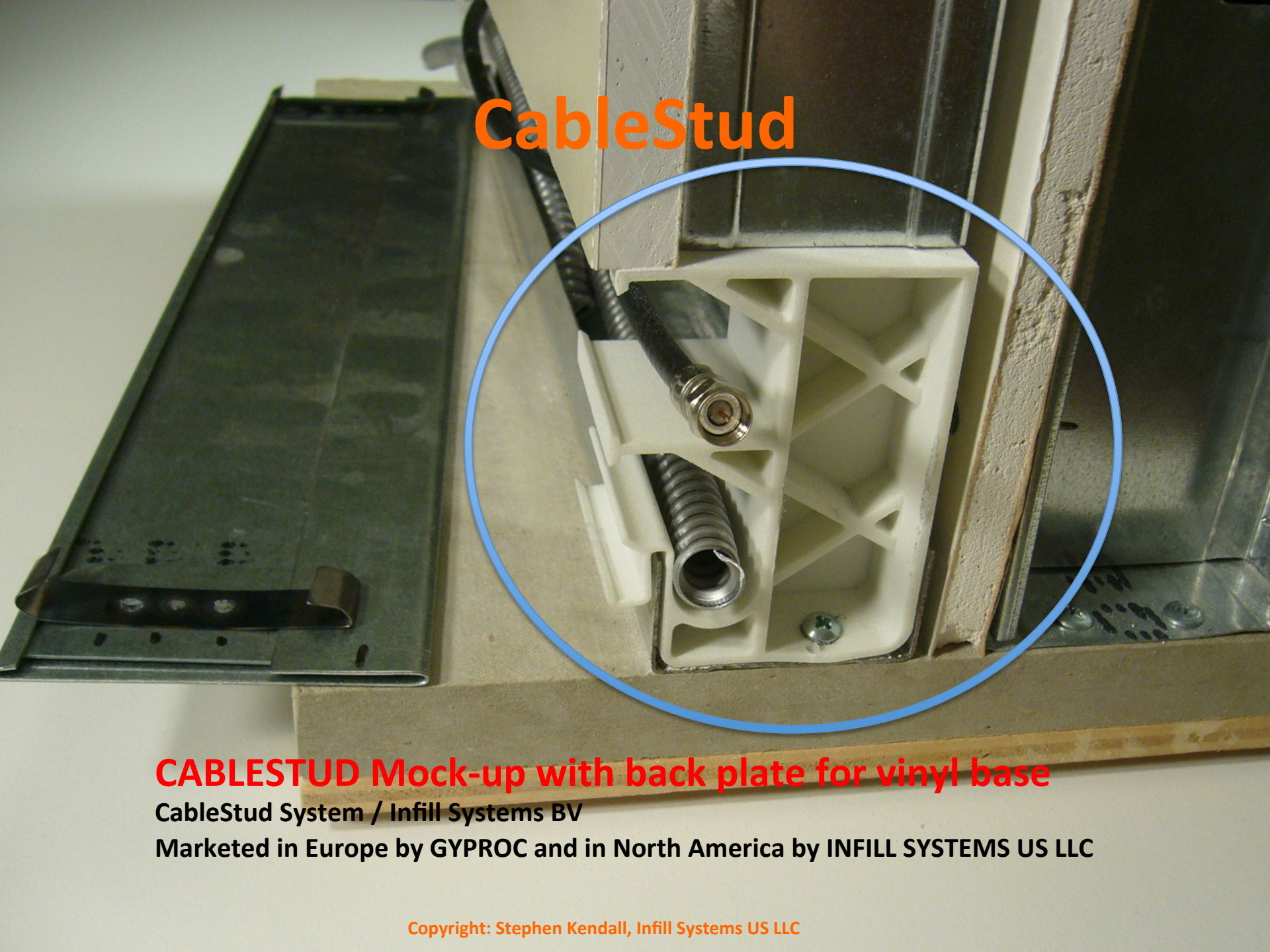
1. Increased quality, coordination and cost control
2. Faster installation
2. No floor penetrations at fixtures
3. Easier maintenance (all plumbing is within a unit)





ISUS PRODUCTS SOLVE PROBLEMS in HANDLING WIRING



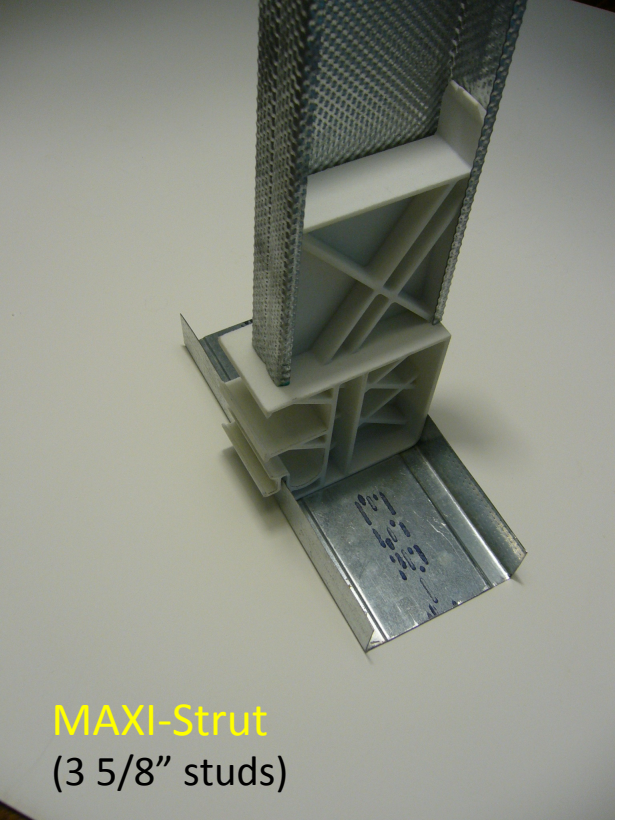


CABLESTUD Mock-up with back plate for vinyl base

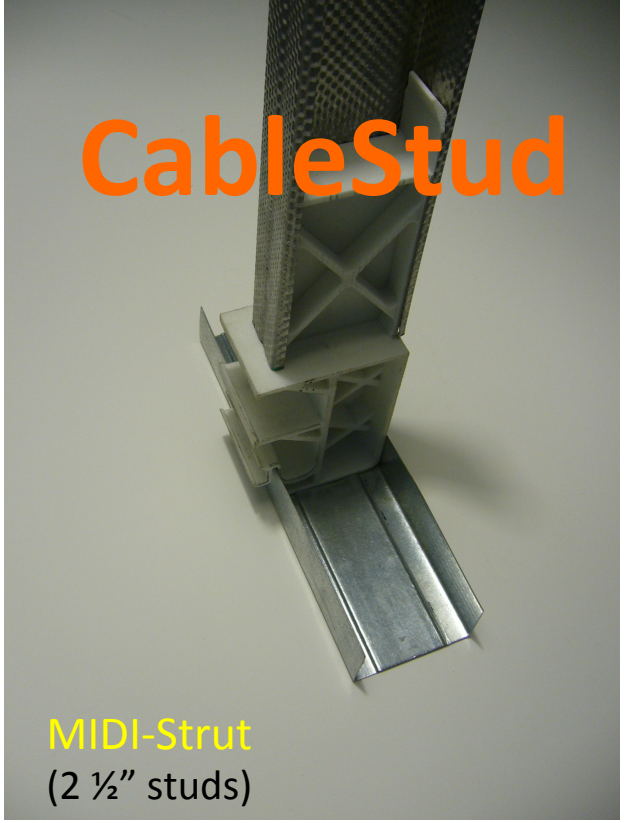
CableStud System / Infill Systems BV

Marketed in Europe by GYPROC and in North America by INFILL SYSTEMS US LLC

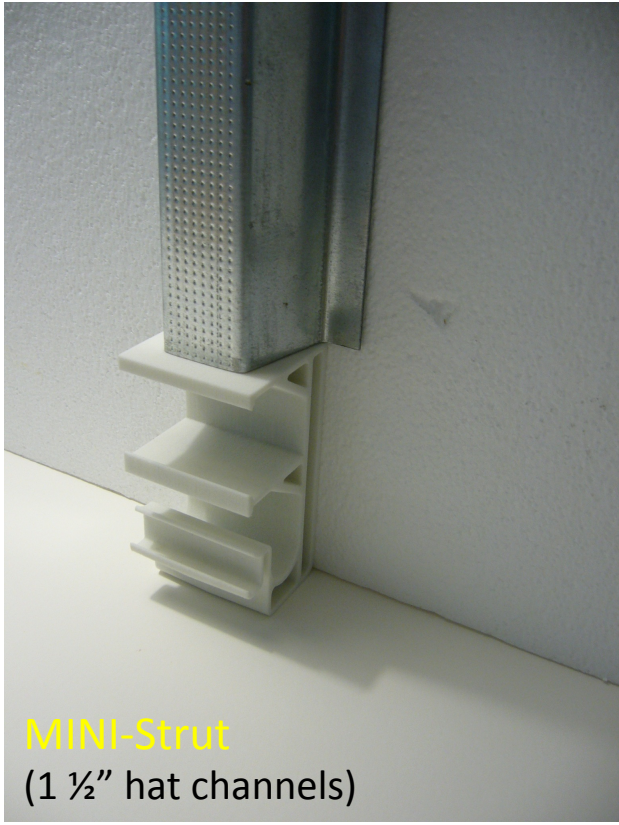
CableStud



MAXI-Strut
(3 5/8” studs)

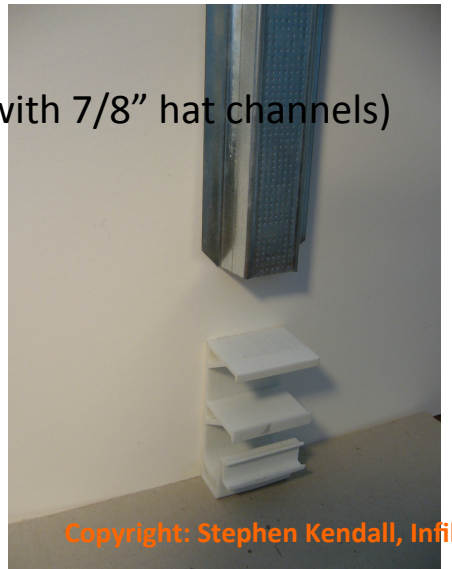


MIDI-Strut
(2 ½” studs)

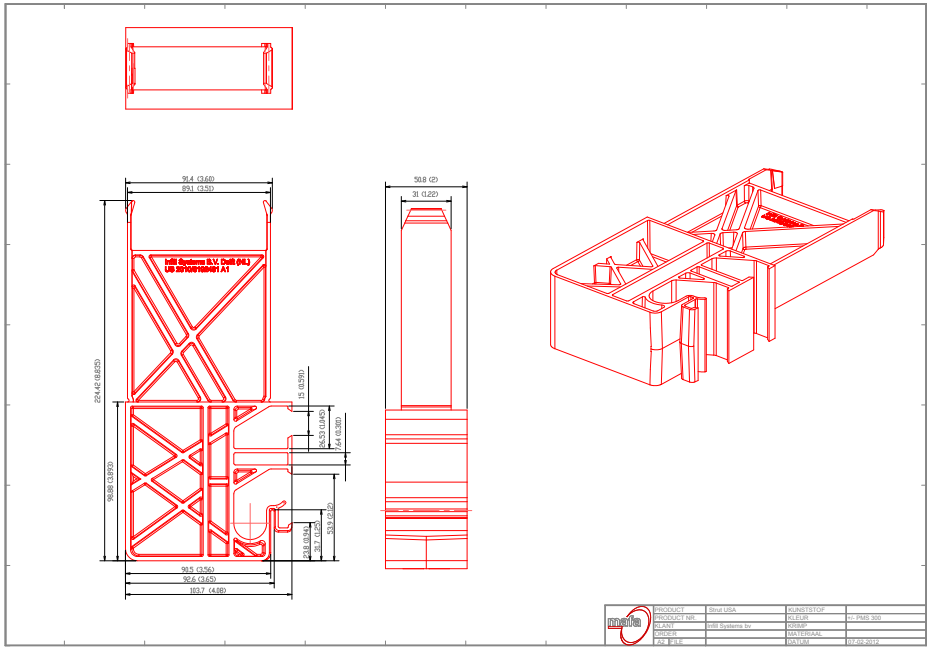


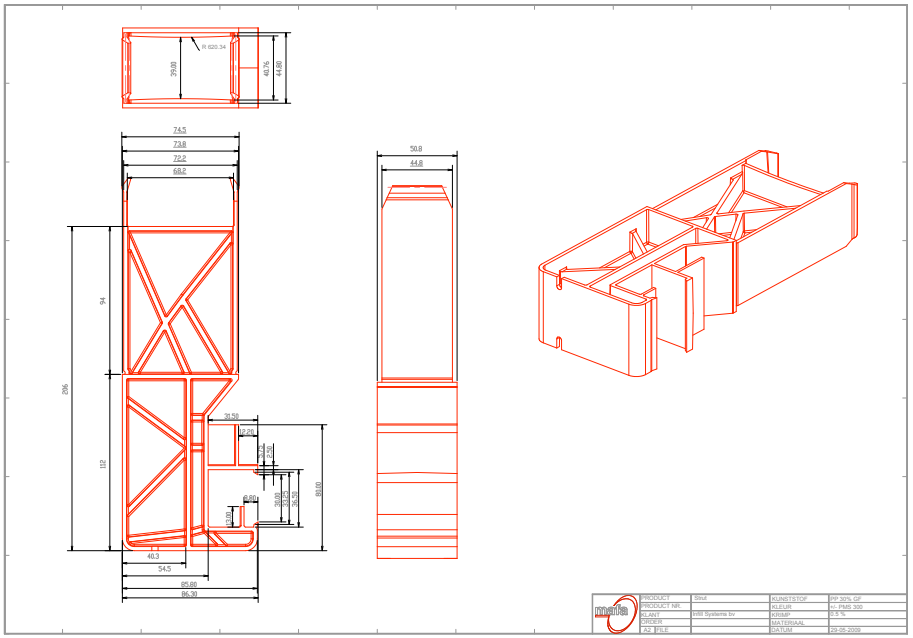
MINI-Strut
(1 ½” hat channels)

MICRO-Strut
(useful in wood-frame and with 7/8” hat channels)



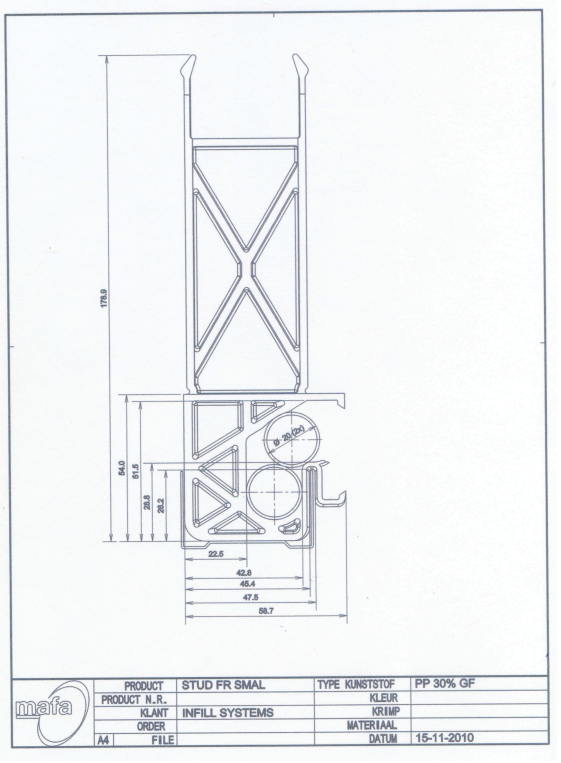
Wood base clip

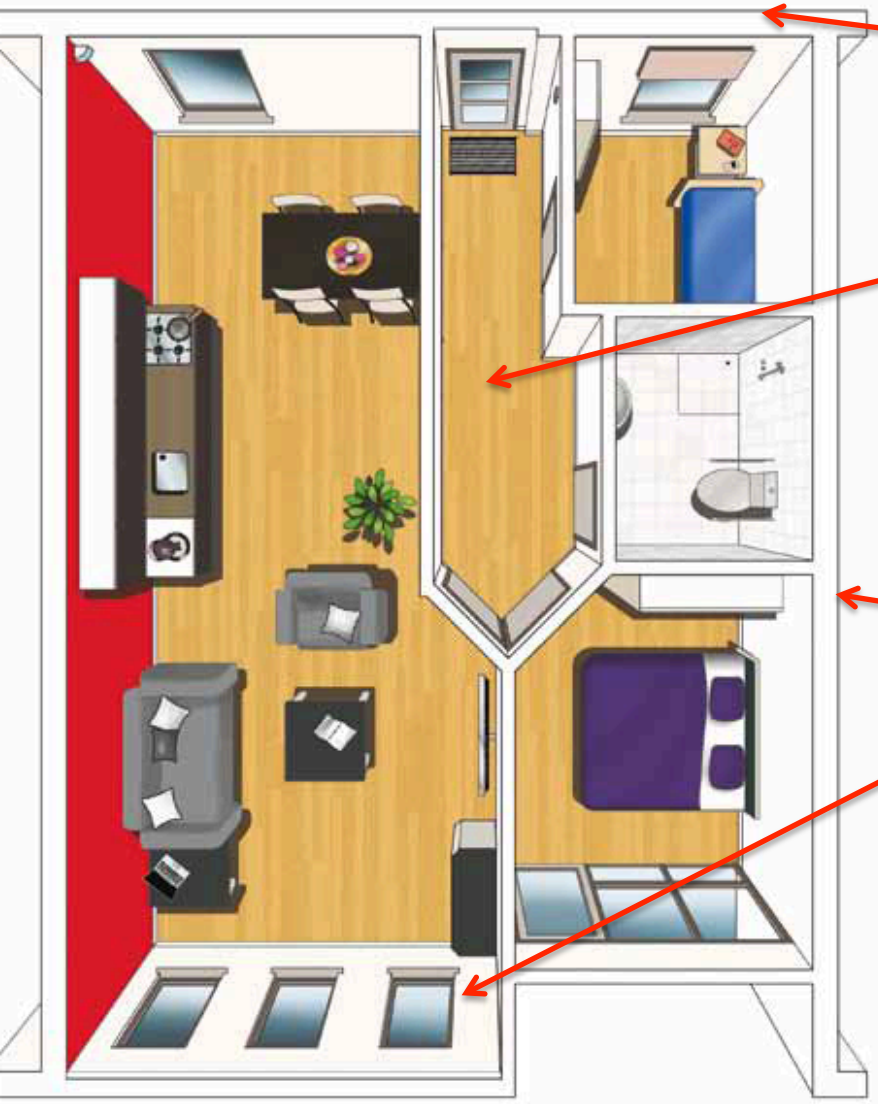


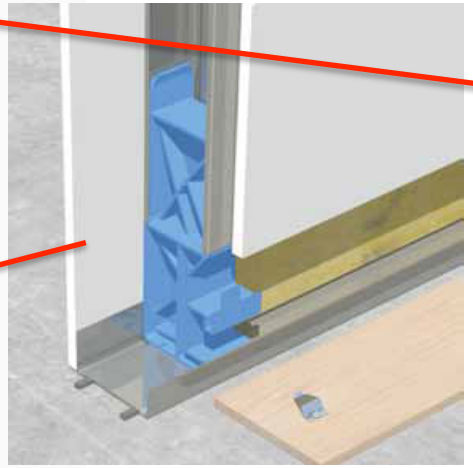


CableStud

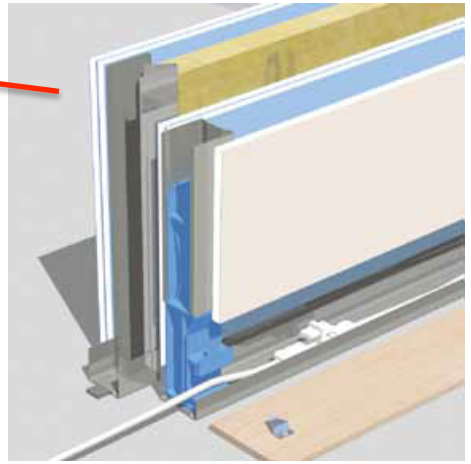
The dimensions of the product are different in Holland, France, and the US…



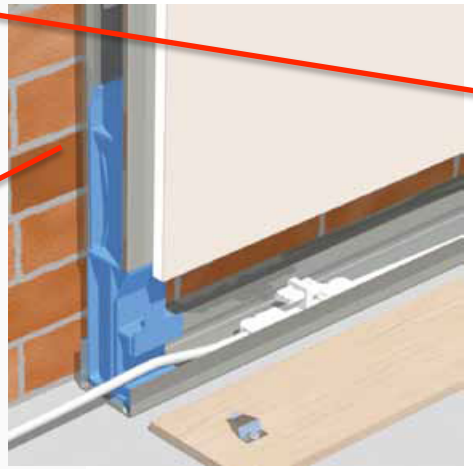




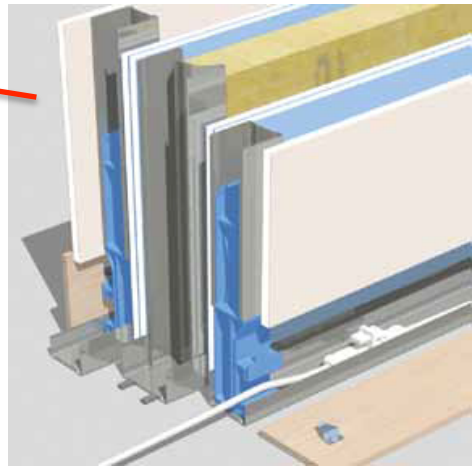
Typical partition wall



Liner wall against fire rated corridor wall



Liner wall against exterior wall



Liner walls on both sides of a unit separation wall

CABLESTUD wall types to meet all conditions

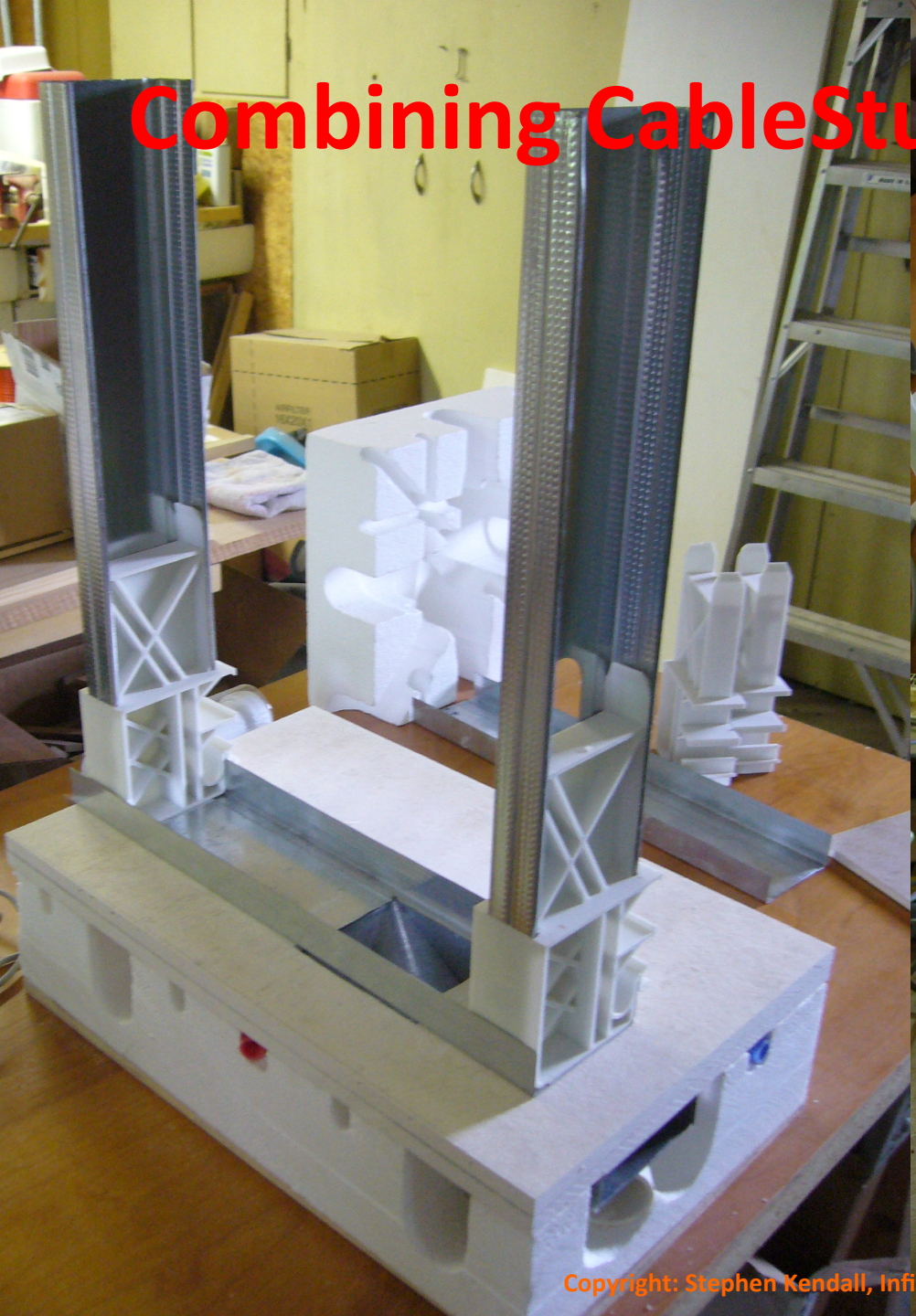
Delivery of metal studs with struts installed

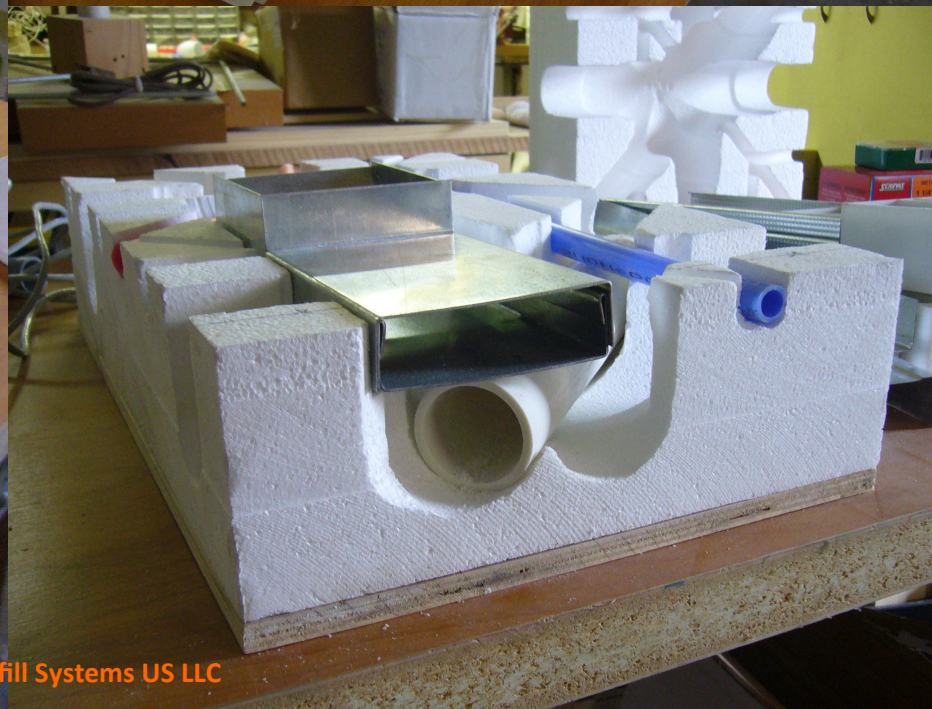
CABLESTUD Installation

(Photos from the Netherlands)

CableStud in a wood-stud application

Combining CableStud and Matrix Tile





ADVANTAGES

- *for DEVELOPERS*

1. Outlets anywhere, anytime
2. Labor savings when data and electric outlets are added or moved

- *for BUILDERS*

1. Simplified mobilization and coordination
2. More organized wiring layout – everyone knows where the wires are
3. Accessible and fast connections behind baseboard

宽广的境界, 放眼于高处

Attitude determines the vision

MATRIX TILE SYSTEM

+

CABLESTUD

Invented by Professor Age van Randen; under development in the Netherlands for several decades.

Both are owned by INFILL SYSTEMS BV, Frans de Vries

I represent INFILL SYSTEMS BV, and have my own company bringing these products into the US market.