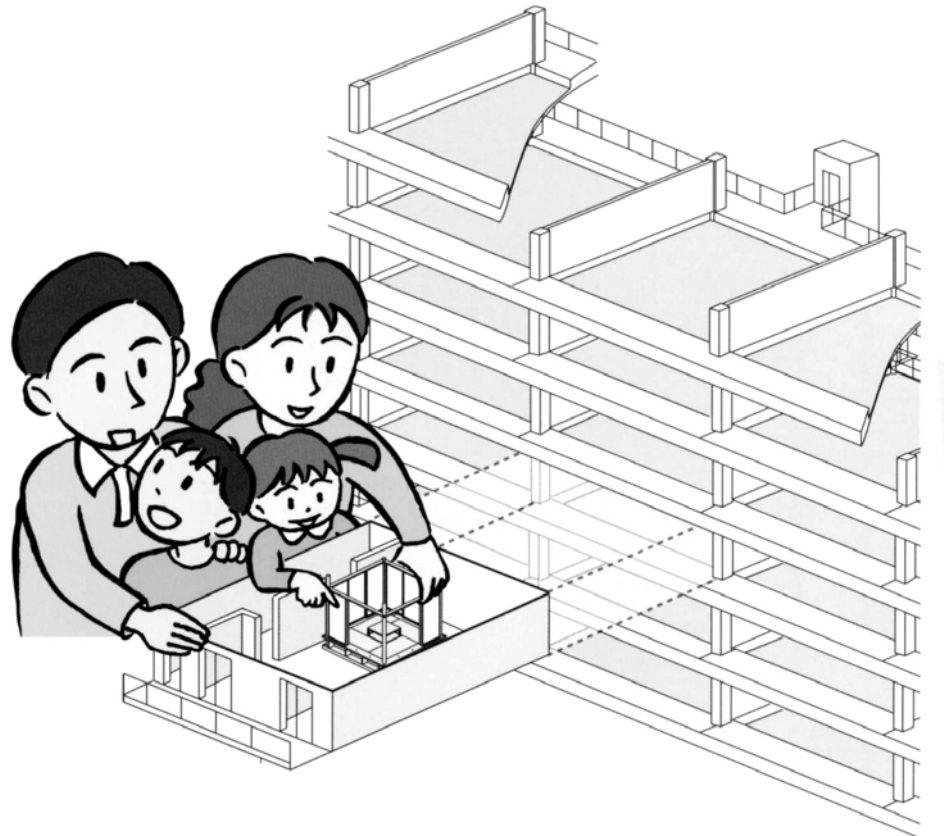
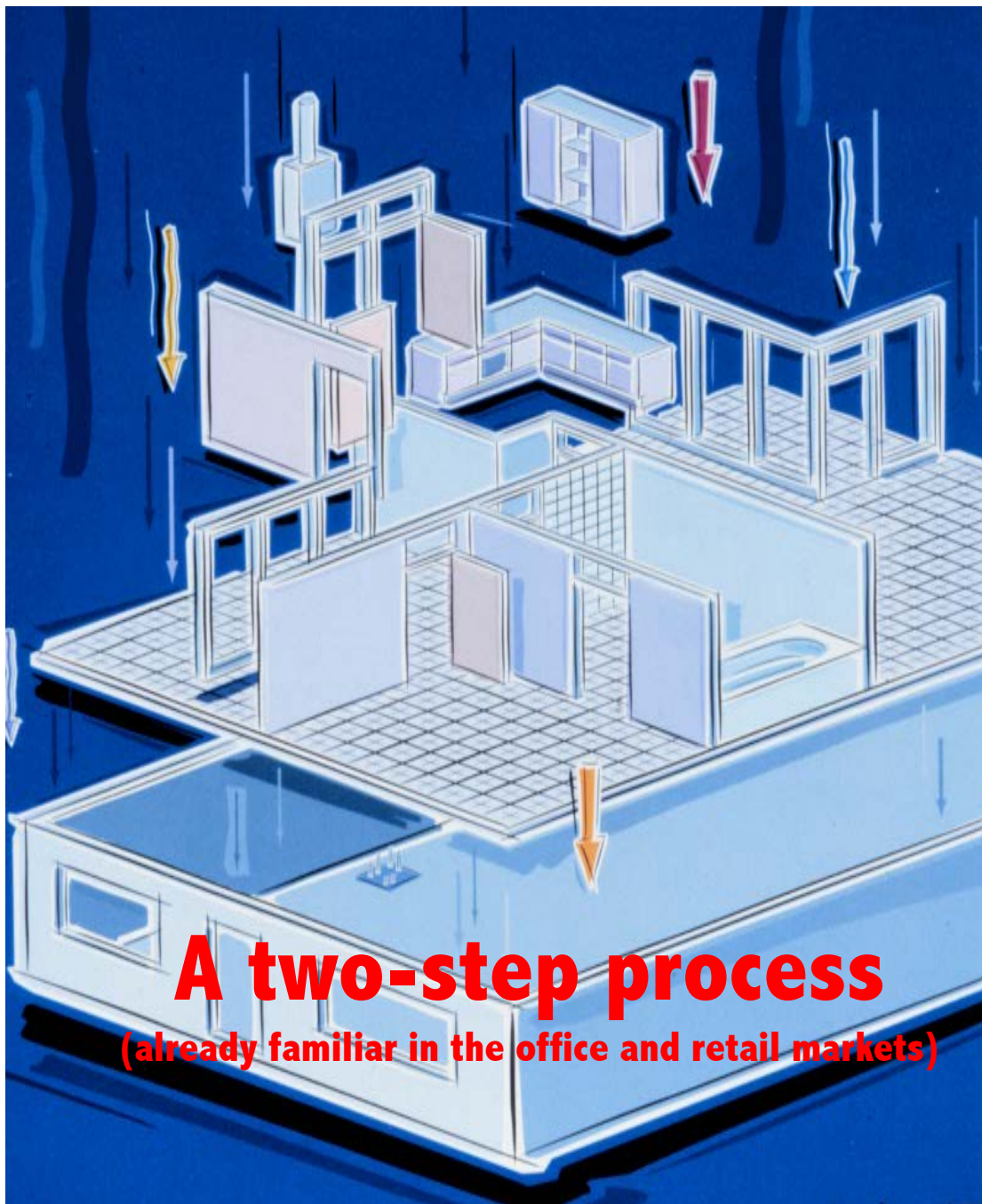


INFILL SYSTEMS

a new business opportunity in the residential real estate market

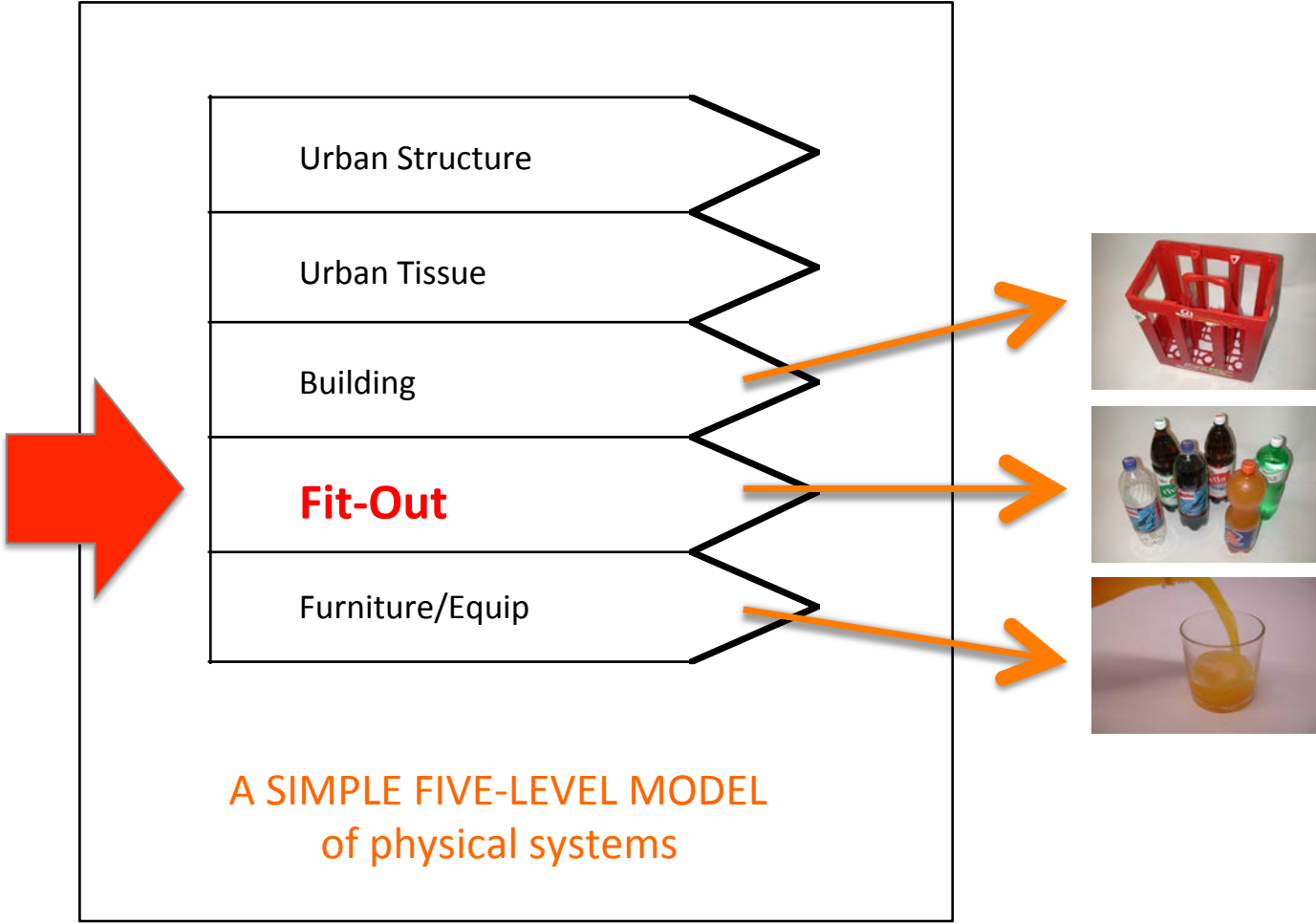




In most countries, the office and retail sectors already use the services of companies specialized in the installation of everything “behind the front door.”

This service includes all utilities, finishes, cabinets, and plumbing and heating/cooling equipment needed for that user.

Infill Systems are a new decision-level in the acquisition and delivery of real estate assets



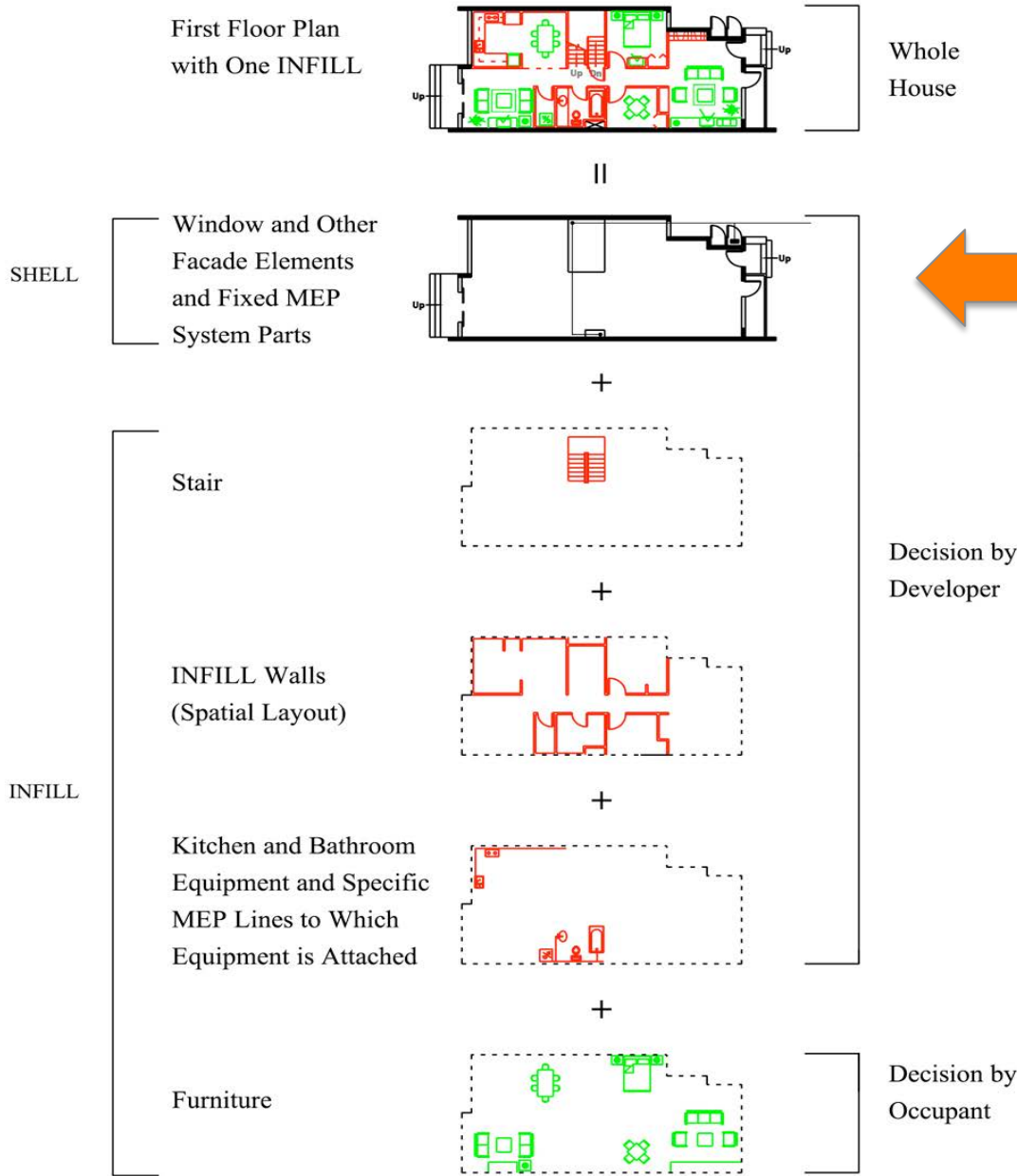


Real estate assets need to be sustainable – to last a long time. But the infill needs to change according to new living standards and changing consumer preferences.

In both new construction and the renovation of existing building stock (e.g. row/terrace houses shown here) separating the real estate asset from its more changeable **INFILL** makes good business sense.



When INFILL SYSTEMS are used, the SHELL is an asset by itself. Each fit-out can be different or the same in a series of houses



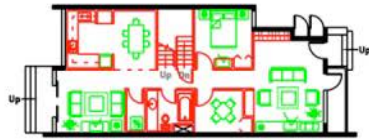
Here is an example:

The SHELL has the building's structure, windows, façade and fixed mechanical systems.

The INFILL consists of the stair selected for the specific floor plan, as well as the interior partitions, all kitchen and bathroom pipes, ducts, and fixtures. (The furniture can be part of the infill or not).

The developer can make decisions about INFILL, or...

First Floor Plan
with One INFILL
Option (1b)

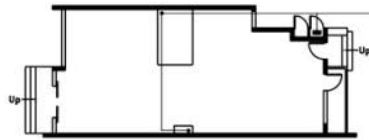


Whole
House

||

SHELL

Window and Other
Facade Elements
and Fixed MEP
System Parts



Decision by
Developer

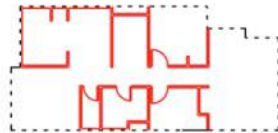
+

Stair



+

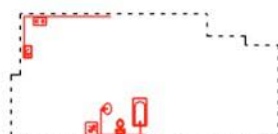
INFILL Walls
(Spatial Layout)



+

INFILL

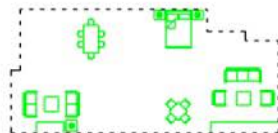
Kitchen and Bathroom
Equipment and Specific
MEP Lines to Which
Equipment is Attached



+

Decision by
Occupant

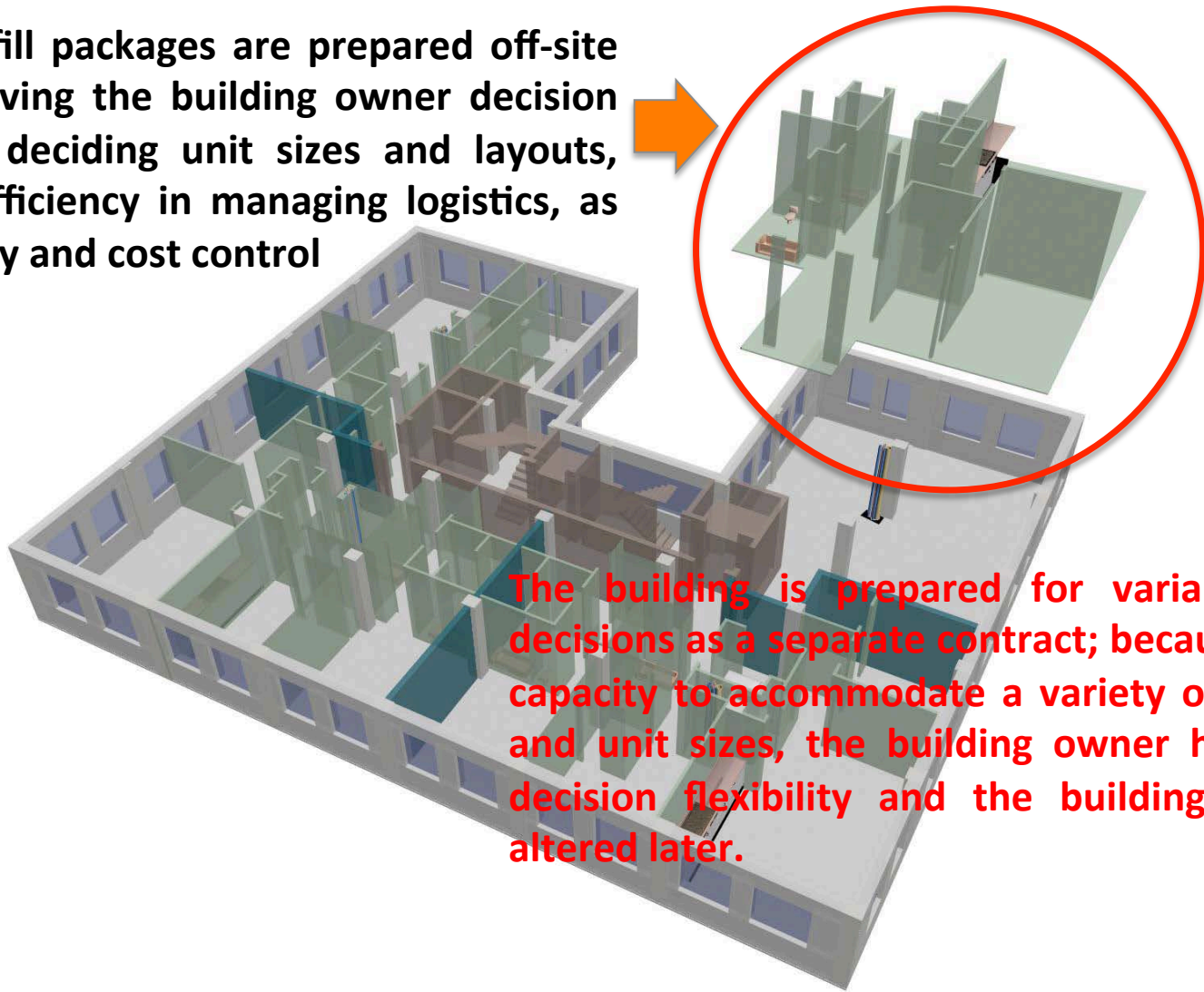
Furniture



**I n s t e a d o f t h e
d e v e l o p e r m a k i n g a l l o f
t h e I N F I L L d e c i s i o n s ,
t h e i n h a b i t a n t c a n
m a k e t h o s e d e c i s i o n s .**

**F o r a c o m p a n y
d e l i v e r i n g i n f i l l , e i t h e r
i s p o s s i b l e .**

Individual infill packages are prepared off-site per unit – giving the building owner decision flexibility in deciding unit sizes and layouts, and offers efficiency in managing logistics, as well as quality and cost control



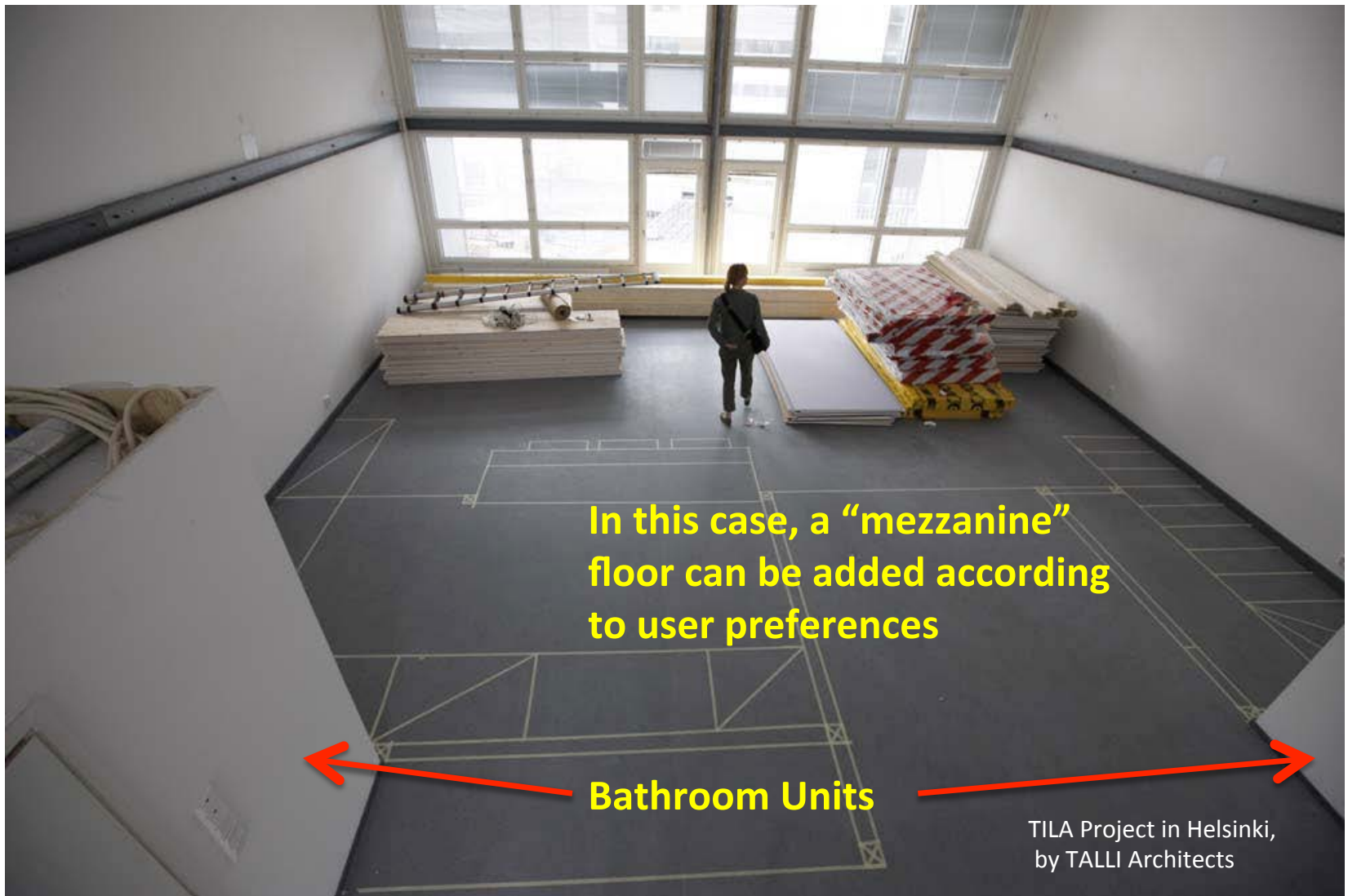
The building is prepared for variable infill decisions as a separate contract; because it has capacity to accommodate a variety of layouts and unit sizes, the building owner has great decision flexibility and the building can be altered later.

Infill Systems companies can offer their product/ service solutions in elevator buildings



An architectural office designs empty (but serviced) spaces, ready for a wide variety of infill solutions

Infill Systems US LLC



In this case, a “mezzanine” floor can be added according to user preferences

Bathroom Units

TILA Project in Helsinki,
by TALLI Architects

Serviced spaces (in base buildings) can be of different kinds; here, two bathrooms are already installed. The kitchen can be in several locations, and inhabitants can add a second floor.



Infill companies have off-site prefabrication facilities and deliver and install everything; all parts are brought in through the door or windows

Infill Systems US LLC



In elevator buildings, everything in an infill package comes up in the elevator or, if too large, thru a window or balcony door.

Infill Systems US LLC



Work progresses most efficiently when Infill companies use trained, multi-skilled teams. Each is assigned to complete a given infill installation job.

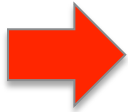
This avoids schedule management and quality control problems - typical when different trades and subcontractors are brought in one after the other.



One or two months after work begins, the home is ready for living

Decision to Build a Residential Townhouse Development

SHELL



SHELL



shell design (Assuming use of homeworks infill or equal. Also assume offsite prefabrication of panel system and key MEP components for the shell.)

building permit approval



construction

shell ready for infill

INFILL



INFILL

trial design/possibilities presentation using interface design tools including cost calculations



decision of customers to purchase infill

Infill detail design including further cost calculation

order sent to distribution/fabrication facility

infill kits prepared



delivery of kit in separate bundles in sequence to shell



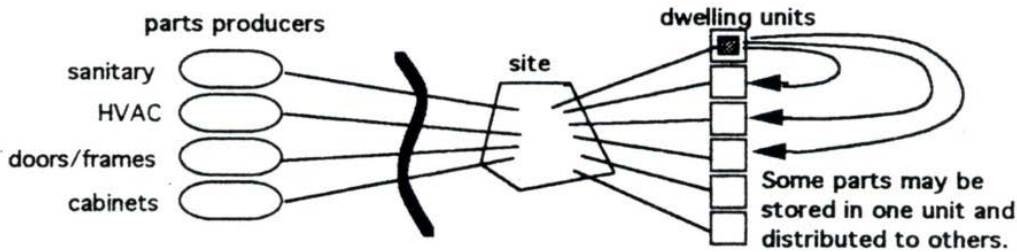
installation by multi-skilled crew

customers move into new townhouse

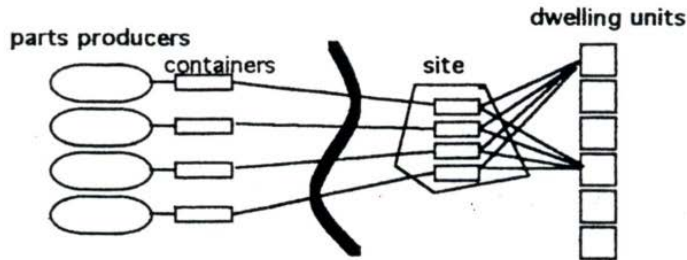


The two-step process in detail

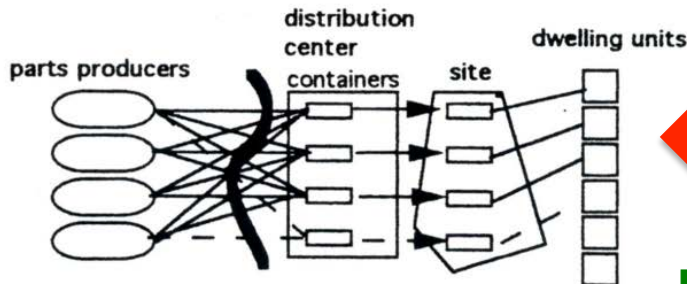
Comparing Logistics Strategies: Traditional vs. Fit-Out



The Traditional Supply and Logistics Chain



Intermediate Strategy



New Logistics Strategy

Infill companies use an advanced logistics strategy

An integrated logistics strategy links manufacturers, a distribution center and the site, using dedicated delivery containers per job. This reduces risk, and assures schedule, price and quality control that the old methods cannot offer.

Infill companies understand how divided construction contracts work (familiar in office/retail projects)



FIT-OUT **Base Building**

Divided Construction Costs

Base Building and Fit-out

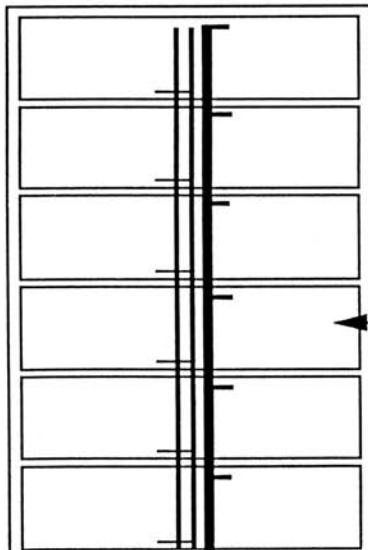
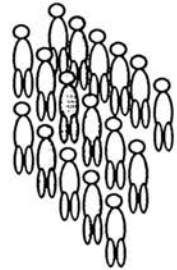
		Base Building	Fit-Out
Preliminaries	BB+FO	.5%	.5%
Foundation		10.2%	
Rough Structure		16.6%	
Full Enclosure		15.1%	
Finishing Trades	BB+FO	3.0%	9.8%
Flooring	FO		7.0%
Interior Trim Carpentry	FO		3.0%
Interior Doors	FO		1.6%
Ceramic Tile	FO		.7%
Cabinets and Vanities	FO		4.2%
Appliances	FO		1.7%
Rough 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%

The most difficult technical challenge is management of the pipes, wires and ducts.

Architecture

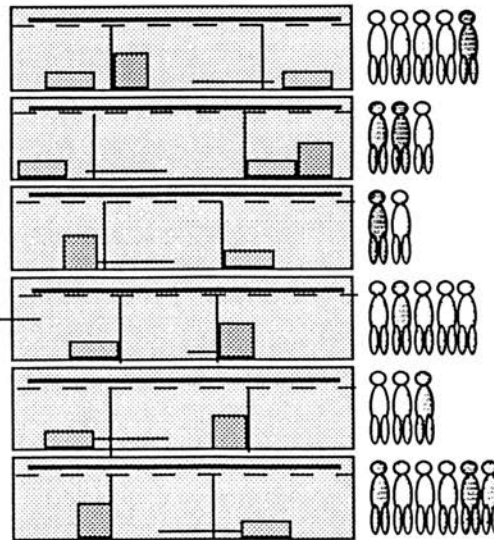
• Open Building

the base building concerns what is shared by everyone



Base Building Level

the fit-out concerns what is decided by each tenant independently

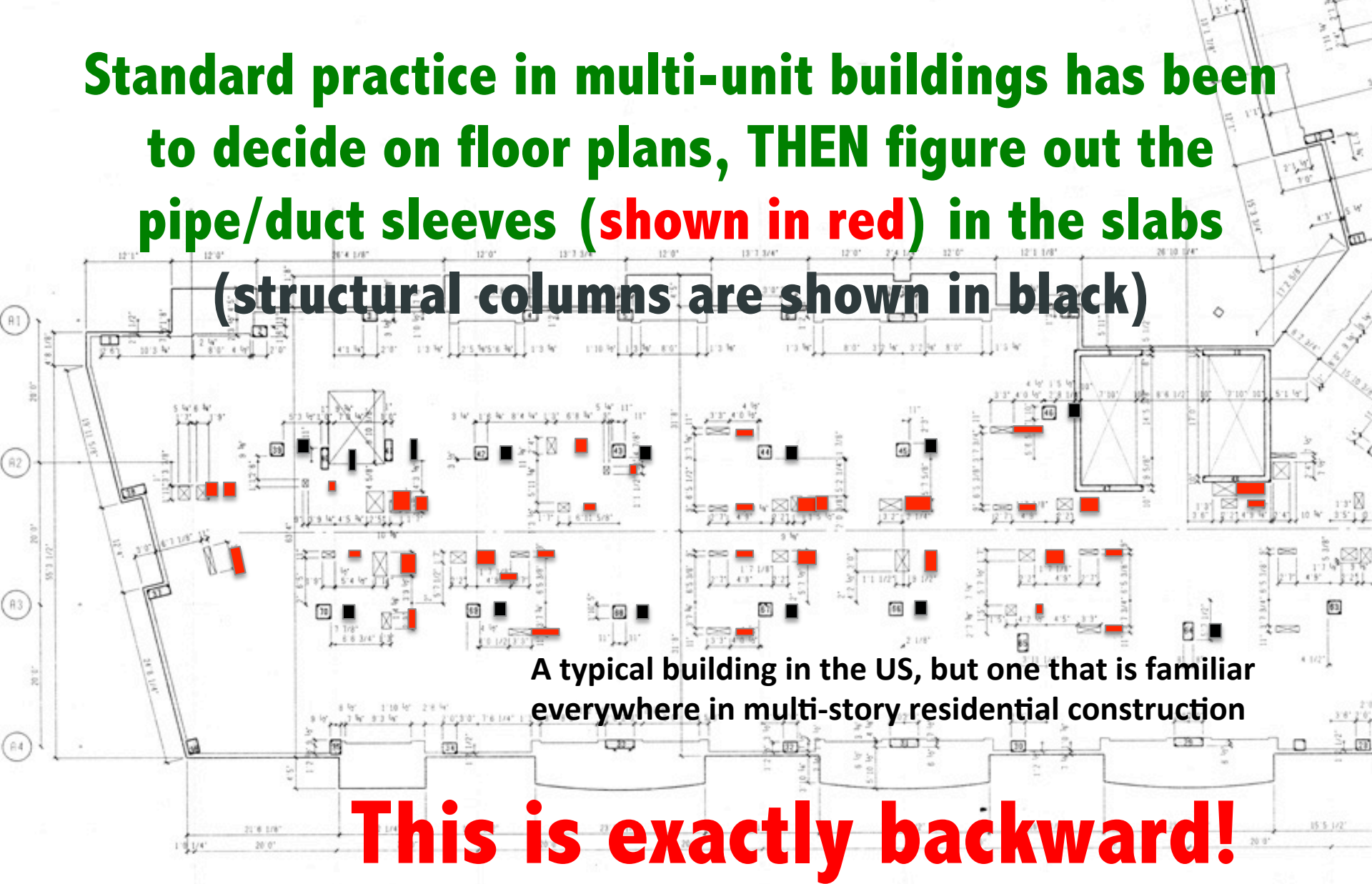


Fit-out Level

The interfaces between the SHELL systems and the INFILL systems need to be untangled.

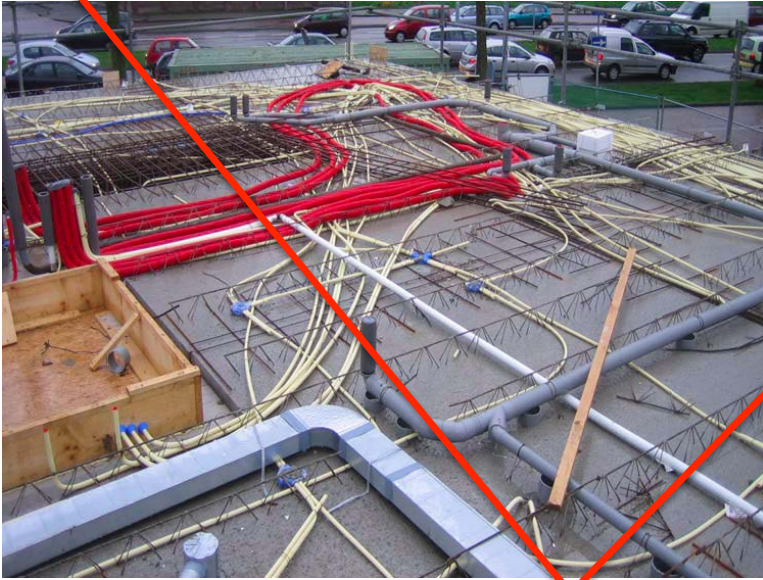
And the distribution of these systems within the INFILL package are critical to success as well.

Standard practice in multi-unit buildings has been to decide on floor plans, THEN figure out the pipe/duct sleeves (shown in red) in the slabs (structural columns are shown in black)



A typical building in the US, but one that is familiar everywhere in multi-story residential construction

This is exactly backward!

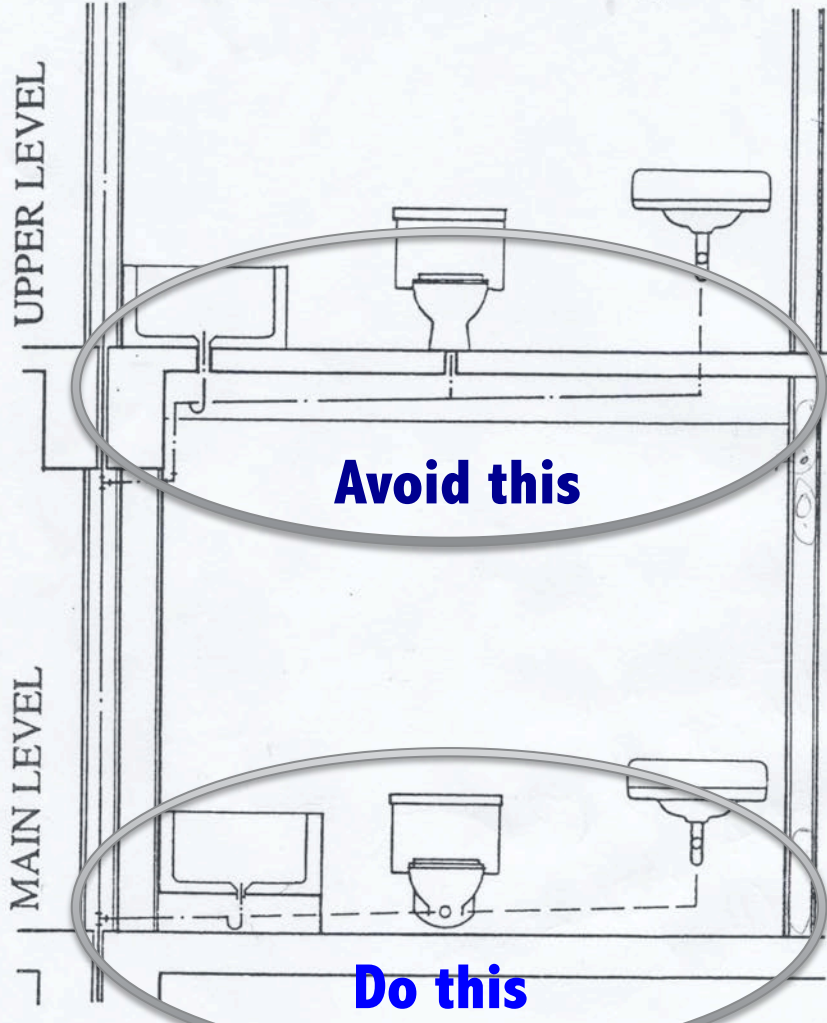


Infill companies have learned how to overcome these obsolete and entangled design and building methods.



Infill companies deliver solutions that separate parts of the investment that must be long-lasting from the parts that will change more frequently.

Tub/Shower: no special requirements for fixture type or location, drain lines are sloped within depth of steel structure
 Water Closet: no special requirements for fixture type or location
 Sink/Lavatory: no special requirements for fixture type or location



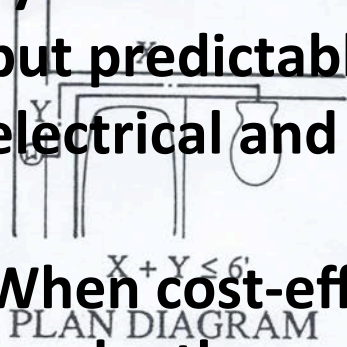
Avoid this

Do this

Smart routing of drainage pipes is critical (also domestic water supply, gas piping and ventilation)

In fact, the key to effective infill lies in systematic management of varied – but predictable - mechanical, electrical and plumbing systems.

When cost-effective solutions are used, other more consumer-oriented choices are affordable.

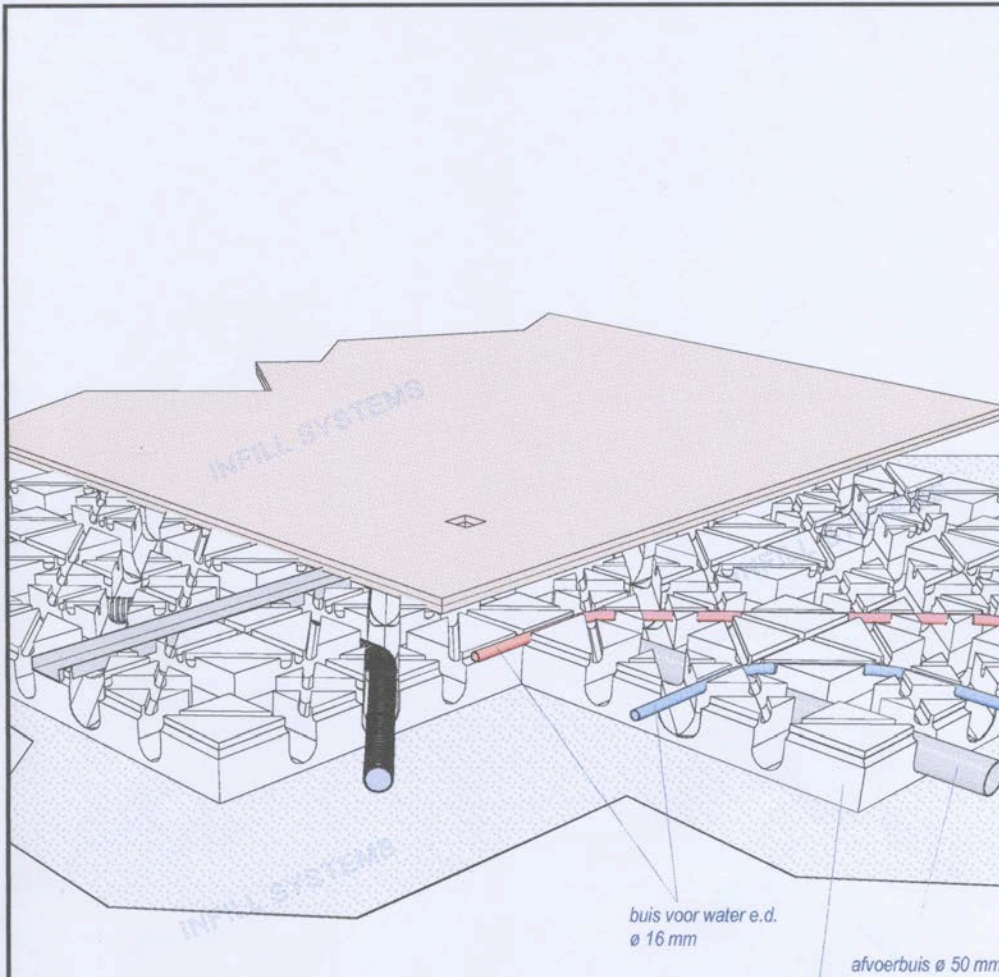


One good solution: the Matrix Tile System



Marketed in Europe by
Infill Systems BV / The
Netherlands

Marketed in North America by Infill
Systems US LLC: www.infillsystemsus.com



in matrixtegel gesneden
gootprofiel voor doorvoer
kabels bij (deur)opening
in wand.
op deze plek geen kruisende
leidingen in matrixtegel

2 x 12,5mm vezelgewapende
vloerplaat

matrixtegel 2 600x600 mm en 85 mm dik
met zwevende vloerfunctie,
ligt op vlakke constructievloer



INFILL SYSTEMS B.V.

oude delft 151 2611 ha delft, tel. 015 - 214 72 59

matrixtegel met leidingen en vloerplaat 2

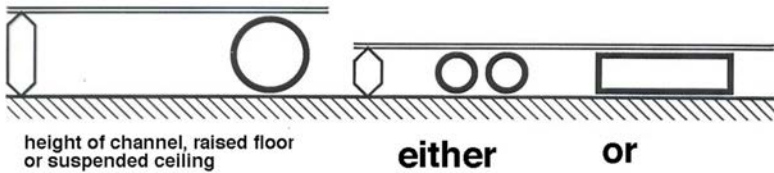
alle rechten voorbehouden

Infill Systems US LLC

The Matrix Tile uses new principles

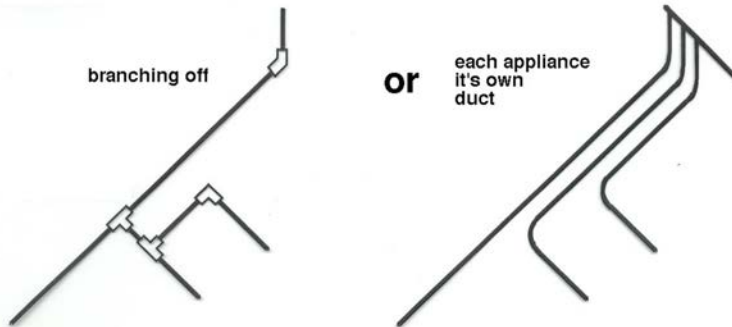
Pipes and ducts can be smaller

Space-requirement



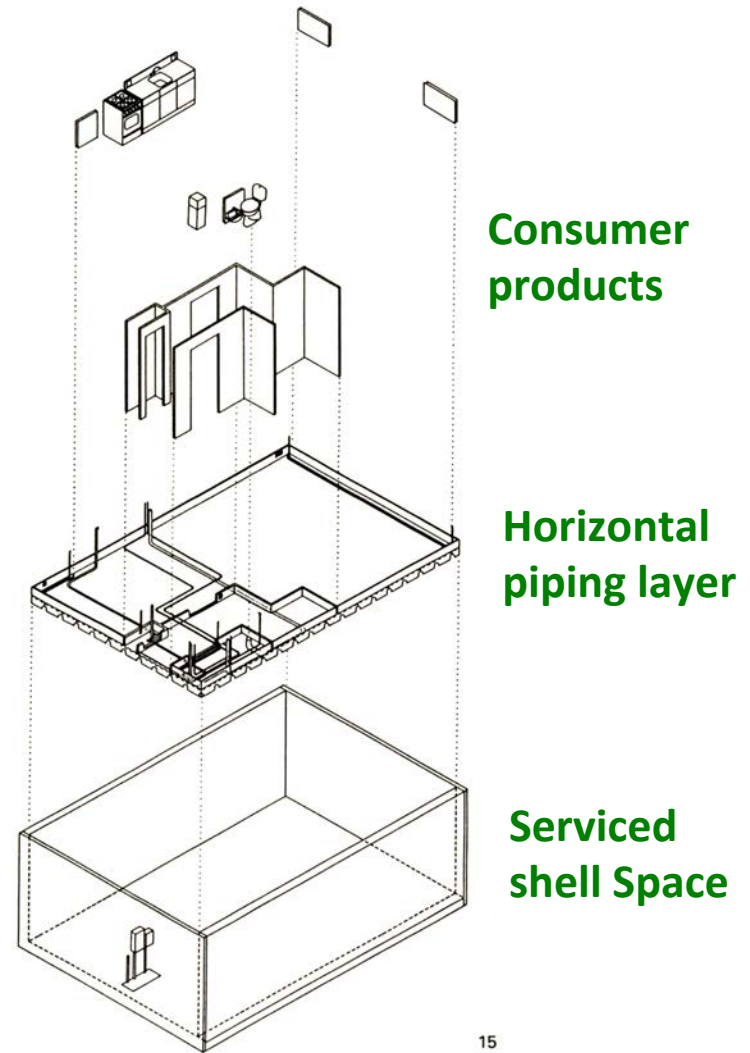
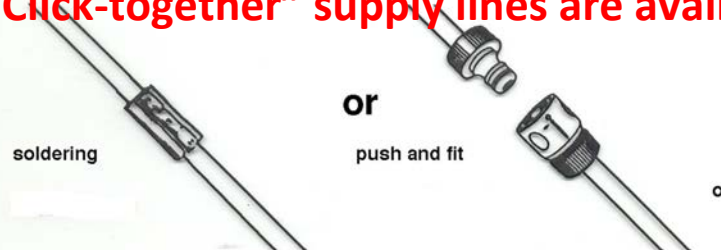
Each fixture can have its own drainage line

Flexible fitting



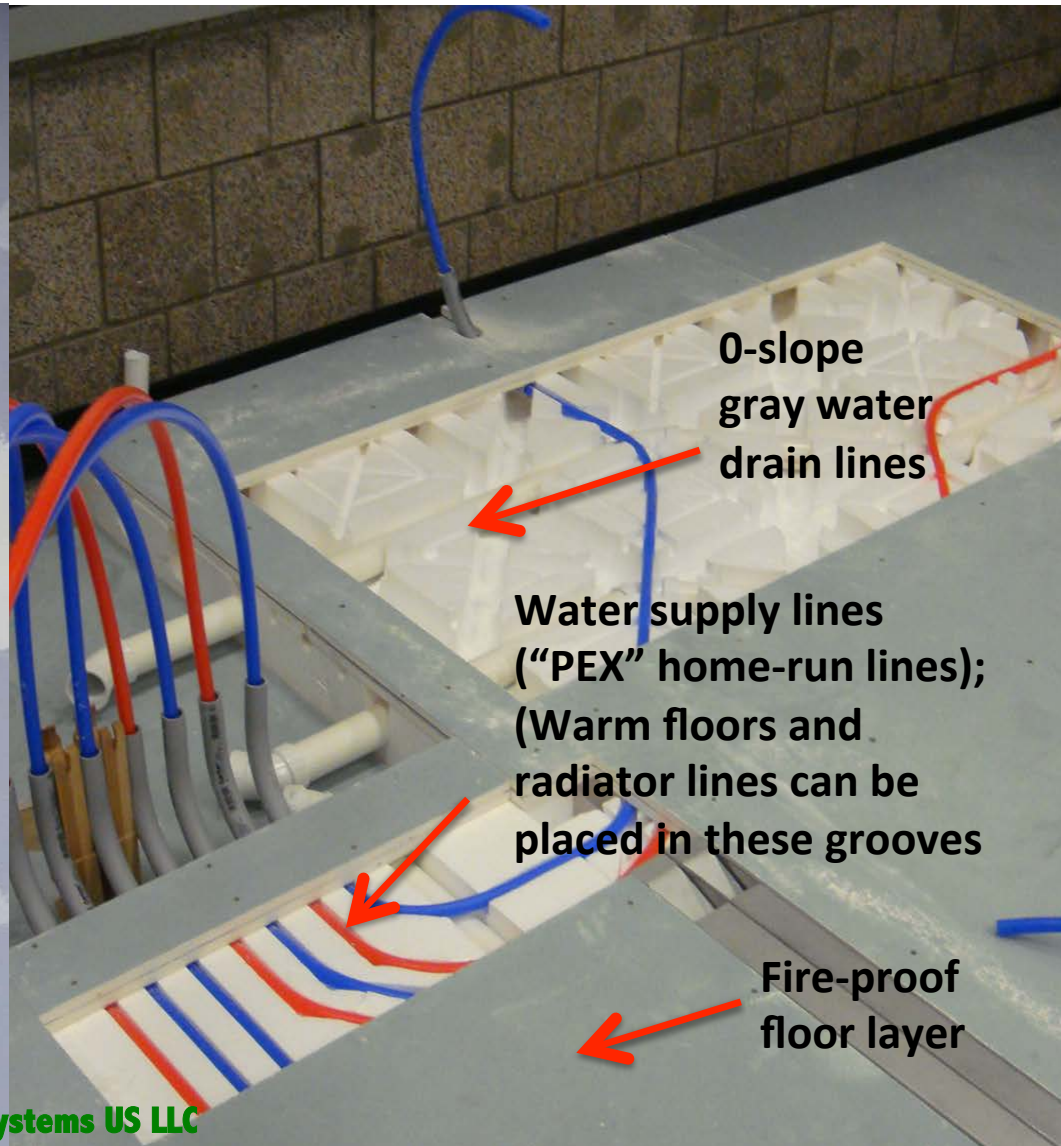
New fitting techniques

"Click-together" supply lines are available



A Matrix Tile system mock-up:

Standard polystyrene tiles (10cm thick with grooves in the top) are laid loose on a leveled floor; piping is laid-out in the grooves and then the floor is closed with a fire-proof layer. Non-load-bearing partitions are mounted, finish flooring placed, and cabinets and fixtures installed



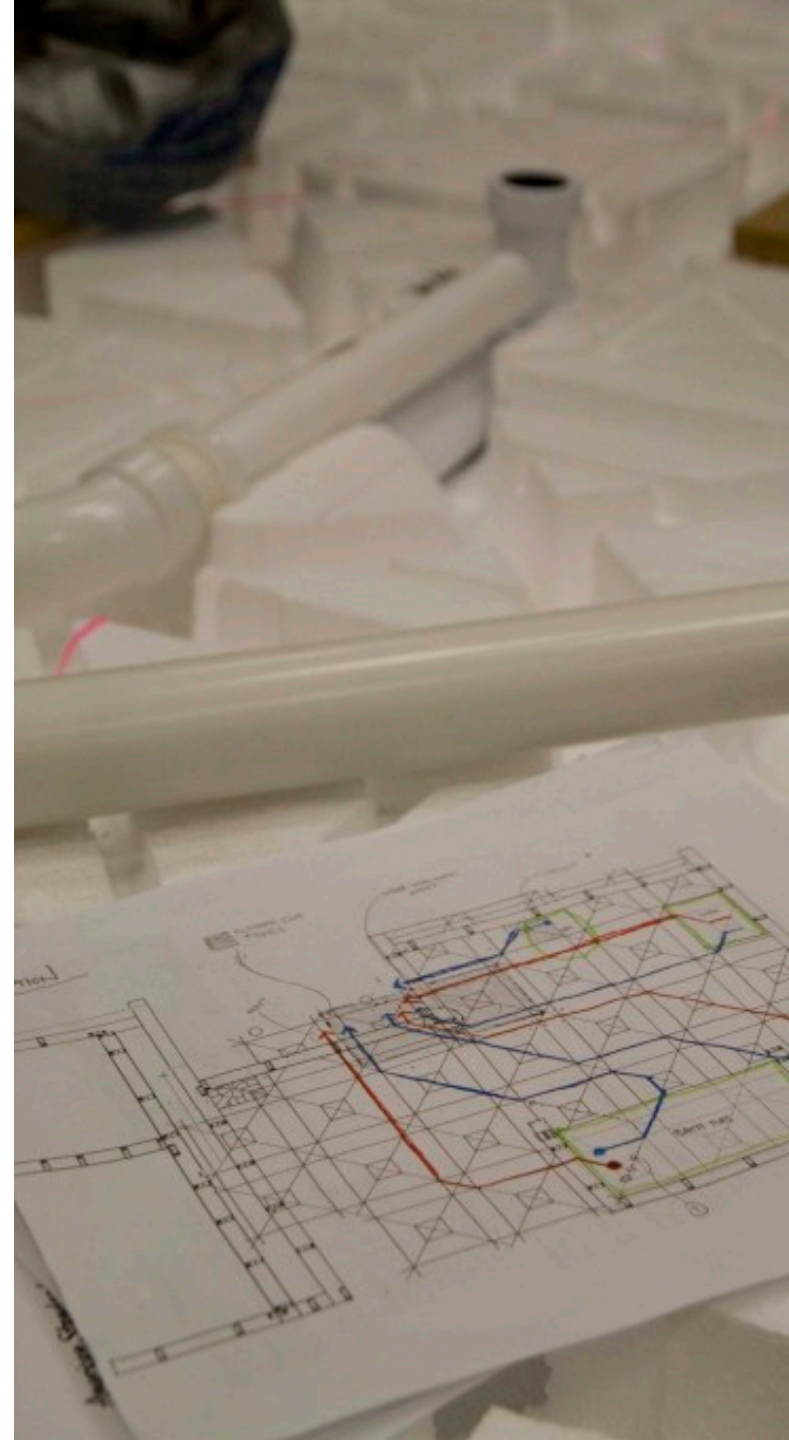
ADVANTAGES

- *for Developers & Consumers*

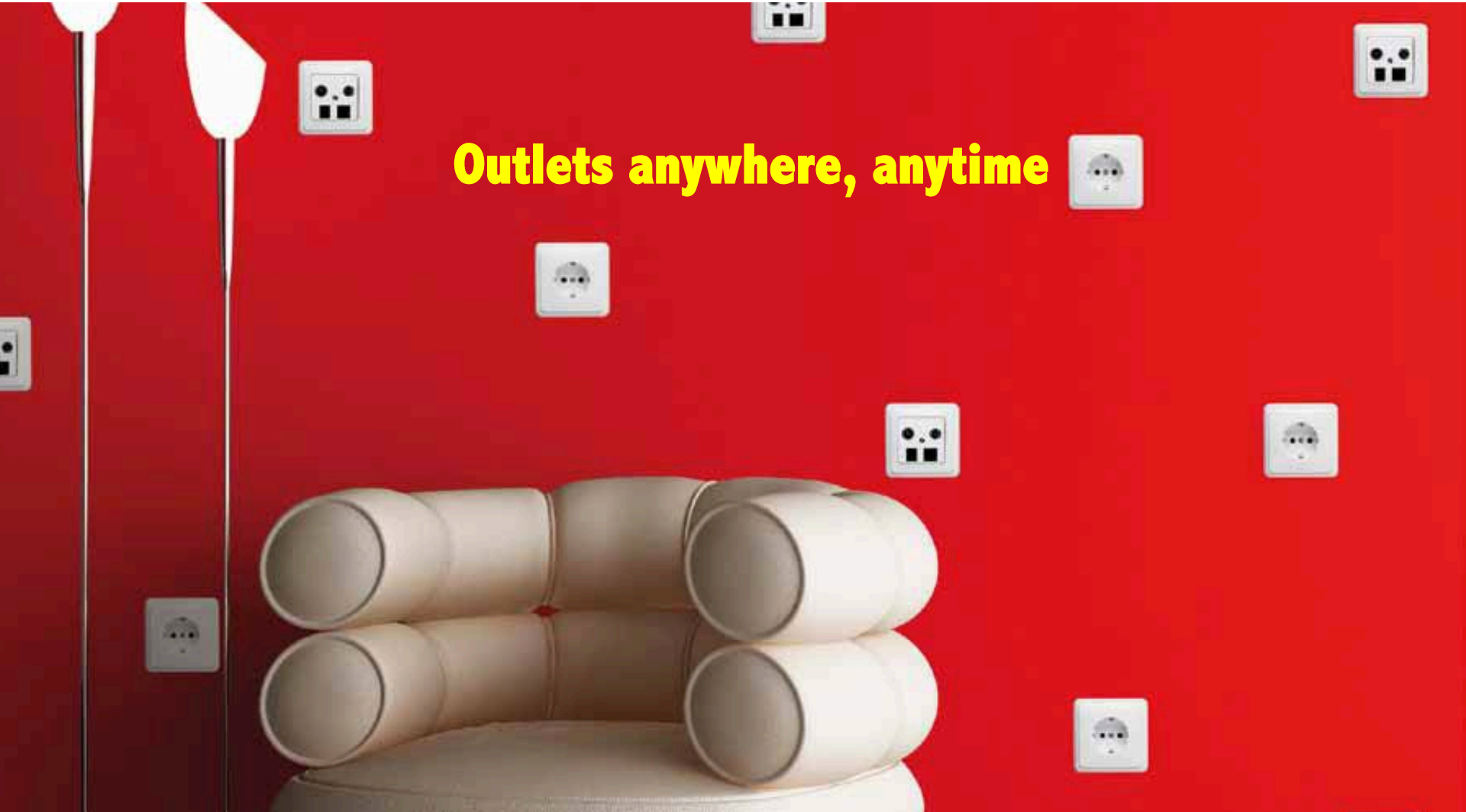
1. **Decision flexibility on floor plans and equipment**
2. **Reduced cost and time for customization**
3. **One-unit-at-a-time rehab**
4. **Improved sound isolation between floors**

- *for Builders*

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



CableStud for wire management



Outlets anywhere, anytime



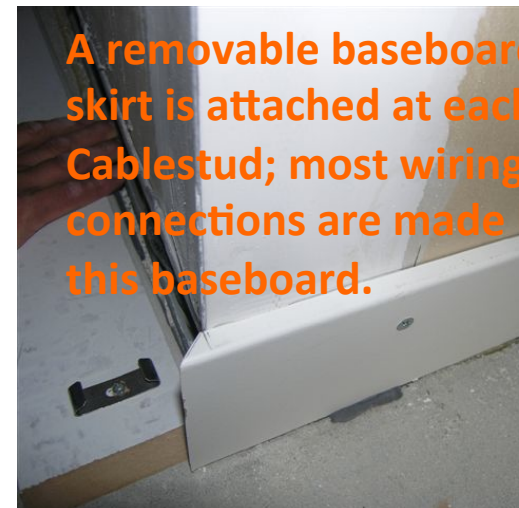
A cablestud is inserted into the bottom of each stud



CABLESTUD Installation



Infill Systems US LLC



A removable baseboard skirt is attached at each Cablestud; most wiring connections are made this baseboard.

ADVANTAGES

- *for Developers & Consumers*

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

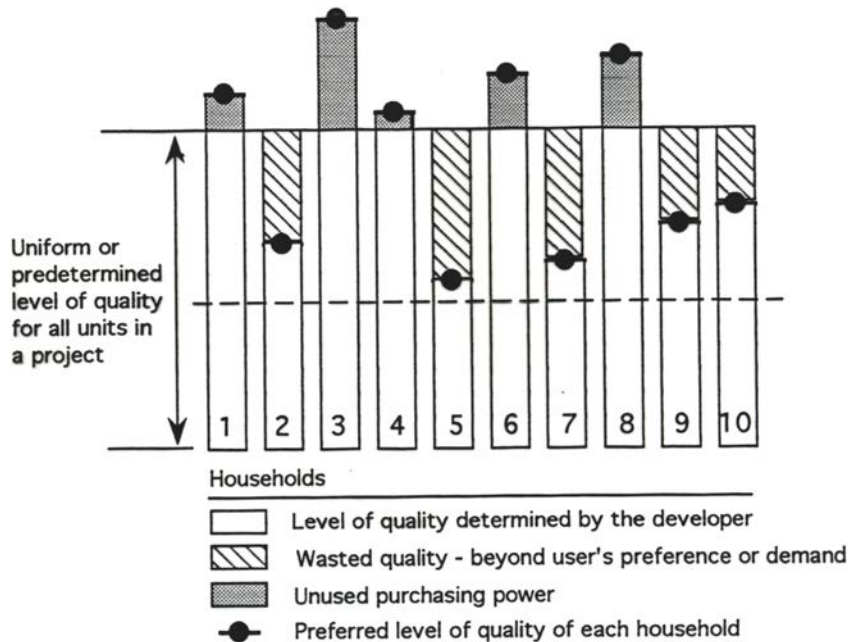
- *for Builders*

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



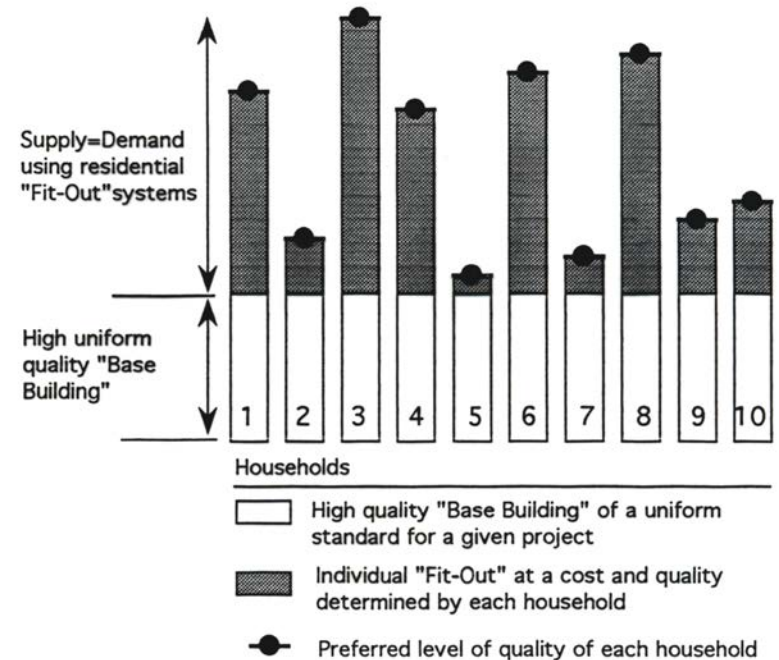
CONCLUSIONS

Infill Companies offer a new way to balance Supply and Demand



A Conventional Project:
Mismatch Between Supply and Demand

Source: Karel Dekker



An Open Building Project:
Matching Supply and Demand Exactly

Infill companies offer a very efficient way of renovating rental or owned units in existing buildings, one-at-a-time.



In summary: Infill Systems are:

- **Well-organized packages of available products prepared off-site**
- **Specified, budgeted and contracted one-dwelling-unit at a time**
- **Specified by the provider (developer) or by the end-user**
- **Effective in repositioning older buildings for residential occupancy**
- **Good for one-unit-at-a-time upgrading in occupied buildings**
- **Effective in new construction where speed-to-market and decision flexibility are critical**

AND

- **Base buildings construction proceeds before infill decisions are made**

Infill System companies offer a new kind of design-build service

using

- **Off-site prefabrication**
- **Advanced supply-chain management**
- **Streamlined software and logistics**
 - **Multi-skilled worker teams**

Providing

Customized just-in-time fit-out in

- **existing buildings**
- **new shells**

A detailed floor plan of a building, likely a commercial space, is shown in the background. It features a central staircase, several rooms, and a large open area. The text is overlaid on this plan.

The time has come for INFILL COMPANIES to get into business

- **The market exists - at various price points**
 - **Software is available - to manage the complexity**
 - **Product solutions are available**
 - **Regulations can adjust to match demand**
- New financing strategies are available**

WHY WAIT?