EYU CIVIL & ENVIRONMENTAL ENGINEERING

IRA A. FULTON COLLEGE

CAPSTONE.

CEEn-2018CPST-003

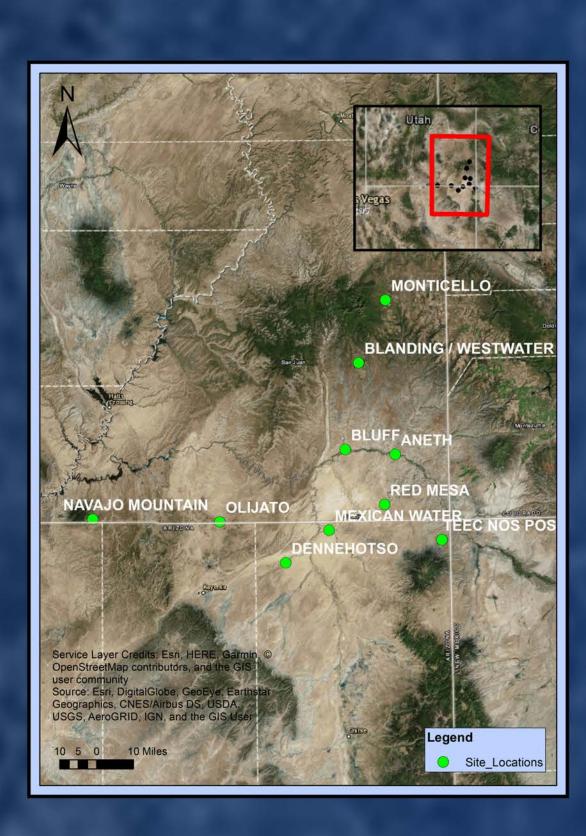
ACUTE/UNTF NAVAJO HOUSE PLANS

Team members: Benjamin Arrington, Zachary Barnett, David Bell, David Blake

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Problem Statement

House plans for the Utah Navajo Trust Fund (UNTF) were engineered to provide buildings that are structurally sound and easy to construct. Before any engineering could be performed, design criteria were obtained for 11 different locations. These criteria included seismic coefficients, snow loads, wind speeds, frost depth, and soil conditions. A comparison of the resulting structural members was conducted following the engineering.

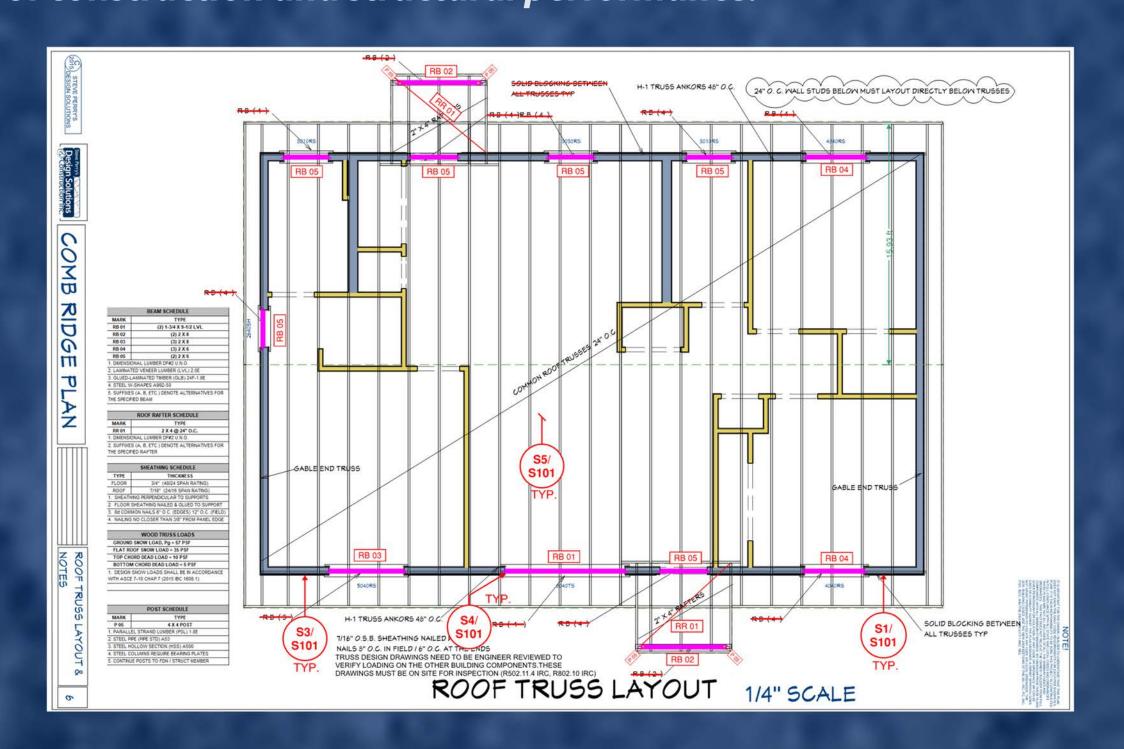


COS) STEVE PERRY'S	TYP. 9/ MW1 FT 20	
Design Solutions COMB	BRACED WALL PANELS EXTERIOR & INTERIOR TO HAVE CONTINIOUS FOOTINGS R403.1.2 IRC BRACED WALL PANELS EXTERIOR & INTERIOR TO HAVE CONTINIOUS FOOTINGS R403.1.2 IRC FOOTING 10" X 20" TYP. A5 PER IRC.	
RIDGE PLAN	COMPACTED SAND & GRAYEL FILL	
FOOTING	2" X 24" VERTICAL FOAM TYP UFER GROUND 3508.1.2 IRC BELOW METER BASE REBAR TO BE 3" ABOVE THE BOTTOM OF FOOTINGS R403.1.3 IRC MW1) FT 20	CA AND CA
16 & WALLS 14" SCALE 2	FOOTING SCHEDULE MARK WIDTH LENGTH THICKNESS REINFORCEMENT TRANSVERSE LENGTHWISE FT20 20 ° CONT. 10 ° - (2) #4 1. CONTINUOUS FOOTINGS SHALL BE CENTERED UNDER WALLS AND SPOT FOOTINGS SHALL BE CENTERED UNDER COLUMNS UNLESS NOTED OTHERWISE 2. FOOTINGS AND FOUNDATIONS, EXCAVATIONS, GRADING, AND FILL SHALL COMPLY WITH THE PROVISIONS OF THE GEOTECHNICAL REPORT (SEE GSN) MASONRY WALL SCHEDULE REINFORCEMENT ROW 1 CMU 8" #4 @24" o.c. (2)#4 @48" o.c. CENTER SOIId THE PROVISIONS OF THE GEOTECHNICAL REPORT (SEE GSN)	NOTE! NOTE! NOTE: OF THE PROPERTY OF THE PR

Design Process

	Acute Process/IBC		IRC		Original			
Member	Beam	Support (T/K)	Beam	Support (T/K)	Beam	Support (T/K)		
Rear 3030	(2) 2X6	1/1	(2) 2X4	1/1	(2) 2X6	1/1		
Rear Door	(2) 2X6	1/1	(2) 2X4	1/1	(2) 2X6	1/1		
Rear 1640	(2) 2X6	1/1	(2) 2X4	1/1	(2) 2X6	1/1		
Rear 4040	(2) 2X6	1/1	(2) 2X6	1/2	(2) 2X6	1/1		
Left back 4040	(2) 2X6	1/1	(2) 2X6	1/2	(2) 2X6	1/1		
Left front 4040	(2) 2X6	1/1	(2) 2X6	1/2	(2) 2X6	1/1		
Front 5040	(3) 2X8	1/1	(2) 2X8	2/3	(3) 2X6	1/1		
Front door	(2) 2X6	1/1	(2) 2X4	1/1	(2) 2X6	1/1		
Front left 4040	(3) 2X6	1/1	(2) 2X6	1/2	(2) 2X6	1/1		
Front right 4040	(3) 2X6	1/1	(2) 2X6	1/2	(2) 2X6	1/1		
Right 3010	(2) 2X6	1/1	(2) 2X4	1/1	(2) 2X6	1/1		
From 8040	(2) 1.75x9.5 LVL	1/1	(2) 2x12	2/3	(2) 2x10	1/1		
Front porch	(2) 2X8	4X4	(2) 2X6	(2) 2X4	(2) 2X8	Not Specified		
Rear porch	(2) 2X8	4X4	(2) 2X6	(2) 2X4	(2) 2X8	Not Specified		
Floor Beams	(3) 2X10	4X4	(3) 2X12	(2) 2X4	(2) 2X10	4X4		
Member	Acute Process/IBC		IRC		Original			
Roof Sheathing	7/16" OSB		5/8" OSB		7/16" OSB			
Roof Nailing	8d @ 12" O.C. field, 6" O.C. ends		8d @ 12" field, 6" O.C. ends		8d @ 8" O.C. field, 6" O.C. ends			
CMU Fdn. Walls	8"X8"X16"		8"X8"X16"		8"X8"X16"			
Footing	10"X20"		6"X20"		10"X20"			
Rebar			48" O.C.		24" O.C.			
Grouted Cells	Fully grouted		48" O.C.		24" O.C.			
Washers			3"X3" (slotted)		3"X3" (slotted)			
Anchor Bolts	1/2"Ø @ 72" O.C.		1/2"Ø @ 72" O.C.		1/2"ØX10" @ 24" O.C.			
Wall Studs	2x6 @ 24" O.C.		2x4 @ 24" O.C.		2x6 @ 24" O.C.			
Rafters	2x4 @ 24" O.C.		2x4 @ 24" O.C.		2x4 @ 24" O.C.			
J Bar		48" O.C.		24" O.C.				
Slab	4"		3.5"		4"			
Dowels to FW (slab)					#4 @ 24" O.C.			
Floor Joists	2X10 @ 16" O.C.		2X10 @ 16" O.C.		9-1/2 TJI @ 16" O.C.			
Footing Rebar	(2) #4		#4		(2) #4, lap 30 bar Ø			
Floor Sheathing	3/4" OSB				3/4" OSB			
Floor Nailing	8d @ 12" O.C. field, 6" O.C. edge		8d @ 12" field, 6" O.C. edge		8d @ 8" O.C. field, 6" O.C. edge			
Wall Sheathing	7/16" OSB		7/16" OSB		7/16" OSB			
Wall Nailing	8d @ 6" O.C.		No. 8 screws @12" O.C. field, 4" O.C. ends		Not Specified			

The structural engineering for the housing plans was completed using both the 2015 IRC prescriptive approach and using the 2015 IBC (in accordance with the Utah Statewide Amendment to the IBC). These designs were compared with the original callouts on the designer's plans provided by the client. The IBC design method was selected for the final design to optimize ease of construction and structural performance.



Deliverables

The plans were edited in pdf format to be returned to the designer, who will redraft the plans in AutoCAD. Because the houses are often usually built by volunteer groups consisting of unskilled laborers, structural detail sheets were included to improve the ease of construction. A bill of materials was included with each plan for the same reason, outlining all of the structural components required for the plans.



