BE16: REVITALIZING MASONRY MULTIFAMILY

WEINBERG COMMONS
PASSIVE TO POSITIVE

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PROJECT BACKGROUND

- (3) BLDGS. / 36 (2) BR UNITS
- 675 NRSF EA.
- PARTIAL BASEMENT / CRAWL SPACE
- (3) STORIES

EXIST. UPPER FLOOR PLAN

EXIST. BASEMENT PLAN
CHALLENGE:
POOR SPATIAL QUALITY & CONSTRAINT
PROJECT BACKGROUND

• (3) BLDGS. / 36 (2) BR UNITS
• 675 NRSF EA.
• PARTIAL BASEMENT / CRAWL SPACE
• (3) STORIES

NON-DESCRIPT SENSE OF PLACE

WASTEFUL, INAPPROPRIATE, AND OUT-DATED SYSTEMS
PROJECT BACKGROUND

LOW-TECH, UN-INSULATED BUILDING ENCLOSURE

UNHEALTHY INTERIOR ENVIRONMENT
EXISTING CONDITIONS

PRE-RETROFIT
NO MANAGEMENT OF CONDENSATION PLANE TEMPERATURES –

MOLD GROWTH ASSURED!!
COMMON OCCUPANT HEALTH PROBLEMS

MOISTURE IN ALL FORMS
• BULK WATER
• MOISTURE CARRIED THROUGH INFILTRATION/EXFILTRATION
• MOISTURE CARRIED THROUGH DIFFUSION
• INTERNAL MOISTURE LOADS

PRIMARY CONTRIBUTORS TO OCCUPANT HEALTH ISSUES

MOLD GROWTH – ASTHMA, ALLERGIES, AND OTHER AILMENTS
AN ORDINARY RENOVATION?

REPAIR-UPGRADE FINISHES, MINIMAL IF ANY INSULATION

NO MANAGEMENT OF CONDENSATION PLANE TEMPERATURES –

MOLD GROWTH STILL ASSURED!!
UNINSULATED MASONRY?

COMFORT FACTORS?
- Air temp
- RH
- Air velocity
- Mean radiant surface temps

surface temp =58°F!!!
ENTER:
THE PH MASONRY RETROFIT
ELIMINATE LOSS: (almost!)

CONTINUOUS INSULATION DEFINING THE THERMAL ENVELOPE
5/8" FIBER CEMENT CLADDING ON PROPRIETARY CLIPS

EXIST. PLASTER OVER GYP. BD. SUBSTRATE & VERT. 1X FURRING

BRICK & CMU BACK-UP

9 ½" WD. ‘I’-JOISTS @ 24” O.C., MECH. ATTACH. @ 36” O.C., STAGGERED

FLUID-APPLIED AIR AND WATER RESISTIVE BARRIER

8” MINERAL WOOL INSULATION @ 6 LB./CU. FT. DENSITY

HORIZ. 5/4 WD. FURRING @ 18” O.C., STAGGERED

5/8” FIBER CEMENT CLADDING ON PROPRIETARY CLIPS
Dew point of interior air = @ 52.5°F

The entire masonry structure is above the dew-point of interior air. Layers outside masonry wall are vapor open.
VAPOR OPEN ASSEMBLIES FOR HEALTH, SAFETY, AND DURABILITY

VAPOR OPEN ASSEMBLIES DRY TO BOTH SIDES

MANAGEMENT OF FIRST CONDENSATION PLANE TEMPERATURES
Interior surface temps are above 65°F. Convection drafts eliminated and comfortable radiant surface temperature.
ORIENTATION:
PRE-DETERMINED SITING
ORIENTATION AND SOLAR GAIN
OPTIMIZING COMFORT
SOLAR GAIN CONTROL & QUALITY OF SPACE

TYPICAL APARTMENT UNIT FLOOR PLAN

BEDRM. 1
BEDRM. 2
LIVING
DINING/STUDY
KITCHEN
BATH
HEATING AND COOLING

ASYMETRICAL LOADS + DISTRIBUTION
SOLUTION: FIXED SOLAR SHADING
SOLAR GAIN WHEN YOU WANT IT (AND NOT WHEN YOU DON'T!!)
PEAK HEATING

Solar Gain 24 hours
PEAK HEATING

Solar Gain / Heating December
SHOULDER SEASON - Cool

Solar Gain / Heating February

February / October

Solar gains
Heating power

Heating / Cooling (kwh/yr)

Time [Hour]

(2/1/2013: 00 - 3/1/2013: 00)
PEAK SUN = PEAK COOLING?

Solar Gain / Cooling June

Histogram showing solar gains and cooling power.
SHOULDER SEASON - THE REAL OVERHEATING RISK

Solar Gain / Hourly - April / August

April / August

JUNE 21st
MAY / JULY 21st
APRIL / AUG 21st
MAR / SEPT 21st
MAR / SEPT
JUNE 21st
JUNE 21st
FEB / OCT
JAN / NOV

Solar radiation [Btu/ft²]
HEATING AND COOLING DESIGN

VRF WITH HEAT EXCHANGE: EFFECTIVE LOW LOAD OPERATION,
HEATING AND COOLING DESIGN

VRF WITH HEAT EXCHANGE:
DUCTED DISTRIBUTION
HVAC DESIGN
ERV COMMON VENTILATION & DISTRIBUTION BY QUADRANT
CASE STUDY:
FROM THEORY TO REALITY
THE HIGH-PERFORMANCE ENCLOSURE
CHALLENGE:
ROOF DETAILS
CHALLENGE:
ROOF TREATMENT
SOLUTION:
LOW-TECH FRAMING & TAPING
SOLUTION: KEEP IT SIMPLE – TAPE AND SHEATHING
CHALLENGE: BASEMENT TREATMENT
SOLUTION:
INCLUDE IN VOLUME
SOLUTION: UTILIZE HARDY CONTROL LAYERS
CHALLENGE: CRAWLSPACE TREATMENT
SOLUTION: MINIMIZE RISK
SOLUTION:
BREAK ONE OF OUR RULES
CHALLENGE: FOUNDATION TREATMENT
FOUNDATION SOLUTION: OPTIMIZE AND CAPITALIZE
ENERGY SIMULATION RESULTS:
WELL WITHIN CRITERIA
CASE STUDY:
CONSTRUCTION PROCESS
PRE-CONSTRUCTION MODEL/PROCESS

“Hey, could you give us some cost feedback on assemblies options?”

“Get all your “A-Team” subs in here and we will explain it all before they price it.”

“THAT MINERAL WOOL AND PROSOCO ARE UN-GODLY EXPENSIVE – YOU GOTTA GET THAT OUTTA THERE”

“Why is this an add? I thought you said the mineral wool and Prosoco were ungodly expensive”

ESTIMATING — HOW DO YOU PRICE SOMETHING NONE OF “YOUR GUYS” EVER HEARD OF??

“PUT IN IN THE DRAWINGS AND I’LL PRICE IT”

“WE’RE GONNA PUT THIS OUT ON THE STREET.”

“Well it is not as robust, but if you are sure it will save us real money we can go with . . .”

“MY GUYS HAVE NEVER DONE THIS– THEY WAY UNDER-BID IT”
5/8" FIBER CEMENT CLADDING ON PROPRIETARY CLIPS

EXIST. PLASTER OVER GYP. BD. SUBSTRATE & VERT. 1X FURRING

BRICK & CMU BACK-UP

9 ½" WD. ‘I’-JOISTS @ 24” O.C., MECH. ATTACH. @ 36” O.C., STAGGERED

2.2 LBS./CU. FT. DENSITY SPRAY-APPLIED FIBERGLASS

REINF. WRB SERVES AS AIR-TIGHT LAYER

VERT. 2 3/8” W. AIR SEALING TAPE

HORIZ. 5/4 WD. FURRING @ 18” O.C., STAGGERED

5/8” FIBER CEMENT CLADDING ON PROPRIETARY CLIPS

LESS ROBUST AND HARDER TO BUILD

POST “VE” ENCLOSURE
CONSTRUCTION CHALLENGES

- Typical Bath Layouts
- Kitchen Layouts (Elevations)
- Plumbing Submittals Approved
- ELECT Submittals
- Tub Surround Submittal
- Foam Block R Value + Thickness BDC
- EXT Block Hollow Needs to Be Filled for Windows
- Foam Block Type + THICKNESS Bold C Step
- EDDRAIN RF1
- GAS LINES ARE HOT + NEED TO BE REMOVED
- DELTA ACCESSORIES Submittals Issues
- 3/4 vs 1" Window Frames
- Steep Dimensions
- Shaft Dimensions
- 2 hr Shaft Dimension

COORDINATION INTENSITY

WHINING-BERG LIST
CONSTRUCTION CHALLENGES

SUBSTITUTION REQUESTS
CONSTRUCTION CHALLENGES

INSTALLATION AND CONTRACTOR CONTINUITY
CONSTRUCTION CHALLENGES

INSTALLATION QUALITY

“TRUST, BUT VERIFY” - EVERYTHING
CONSTRUCTION CHALLENGES

TEMPORARY MATERIAL PROTECTION AND SEQUENCE
CONSTRUCTION CHALLENGES

LACK OF SUBCONTRACTOR CONTROL
CONSTRUCTION CHALLENGES

LACK OF SUBCONTRACTOR CONTROL
CONSTRUCTION CHALLENGES

LACK OF SUBCONTRACTOR CONTROL
CONSTRUCTION CHALLENGES

TELL THEM...

SEQUENCING REQUIREMENTS FOR ACHIEVING PASSIVE HOUSE AIR-TIGHTNESS:

1) All (1) buildings for this project are subject to the Passive House Air-Tightness criteria. It is defined as 0.6 ACH1 h-1 (air changes per hour under 50 pascal of pressure).

2) The air-tightness will be measured via whole-building application with blower door testing by a certified passive nature according to passive guidelines.

3) Prior to commencement of air-sealing work, an (air-sealing-specific) pre-construction meeting must be accomplished. The project manager, the general contractor, the building science consultant, and the owner/owner’s representative must be in attendance.

4) Prior to commencement of window installation work, a (window-specific) pre-construction meeting must be accomplished. The project manager, the general contractor, the building science consultant, and the owner/owner’s representative must be in attendance.

5) The air-tight layer indicated throughout the set of contract documents is represented by a thick red dashed line. Generally, for the superstructure, this layer is to be at the exterior face of existing building shell (flashing). This layer also serves as the secondary drainage plane to the assembly. Application specifications of the air and moisture barrier must be strictly adhered to. Refer to a specific project sheet, the set for the roof, the exterior side top of roof sheathing is the air-tight layer. Refer to applicable details for more specifics.

6) Generally for sub-grade conditions, the air-tight layer is to be on the interior face of existing building shell, and the top side of existing basement/granite floor. Refer to applicable details for more specifics.

7) All penetrations, fastenings through, and attachments to be performed with extreme care and are subject to field inspection by the architect and building science consultant at any time and prior to covering over. Scheduling of all covering installations must be given to inspecting entities with 24 hr. advance notice.

8) A qualifying air-tightness test must be achieved after the installation of all windows and doors and after application of the fluid-applied air and moisture barrier, and prior to the application of all exterior building face-mounted fabrications, components, materials, and equipment. This test must coincide with air-sealing of the roof sheathing, prior to installation of roof insulation and the balance of the roofing system. This test may coincide with air-tightness tests itemized below.

9) The roof sheathing and air sealing junctions (taped joints, parapet, and dome connections, etc.) must be temporarily protected from climatic temperature extremes, weather, water, and moisture until the final application of the insulating layers is complete.

10) A qualifying air-tightness test must be achieved after the complete installation of the vapor and air barrier layer (including perimeter terminations, beam connections, and material transitions, etc.), in the basement and crawlspaces. This test must coincide with air-tightness test item 9 above.

11) An additional qualifying air-tightness test must be achieved after the application of the vertical 1-joint system proposed to hold the exterior insulation panels and cladding system, and prior to the application of exterior insulation.

12) Prior to the installation of the vapor and air barrier layer and insulation in the crawlspaces, all mechanical, electrical, and plumbing rough-in work to be complete these spaces.

13) In the circumstance that rough-in work in the crawlspace is not feasible phased as outlined in item 12 above, or there is a subsequent change to the scope of work: insulation and air-tight layers must be fully protected to prevent puncture, compression, or disintegration. The contractor is responsible to submit a protection plan prior to commencing such "out-of-phase" work. The protection plan is subject to project manager and building science consultant and owner/owner's representative approval.

PH SEQUENCING & AIR-TIGHT LAYER PROTOCOL
CONSTRUCTION CHALLENGES

...TELL THEM YOU TOLD THEM...
CONSTRUCTION CHALLENGES

...TELL THEM AGAIN.
CONSTRUCTION CHALLENGES

MOCK-UP
FIELD CONDITION CHALLENGES

MOCK-UP
CHALLENGES WITH BUILDING

MOLD...
CHALLENGES WITH BUILDING
CHALLENGES WITH BUILDING ...AND HYDROSTATIC MOISTURE...
CHALLENGES WITH BUILDING

...AND HYDROSTATIC MOISTURE...
CHALLENGES WITH BUILDING ...AND BULK WATER.
INTERIOR ENVIRONMENT:
QUALITY OF NATURAL LIGHT
INTERIOR ENVIRONMENT:
QUALITY OF NATURAL LIGHT
INTERIOR ENVIRONMENT: AVOID “TUNNEL VISION”
...AND OPTIMIZED SOLAR GAIN.
AIR-TIGHTNESS:
NOW TO THE EXTERIOR

DEFINING THE AIR-TIGHTNESS LAYER:

- No drafts reduce low humidity in winter
- Reduces excess humidity in summer
ALL STRIPPED DOWN
CREATING THE INSULATION CAVITY
CREATING THE INSULATION CAVITY
CREATING THE INSULATION CAVITY
THE ROOF RETROFIT: AN AIR SEALING AND SEQUENCING CHALLENGE
THE AIR-TIGHT LAYER SEQUENCE
DETAILS AS A RESULT OF “VALUE-ENGINEERING”
CRAWLSPACE INSULATION AND VAPOR CONTROL SEQUENCE
CRAWLSPACE INSULATION AND VAPOR CONTROL SEQUENCE
CRAWLSPACE INSULATION AND VAPOR CONTROL SEQUENCE
CRAWLSPACE INSULATION AND VAPOR CONTROL SEQUENCE
THE ROOF RETROFIT: AN AIR SEALING AND SEQUENCING CHALLENGE
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THE ROOF RETROFIT: AN AIR SEALING AND SEQUENCING CHALLENGE
THANK YOU.