ATHEN BUILDERS INC.

P.O. BOX 4404 ASPEN, CO 81612 970-618-8003

Centennial HOA Exterior Renovations
Proposal.

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I'd like to take a moment to introduce our company.

*We are **Athen Builders**.

*Together AB has **40+ years** of homebuilding experience in the Roaring Fork Valley.

*We specialize in residential as well as commercial work. Remodeling has been the majority of our projects.

*We have completed over **60** different projects in the last 6 years.

Our **philosophy** focuses on quality, budget, timely completion, and client satisfaction. The ability to maintain long-term relationships with our subcontractors affords us a level of confidence in pricing and quality control. In addition to our construction knowledge and contracts, we have an in-house design and drafting department and are well versed in all aspects of the permitting process.

Specifically for Centennial, we can provide all aspects of rough framing and finish carpentry, door, window, hardware, and cabinet installations, as well as drywall installation and finishing.

*We offer full cost estimation and budget analysis for each of our projects.
*The majority of our work is done on a design-build, time and materials basis.
*Labor Rate=$60.00 per man hour for carpenters
*Labor Rate=$32.50 per man hour for laborers
*Materials-billed at cost plus15% fee that includes overhead, profit, shipping and handling.
*Subcontractors will be billed at cost plus 15% fee that includes overhead, profit, coordination, supervision and quality control.

Thank you for the opportunity to do business with you and we look forward to hearing from you.

This winter, Athen Builders was fortunate to have Joseph Lstiburek as a business consultant. Dr. Lstiburek is a Mechanical Engineer, a building scientist who investigates building failures and is internationally recognized as an authority on moisture related building problems and indoor air quality. Dr. Lstiburek is an acclaimed public speaker and lecturer in building science and has written numerous books and technical papers on building construction including, *Builder's Guide to Cold Climates a systems approach to designing and building homes that are safe, healthy, durable, comfortable, energy efficient and environmentally responsible.*

Dr. Lstiburek performed several walk-through meetings with Marc Tergeoglou on the Centennial siding project. It is an honor to have one of the world's foremost authorities on energy efficient construction techniques and heads one of the four the Building America program teams for the U.S. Department of Energy involved with this construction.

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PROPOSAL FOR RENOVATION

SCOPE OF WORK

Scope of work.

Centennial HOA

We intend to remove all vertical wall assemblies on the following Units;

200,300,400 Teal Ct.

We intend to remove all vertical wall assemblies on the following Units.

100,200,300,400 Free Sliver Ct.

We will remove all south facing assembly; this requires removal of exterior plywood sheathing down to the studs, upon examination, some studs might have to be replaced due to excessive water damage.

South facing locations with second floor decks will require new EPDM rubber membrane installed due to age and leaks.

The large east and west facing walls have fared better, we will assess if replacement is necessary.

Most work required will be to replace existing redwood siding.

We will include a type X drywall (Densglass) attached to plywood sheathing.

The North side has isolated locations of water damage but would be replaced; all vertical walls would receive the same replacement application per Exhibit "A "Wall Assembly.

Currently the bottom 3ft of siding has No water protection backer such as Grace Ice & Water Shield to prevent water & ice moisture penetration behind the redwood siding.

We will correct that aspect during the re-installation of new siding.

South facing inside corners shows most of the water damage.

Our assemble practice is as follows;

1. Remove existing redwood siding.

2. Remove existing Type X Drywall.

3. Remove ½" CDX sheathing.

4. Remove old wall insulation.

5. Remove water damaged 2x6 exterior studs.

6. Remove Water damaged 2x6 bottom plate framing if need be.

We intend to replace all the above with the New Wall Assembly (Exibit A Wall Assembly) that has been approved by the City of Aspen Community Development Building Dept.

We intend to replace the R-19 pink insulation with New Low Formaldehyde R-19 insulation.

Mold mitigation will be on a case to case unit inspection and will be implemented where necessary.

All Materials that are to be replaced are as follows;

1. Redwood Siding.

2. Type X Gyp Board (Drywall)

3. ½" CDX Sheathing.

4. 2 x 6 exterior Studs.

5. R-19 Pink insulation.

6. 2 x 6 Bottom Plates.

The Proposed New Wall Assembly that has been approved by the City of Aspen Community Development Building Dept. is as follows.

1. New 2 x 6 Bottom Plates

2. New 2 x 6 wall framing studs.

3. New R-19 Low Formaldehyde Insulation.

4. ½" CDX Plywood Sheathing.

5. 5/8" Densglass (Exterior Drywall) 1 hour fire rated sheathing.

6. Tyvex Building Wrap.(Weather and Moister barrier)

7. 3/8" Foil Backed Rigid Insulation Strips- 2" wide per plan.

8. 6-ft. Bottom Up of Grace Water & Ice Shield Moister Membrane Barrier wrapped 360 Degrees around the entire Perimeter of the building where siding applies.

9. 15-Year Warrantee Baked on Colored Finished Hardiplank Cementitious Siding Product - Lap Installation per MFG. Specifications'.

The above improvement renovations concur with the Analysis from August Hasz from REG Engineering and the BSC (Building Science Corporation) Building Enclosure Investigation and Analysis.

PRICING FOR RENOVATIONS

SCHEDULE OF VALUES

ATHEN BUILDERS INC.
P.O. BOX 4404 ASPEN, CO 81612 970-618-8003

DATE 4/21/2013

Centennial HOA Exterior Renovations. Aspen, CO 81611 Description of Work	Scheduled Value	Change Orders	New Value	Previous Billing Apps	Billings This Period	Total Billings To Date	Balance to Finish
DIVISION I - GENERAL REQUIREMENTS							
01010 SUMMARY OF WORK							
01020 ALLOWANCES - SITE SUPERVISION			$0.00			$0.00	$0.00
1021 - PROJECT MANAGEMENT	$240,800.00		$240,800.00		$0.00	$0.00	$240,800.00
01030 Permit Fees	TBD		$0.00			$0.00	$0.00
TBD	TBD		$0.00			$0.00	$0.00
Submit bond and insurance documents			$0.00			$0.00	$0.00
Prepare and submit project schedule			$0.00			$0.00	$0.00
Prepare and submit schedule of values			$0.00			$0.00	$0.00
1040 Use Tax City of Aspen	TBD		$0.00			$0.00	$0.00
01040 COORDINATION			$0.00			$0.00	$0.00
01050 FIELD ENGINEERING			$0.00			$0.00	$0.00
01060 REGULATORY REQUIREMENTS			$0.00			$0.00	$0.00
01061 MATERIALS TESTING AND INSPECITON - ASBESTOS	$8,400.00		$8,400.00		$0.00	$0.00	$8,400.00
01065 Obtain building permits			$0.00			$0.00	$0.00
01070 ABBREVIATIONS AND SYMBOLS			$0.00			$0.00	$0.00
01072 PRODUCT PROTECTION	$3,500.00		$3,500.00		$0.00	$0.00	$3,500.00
01073 Final Clean/Window Clean			$0.00			$0.00	$0.00
01075 Daily Clean/General Labor	$106,000.00		$106,000.00		$0.00	$0.00	$106,000.00
01080 IDENTIFICATION SYSTEMS			$0.00			$0.00	$0.00
01100 ALTERNATES/ALTERNATIVES			$0.00			$0.00	$0.00
01150 MEASUREMENT AND PAYMENT			$0.00			$0.00	$0.00
01200 PROJECT MEETINGS			$0.00			$0.00	$0.00
01300 SUBMITTALS			$0.00			$0.00	$0.00
Submit preliminary shop drawings			$0.00			$0.00	$0.00
Submit monthly requests for payment			$0.00			$0.00	$0.00
Long Lead Procurement			$0.00			$0.00	$0.00
Submit shop drawings and order long lead items - steel			$0.00			$0.00	$0.00
Submit shop drawings and order long lead items - roofing			$0.00			$0.00	$0.00
Submit shop drawings and order long lead items - elevator			$0.00			$0.00	$0.00
Submit shop drawings and order long lead items - plumbing			$0.00			$0.00	$0.00
Submit shop drawings and order long lead items - electric			$0.00			$0.00	$0.00
Submit shop drawings and order long lead items - HVAC			$0.00			$0.00	$0.00
Detail, fabricate and deliver steel			$0.00			$0.00	$0.00
01400 QUALITY CONTROL			$0.00			$0.00	$0.00
01500 CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS			$0.00			$0.00	$0.00
01505 Dumpster, Trash and Dump Fees	$217,500.00		$217,500.00		$0.00	$0.00	$217,500.00
01510 TEMP ELECTRIC							
01506 TEMP TOILET FACILITY	$11,250.00		$11,250.00		$0.00	$0.00	$11,250.00
Mobilize on Site			$0.00			$0.00	$0.00
01700 CONTRACT CLOSEOUT			$0.00			$0.00	$0.00
01800 MAINTENANCE MATERIALS			$0.00			$0.00	$0.00
DIVISION 2 - EXISTING CONDITIONS							
02050 DEMOLITION - doors and kitchen			$0.00			$0.00	$0.00
02051 DEMOLITON - BATHROOMS							
02100 SITE PREPARATION EXT ONLY			$0.00			$0.00	$0.00
02150 ASBESTOS ABATEMENT			$0.00			$0.00	$0.00
02151 MOLD MITIGATION	$280,000.00		$280,000.00		$0.00		$280,000.00
02152 SECOND FLOOR DECK REPAIR IMPROVEMENTS (26)	$143,000.00		$143,000.00		$0.00		$143,000.00

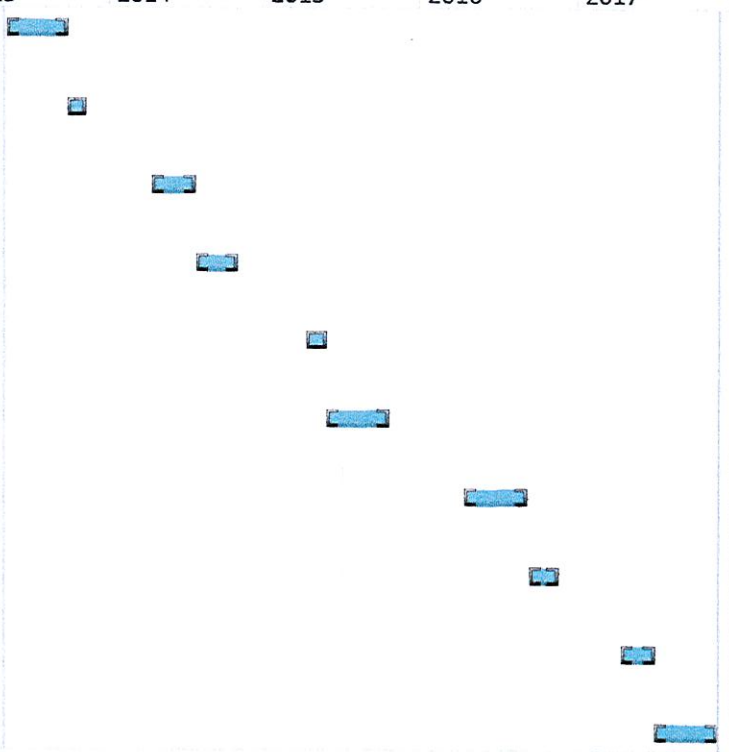
			$0.00			$0.00	$0.00
DIVISION 3 - CONCRETE							
0300 FOUNDATION - FOOTERS			$0.00			$0.00	$0.00
0301 FOUNDATION - WALLS			$0.00			$0.00	$0.00
0302 SLABS			$0.00			$0.00	$0.00
			$0.00			$0.00	$0.00
DIVISION 4 - MASONRY							
04000 STONE			$0.00			$0.00	$0.00
04100 Exterior walls			$0.00			$0.00	$0.00
04200 Exterior sills			$0.00			$0.00	$0.00
04300 chimney cap			$0.00			$0.00	$0.00
04400 interior veneer			$0.00			$0.00	$0.00
04500 interior veneer at fireplace			$0.00			$0.00	$0.00
04600 interior fireplace hearthstone			$0.00			$0.00	$0.00
			$0.00			$0.00	$0.00
DIVISION 5 - METALS							
05010 METAL MATERIALS AND METHODS			$0.00			$0.00	$0.00
05050 METAL FASTENING -			$0.00			$0.00	$0.00
05100 STRUCTURAL METAL FRAMING AND BEAMS			$0.00			$0.00	$0.00
05200 METAL JOISTS			$0.00			$0.00	$0.00
05300 METAL DECKING			$0.00			$0.00	$0.00
05400 COLD-FORMED METAL FRAMING			$0.00			$0.00	$0.00
05500 METAL FABRICATIONS	TBD		$0.00			$0.00	$0.00
05700 ORNAMENTAL METAL			$0.00			$0.00	$0.00
05800 EXPANSION CONTROL			$0.00			$0.00	$0.00
05900 METAL FINISHES			$0.00			$0.00	$0.00
DIVISION 6 - WOOD AND PLASTICS			$0.00			$0.00	$0.00
06050 FASTENERS AND SUPPORTS			$0.00			$0.00	$0.00
06100 ROUGH CARPENTRY			$0.00			$0.00	$0.00
06130 HEAVY TIMBER CONSTRUCTION			$0.00			$0.00	$0.00
06150 WOOD-METAL SYSTEMS - SIPS LABOR			$0.00			$0.00	$0.00
06170 PREFABRICATED STRUCTURAL WOOD			$0.00			$0.00	$0.00
06200 FINISH CARPENTRY - DOOR TRIM AND REPAIR BASE TRIMS			$0.00			$0.00	$0.00
06210 HARDI BOARD SIDING/15 YEAR WARRENTY	$825,000.00		$825,000.00		$0.00		$825,000.00
06300 TRIM AND FASCIA	$175,000.00		$175,000.00		$0.00	$0.00	$175,000.00
06350 WOOD TREATMENT/ENTRY RAMP,PONYWALLS & HANDRAILS	$245,000.00		$245,000.00		$0.00	$0.00	$245,000.00
06400 ARCHITECTURAL WOODWORK - TRIM			$0.00			$0.00	$0.00
06410 CABINETS			$0.00			$0.00	$0.00
06415 CABINET PULLS - HARDWARE			$0.00			$0.00	$0.00
			$0.00			$0.00	$0.00
DIVISION 7 - THERMAL AND MOISTURE PROTECTION							
07100 WATERPROOFING	$150,000.00		$150,000.00		$0.00	$0.00	$150,000.00
07150 DAMPPROOFING			$0.00			$0.00	$0.00
07200 INSULATION - INTERIOR WALLS SOUND DAMPENING			$0.00			$0.00	$0.00
07250 FIREPROOFING	$150,000.00		$150,000.00		$0.00	$0.00	$150,000.00
07300 SHINGLES AND ROOFING TILES			$0.00			$0.00	$0.00
07400 PREFORMED ROOFING AND SIDING			$0.00			$0.00	$0.00
07500 MEMBRANE ROOFING			$0.00			$0.00	$0.00
07570 TRAFFIC TOPPING			$0.00			$0.00	$0.00

07600 FLASHING AND SHEET METAL							
07800 ROOF ACCESSORIES			$0.00			$0.00	$0.00
07900 SEALANTS			$0.00			$0.00	$0.00
07910 METAL FABRICATIONS/BSC DESIGN FLASHINGS	$155,000.00		$155,000.00		$0.00	$0.00	$155,000.00
DIVISION 8 - DOORS AND WINDOWS							
08100 METAL DOORS AND FRAMES - exterior and sliders			$0.00			$0.00	$0.00
08200 WOOD AND PLASTIC DOORS - MATERIALS			$0.00			$0.00	$0.00
8201 WOOD AND PLASTIC DOORS - LABOR			$0.00			$0.00	$0.00
08250 DOOR OPENING ASSEMBLIES			$0.00			$0.00	$0.00
08300 SPECIAL DOORS - garage doors			$0.00			$0.00	$0.00
08400 ENTRANCES AND STOREFRONTS			$0.00			$0.00	$0.00
08500 METAL WINDOWS			$0.00			$0.00	$0.00
08600 WOOD AND PLASTIC WINDOWS			$0.00			$0.00	$0.00
08650 SPECIAL WINDOWS			$0.00			$0.00	$0.00
08700 HARDWARE - MATERIALS			$0.00			$0.00	$0.00
8701 HARDWARE - LABOR			$0.00			$0.00	$0.00
08800 GLAZING - shower surrounds / doors							
08900 GLAZED CURTAIN WALLS			$0.00			$0.00	$0.00
DIVISION 9 - FINISHES							
09230 AGGREGATE COATINGS			$0.00			$0.00	$0.00
09250 GYPSUM WALLBOARD - tape, mud, and installed			$0.00			$0.00	$0.00
09300 TILE - MATERIALS			$0.00			$0.00	$0.00
09350 TILE - LABOR and Wonderboard backing / blocking			$0.00			$0.00	$0.00
09400 TERRAZZO			$0.00			$0.00	$0.00
09500 ACOUSTICAL TREATMENT			$0.00			$0.00	$0.00
09550 WOOD FLOORING			$0.00			$0.00	$0.00
09600 STONE AND BRICK FLOORING - clean and seal			$0.00			$0.00	$0.00
9601 STONE AND BRICK FLOORING - INSTALL NEW FLOORING			$0.00			$0.00	$0.00
09650 RESILIENT FLOORING			$0.00			$0.00	$0.00
09680 CARPETING			$0.00			$0.00	$0.00
09700 SPECIAL FLOORING			$0.00			$0.00	$0.00
09760 FLOOR TREATMENT			$0.00			$0.00	$0.00
09800 SPECIAL COATINGS			$0.00			$0.00	$0.00
09900 PAINTING			$0.00			$0.00	$0.00
09950 WALL COVERING			$0.00			$0.00	$0.00
DIVISION 10 - SPECIAITIES							
010140 SIGNAGE			$0.00			$0.00	$0.00
010800 TOILET AND BATH ACCESSORIES - MATERIALS			$0.00			$0.00	$0.00
FIREPLACE INSERT			$0.00			$0.00	$0.00
DIVISION 11 - EQUIPMENT							
11020 SECURITY AND VAULT EQUIPMENT			$0.00			$0.00	$0.00
11800 TELECOMMUNICATION EQUIPMENT			$0.00			$0.00	$0.00
DIVISION 12 - FURNISHINGS							
12360 COUNTERTOPS - MATERIALS AND LABOR			$0.00			$0.00	$0.00
12400 MIRRORS - MATERIAL ONLY			$0.00			$0.00	$0.00
12500 APPLIANCES			$0.00			$0.00	$0.00

DIVISION 13 - SPECIAL CONSTRUCTION			$0.00			$0.00	$0.00
13000 UNFORSEEN CIRCUMSTANCES	TBD						
DIVISION 14 - CONVEYING SYSTEMS			$0.00			$0.00	$0.00
14100 FORKLIFT & MATERIAL PROCUREMENT	$135,000.00		$135,000.00		$0.00		$135,000.00
DIVISION 15 - MECHANICAL							
15100 - PLUMBING PER PLANS			$0.00			$0.00	$0.00
15200 NOISE, VIBRATION, AND SEISMIC CONTROL			$0.00			$0.00	$0.00
15250 INSULATION - TAGGING - MATRIX			$0.00			$0.00	$0.00
15300 SPECIAL PIPING SYSTEMS			$0.00			$0.00	$0.00
15400 PLUMBING SYSTEMS			$0.00			$0.00	$0.00
15450 PLUMBING FIXTURES AND TRIM			$0.00			$0.00	$0.00
15500 FIRE PROTECTION			$0.00			$0.00	$0.00
NEED SPRINKLER DESIGN SPECIFICATION			$0.00			$0.00	$0.00
15600 POWER OR HEAT GENERATION			$0.00			$0.00	$0.00
15650 REFRIGERATION			$0.00			$0.00	$0.00
15700 LIQUID HEAT TRANSFER			$0.00			$0.00	$0.00
15800 AIR DISTRIBUTION			$0.00			$0.00	$0.00
SUBCONTRACTOR IN DESIGN PROCESS			$0.00			$0.00	$0.00
15900 CONTROLS AND INSTRUMENTATION			$0.00			$0.00	$0.00
DIVISION 16 - ELECTRICAL							
16050 BASIC MATERIALS AND METHODS			$0.00			$0.00	$0.00
OPTION - CABLE LIGHTING 20% SAVINGS INSTALLED THRU T.O. BEAMS							
16200 POWER GENERATION			$0.00			$0.00	$0.00
16300 POWER TRANSMISSION			$0.00			$0.00	$0.00
16400 SERVICE AND DISTRIBUTION			$0.00			$0.00	$0.00
16500 LIGHTING			$0.00			$0.00	$0.00
16600 SPECIAL SYSTEMS			$0.00			$0.00	$0.00
16650 ELECTRICAL PERMIT			$0.00			$0.00	$0.00
16660 TRACK LIGHT ALLOWANCE			$0.00			$0.00	$0.00
16700 COMMUNICATIONS			$0.00			$0.00	$0.00
16850 HEATING AND COOLING			$0.00			$0.00	$0.00
16900 CONTROLS AND INSTRUMENTATION			$0.00			$0.00	$0.00
			$0.00			$0.00	$0.00
28000 SECURITY - ACCESS SECURITY SYSTEM IN DESIGN PROCESS			$0.00			$0.00	$0.00
			$0.00			$0.00	$0.00
			$0.00			$0.00	$0.00
			$0.00			$0.00	$0.00
			$0.00			$0.00	$0.00
			$0.00			$0.00	$0.00
subtotal	$2,845,450.00	$0.00	$2,845,450.00	$0.00	$0.00	$0.00	$2,845,450.00
Profit and Overhead 7% and 7%			$398,363.00	$0.00	$0.00	$0.00	$398,363.00
TOTALS	**$13.00**	**$0.00**	**$3,243,813.00**	**$0.00**	**$0.00**	**$0.00**	**$3,243,813.00**

PROJECT SCHEDULE

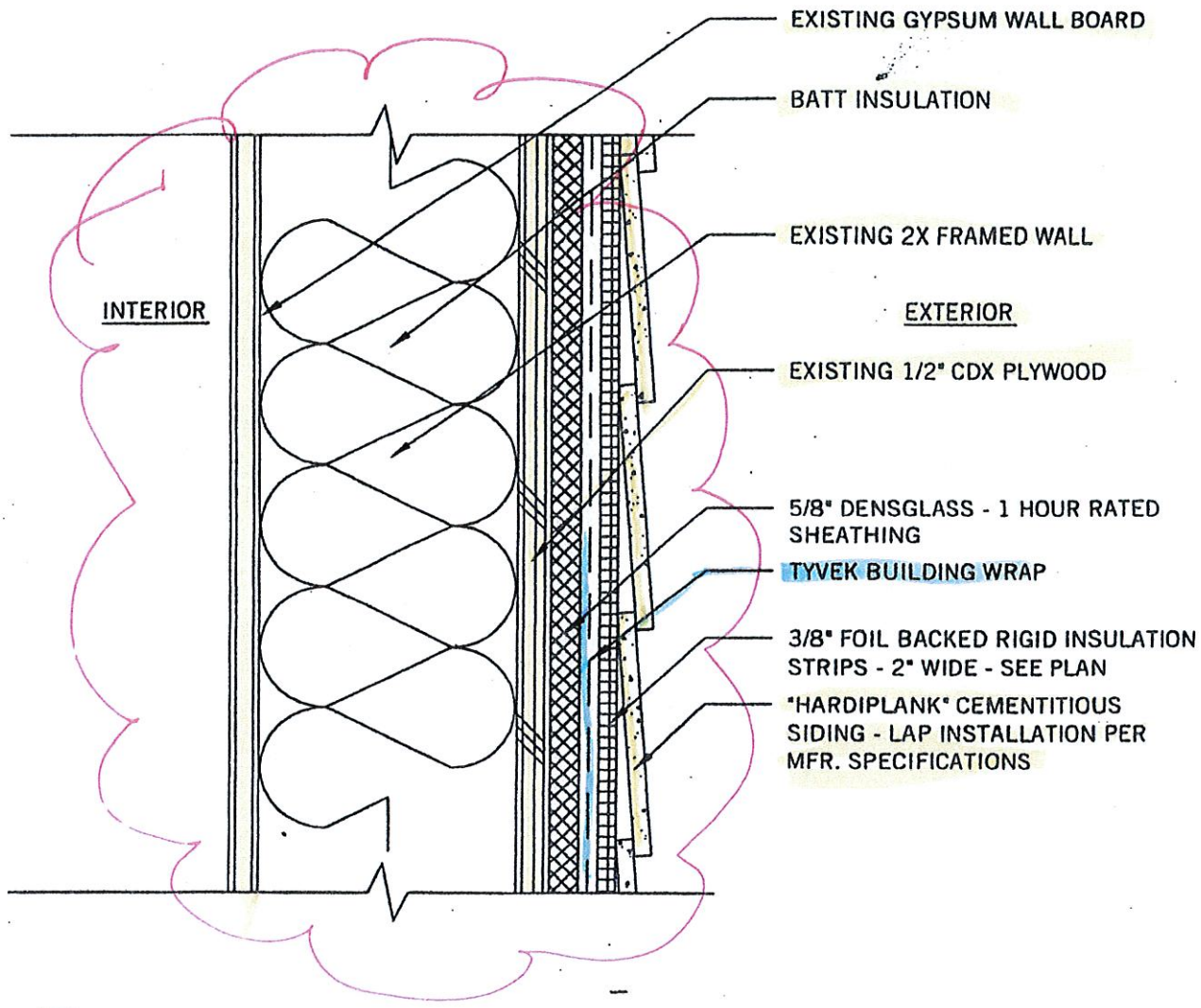
ID	Task	Task Name	Duration	Start	Finish
1		100 FREE SILVER COURT	104 days	Mon 5/6/13	Thu 9/26/13
2					
3		200 FREE SILVER COURT	30 days	Fri 9/27/13	Thu 11/7/13
4					
5		200 FREE SILVER COURT	74 days	Mon 4/14/14	Thu 7/24/14
6					
7		300 FREE SILVER COURT	69 days	Mon 7/28/14	Thu 10/30/14
8					
9		300 FREE SILVER COURT	35 days	Mon 4/13/15	Fri 5/29/15
10					
11		400 FREE SILVER COURT	104 days	Mon 6/1/15	Thu 10/22/15
12					
13		200 TEAL COURT	104 days	Mon 4/18/16	Thu 9/8/16
14					
15		300 TEAL COURT	47 days	Fri 9/16/16	Mon 11/21/16
16					
17		300 TEAL COURT	57 days	Mon 4/17/17	Tue 7/4/17
18					
19		400 TEAL COURT	104 days	Wed 7/5/17	Mon 11/27/17



Project: Project1
Date: Sat 4/27/13

Task		External Milestone		Manual Summary Rollup	
Split		Inactive Task		Manual Summary	
Milestone		Inactive Milestone		Start-only	
Summary		Inactive Summary		Finish-only	
Project Summary		Manual Task		Deadline	
External Tasks		Duration-only		Progress	

EXHIBITS

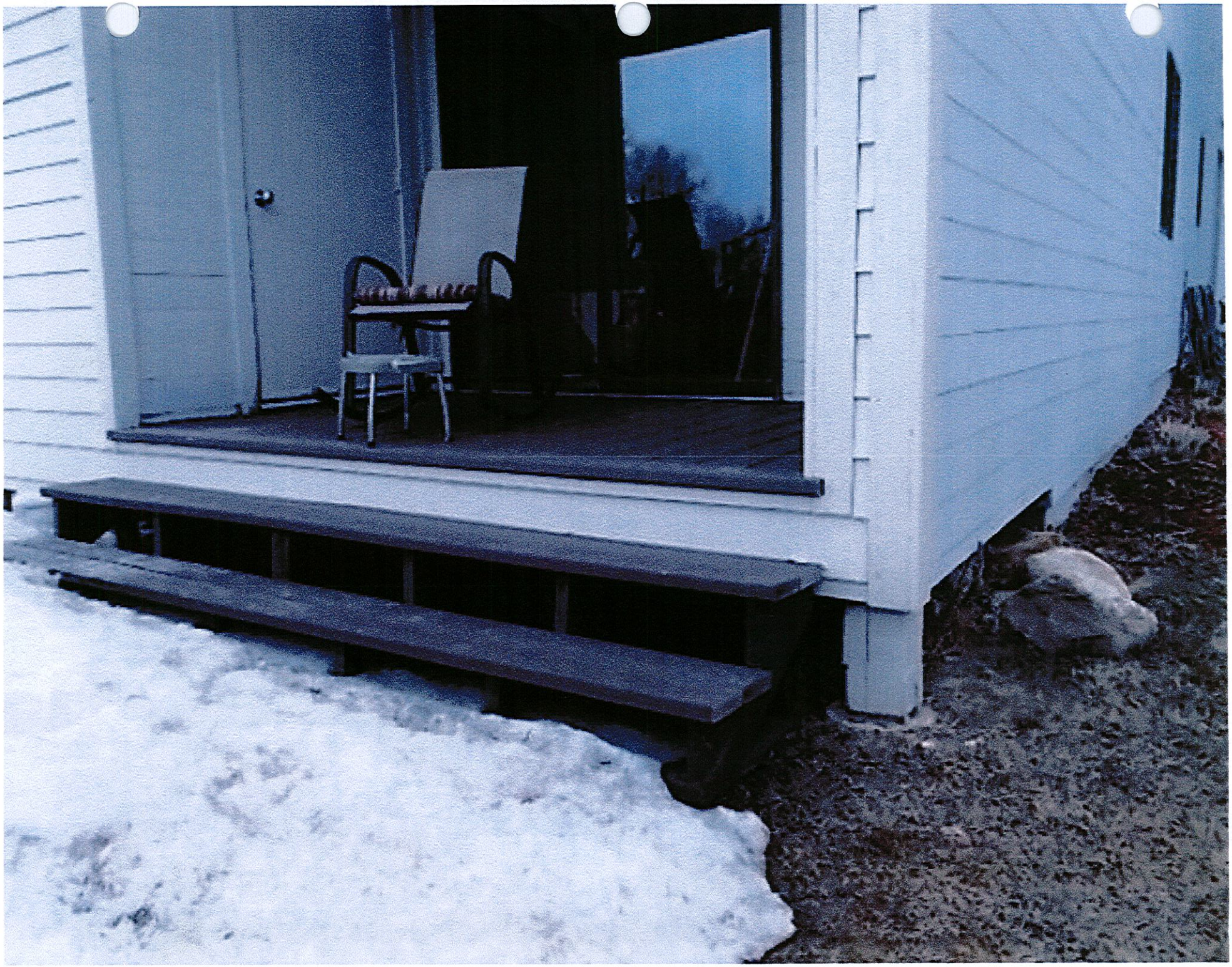


W-1 / A30 PROPOSED WALL ASSEMBLY W-1

SCALE: 3 = 1'-0"

SAW	PROJECT: CENTENNIAL ASPEN, CO 81611	TITLE: W-1 WALL ASSEMBLY	W-1
		DATE: AUGUST 08, 2011	PROJECT NO:
		SCALE: 3" = 1'-0"	DRAWN BY: SW


GP
ensGlass
Sheathing




Glass


GRACE
Split Release
On Demand

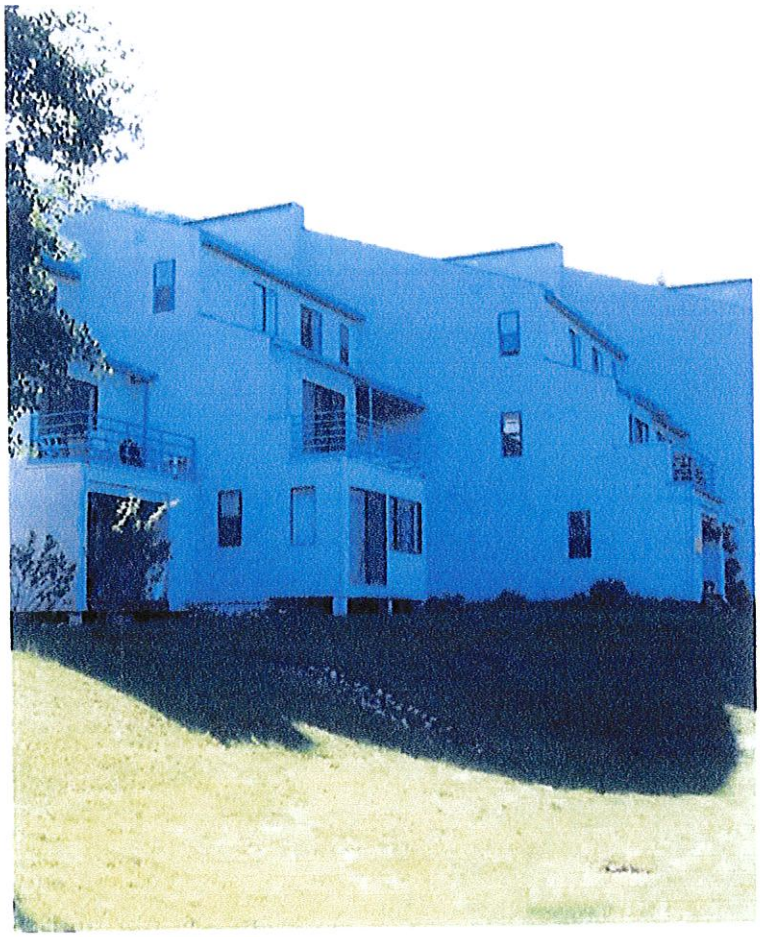
ANALYSIS

A. BSC-BUILDING SCIENCE CORPORATION

B. REG-RESOURCE ENGINEERING GROUP,INC.

Building Science Corporation

BUILDING ENCLOSURE INVESTIGATION AND ANALYSIS
CENTENNIAL CONDOMINIUMS
ASPEN, CO



Date:

2011.02.21

Prepared For:

Stephen W. Bossart
Project Manager
Capital Asset Department
City of Aspen

Prepared By:

Peter Baker, P.Eng.
Senior Associate
Building Science Corporation

Cathy Gates, AIA
Associate
Building Science Corporation

Contents

List of Figures

Introduction

Building Science Corporation was retained by the City of Aspen to investigate water intrusion concerns related to the enclosure assemblies at the non-rental unit buildings at Centennial Housing in Aspen, CO. The non-rental buildings are 100 - 400 Free Silver Court and 200 - 400 Teal Court. BSC's investigation consisted of a review of the construction documents and details of the buildings and a site review of the buildings during which isolated intrusive disassembly was performed for investigation purposes.

Description of Building Complex

The complex consists of 7 buildings. Each building consists of a series of blocks or sections which are offset from each adjacent module by either 12 or 18 feet. On the southwest elevation, in each block, the outer wall for each floor steps back from the lower floor and the roof on each floor slopes down towards the façade. The outermost part of the first floor on the southwest elevation consists of a covered porch with a storage closet on one side. (See Figure 1) In some cases, the roof for the covered porch and storage area has been replaced with a 2nd story deck. On the northeast elevation, at each block, the roof slopes to the side with a vertical wall marking the transition to the sloping roof on the southwest. The roof conditions at the ends of the buildings vary (See Figure 2). Thus in general, on the southwest side of the buildings, there are roof/wall connections on the southeast or northwest facing walls whereas on the northeast side of the buildings, the roof/wall connections occur primarily on the northeast walls.

Figure 1: 300 Free Silver Ct Southwest (from west)

Figure 2: 200 Teal Ct Northeast (from north)

Reported History

The buildings were constructed in the 1980's. The buildings are wood-framed with horizontal ship-lap redwood siding on all walls and standing seam metal roofs. There is a continuous crawl space underneath the buildings.

At the time of construction, the second floor decks on the southwest side of the buildings in the original design were deleted from the project. These decks had been designed to extend over the first floor porch and exterior storage closets. Instead, a sloped roof was constructed over these storage closets. A number of second floor homeowners have subsequently added decks to their units.

In the early 1990's, problems relating to water infiltration and high indoor humidity generation were identified. Some investigation into the extent of the problems was conducted and the issued identified were associated with lack of overhangs, issues with sealant, inadequate removal of interior generated moisture, and inadequate crawlspace and attic ventilation. It was not clear exactly what work was done to correct the identified problems; however some additional exterior retrofit work including the addition of metal overahangs and some kickout flashings was completed. The most common complaint of water intrusion made by homeowners has been that water gets into the wall of the exterior storage units on the southeast side of the building. It was reported that this situation is at its worst when there is snow on the roof that starts to melt.

A partial renovation was completed in August of 2009. The initial cause of the retrofit was due to a broken waste pipe within one of the second floor party walls. While the repairs were being made, the contractor noted that there was significant water damage in the extension of that wall where it becomes an exterior wall. The scope of the repair was increased to include the damage found in the exterior walls. The following observations were reported to BSC by August Hasz of REG:

- The repairs were done on most if not all of the south wall of both levels, the full length of the wall affected (west facing), plus on the north end of the unit the north and east facing walls.

- During this work most of the studs, plywood sheathing, exterior gypsum board sheathing, insulation, structural headers etc. were found to be mostly rotten and needed to be replaced.
- While working on the west facing wall on the north end of the lower unit, the mold and rot was observed be in the partition wall that adjoins the exterior wall, the adjoining flooring was rotted and had buckled. This was not near the waste pipe link and was unrelated. It appears this damage was from water that had penetrated from the exterior wall, and then migrated into the floor system and partition wall.
- The sill plate at the east facing wall (north side of the unit) was completely rotted out.
- To complete this 'exterior wall' scope of work, the kitchen and bathroom both had to be almost completely removed because of the moisture damage to the floor system and partition wall.
- The damage at the south wall was extensive. This needs to be verified, but I don't believe this is a unit with any changes to the south wall (i.e. no porch was added to the unit above). Yet the header above the south door was damaged and starting to get crumbly. This entire wall was rebuilt, again no relation to the waste pipe damage.
- The siding that was removed was brittle and not salvageable in any significant quantity.

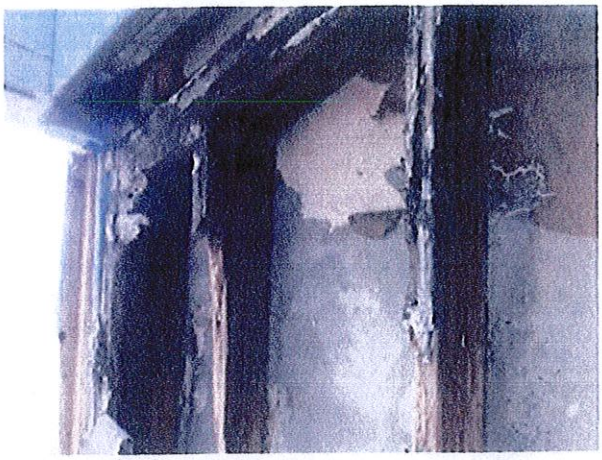


Figure 3: Porch Exterior Wall (photo courtesy of REG)

Figure 4: South Header (photo courtesy of REG)

Figure 5: Typical first floor sill plate at east wall of 314 (photo courtesy of REG)

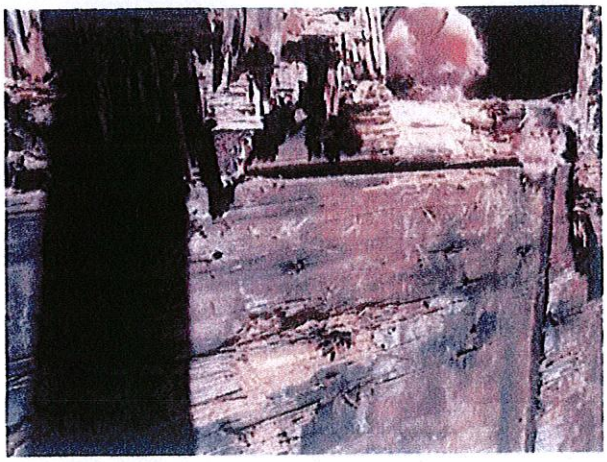


Figure 6: LVL beam supporting cantilever of unit above unit 314 (photo courtesy of REG)

Observations

BSC conducted a site review of the buildings on June 30, 2010. The site review was conducted by Peter Baker and Cathy Gates of BSC. Present during the site review were Stephen Kanipe, Scott Miller, Jeff Pendarvis, Lee Cassin, and C.J.Oliver of the City of Aspen, Travis Beard of First Choice Properties, Mike Van Dyke of National Jewish Health, and Arlen Wussow of Rudd Construction.

A survey of the exterior of the buildings was conducted. Several openings were cut to examine the underlying conditions at representative locations. A survey of one attic space (321 Free Silver Ct) and a survey of the southeast end of the crawl space under 300 Free Silver Ct were also conducted.

Attic

The attic is designed to be ventilated. There is one ventilation chimney/shaft at one end of each block. Each chimney serves as a vent for the two adjacent attics. (See Figure 7 and Figure 8) Attic vents are located in the end walls on the northwest elevation just above the attic floor (see Figure 9) and on the exposed sides (southwest or northeast) on the other side of the building. In Figure 9, the two vents in the foreground (above the windows) are the attic vents. The two higher vents in the background are used for dryer vents. In the surveyed attic, there is a separation wall between the two vents which separates attic space in the block into 2 separate spaces.

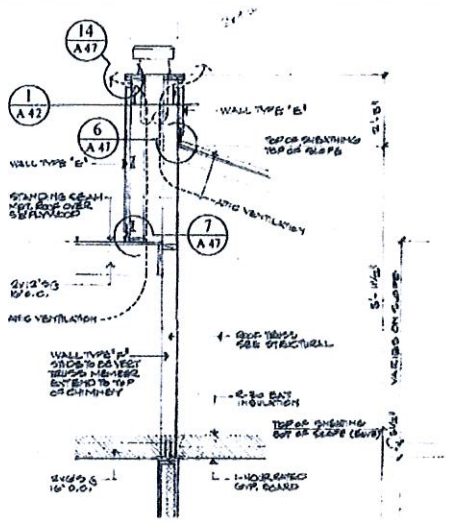


Figure 7: Ventilation Shaft Section

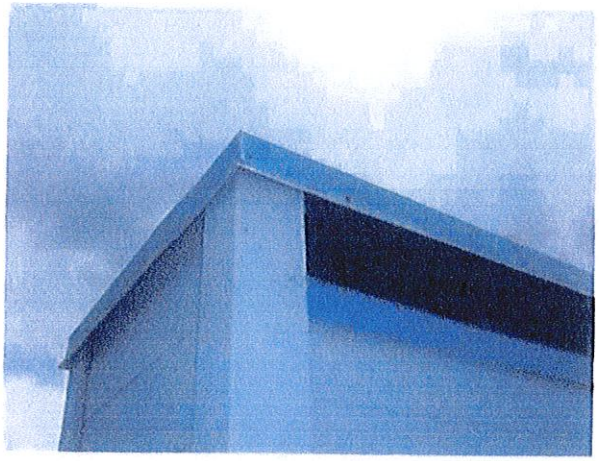


Figure 8: Ventilation Shaft

The surveyed attic was accessed via a pull-down stair. The access hatch was not gasketed; it had been taped shut by the homeowner for air-sealing. In the attic, only one vent was observed (Figure 10). There may have been another similarly sized vent along the side wall on the southwest end of the attic.

There was no observed evidence of water intrusion in the attic. However, there were multiple locations of condensation staining on the framing close to the roof or exterior wall sheathing (See Figure 11). Evidence of condensation was most significant near the dryer vent attachment to the exterior wall (See Figure 12).

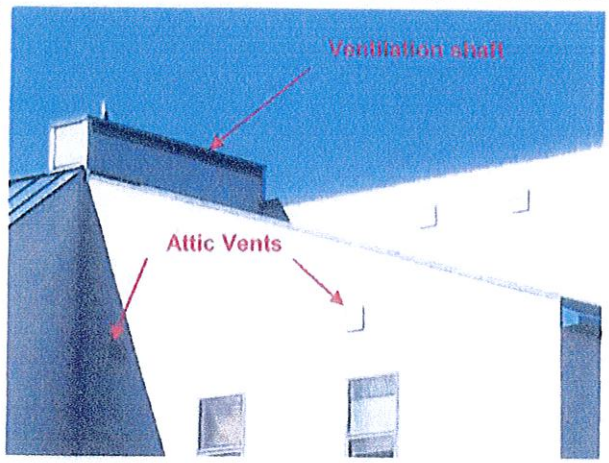


Figure 9: Ventilation Shaft and Attic Vents

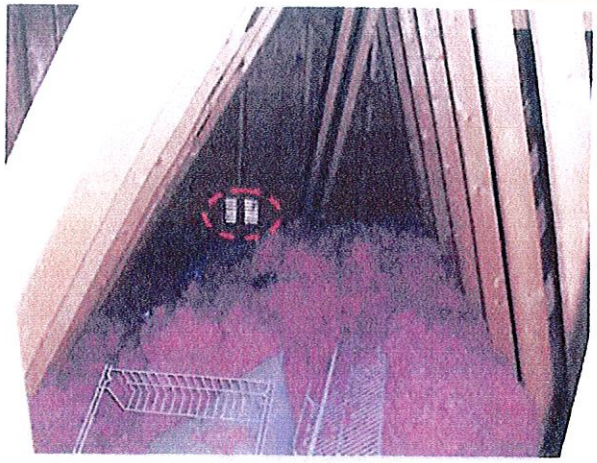


Figure 10: Attic Vent from Interior

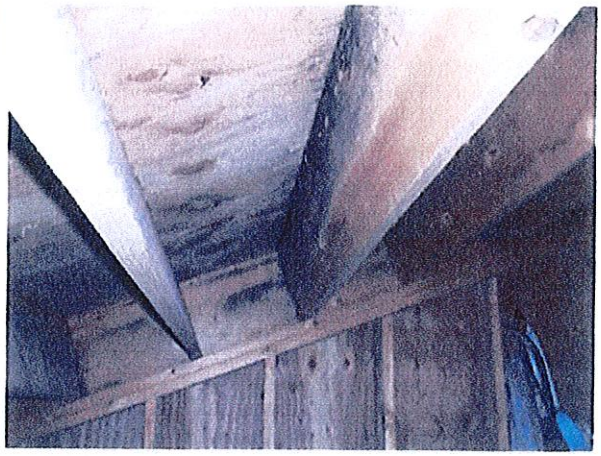


Figure 11: Attic condensation stains

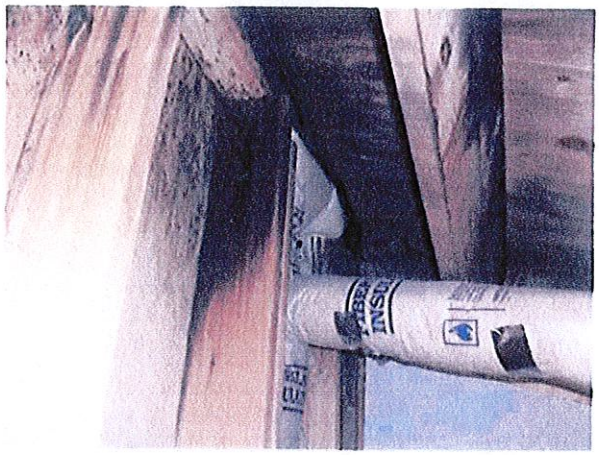


Figure 12: Attic condensation stains at dryer vent

While there was a bathroom with an operating ventilation fan located directly below the attic, there was neither a vent nor a duct for it observed in the attic. It was reported that at the time of construction, the local code did not require that bathroom fans be ducted to the exterior. Therefore, it is assumed that the bathroom fan vented either into an interior second floor wall or into the floor of the attic.

During the exterior wall survey, a cut was made from the exterior into an attic wall for one of the units in 200 Free Silver Court. It was observed that the attic wall was insulated and then covered with a layer of polyethylene. At another location in that building, when the exterior vent cover was removed for one of the lower attic vents, it could be seen that the opening was being used as a duct termination rather than for attic ventilation. These observations suggest that the lower attic vents in some of the units have been blocked by homeowners.

Exterior Walls

The exterior walls of the buildings are constructed with a layer of exterior gypsum board on the exterior side of the plywood wall sheathing as part of a 1-hour fire rated assembly. The shiplap horizontal siding is applied directly over the gypsum board. (Figure 13) There is a layer of polyethylene applied on the interior side of the studs.

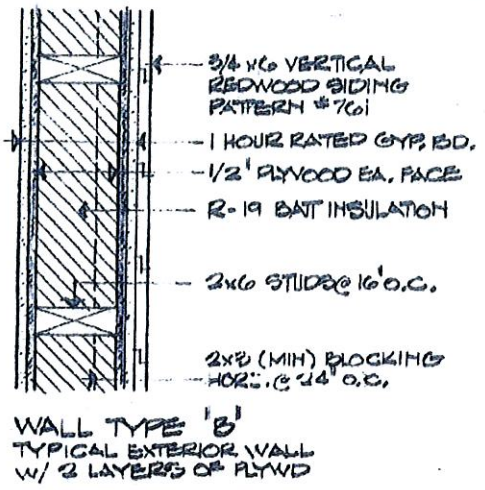


Figure 13: Exterior Wall Section

Figure 14: SE wall with storage closet

Many of the roof/wall intersections, especially on the southwest side of the buildings, showed evidence of peeled paint. Based on homeowner reports of water intrusion at exterior storage closets, a roof/wall intersection at one of the storage closets was selected for further investigation (Figure 15).

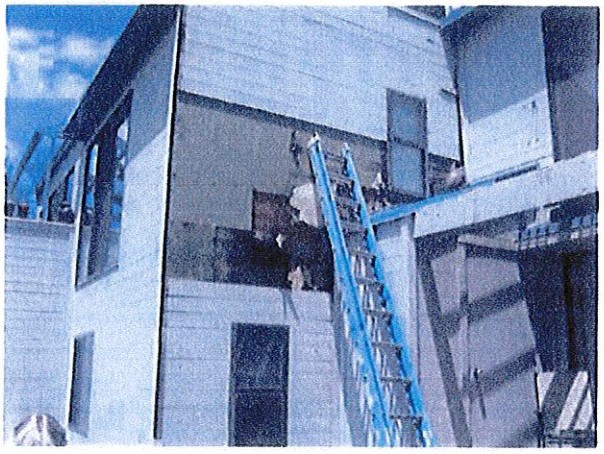


Figure 15: Investigation of SE wall

Figure 16: Investigation at roof/wall connection

Upon removal of the siding, it was observed that the exterior gypsum board was water damaged along the sloped intersection of the wall and the roof. The exterior gypsum board was crumbling at the roof/wall connection. For several inches above the connection, the outer paper surface of the gypsum board was peeling away but the gypsum core remained intact. The plywood wall sheathing behind the gypsum board appeared undamaged. The water damage was more extensive towards the outer edge of the roof.

It was observed that the roof underlayment was turned up several inches and sealed to the exterior plywood wall sheathing. The connection between the metal deck and the wall sheathing was covered with a continuous bent sheet metal flashing. The sheet metal flashing was noted to be flashed back to the plywood wall sheathing. This places the flashing behind the exterior gypsum board (See Figure 16).

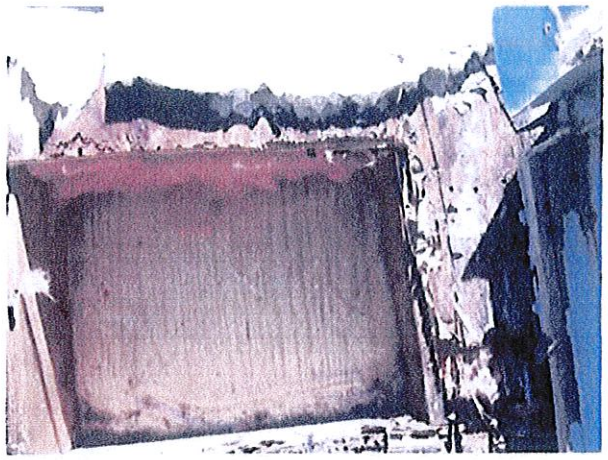


Figure 17: Investigation at wall/wall connection

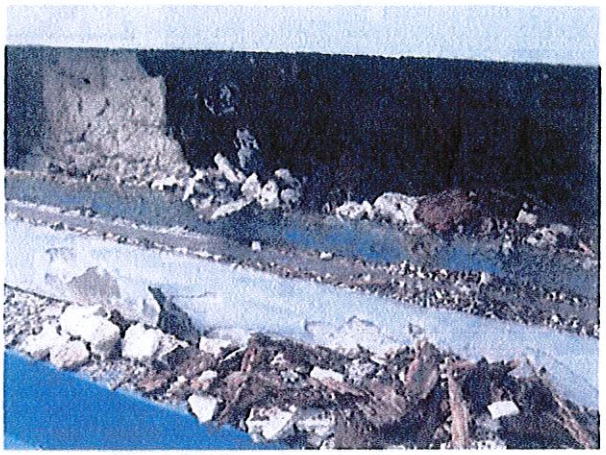


Figure 18: Investigation at base of wall

The investigation was continued at this location by removing the siding down along the wall-to-wall connection at the exterior of the storage closet. Here, the exterior gypsum board was water damaged and crumbled. This extended out approximately 12" from the wall-to-wall intersection. Since the plywood sheathing showed water staining, a cut was made in the plywood to investigate the wall structure. No damage to the studs was evident at this location (See Figure 17).

The siding was then removed at the base of this exterior wall. Here extensive damage was observed with both the exterior gypsum board and the plywood crumbling and evidence of rot along the outside edge the wall studs and sill plates (See Figure 18). Note that at this location, the concrete foundation wall and sill plate is proud of the siding; metal flashing covers the extension. The flashing was noted to be sloped backwards in many locations directing water up against the building.

All of the siding that was removed at this location was in excellent condition. It had originally been primed on all sides and there was no sign of water damage.

It should be noted that the first floor decks on the southwest side of the buildings were originally constructed as cantilevered structures. There was water damage reported in the past at the decks –all the original stairs were removed because of damage – and damage can be seen to the some of the structure underneath. (See Figure 19) In some cases, homeowners have added support underneath suggesting that the original decks may be sagging. (See Figure 20)

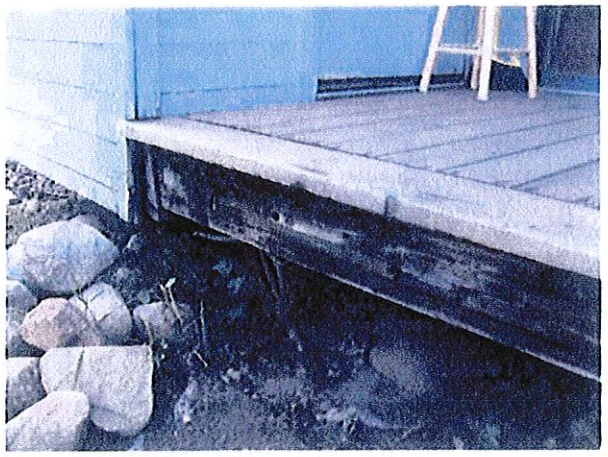


Figure 19: SW porch deck

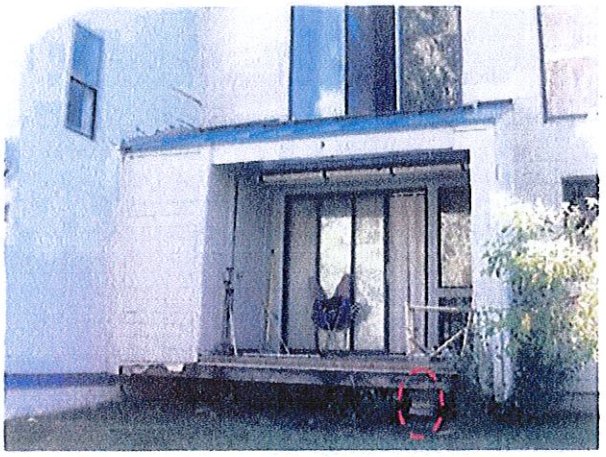


Figure 20: SW porch with added "support"

Some homeowners have added decks at the second floor on the southwest side. By doing so, they replaced the original roof structure at the exterior storage closets below. Figure 21 shows an example of this.

It was reported that there has been water intrusion in the storage closets with modified construction as well as in the original construction. Therefore a disassembly investigation was performed at the wall along one such deck. (See Figure 22) In this case, the original sidewall was extended up to form a wing wall for the 2nd floor deck. Siding was removed from the wing wall to check for water damage which can be seen on the exterior gypsum board at several places (Figure 23). A cut was

made through the plywood in the building wall at the connection point to see if the water damage extended into the wall. There was dampness felt in the stud space, but no damage to the stud could be seen (Figure 24).

Figure 21: Example of deck over storage closet

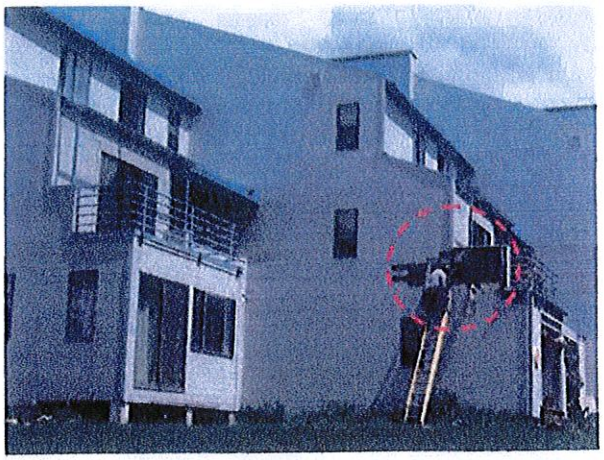


Figure 22: SW porch with added

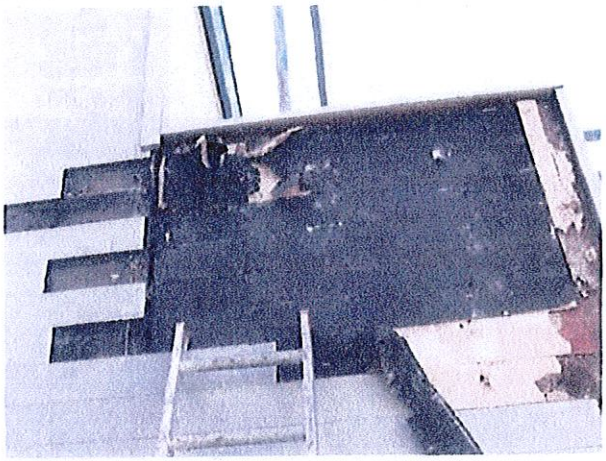


Figure 23: Wing wall built over existing structure

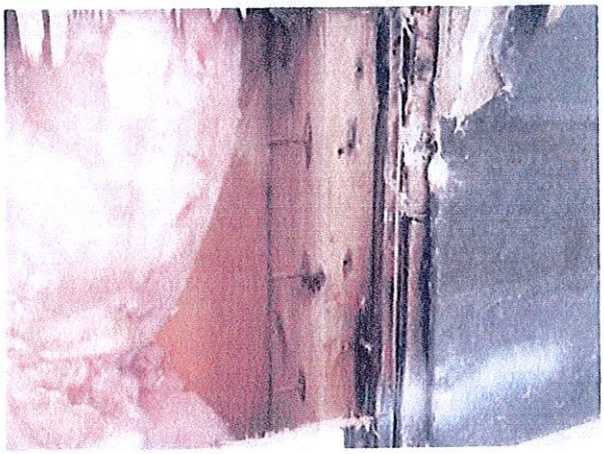


Figure 24: Wing wall attachment to building

The next field disassembly was located at a roof/wall intersection along the northeast side of the building (Figure 25). The siding was removed so the condition of the wall could be examined (Figure 26). There was some water staining on the face of the exterior gypsum board causing peeling of its outer layer but the core was not damaged. The gypsum board was broken off to look at the plywood behind, which was not damaged. The roof/wall flashing detail was similar to that described earlier.

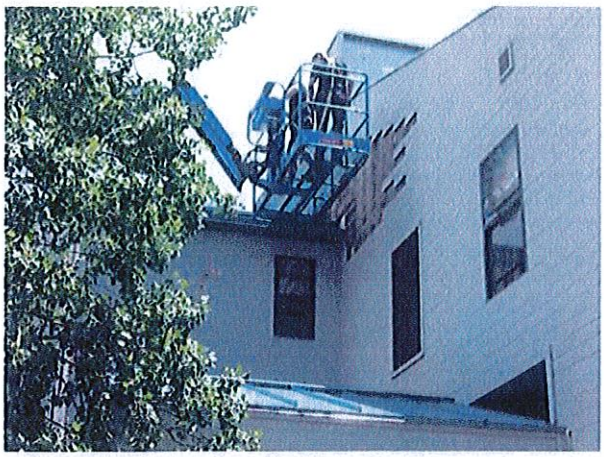


Figure 25: Investigation at NE wall at roof/wall

Figure 26: Detail at roof/wall

Additional investigation openings were made at two locations – in the wall field on a northeast wall and on a southeast wall. At the location on the northeast wall, when the siding was removed, some water stains could be seen on the face of the exterior gypsum board at siding nail penetration and around the windows, but there was no deterioration (See Figure 27). It should be noted that there is no overhang over this wall. On the other hand, along the southwest wall, where there is an overhang, no water staining of the exterior gypsum board was observed (See Figure 28).

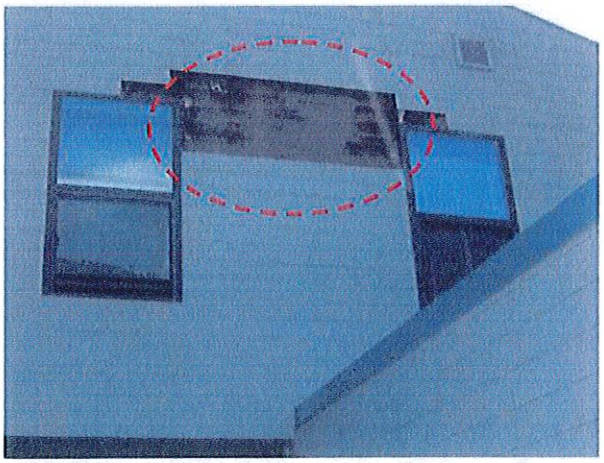


Figure 27: Investigation at NE wall (field)

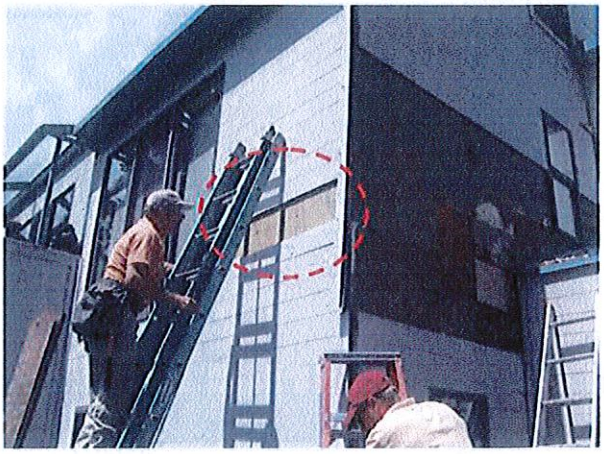


Figure 28: Investigation at SW wall (field)

The windows from the original construction are still in place. They are double glazed windows and some are reported to be experiencing condensation within the glazing. The siding was removed at a window on the southwest side of the building (on a southeast facing wall) and at a window on the northeast side of the building to check for water damage around the windows (See Figure 29 and Figure 30). In both cases, the windows are on walls for which there is no overhang. There was no flashing observed at the windows (this lack of flashing was also noted at door heads, louvered vents, and mechanical penetrations). There was some water staining on the exterior gypsum board around both of the windows and on the plywood behind. The plywood was cut at the window on the northeast side to check for damage inside the wall, but none was observed.

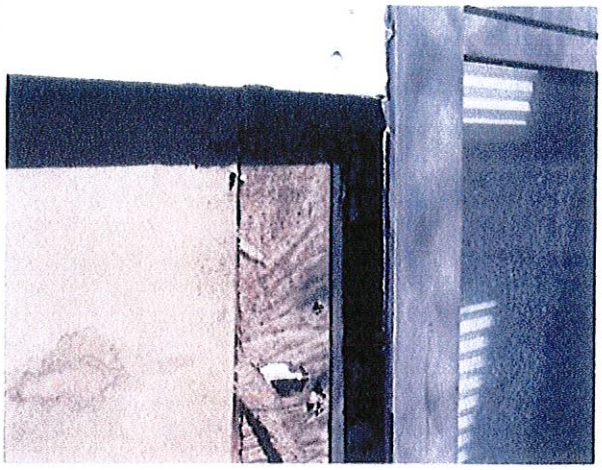


Figure 29: Investigation at window (SE wall)

Figure 30: Investigation at window (NE wall)

Crawlspace

The crawlspace is a ventilated, insulated space (See Figure 31). Crawlspace vents were observed along the northeast façade and are also called out in the drawings to be located on the southwest under the first floor porches. The framing and the first floor subfloor are exposed. There is no insulation between the first floor and the crawlspace (See Figure FS-3). Each unit contains its own water heater and heating is provided by electric baseboard. So there is no equipment in the crawlspaces other than plumbing and wiring. During the survey, the crawlspace was not damp nor did it smell musty.

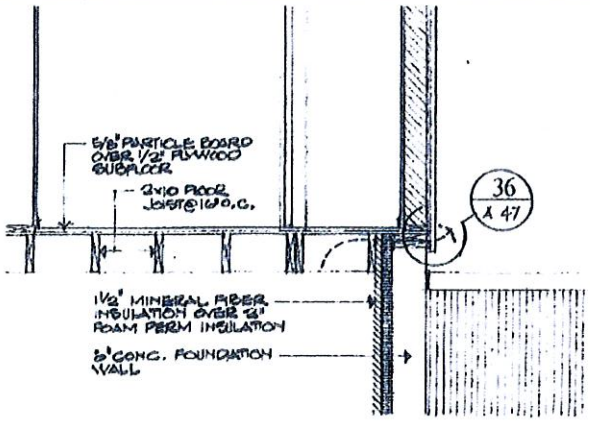


Figure 31: Basement Ventilation Section

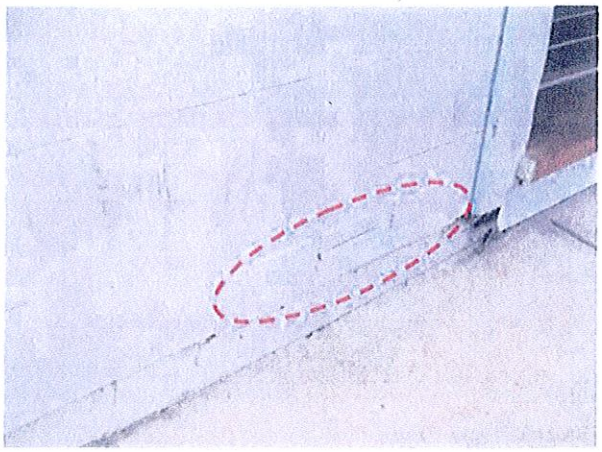


Figure 32: Exterior Basement Vents

In general, the subfloor and framing was clean and free of water staining. However, there was occasional evidence of condensation. This can be seen on the blocking above plumbing pipes in Figure 33. There was also evidence of condensation along the rim joist (See Figure 34). No structural water damage was observed on the floor framing or on any portions of the rim board that were examined.

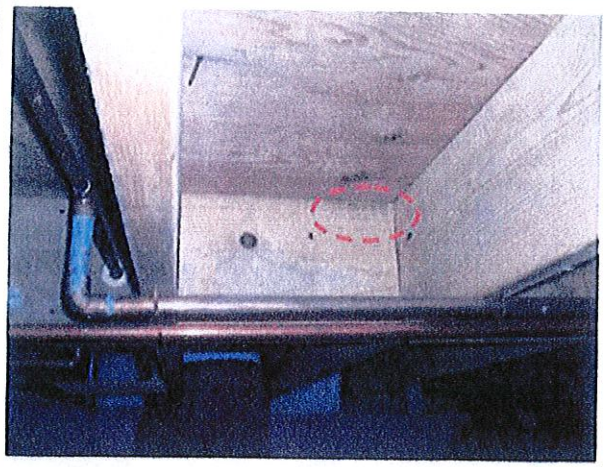


Figure 33: Piping in Basement

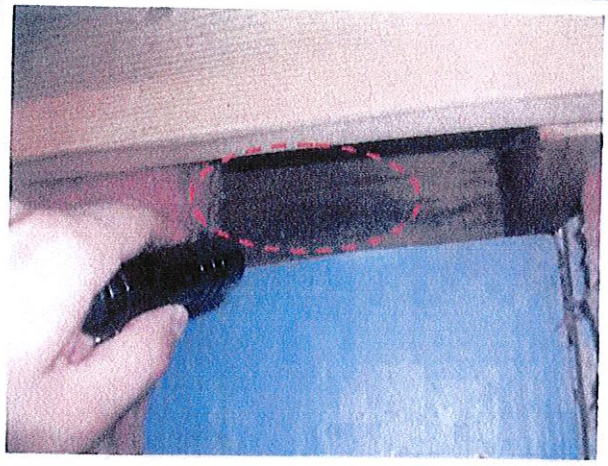


Figure 34: Rim board

The walls of the crawlspace are insulated with a layer of XPS against the concrete foundation wall which is covered with a blanket of fiberglass insulation. The crawlspace floor has a continuous ground cover of polyethylene. The ground cover is sealed to the footing at the interior columns (Figure 37) and is sealed to the XPS at the walls (Figure 38).

The crawlspace vents were difficult to locate and were partially covered with fiberglass insulation. Where the vents could be seen, the free area was limited. Observations provided by REG indicated that some vents were blocked with XPS.

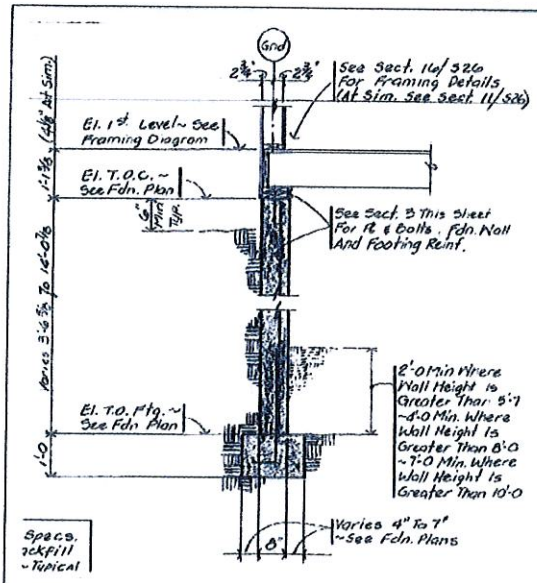


Figure 35: Foundation wall

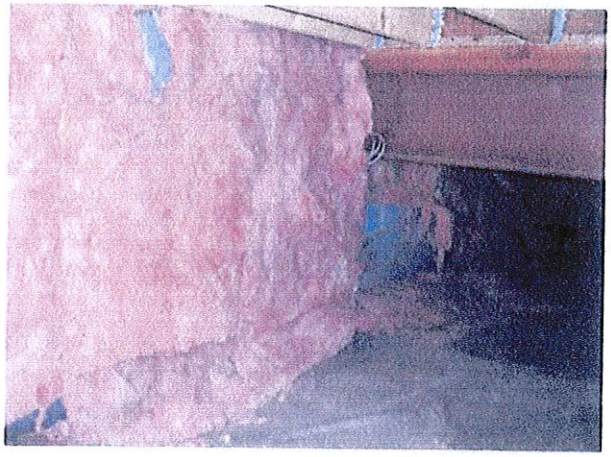


Figure 36: Foundation wall insulation

Figure 37: Poly ground cover at lally column

Figure 38: Poly ground cover sealed to wall insulation

Additional information provided from REG did indicate areas where the sill plates and floor joists were observed to be stained and in some cases deteriorating. In addition some areas of the crawl were also noted to have insulation installed in the floor joists. The insulation appeared dirty and black.

Figure 39: Deteriorating sill plates in 300 building crawl (photo courtesy of REG)

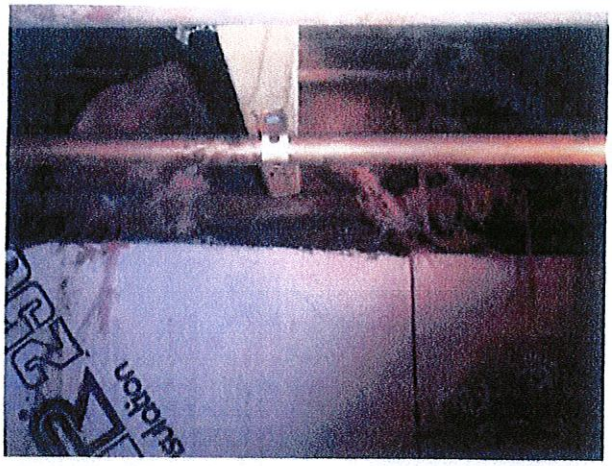


Figure 40: Deteriorating sill plates in 300 building crawl (photo courtesy of REG)

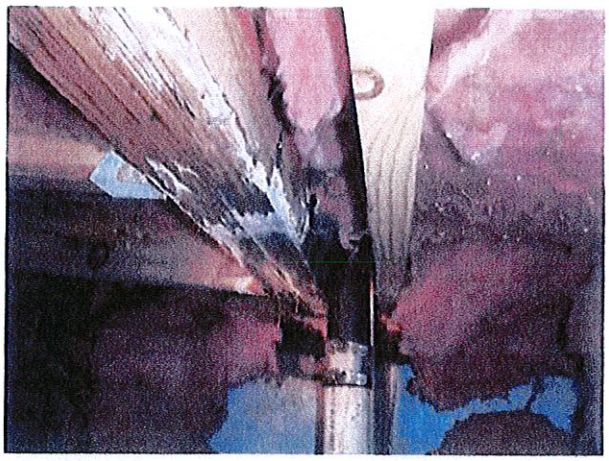


Figure 41: Water staining on LVL beam (photo courtesy of REG)

Figure 42: Insulation falling out of floor joists (photo courtesy of REG)

Analysis

The problems identified in these buildings are caused primarily by water intrusion at certain locations in the exterior wall assemblies. Some secondary concerns were noted that related to condensation accumulation.

Attic

The design of the buildings specifies ventilated attics. In cold climates, the primary purpose of attic ventilation is to maintain a cold roof temperature to control ice dams and to vent moisture that moves from the conditioned space to the attic. Attic ventilation is primarily driven by stack effect, and therefore requires both lower openings as well as higher openings to allow for flow. The amount of flow is a function of the size of the openings and the vertical distance between them.

In terms of moisture control, in order for the attic ventilation to be effective, the rate of moisture removal from the attic must exceed the rate of moisture leakage into the attic.

Each attic space is designed to have two wall attic vents and a venting chimney with a 1-hour rated attic floor system separating the unit below from the attic. The area of lower wall vents is insufficient to provide for adequate ventilation of the attic. In addition, the design of the ceiling leaves a large potential for air leakage from the conditioned space into the attic. A clearly observed and significant gap is around the non-gasketed pull down attic access hatch. However, there are likely other pathways as well such as around light and electrical fixtures, at the top plates of partition and exterior framed walls. In

addition to the air leakage from the interior space, there is concern relating to moisture loading of the attic from bathroom fans and dryer exhaust (as was observed in the unit investigated).

The resulting moisture load is greater than can be managed by the ventilation scheme. As a result, condensation accumulates at various places on sheathing and framing at the exterior surfaces.

Exterior Walls

The exterior walls are showing wide range of conditions. The areas investigated by BSC during the field visit of June 30 2010 seemed to be performing to a moderate level with some surface material deterioration but with little damage to the underlying structure in most locations. These observations do not correlate with the observations of REG during the retrofit of units 314/316. The damage noted during the renovation was extensive with significant deterioration to the sheathing elements and structural framing. The damage was reported to be pervasive enough to require repair to interior partition walls, flooring, and ceiling assemblies.

Water damage of building elements is a function of moisture balance. The rate of wetting must exceed the rate of drying in order for accumulation to occur, and the amount of accumulation must exceed the safe storage capacity of the material in order for damage to occur. Therefore, while pathways for water infiltration into the exterior wall assemblies do exist on the buildings, damage will only occur provided that sufficient water volume is able to penetrate into the system and provided the water cannot be drained to the exterior or dried out effectively.

Figure 43: Rake edge at end wall and eave overhang extension

There were three primary locations where the system had noted problems.

- Wall to lower sloped roof connections
- Second floor balcony additions
- Window systems

Wall to Lower Sloped Roof Connection

The most severe area of damage noted during the investigation was related to the wall to lower roof interfaces that terminate in the field of the wall. The main problem stems from the roof to wall flashing being installed behind the exterior gypsum layer and the lack of kick out flashings at the termination of the sloped roof in the field of the walls.

Water management of the enclosure in the Aspen environment requires a system that not only addresses rainwater penetration but also handles potential for water accumulation created by the formation of ice dams.

Because the flashing was installed behind the exterior gypsum board layer it created a hole at the roof edge termination in the field of the wall. This hole funneled water that was draining down along the flashing in between the gypsum and plywood sheathing. The location was particularly susceptible to water infiltration due to ice dams. The ice dams created a situation that allowed the water to back up above the height of the lower flashing leg and subsequently drain into the wall assembly. This analysis was corroborated with the reported history of the building that identified problems occurring more often during times of ice damming.

The problem appeared to be more severe on the Southeast elevations than the Northwest elevations. It was theorized that this may be due to the solar exposure of the South East roofs leading to more solar heating and subsequent cyclical melting

and freezing of water at the ice dam formations. The Northwest elevations are more shaded reducing the melting potential of the roofs.

The leakage at the roof to wall connections is resulting in damage of the first floor structure where the wood frame structure is connected to the concrete foundation. The buildings are designed with the framing set back from the exterior edge of the foundation wall (Figure 44). This created a ledge for the water to accumulate at the base of the wall assembly. Removal of the siding material at the base of the southeast facing wall during the field investigation revealed that the framing had deteriorated (Figure 45).

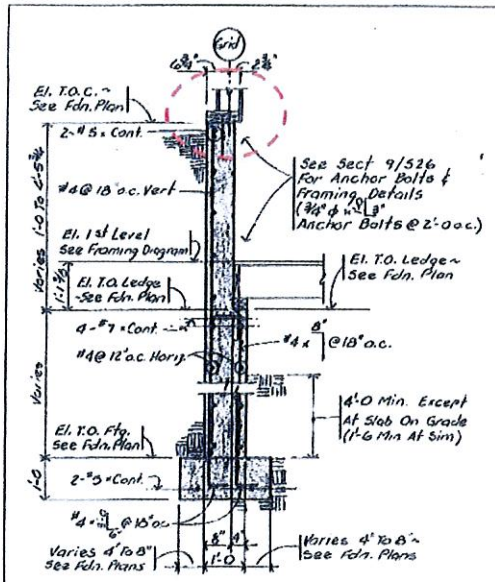


Figure 44: Foundation wall section

Figure 45: Base of wall at foundation wall ledge

Second Floor Balcony Additions

The addition of the exterior second floor decks was reported to have been done over several years with no specific details used for the construction. It was stated that the design and construction was typically left up to the contractor performing the work. This creates a situation where the actual construction could be variable at each location.

At the deck interface that was reviewed, no saddle flashings or other water proofing was installed at the wall to wing wall interface or below the wood trim.

Without water proofing or flashing installed at the balcony wing walls, water is able to penetrate directly into the structure below. The removal of the wood siding at the wing wall to structural wall interface revealed a concentration of deteriorated material at the interface.

Window Systems

Since the windows are original to the building and no flashing was applied when they were installed, there is potential for water intrusion at each the windows (this observation extends to doors and mechanical vent penetrations as well). Based on the observed water staining of the exterior gypsum board around the windows, some water is getting behind the cladding at the windows; however the observed damage was not extensive around the openings.

The current condition of the windows in the rough openings is a function of the amount of water reaching the windows. The windows on walls that have overhangs are less likely to show water intrusion than those that are on walls without overhangs or those that are exposed to additional water from nearby roof drainage.

A secondary concern was noted with the window systems. The evidence of sealed unit failure as noted by the condensation accumulation between the two lites of the insulating glass units is an indication of the insulating glass units sitting for prolonged periods of time in water. This is an indication that water is getting past the exterior seals and being held in the glazing pocket. This creates a concern of water leakage occurring through the window frame itself and not just at the window to wall interface. Without a pan flashing installed below the window there is a risk of water infiltration into the building.

Crawlspace

The design of the crawlspace of the buildings is for a ventilated but insulated space with no insulation in the first floors of the living space. The polyethylene ground cover is sealed to the wall insulation and around the discontinuities at the support columns. The space appears to have functioned well with only a slight evidence of condensation accumulation on the floor framing.

Given the observed condition of the vents, it is unlikely that the crawlspace was being effectively ventilated. This does not create much of a concern as ventilation of this crawlspace is unnecessary and creates a discontinuity in the thermal enclosure of the buildings. In addition, the ventilation and any other air gaps that exist along the top of the wall may be the source of the moisture. In the winter, any air brought in by the ventilation will make the basement cooler than the space above. In the summer, outdoor air brought in will tend to be more humid.

There was very little evidence of past liquid water intrusion into the crawl space through the foundation wall (ie. through the concrete foundation or from high groundwater). The polyethylene ground cover is turned up and sealed it to the interior face of the rigid wall insulation. In this configuration, any water infiltration though the foundation wall would be directed under the polyethylene ground cover. Therefore noted water infiltration would likely have had to come from the wood framed walls above, and would not be considered a crawlspace issue.

Recommendations

The following is a list of potential strategies that may be employed to address the concerns identified with the performance and durability of the building enclosure assemblies. The intent of this section is to provide sufficient information regarding the scope of work needed to repair the buildings that can be provided to a cost estimator for overall project budgeting purposes. Due to the unknown amount of deterioration of the building components, BSC and REG have worked together to develop two sets of damage estimates (representing what we feel to be the best case and worst case scenarios). The purpose of this exercise is to bracket the potential costs that may be associated with the rehabilitation of the buildings.

The work has been broken down into the following categories:

1. Attic
2. Exterior Walls
3. Windows and Patio Doors
4. Crawlspace
5. Cantilevered Decks
6. Energy Performance Upgrades

Attic

There are two proposed strategies that could be employed to reduce the potential for condensation from occurring in the attic spaces:

Option 1: Increase ventilation and air seal the attic floor

This strategy would try to increase the ventilation rate for the attic as well as reduce the infiltration of conditioned air into the attic from the living space below. The following is an outline scope of work:

1. Add additional lower vent openings, including soffit vents at the eave overhang extensions. Ensure existing vents are open.
2. Replace pull down ladder access hatched with gasketed and sealed hatches (a secondary hatch cover should also be considered given the high potential for infiltration through the attic hatch).
3. Air seal gypsum ceiling at all partition walls, electrical and mechanical penetrations, and exterior framed wall. This will require the removal of any plywood attic flooring and moving blown in insulation in order to expose the ceiling gypsum from the top.

Additional strategy options:

1. Mechanically induce attic ventilation through the use of fan. The fan should be positioned to blow exterior air into the attic space. DO NOT exhaust air from the attic space as this may result in an increase of infiltration of conditioned air into the attic.

Option 2: Modify the attic to be an unvented attic

This strategy would add air impermeable insulation to the underside of the roof sheathing as well as the end walls bringing the attic within the thermal and air tightness boundary of the units. The following is an outline scope of work:

1. Close and seal all vent openings to the exterior
2. Close and block the vent shaft and re-flash the top to prevent wind blown rain from being able to infiltrate into the vent shaft.

3. Install a 5" layer of closed cell spray polyurethane foam to the underside of the roof deck (Minimum thickness to meet R-30 based on *Table R806.4 Insulation for Condensation Control* of the 2009 IRC). Add additional insulation (such as netted and blown cellulose or fiberglass) in sufficient thickness (5.5" of cellulose or fiberglass) to make up the remaining thermal resistance to reach the minimum of R-49 required by the local building code.
4. Install a 2" layer of closed cell spray polyurethane foam to the end walls.
5. Fill the remaining space (3.5") with mineral fiber insulation (Rockwool or equivalent)

Additional recommended work

The following additional work is recommended independent of either option chosen:

1. Ensure all dryer exhaust ducts are properly ducted to the exterior. Seal around all connections to prevent leakage of dryer exhaust into the attic space.
2. Duct all bathroom exhaust fans properly to the exterior.

Exterior Walls

To correct the concerns relating to water intrusion, the damage areas need to be repaired and the details leading to the water intrusion problems should be modified to prevent future infiltration. The following outline scope of work should be used for the repair.

1. Remove all of the cladding materials to expose underlying exterior wall sheathing.
2. Remove any water damaged sheathing material and framing (material that has lost its structural capacity or is friable would be considered damaged. Surface stained material with no loss of structural capacity can remain in place)
3. Remediate any mold discovered (procedures for mold remediation are outside of this scope, however we feel that it would not be necessary to investigate wall cavities behind exterior sheathing areas that are not exhibiting signs of water damage from the exterior – only cavities that are exposed due to the removal of water damaged material need to be remediated)
4. Replace damaged material with new.
5. Install new building wrap over the exterior wall assemblies.
6. Install a drainage space (1x4 wood furring at 16" OC, 3/8" XPS fanfold (cut into 2" strips) at 16" OC, or homeslicker by Benjamin Obdyke)
7. Integrate new metal head flashing above all horizontal trim elements (including window head, doors, louvered vents, and other mechanical penetrations.
8. Install new cladding.

There are significant unknowns as to the amount of damage that may be uncovered during the retrofit. In order to bracthe potential project cost differences we have developed the following specific location repair scopes as well as estimated quantities of damaged material (intended to be our best estimate of best and worst case scenarios). These quantities can be referenced when developing construction cost estimates.

Wall Structure Repairs (All percentages represent portions of total wall area)		
Replace damaged exterior gypsum	60%	10%
Replace damaged exterior plywood*	35%	5%
Replace wall studs	25%	3%
Replace batt insulation	25%	3%
Replace interior plywood	5%	1%
Replace interior gypsum**	5%	1%
* these same quantities may be used for estimating of mold remediation of exterior wall cavities		
** where interior gypsum is replaced budget for repainting of entire interior wall		

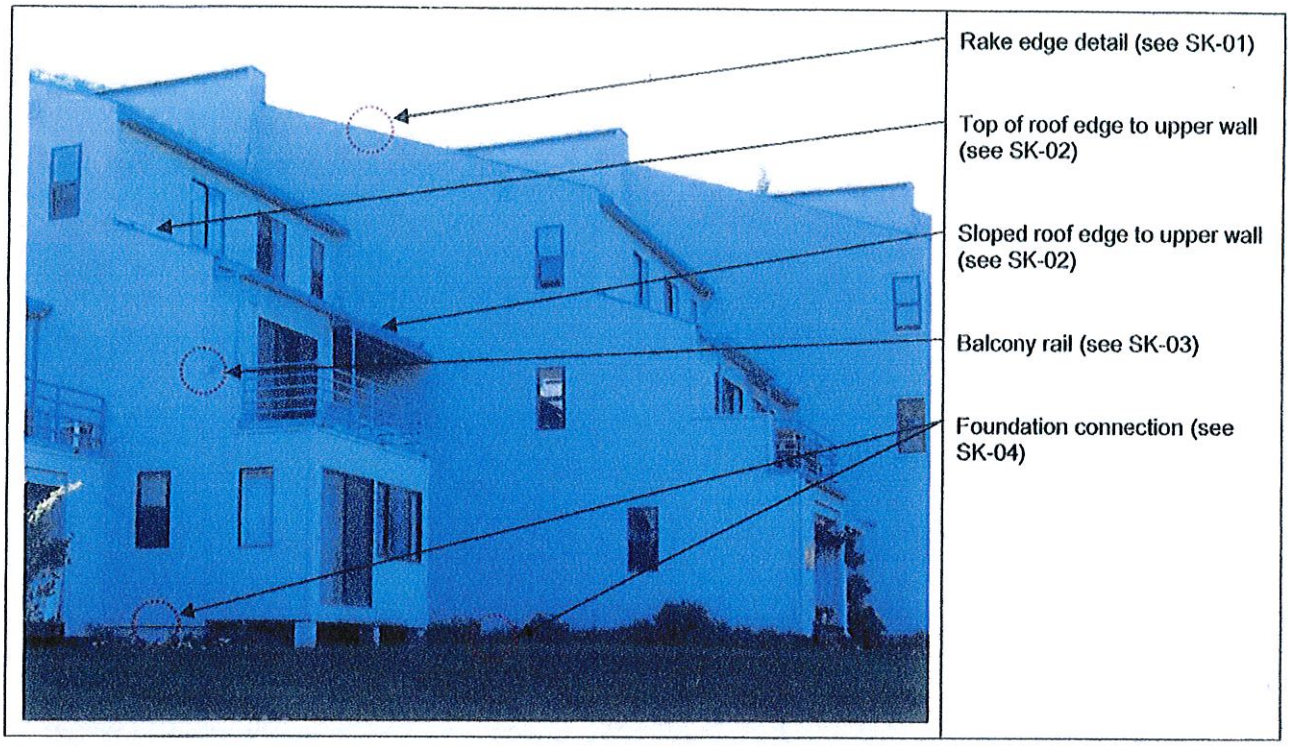
First floor - floor framing (All percentages represent portions or total perimeter length)		
Replace damaged double 2x8 sill plate	50%	5%
Replace damaged double 2x10 rim boards	50%	5%
Repair damaged 2x10 floor joists (assume 2' splice needed to repair damaged joist ends)	25%	3%
Replace damaged 1/2" plywood and 5/8" particle board sub floor* (assume 2' in from	25%	3%

	exterior wall for every lineal foot of perimeter)		
	*where subfloor repair is done, budget to replace carpet in affected room		

Second floor - floor framing (All percentages represent portions or total perimeter length)			
	Replace damaged double 2x8 sill plate	25%	3%
	Replace damaged double 2x10 band joist	25%	3%
	Repair damaged 2x10 floor joists (assume 2' splice needed to repair damaged joist ends)	12%	2%
	Replace damaged first floor ceiling gypsum (assume 2' in from exterior wall for every lineal foot of perimeter)	12%	2%
	Replace damaged 1/2" plywood and 5/8" particle board sub floor* (assume 2' in from exterior wall for every lineal foot of perimeter)	12%	2%
	*where subfloor repair is done, budget to replace entire flooring in affected room		

Third floor - floor framing (All percentages represent portions or total perimeter length)			
	Replace damaged double 2x8 sill plate	12%	2%
	Replace damaged double 2x10 band joist	12%	2%
	Repair damaged 2x10 floor joists (assume 2' splice needed to repair damaged joist ends)	6%	1%
	Replace damaged ceiling gypsum (assume 2' in from exterior wall for every lineal foot of perimeter)	6%	1%
	Replace damaged 1/2" plywood and 5/8" particle board sub floor* (assume 2' in from exterior wall for every lineal foot of perimeter)	6%	1%
	*where subfloor repair is done, budget to replace carpet in affected room		

As part of the scope, interfaces with other building elements are recommended to be modified to maintain the continuity of the water management system. Please see attached detail sheets for direction on the repair of the building interfaces.



Window and Patio Door Systems

The windows and sliding glass patio doors should be removed and replaced. The replacement units are recommended to have a maximum U-Value of 0.35 as per the 2009 IECC. The units should be installed in a pan flashed and drained manner that is properly integrated with the new WRB installed on the walls. Please see the attached window installation details (note - sliding glass patio doors would be installed using the same approach).

Crawlspace

We would recommend that the existing vents be sealed and the space operated as a conditioned crawlspace. To protect against condensation, the rim joist is recommended to be sprayed with a 2" layer of closed cell spray polyurethane foam connecting from the underside of the floor sheathing to the top edge of the XPS insulation. The foam should be covered with a layer of rockwool insulation.

In order to mitigate the potential for air infiltration from the crawlspace into the living spaces above, a strategy would be to install a fan to exhaust air from the crawlspace to the exterior. This will depressurize the crawlspace with respect to the living spaces above. The benefit of the net air flow being from the conditioned space into the crawl will be prevention of pollutants from migrating into the living spaces from the crawlspace as well as some heat transfer to the crawlspace to help protect against freezing of the pipes. From experience we would recommend approximately 50cfm of exhaust for every 1000 square feet of crawlspace.

Cantilevered Decks

The framing of the cantilevered decks is deteriorating in many locations. Damaged deck material should be replaced. In addition, the foundation support for each porch should be reviewed and modified as necessary.

Cantilevered Decks - framing (All percentages represent portions or total perimeter length)		
Replace damaged decking	50%	10%
Replace damaged joists	25%	3%

Energy Performance Upgrades

De-cladding the building provides an opportunity to improve the overall thermal performance of the building. Adding exterior rigid insulation to the wall can significantly improve the thermal resistance of the building. As an example, the addition of 2" of foil faced polyisocyanurate insulation (R-13) can effectively double the total thermal resistance of a 2x6 stud wall with batt

insulation. The following additions to the above recommendations would be recommended for energy improvements to the building.

In addition to the above scope the following could be added for improvement to the thermal performance:

1. 2" or more of exterior rigid insulation (foil face polyisocyanurate (R-13), or more total) installed exterior of the new building wrap. (This recommendation is based on experience rather than a detailed energy analysis – such analysis is currently outside this scope of work)
2. 1x3 or 1x4 vertical wood strapping spaced at 16" OC (located over studs). This currently is one of the cladding attachment options presented in the retrofit work above – this option must be used with this approach.
3. At all window and door locations, trim returns will be required to cover the edge of the rigid foam insulation.
4. Roof raked edge flashings will need to be increased in size to accommodate the additional foam thickness

An additional option for the buildings is to upgrade the window and patio doors from standard double glazed lowE windows to high performance triple glazed windows. We would recommend windows with a U-Value ~ 0.2 and SHGC ~ 0.25.

B. REG ANALYSIS

Resource
Engineering
Group, Inc.
efficiency • sustainability • simplicity

Ed Cross
President
Centennial Home Owner's Association
c/o First Choice Property Rentals
0252 Corywell Ridge Road
Glenwood Springs CO 81601

August 20, 2009

Regarding: Centennial Site Report

Ed:

Per your request Dodson Harper and I visited the Centennial Housing Complex in Aspen Colorado on August 17 & 18, 2009. At the time of our visit repairs were being performed on Unit 314 & 316. The siding, exterior gypsum board, and sheathing had been removed on the south and east facades of unit and the west façade of Unit 316. Some of the interior drywall had also been removed in Unit 316. We also toured the exterior of the seven buildings comprising the Owner Occupied portion of the complex and a cursory tour of the rented buildings.

Scope of Work
Our scope of work is to investigate structural issues and how the required repairs may be included in the plans for energy efficiency upgrades to the buildings. This report details our observations and recommendations for the next steps in this process.

Observations
Observations in the open walls of Units 314 & 316:

- The areas of exterior wall that were open for observation showed multiple structural members with significant moisture damage. It appears the predominant cause of this damage is poor waterproofing details in the original construction. This damage extends to the foundation level in many areas.
- The flooring in the kitchen of Unit 314 has swelled due to moisture and created an uneven surface. It appears this is from moisture transported through the structural system from the exterior wall.
- The exterior shower stall wall in Unit 314 was open for investigation and showed signs of moisture damage both of the exterior moisture issue and from improper moisture detailing for shower stall construction.
- There is some moisture damage from a leaking drainpipe in the common wall between Units 314 & 316. However, the structural system in this area is mostly intact.
- We also observed conditions in the crawlspace under this building. In the crawl space, the sill plates of the east facing walls on the north side of the building showed signs of moisture damage and rot. A few joists showed signs of surface mold. One LVL beam showed extensive rot on one end, and others had signs of moisture damage. The air in the crawlspace

was damp and most of the passive vents were covered with batt insulation. It appears this is typical of all the crawlspaces.

General observations from the Owner Occupied buildings (92 units total):

- Buckled siding boards
- Nails popped out of siding (some were rusting)
- Gaps between siding and flashing
- Flashing installed incorrectly
- Flashing details that were improperly designed
- No flashing for any windows, doors or vent penetrations. Exterior penetrations appear have been addressed with caulking during the original construction. This method of waterproofing has a typical life span of around seven years and is not considered adequate for maintaining a drainage plane, even when freshly installed.
- Some units had made minor repairs to deal with extensive ice daming (metal siding, heat tape, etc).
- Beams supporting deck roofs and deck glulams on decks showing extensive rot.
- The typical exterior wall assembly varies somewhat, but consistently includes a vapor barrier on the interior face of the studs and a layer of drywall beneath the siding. The drywall is not protected from moisture, and therefore absorbs a large amount of moisture. Moisture is held in the wall cavity by the outer drywall and sheathing layer and interior vapor barrier.

From our conversations with Lance Sigley of Kauri Construction (and crew), and photos Lance had taken, these conditions were similar to those found outside of Unit 314 prior to removal of the wall assembly. This leads us to believe that the conditions found at Unit 314 will likely be found in most of other buildings and units. We did observe a few walls that appear to be in better condition, as well as areas that are clearly in worse condition. However, without removal of siding on each individual wall, the precise level of damage to the structural systems cannot be known.

Recommendations

Our recommendations for moving forward include:

- For recommendations regarding the repair of Units 314 & 316 see our letter titled "**Centennial Housing Unit 314 & 316 Site Observations,**" from August 2009.
- Remove siding on all units in the complex to inspect the level of moisture damage to the structure and repair and replace damaged members. A local inspector should be hired during this time to inspect units on a case-by-case basis to specify which members should be replaced.
- Mechanically vent all crawlspaces for proper humidity control.
- Remove all roofing material to allow for the installation of proper flashing detailing. At this time the roof sheathing would also be inspected. The attic spaces of all units should be inspected for signs of moisture damage on the under side of the sheathing.
- Remove and replace any damaged members in the porches and decks.
- When the wall and roof structural systems are exposed, new waterproofing/flashing details must be installed to prevent moisture damage in the future. These details will need to be provided by the Architect and/or waterproofing specialist.

- Contract with mold mitigation specialists to investigate the level of mold issue in the buildings and determine the proper remediation steps as needed. Based on the observations and report prepared by DS Consulting of the mold conditions found in Units 314 & 316, it is possible that mold could be found in many of the units within the complex.
- We recommend that similar steps are taken at the rental properties adjacent to the units that are part of the HOA.

All of the above recommendations should be done as soon as is feasible.

In our opinion, the moisture damage observed is primarily from poor design and installation of flashing and other waterproofing details, not a lack of maintenance. These details (or lack thereof) have resulted in water flowing within the wall cavity [Lance Sigley has photos documenting this effect] during moisture events (rain and/or snow melt). The wall assembly cannot properly dry out between moisture events, this condition has been largely masked for over two decades by the choice of redwood for siding. Redwood is naturally very resistant to moisture damage and therefore effectively hid the issues within the structure resulting in the possible wide spread damage currently in place.

We will work with you, the Centennial HOA construction committee, Seth Hmielowski (Architect), DS Consultants (mold specialists) and Lance Sigley (Contractor) to determine the best path forward and help determine cost estimates for the work required. The current work underway at Units 314 & 316 will provide an average cost per square foot number that can be extrapolated and adjusted as a reference for estimating. We will also work to incorporate the parallel goal of increasing the energy efficiency of the units to lower the Owner's annual operating costs.

I have included a selection of photos to illustrate some of the typical conditions found in our site visit.

Please feel free to contact us further if you have any additional questions.

Sincerely,

August Hasz, PE

P.O. Box 3725 • Crested Butte CO 81224 USA • tel (970) 349-1216
fax (970) 349-1218 • info@reginc.com • www.reginc.com

ALTERNATIVES FOR IMPROVEMENTS

The Aspen Insulation Company
1241 Heritage Drive
Carbondale, CO 81623

Phone: 970-945-5088
Fax : 970-945-5154

Estimate

Date	Estimate #
3/19/2013	1814

Name / Address
Athen Builders P.O. Box 4404 Aspen, CO 81612

Project:	Centennial

Description	Qty	Total
Units A,B,C,D - Free Silver - 64 Units At Attice Space - Re-blow over existing insulation - R-30 $49,997.00		0.00
Units A,B,C,D - Free Silver - 64 Units At Crawl Space Ceiling - R-38 Batt $30,644.00		
Units A,B,C,D - Free Silver - 64 Units At Crawl Space Floor at Grade - 6 mil Poly Vapor Barrier Glued in Place $29,031.00		
Units A,B,C,D - Free Silver - 64 Units At Crawl Space Rim Joists - 3" Spray Foam - R-21 $17,952.00		
Units A,B,C,D - Free Silver - 64 Units At Crawl Space Exterior Walls - R-11 Curtain $15,776.00		
Building O - Teal Court - 10 Units At Attice Space - Re-blow over existing insulation - R-30 $7,644.00		
Building O - Teal Court - 10 Units At Crawl Space Ceiling - R-38 Batt		
	Total	

Signature _____

The Aspen Insulation Company
1241 Heritage Drive
Carbondale, CO 81623

Phone: 970-945-5088
Fax : 970-945-5154

Estimate

Date	Estimate #
3/19/2013	1814

Name / Address
Athen Builders P.O. Box 4404 Aspen, CO 81612

Project:	Centennial

Description	Qty	Total
$5,187.00 Building O - Teal Court - 10 Units At Crawl Space Floor at Grade - 6 mil Poly Vapor Barrier Glued in Place $4,914.00 Building O- Teal Court - 10 Units At Crawl Space Rim Joists - 3" Spray Foam - R-21 $1,538.00 Building O - Teal Court - 10 Units At Crawl Space Exterior Walls - R-11 Curtain $2,285.00 Building P - Teal Court - 10 Units At Attice Space - Re-blow over existing insulation - R-30 $7,644.00 Building P - Teal Court - 10 Units At Crawl Space Ceiling - R-38 Batt $5,187.00 Building P - Teal Court - 10 Units At Crawl Space Floor at Grade - 6 mil Poly Vapor Barrier Glued in Place $4,914.00		
	Total	

Signature _____

The Aspen Insulation Company
1241 Heritage Drive
Carbondale, CO 81623

Phone: 970-945-5088
Fax : 970-945-5154

Estimate

Date	Estimate #
3/19/2013	1814

Name / Address
Athen Builders P.O. Box 4404 Aspen, CO 81612

Project:	Centennial

Description	Qty	Total
Building P - Teal Court - 10 Units At Crawl Space Rim Joists - 3" Spray Foam - R-21 $1,538.00		
Building P - Teal Court - 10 Units At Crawl Space Exterior Walls - R-11 Curtain $2,285.00		
Building Q - Teal Court - 5 Units At Attice Space - Re-blow over existing insulation - R-30 $3,822.00		
Building - Teal Court - 5 Units At Crawl Space Ceiling - R-38 Batt $2,594.00		
Building Q - Teal Court - 5 Units At Crawl Space Floor at Grade - 6 mil Poly Vapor Barrier Glued in Place $2,457.00		
Building Q - Teal Court - 5 Unitsnits At Crawl Space Rim Joists - 3" Spray Foam - R-21 $969.00		
Building Q - Teal Court - 5 Units At Crawl Space Exterior Walls - R-11 Curtain		
	Total	

Signature _____

The Aspen Insulation Company
1241 Heritage Drive
Carbondale, CO 81623

Phone: 970-945-5088
Fax : 970-945-5154

Estimate

Date	Estimate #
3/19/2013	1814

Name / Address
Athen Builders P.O. Box 4404 Aspen, CO 81612

Project:	Centennial

Description	Qty	Total
$1,143.00 Notes: At attic spaces, upon inspection of each unit, AI Insulation will decide if baffles are needed. If necessary, AI Insulation can remove existing insulation at T&M Rate - $38/hr per man.		
	Total	$0.00

Signature _____

Heating Plumbing Drain Cleaning Air Conditioning Air Quality

Estimate

AAA MECHANICAL

Triple The Service!

Name / Address

Athens Builders LLC
PO Box 404
Aspen, CO 81612

Date	Estimate #	Location
4/9/2013	1444	Cenntennial

Description	Qty	Rate	Total
Estimate to install shut off valves for the individual owner units a total or 96 units the valves will be located in the crawl space at the entrance of the crawlspace just inside the access. all Valves will be labeled with a tag to identify the unit.			
Aquapex 3/4			237.19
Unistrut			44.33
Labor	2.5	100.00	250.00
This is a per each individual unit price			

MasterCard VISA AMEX DISCOVER Lochinvar

Sales Tax $14.92 **Est. Total** $546.44

Proposal is valid for thirty days from date of issue. Upon acceptance of proposal a 50% deposit is required, remaining 50% will be due with-in fifteen days after completion. All non-returnable items are payable in full upon acceptance. Any request above and beyond this estimate will require a signed change order. Any additional expense due to previous poor workmanship or items that could not be forseen or have not been communicated will be in addition to this proposal. The total sales tax may vary. The amount indicated on this estimate is intended as an estimate only not an exact quote.

Acceptance Signature: _____ **Printed:** _____ **Date:** _____

Local authorized, warranty and service provider for Lochinvar Corp.
PO Box 639 Glenwood Springs, CO 81602 P. 970.947.0606 F.970.945.9366 E. fran@aaamechanicalgroup.com