RESIDENTIAL CONSTRUCTION

SINGLE FAMILY
MULTI FAMILY
RENOVATION
REMODELING
MAINTENANCE

2ND. LARGEST INDUSTRY IN US
580,000+ SMALL BUSINESSES
10+ MILLION EMPLOYED
SINGLE FAMILY
MULTI FAMILY
RENOVATION
REMODELING
MAINTENANCE

INSTRUCTOR - JOE CROSS
WHAT YOU MAY LEARN

• THEY DON’T BUILD THEM LIKE THEY USE TO- A HISTORY LESSON (AND THAT’S GOOD)

• YOU CAN’T FIX IT (AND THAT’S GOOD, TOO)

• COMPONENTS, ASSEMBLIES -HOW THEY MAY AFFECT YOUR HOUSE

• HOW TO HIRE THE “APPROPRIATE” PERSON

• HOW TO (MAYBE) GET WHAT YOU EXPECTED

• COMMON PROBLEMS

• THE THIN LINE OF INSPECTION (AKA YOU GET WHAT YOU PAY FOR)

• HOW TO CONTRACT YOUR EXPECTATIONS

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HOUSING DEVELOPED FROM AVAILABLE MATERIALS

Humans Improvise Using What’s Available

Nature Provides
A BRIEF RECENT U.S. HISTORY OF RESIDENTIAL, CONSTRUCTION

RURAL

1700’s

Antebellum

Post Civil War

Early 20th Century

URBAN

1700’s

Antebellum

Post Civil War

Early 20th Century

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"WHICH MODEL TO FOLLOW?"

MIES VAN DER ROHE

"Form Follows Function"
"Less is More"

FRANK LLOYD WRIGHT
Falling Waters
Prairie Style

LE CORBUSIER
"The house is a machine for living in".
EVOLUTION OF LIGHT (RESIDENTIAL) CONSTRUCTION

US Industrial Revolution & WW I
- Agricultural Mechanical Revolution drives people to cities
- WW I ramps up mass production

Warren Bechtel & Steven Bechtel (Son)
1920’s & 1930’s Railroads & Hoover Dam
Construction by Process & Machinery
Time a consideration

As a Contractor there are three choices:
1. We can build a quality house
2. We can build a fast house
3. We can build an inexpensive house

As the Owner, you can make only two choices
(Old Axiom)
AN INDUSTRY MATURES

PROBLEM

Hard to build
Unsanitary
No Personal Space
Crowded
No Open Space
No Ownership

Required a New Way of Construction

MASS PRODUCTION ASSEMBLY LINE

SOLUTION

Subdivisions
New Towns

Columbia, Md.
Reston, Va

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SECRET TO MASS (HOUSING) PRODUCTION: BUILD ‘CHASSIS’ FOR HOUSES JUST AS DETROIT DOES FOR AUTOMOBILES……
HENRY J. KAISER

Abraham Levitt & William Levitt (Son)
1930’s Luxury Homes in Westchester
Post WWII Basic 2-3 bedroom Cape Cod on Long Island
By 1955, one house completed every 16 minutes

Cost and Time can be FIXED
HOW TO CONTROL QUALITY, PRICE AND TIME?

Assemble, don’t build
Standardize components, don’t create
Simplify, don’t confuse

WWII Military-
Project Management
NASA-
Critical Path Project Management
SO DOES FORM FOLLOW SOMETHING ELSE?
EVOLUTION OF LIGHT (COMPONENT) CONSTRUCTION

- Handmade Doors & Windows → Standard Sizes and Shapes
- Plaster → Drywall
- Wood Beams → Trusses
- Single Strand Wire → 3-Wire Insulated
- Wood Sheathing & Sub-Floor → Plywood
- Insulated Fiberboard
- Random Sizes → 2 foot x 4 foot Modules
- Metric
- Terra Cotta & Lead Pipe → Cast Iron
- PVC Pipe

Over 1,200 new products each year
<table>
<thead>
<tr>
<th><strong>YEA!! THAT’S GOOD</strong></th>
<th><strong>RAT’S!! THAT’S BAD</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EIFS</strong></td>
<td><strong>Leaks, Causes Rot &amp; Mold</strong></td>
</tr>
<tr>
<td>Synthetic Stucco</td>
<td><strong>Dents, Alum Nails Fail</strong></td>
</tr>
<tr>
<td><strong>Aluminum Siding</strong></td>
<td><strong>Joints Show and Fail</strong></td>
</tr>
<tr>
<td><strong>Drywall</strong></td>
<td><strong>Heat, Expands/Contracts</strong></td>
</tr>
<tr>
<td><strong>Aluminum Wiring</strong></td>
<td><strong>Joints Leak, Brittle w/ Age</strong></td>
</tr>
<tr>
<td><strong>QUEST Pipe</strong></td>
<td><strong>Rots Band Board- Collapse</strong></td>
</tr>
<tr>
<td><strong>“Hanging” Decks</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Residential Construction Systems and Maintenance</strong></td>
<td><strong>Christopher Wren Association Lifelong Learning 2018</strong></td>
</tr>
</tbody>
</table>
COMPONENTS & LIFE SPANS

ALL COMPONENTS HAVE DIFFERENT LIFESPANS

WE ACCEPT THE NEED TO FIX A LEAKY SUN ROOF

WE BALK AT THE NEED TO FIX A LEAKY HOUSE ROOF

THE OLDER A HOUSE GETS THE MORE MAINTENANCE IT REQUIRES
UNTIL..... MAINTENANCE BECOMES ALMOST CONTINUOUS

NEW PRODUCTS COBBLED ON OLD HOUSES

“MAKING IT FIT”

ENLARGING EXISTING TO ACCOMMODATE NEW

FINDING THE UNEXPECTED

PLUS- WE KEEP FINDING NEW THINGS WE WANT IN HOUSES

BUT WHY NOW? NEVER HAD SO MUCH MAINTENANCE BEFORE!
WHY ARE MAINTENANCE & RENOVATION PROJECTS GROWING?

#1: Entropy- AKA Varying Component Lifespans

#2: Longer Stay at the Same House

#3: Changing Lifestyles & Working From Home

#4: Efficiencies- we want it cheaper, faster,

#5: Regulations and Building Code Updates
#1 ENTROPY
THE GENERAL TREND OF THE UNIVERSE TOWARD DEATH AND DISORDER.  —JAMES R. NEWMAN

HOUSES ARE NO EXCEPTION—JOE CROSS

"I said from the very beginning, I don't want a big house, I don't want big grounds, I don't want the trouble with the maintenance and all of that."

   Nancy Reagan

"Our summer cottage in Newport is frightfully expensive."

   Alice Vanderbilt

“No man who owns his own house and lot can be a Communist. He has too much to do”

   William Levitt

1952

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#2 LIVING IN THE SAME HOUSE LONGER

<table>
<thead>
<tr>
<th>Year</th>
<th>Mobility Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990-1995</td>
<td>16.8%</td>
</tr>
<tr>
<td>2010</td>
<td>5.4%</td>
</tr>
<tr>
<td>2016</td>
<td>1.7%</td>
</tr>
</tbody>
</table>

US Census Mobility Rates

Translation:
We are outliving the lifecycle of components of our homes
- Roofing
- Wood rot
- Windows
#3 CHANGING LIFESTYLES

Changing Lifestyles

1. Family Rooms → Media Rooms
2. Dining Room → Entertainment Kitchens
3. Master Closets → Fitness Rooms
4. Porches / Decks → Sun Rooms, Hot Tubs

Internet Based Workforce

1. Libraries → Home Offices → His Office / Her Office

Multi-generational living

1. Extra Bedroom → In-House Suites

Cost

A fraction of the cost of new

Does anyone remember

Parlors, Receiving Rooms, Sleeping Porches, Tea Rooms, Mud Rooms
EFFICIENCIES - CHEAPER FASTER

Environmental Awareness

Less Pollution

Lower Operating Costs

Improved Products

Longer Lifespans

Less Maintenance with Greater Performance

New Products

Things we didn’t know we couldn’t live without

Multi-functional products
REGULATIONS & BUILDING CODE UPDATES

Local & State

Building code updates every two years
- Building
- Mechanical
- Fire
- Electrical
- Plumbing

Local Ordinances
- Site & Drainage
- Chesapeake Bay
- Tree
- Buffers

Federal
- Lead Paint
- Asbestos
- OSHA
- Wetlands
- Fish & Wildlife

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ELEMENTS OF MAINTENANCE

Existing Conditions
FROM THE GROUND UP: SOIL

Dirt’s Dirt, Isn’t it?

JC & York Co - it’s a marble cake

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ELEMENTS OF MAINTENANCE

Existing Conditions
Foundation & Soil Profile- What you can’t see

ASSUMED SOIL BEARING CAPACITY 2,500 psf

- Original Surface
- Lot Clearing & Fill: Varies by type & compaction
- Clay Lens: Varies by moisture
- Footer
- Foundation Wall
- Unconsolidated Silt – 800 psi
Elements of maintenance

Concrete (Footings, Slabs, Driveways and Flat Work)

Follow the PISS Rule:
Put In Some Steel
Concrete is strong but very brittle

Masonry:
Brick, Concrete Block (CMU) & Stone
Costly, mostly footers, fireplaces and brick veneer

Cement: a powder of alumina, silica, lime, iron oxide, and magnesium oxide burned together in a kiln and finely pulverized and used as an ingredient of mortar and concrete;

Concrete: a composite material composed of coarse aggregate bonded with a fluid cement that hardens. Most concretes are lime.

Concrete Strength
Varies according to the amount of Water or cement added from 50 psi to 18,000 psi. Standard mix for residential use is 2,500 psi.
ELEMEENDS OF MAINTENANCE

METALS

Steel Beams
Pipe Columns
Angle Iron Lintels

WOOD

PLASTICS & COMPOSITS

Original Platform Framing System
ELEMENTS OF MAINTENANCE

FRAMING

Material Revolution-
Engineered Lumber
Wood Composites
Steel Studs
Wall Panels

Span
2 x 10 SYP  17’-4”
Wood Floor Truss  25’
Less Deflection
ELEMENTS OF MAINTENANCE

Treated Wood- Not so simple anymore

http://preservedwood.org/TechResources/SmartphoneApp.aspx

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ELEMENTS OF MAINTENANCE

Thermal & Moisture Protection

Roofing
- Asphalt Type & Weight
- Metal
- Sheet Membranes
- Slope

Flashing
- Plumbing Vent Stocks
- Counter Flashing

Insulation
- Granular/Batt/Foam
- Air Stops
- Thermal Bridging

Caulking is for Boats
Sealants are for Construction

http://www.finehomebuilding.com/2004/05/01/making-sense-of-caulks-and-sealants

Residential Construction Systems and Maintenance
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### Elements of Maintenance

**A Special Cross News Bulletin..... MOISTURE LEVELS AFFECT ALL THINGS !!**

#### Moisture of Wood By Temperature & Humidity

<table>
<thead>
<tr>
<th>Temp</th>
<th>30%</th>
<th>40%</th>
<th>50%</th>
<th>60%</th>
<th>70%</th>
<th>80%</th>
<th>90%</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>6.3</td>
<td>7.9</td>
<td>9.5</td>
<td>11.3</td>
<td>13.5</td>
<td>16.5</td>
<td>21</td>
</tr>
<tr>
<td>40</td>
<td>6.3</td>
<td>7.9</td>
<td>9.5</td>
<td>11.0</td>
<td>13.5</td>
<td>16.5</td>
<td>21</td>
</tr>
<tr>
<td>50</td>
<td>6.2</td>
<td>7.9</td>
<td>9.5</td>
<td>11.0</td>
<td>13.5</td>
<td>16.5</td>
<td>21</td>
</tr>
<tr>
<td>60</td>
<td>6.2</td>
<td>7.8</td>
<td>9.4</td>
<td>11.0</td>
<td>13.3</td>
<td>16.2</td>
<td>20.7</td>
</tr>
<tr>
<td>70</td>
<td>6.2</td>
<td>7.7</td>
<td>9.2</td>
<td>11.0</td>
<td>13.1</td>
<td>16</td>
<td>20.5</td>
</tr>
<tr>
<td>80</td>
<td>6.1</td>
<td>7.6</td>
<td>9.1</td>
<td>10.0</td>
<td>12.9</td>
<td>15.7</td>
<td>20.2</td>
</tr>
<tr>
<td>90</td>
<td>5.9</td>
<td>7.4</td>
<td>8.9</td>
<td>10.0</td>
<td>12.8</td>
<td>15.4</td>
<td>19.8</td>
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<tr>
<td>100</td>
<td>5.8</td>
<td>7.2</td>
<td>8.7</td>
<td>10.0</td>
<td>12.3</td>
<td>15.1</td>
<td>19.5</td>
</tr>
</tbody>
</table>

A 2% change in Humidity can expand hardwoods 1/32”
Kiln dried lumber delivered to a Virginia site will vary from 8%-18% +

Moisture Meters are **ESSENTIAL** to Quality Residential Construction

---

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ELEMENTS OF MAINTENANCE

Openings – Doors & Windows

Energy Star.gov

WINDOWS

<table>
<thead>
<tr>
<th>CLIMATE ZONE</th>
<th>U-FACTOR&lt;sup&gt;1&lt;/sup&gt;</th>
<th>SHGC&lt;sup&gt;2&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern</td>
<td>≤0.27</td>
<td>Any</td>
</tr>
<tr>
<td></td>
<td>=0.28</td>
<td>≥0.32</td>
</tr>
<tr>
<td></td>
<td>=0.29</td>
<td>≥0.37</td>
</tr>
<tr>
<td></td>
<td>=0.30</td>
<td>≥0.42</td>
</tr>
<tr>
<td>North Central</td>
<td>≤0.30</td>
<td>&lt;0.40</td>
</tr>
<tr>
<td>South Central</td>
<td>≤0.30</td>
<td>≤0.25</td>
</tr>
<tr>
<td>Southern</td>
<td>≤0.40</td>
<td>≤0.25</td>
</tr>
</tbody>
</table>

SKYLIGHTS

<table>
<thead>
<tr>
<th>CLIMATE ZONE</th>
<th>U-FACTOR&lt;sup&gt;1&lt;/sup&gt;</th>
<th>SHGC&lt;sup&gt;2&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern</td>
<td>≤0.50</td>
<td>Any</td>
</tr>
<tr>
<td>North Central</td>
<td>≤0.53</td>
<td>≤0.35</td>
</tr>
<tr>
<td>South Central</td>
<td>≤0.53</td>
<td>≤0.28</td>
</tr>
<tr>
<td>Southern</td>
<td>≤0.60</td>
<td>≤0.28</td>
</tr>
</tbody>
</table>

Air Leakage ≤ 0.3 cfm/ft²

1: Btu/ft²°F
2: Solar Heat Gain Coefficient

Potential Savings
Tax Deductions
15% + Energy Save

LOW “E” Coated Glass
Argon Fill
Spacer

Multiple Panes
Insulated Frame

LOW-“E” GLASS
Special coatings reflect infrared light, keeping heat inside in winter and outside in summer. They also reflect damaging ultraviolet light, which helps protect interior furnishings from fading.

GAS FILLS
Some energy-efficient windows have argon, krypton, or other gases between the panes. These odorless, colorless, non-toxic gases insulate better than regular air.

WARM EDGE SPACERS
A spacer keeps a window’s glass panes the correct distance apart. Non-metallic and metal/non-metal hybrid spacers also insulate panes edges, reducing heat transfer through the window.

WHAT MAKES A WINDOW ENERGY-EFFICIENT?

Today, manufacturers use an array of technologies to make ENERGY STAR qualified windows.

QUALITY FRAME MATERIALS
A variety of durable, low-maintenance framing materials reduce heat transfer and help insulate better.

MULTIPLE PANCES
Two panes of glass, with an air-gap filled space in the middle, insulate much better than a single pane of glass. Some ENERGY STAR qualified windows include three or more panes for even greater energy-efficiency, increased impact resistance, and sound insulation.

ENERGY STAR.gov
ELEMENTS OF MAINTENANCE

Finishes, Specialties, Equipment & Furnishings

The sky is not the limit, only the beginning....

Zsa Zsa went home to find decorations for her new house. I’m not saying she went overboard, but when she returned, her shopping spree had lifted Hungry out of it’s post war depression..... Bob Hope.

“To infinity and beyond” (sign in a Va. Beach decorator’s shop)

Molded/extruded
Plastic Trim & Decorations

Why ??

Wood, Laminate & Composite Floors

Dimensionally Stable
Machine Acrylic Finish
Easy to Install – Hard on Knees

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## Elements of Maintenance

### Interiors & Finishes

<table>
<thead>
<tr>
<th>Drywall</th>
<th>Tile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Types</td>
<td>Thin-Set</td>
</tr>
<tr>
<td>Thicknesses</td>
<td>Thick-Set</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Finish Woods &amp; Moldings</th>
<th>Cabinets - The Revolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finger-Jointed</td>
<td>Modular</td>
</tr>
<tr>
<td>Plastic</td>
<td>Pre-Finished</td>
</tr>
<tr>
<td>Hardwoods</td>
<td>Oodles of Features</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Paints &amp; Finishes</th>
<th>Flooring - Anything Goes Anywhere</th>
</tr>
</thead>
<tbody>
<tr>
<td>Encapsulate</td>
<td>(Remember - The Transition Strip)</td>
</tr>
<tr>
<td>Low Volatility</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Closets &amp; Dressing Rooms</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Elements of Maintenance

Plumbing - Distribution

Copper vs. Cross-Linked Polyethylene (PEX & XLPE)

**Copper** - Rigid, Expensive, Skilled Labor and Proven. Bursts on freezing, right angles, more joints.

**Flexible** - Flexible, Inexpensive, easy to run, requires little training, degrades in sunlight, fewer joints, higher pressures, expands on freezing.

Plumbing – Hot Water Supply

Tanks vs. Tankless

**Tanks** - Lower material & labor costs, Limited volume.

**Tankless** - Greater cost, Continuous volume

Popular in Europe and Japan because:
Fewer bathrooms and water fixture units
220 volt electrical system (vs. US 110 volt)

Unusually Large Water Bills & Leaks - What Happened?
ELEMENTS OF MAINTENANCE

Plumbing – Waste Disposal (Sewer) Lines

PVC replaced Cast Iron sewer pipe circa 1965.

Slope and the “Need for Speed”
Water needs at least \( \frac{1}{4} \)” of fall in one foot along a smooth surface to drain

Add solids and semi-solids and you need at least 2” in 12 feet to clear a line.

Add congealed grease, dirt, et. al. and you have a clog

Clean-outs, Metal Snakes & Power Washing
ELEMENTS OF MAINTENANCE

HVAC- Heating, Ventilation, Air Conditioning

DESIGN REVOLUTION

OLD

AMOUNT OF COOLING
(GROSSLY SIMPLIFIED)

+ GEOGRAPHIC LOCATION

+ TOTAL CUBIC FEET IN HOUSE

= TONS OF AC

OLD AIR VOLUME

NO. BEDRMS X 150 CFM
LIV RM & KIT @ 240 CFM
BATHS @ 100 CFM

TO A TOTAL OF 1,800 CFM
(BECAUSE THAT WAS A STANDARD AIR HANDLER)

NEW

MANY FACTORS

• WINDOW GLASS/RM
• ORIENTATION OF RM
• SIZE OF RM
• TREE COVERAGE ON LOT
• CHIMNEY(S)
• CAN LIGHTS COVERED
• GAS OR ELECTRIC RANGE
• SIZE OF AIR VENTS
• LENGTH FROM SOURCE
• ETC.
ELEMENTS OF MAINTENANCE

HVAC - Heating, Ventilation, Air Conditioning

Heat Pumps
   Air Sourced
   Ground Sourced

[Diagram of heat pump parts and process]
ELEMENTS OF MAINTENANCE

HVAC- Continued

SEER RATINGS (Seasonal Energy Efficiency Ratings)

<table>
<thead>
<tr>
<th>Year</th>
<th>Rating</th>
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<tbody>
<tr>
<td>1980</td>
<td>6</td>
</tr>
<tr>
<td>1985</td>
<td>7</td>
</tr>
<tr>
<td>1991</td>
<td>8</td>
</tr>
<tr>
<td>2005</td>
<td>12</td>
</tr>
<tr>
<td>2013</td>
<td>13</td>
</tr>
<tr>
<td>2017</td>
<td>17</td>
</tr>
</tbody>
</table>

Reasons You can’t fix your HVAC
1. It will void any warranty
2. It’s high voltage
3. You can’t buy the fried control board or leaked refrigerant gas

FILTERS-
CHANGE WHEN YOU SWITCH FROM HEATING TO COOLING CYCLES (2X / YR)

WARRANTIES & HOW THEY WORK
NEW WRINKLES

PROGRAMMABLE THERMOSTATS

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ELEMENTS OF MAINTENANCE

ELECTRICAL-

- **AMOUNT OF SERVICE**
  - 1950's: 50 amps
  - 1960's: 150 amps
  - 1970's: 200 amps
  - 1990's: 400 amps

- **SERVICE DEPENDS ON NUMBER OF BREAKER SLOTS IN PANEL BOX**
  - Breakers & Mini-breakers

- **WIRE**
  - COPPER VS. ALUMINUM

- **JUNCTION BOXES**
  - PLASTIC VS. METAL

- **USUAL ELECTRICAL ISSUES**
  - CRITTERS
  - DEAD OUTLETS
  - LOOSE WIRES IN OUTLETS
ELEMENTS OF MAINTENANCE

Ohm’s Law & Redi Kilowatt
Basic Circuit Design

Reasons You shouldn’t design circuits & loads:

YOU CAN’T / WON’T DO THE MATH

START-UP AMPS

LOW VOLTAGE (READ LED’S)
CHANGE EVERYTHING

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COMMON PROBLEMS

THE BIG THREE
MOISTURE
CRITTERS
LIFE SPANS

SOLUTIONS
HIGHER CRAWL SPACES
CRAWL SPACE FANS
CUT BACK/ REMOVE TREES
POSITIVE CRAWL SPACE DRAINAGE
POKE HOLES PLASTIC “CUPS”
POWER WASH SIDING DURING LOW HUMIDITY

MOISTURE
PRECIP 1990-2017 AVER 50”/YR
REL HUMID SUM 1990-2017 AVER 78%
ALL ORGANICS SOAK WATER INCLUDING INSECTS & RODENTS
MOLD STARTS GROWING IN MEDIA WITH AT LEAST 18 % MOISTURE
WOOD ROT STARTS AT 22% MOISTURE
AC DUCTS CONDENSE MOISTURE AT ABOUT 1 PINT/HR/10’ RUN
AFFECTS MOSTLY CRAWL SPACES, DECKS, SIDING AND TRIM

Residential Construction Systems and Maintenance
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COMMON PROBLEMS

THE BIG THREE

MOISTURE

CRITTERS

LIFE SPANS

RODENTS

(SQUIRRELS/RATS/MICE)

INSECTS

(TERMITES & ROACHES)

LOVE DAMP CRAWLSPACES

TUNNELS

ALL LOVE ATTICS FOR NESTS

BIRDS

(WRENS/ FINCHES)

FERAL CATS

(DON’T FEED)

RABBITS

(DRAW OTHERS)

Residential Construction Systems and Maintenance
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COMMON PROBLEMS

THE BIG THREE

MOISTURE

CRITTERS

LIFE SPANS

DEPENDS ON

• QUALITY OF MATERIALS
• PERIODIC MAINTENANCE
• LOCAL ENVIRONMENT
• USAGE

WARRANTIES:

• UNLICENSED – NONE
• LICENSED – 1 YEAR AFTER COMPL
• EQUIPMENT PASS-THRU VARIES

EVERY ENGINEERED PRODUCT HAS A DESIGNED LIFESPAN

MOST PROVIDE A WARRANTY TO END USER FOR A PORTION OF LIFESPAN USED

“Your use of our product may alter its life expectancy and the provided warranty.”

(Old Salesman’s disclaimer)

Go on, Go on, You saw the lady with a mustache. To see the bearded lady, you have to pay more. Quality pays you know.

WC Fields
COMMON PROBLEMS

THE LESSER TWO

INCOMPATIBLE PRODUCTS

CONTRACTOR ERROR

Products are designed for wide application, but not every application.

Conflicting local and federal rules can result in less optimal results.

Local tradesmen may not follow the manufacturers instructions.

Products can be used in unintended applications that don’t work.
COMMON PROBLEMS

THE LESSER TWO

INCOMPATIBLE PRODUCTS

CONTRACTOR ERROR

Lack of product knowledge and training

“Git-er-dun” philosophy

Inability to think through problems

Time of completion trumps quality

Lack of coordination between trades
COMMON PROBLEMS

FINALLY- EVERYTHING IS A SYSTEM

Designed and engineered as a system

Installed and serviced by trained and authorized representatives

For more and more specific applications

Forcing the local trades to specialize

Chimney Sweeps  Decks & Patios
Foundation Repairs  Insulation
Plumbers who specialize in  Moisture
  Water Heaters  Disposals & Clogs
  Sinks & Faucets
COMMON PROBLEMS

A WORD ABOUT THE BUILDING CODE

Dates at least back to the Code of Hammurabi
US- City of Baltimore 1859, Chicago Fire 1871
Hurricane Andrew- Florida

“IT MEETS CODE, IT PASSES”


THE BUILDING CODE IS A MINIMUM STANDARD

ONE STEP LESS IN ANY AREA AND THE HOUSE IS CONDEMNED FROM HABITATION

Residential Construction Systems and Maintenance
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COMMON PROBLEMS

BUILDING PERMITS AND CODE INSPECTIONS

FACT: Most Va. Localities require a building permit form any replacement
FACT: Many repair men don’t have a license capable of pulling a permit
FACT: Any homeowner can pull a building permit
FACT: The permit holder is responsible for inspections & meeting code

and the locality holds you responsible for meeting permit requirements
## Common Problems

### Reviews and Code Inspections

**Usual Review & Approvals**
- Site Plan
- Erosion & Sedimentation Control Plan
- Storm Water Management Plan
- Architectural & HOA approvals

**Usual Inspections**

<table>
<thead>
<tr>
<th>Issue</th>
<th>Rough-In</th>
<th>Complete</th>
<th>Final</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site Plan &amp; E/S</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land Clearing &gt; 2,000 sf</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Footer</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foundation &amp; Crawl Space</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Framing</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Roofing</td>
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<td>X</td>
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<tr>
<td>Electrical</td>
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<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Plumbing</td>
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<tr>
<td>Mechanical</td>
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<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Insulation</td>
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<td>X</td>
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<tr>
<td>Special</td>
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<td></td>
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</tr>
</tbody>
</table>

**Certificate of Occupancy**

DOMINION WILL NOT SET METER AND ENERGIZE HOUSE WITHOUT

CALL MISS UTILITY

Homeowners & Contractors
Request a Ticket Here!

Call Before You Dig
Va811.com
Dial 811 in Virginia

DOMINION WILL NOT SET METER AND ENERGIZE HOUSE WITHOUT

Certificate
Of
Occupancy

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COMMON PROBLEMS

A WORD ABOUT HOME INSPECTORS

The have their place in finding:
- Gross flaws in plain sight
- Symptoms
- Items that previously met code (but do not now).

They have their limitations in
- Using a check-off template method
- The amount of time they spend.
- Looking behind the symptoms
- Understanding system problems

ALWAYS ORDER A FULL REPORT

A STATE LICENSE IN ANY AREA IS NO GUARANTEE
CONTRACTING 101

LEVELS OF SERVICE

HANDYMAN

UNLICENSED CONTRACTOR

TRADESMAN-MAN. REP.

LICENSED BUT NO INSURANCE CLASS “B” OR “C” LICENSE

LICENSED CLASS “A”

LICENSES

NO BUS. LICENSE

BUS. LICENSE

MAYBE

INSURANCE

NO INSURANCE

GEN. LIABILITY

GEN. LIABILITY

GEN. LIABILITY WORKMAN’S COMP

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TYPES OF CONTRACTS

ORAL

WRITTEN- INFORMAL

ESTIMATE/QUOTE SHEET

WRITTEN SEMI-FORMAL

WRITTEN FORMAL

Elements of Construction Contracts

REQUIRED

Legally Competent Parties
Mutual Agreement
Consideration
Legal Purpose

PROTECTIVE

Full Work Description
Specification of Products
Methods of Installation
Time Required & Any Penalty
Work Be Fully Complete
Standard of Quality Expected

Disclaimer: I am not an attorney—always seek legal advice
<table>
<thead>
<tr>
<th>METHODS OF CONTRACTING</th>
<th>PROS &amp; CONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>FIXED FEE</td>
<td>YOU KNOW COST</td>
</tr>
<tr>
<td></td>
<td>YOU DON’T GET SAVINGS</td>
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<tr>
<td>COST PLUS</td>
<td>YOU KNOW COSTS</td>
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<tr>
<td></td>
<td>YOU DON’T GET REBATES</td>
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<tr>
<td>COMPETITIVE BID</td>
<td>PROJECT MAY TAKE LONGER</td>
</tr>
<tr>
<td>OPEN BOOK &amp; FEE FOR SERVICES</td>
<td>SEMI-FIXED PRICE</td>
</tr>
<tr>
<td></td>
<td>CHANGE ORDERS</td>
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<tr>
<td></td>
<td>REQUIRES DETAILED DOCUMENTS</td>
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<tr>
<td>DESIGN-BUILD</td>
<td>YOU KNOW COST</td>
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<tr>
<td></td>
<td>REQUIRES AN ACCOUNTANT’S MIND</td>
</tr>
<tr>
<td>HYBRIDS</td>
<td>FEWER CHANGE ORDERS</td>
</tr>
<tr>
<td></td>
<td>LONGER PLANNING PHASE</td>
</tr>
</tbody>
</table>

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CONTRACTING 101

ADMINISTRATION

BASIC CONSTRUCTION BUSINESS TENENTS:

1. Use other people’s money
2. Get as much as you can upfront
3. Add profit to everything
4. Use the next job to pay for the last job, if you have to

SMALL CONTRACTOR REALITIES

1. Chronically under capitalized - cash basis
2. Chronically bad business people
3. Little understanding of accounting
4. Chronically understaffed
5. May have supplier liens against past work
6. Usual and customary to trade is not quality

RISE OF THE FRANCHISE

One Hour Serve Pro
Michael & Son Mr. Electric Mr. Sparky

SMALL CONTRACTOR PRACTICES

1. Ask for 50% as an advance for materials
2. Ask for frequent payments
3. Promise anything - there’s always an excuse
4. Always work on the job nearest a billing point
5. As long as it looks good and passes inspection, it’s quality.
MECHANIC’S LIENS

1. A lien by an involved party against a project, usually in, residential projects, a claim for unpaid labor and/or materials
2. Seek an attorney’s help

MECHANIC’S LIEN WAIVER

When in an owner/contractor agreement, it prohibits the contractor from filing a lien on that work

When in a contractor’s agreement with a sub or supplier, it prohibits subs and suppliers from filing a lien - extremely rare in residential construction.

MECHANIC’S LIEN WAIVER FORM

A legal document signed by all owed money to a project that they are paid or will waive future payment for past work via a mechanics lien. Must be executed for each draw to protect against a lien.

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INDUSTRY TRENDS

CONSOLIDATION
MORE EXPENSIVE
WIDENING AFFORDABILITY /COST GAP
SMALLER LOTS & HOMES
FEWER LIFETIME MOVES
MORE STANDARDIZATION
MORE CUSTOMIZATION
ENERGY EFFICIENCY
MORE SOLAR
AIR BNB
NAHB LOSES POTENCY
INDUSTRY TRENDS

“WHICH MODEL TO FOLLOW?”

HOUSING INDUSTRY IS FOLLOWING THE AUTO INDUSTRY

EUROPEAN MODEL

LE CORBUSIER

"The house is a machine for living in".