

CEEn-2018CPST-003

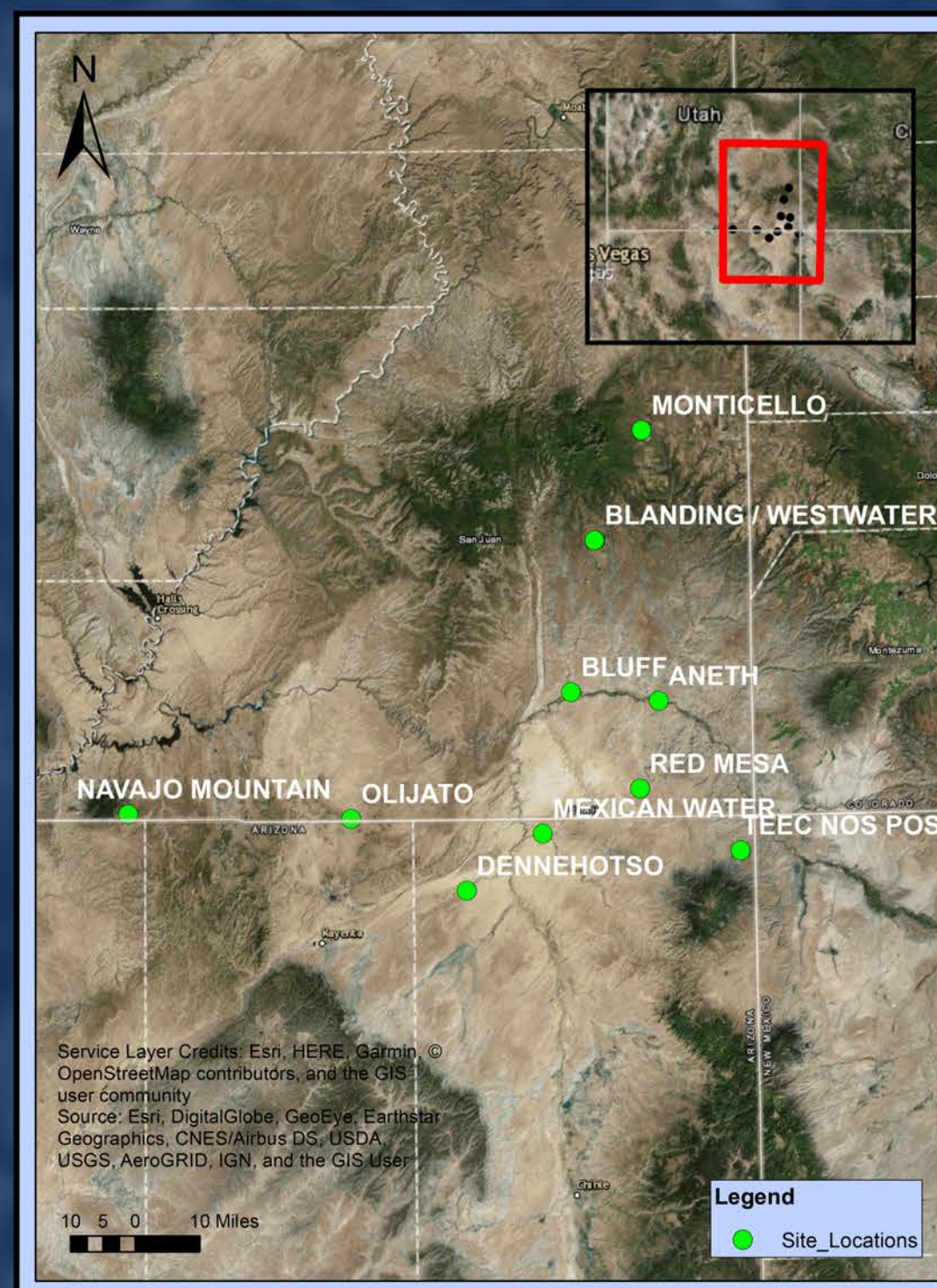
ACUTE/UNTF NAVAJO HOUSE PLANS

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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.



Design Process

Member	Acute Process/IBC		IRC		Original	
	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	
	Beam	Support (T/K)	Beam	Support (T/K)	Beam	Support (T/K)
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.

