ARROWHEAD STRUCTURAL/GEOTECHNICAL
Project ID: CEEn_2017CPST_001

by

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A Capstone Project Final Report

Submitted to

Fritzi Realty

Department of Civil and Environmental Engineering
Brigham Young University

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Executive Summary

PROJECT TITLE: Arrowhead Structural/Geotechnical
PROJECT ID: CEEn-2016CPST-001
PROJECT SPONSOR: Fritzi Realty
TEAM NAME: KADD Engineering

The following report is a summary of the work done by the structural/geotechnical team involved in the Arrowhead Site Project for Fritzi Realty as a part of the BYU Civil & Environmental Engineering Capstone program. The team was tasked with evaluating the current structural status of the existing Arrowhead Center building as well as determining the structural and geotechnical reports required by the City of Spanish Fork for further development of the area. The evaluation of the building was primarily inspection based with some basic supporting analyses included.

Two main areas of the building had steel framing: EDSCO and the East Warehouse (see Figure 16 in the appendix). Some columns have been damaged by workplace accidents in the EDSCO section. These columns should be inspected and analyzed by a licensed engineer to determine structural adequacy. Analysis of the EDSCO shed roof and warehouse open web trusses showed compliance with the current building code used in Spanish Fork. The analyses were based on measurements taken by engineers in training and should be verified by a licensed structural engineer before use in design. The East Warehouse seems to be in overall good conditions.

The portion of the Arrowhead Center that includes the wood framed structure has been inspected. A site visit revealed that many of the wooden members in this portion of the building have split or exhibit potential water damage. It is recommended that these members be inspected by a licensed structural engineer to determine any needed retrofits. There is also evidence that the masonry walls are not reinforced. We recommend that these walls be retrofitted to include proper seismic reinforcement or replaced with reinforced masonry walls.

Geotechnical reports have been reviewed and it has been determined that new structures with a bearing capacity greater than 1500 psf built on Parcel 1 will need to be placed on compacted fill. It has also been determined that Parcel 1 is located on a floodplain. If structures are built on this parcel, the effects of the floodplain will need to be taken into consideration before structural design. The soil strength of Parcels 2-4 is sufficient to support structural loads up to 2500 psf.

The inspection of the existing Arrowhead Center structure as presented in this report was performed by unlicensed engineers in training. As such, the inspection and recommendations are subject to error. The analysis performed on the structural members is based on the measurements obtained by the engineers in training and not on specific building plans, which were unavailable. The results of the analyses are based on the International Building Code, 2015 and ASCE 7-10. All observations and suggestions provided in the report are optional. Any recommendations given by the engineers in training that are used in the final design of the building should be verified by licensed structural or geotechnical engineers.

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Introduction

Fritzi Realty is planning to further develop the Arrowhead Center and Development Property in Spanish Fork, Utah. As a part of this endeavor, they have reached out to the BYU Capstone program. Several teams were formed to help facilitate the process. Arrowhead Team 1 was given responsibility for the structural and geotechnical aspects of the project.

The structural aspect of the project primarily relates to an existing building on the property. The building is owned by Fritzi Realty, who rents the building out to local businesses, such as Habitat for Humanity and EDSCO. The building is dated and thus needs a structural analysis to determine its current structural stability and its level of conformity to the current building code. If the building were to be preserved as a part of the development of the area, it may be required to determine needed retrofits and their associated costs. A basic inspection of the building was performed along with some supporting structural analyses.

Another important piece of the project is to determine what structural and geotechnical reports are required by the city of Spanish Fork for further development. This includes an extensive study of the geotechnical conditions of the site, which has previously been performed by AVEC, and structural plans for proposed buildings, which will be provided by licensed engineers. Floodplains were also considered as a part of the project. The geotechnical information in this report supports the land use proposals by Fritzi Realty and several BYU capstone teams. These proposals and a basic overview of the property can be found in the appendix (Figure 14 and Figure 15).

Schedule

October 27, 2017 – Team meeting discussing goals, expectations, and proposal tasks. Reviewed photos and documents from Fritzi Realty.

November 8, 2017 – Preliminary site visit, gathered information about the surrounding area and exterior structural information.

November 13, 2017 – Finalized and submitted initial project proposal.

January 2018 – Analyzed documents, determined requirements.

February 3, 2018 – Inspection of structural efficiency. Took measurements of structural members and determined overall safety and quality of building.

February 2018 – Determined loads and building requirements.

February-March 2018 – Preliminary structural analysis. Determination of additional analyses that may still be needed.

March-April 2018 – Discussed findings with other involved capstone groups. Determined the best options for the facility. Compiled findings and made recommendations.

April 2018 – Finalized report and formal presentation.

April 12, 2018 – Present report to Fritzi Realty.

Assumptions & Limitations

Assumptions:

- Roof dead and live loads follow ASCE 7-10
- Seismic reinforcement does not exist in masonry structure
- Sizing of structural members (no structural plans were provided)
- Z-Purlins on the side of the walls of the EDSCO shed structure are the same as the purlins supporting the roof (used for EDSCO shed roof analysis)

Limitations

- Because loads were assumed, conservative estimates were used for the loads and material grades.
- Any member that is split or damaged would need to be inspected to determine structural adequacy. This was beyond the capabilities of the capstone team.
- No structural plans were provided, so measurements had to be taken. Due to lack of time and resources, some measurements were not obtained.
- If the Z-Purlins on the walls of the EDSCO shed structure are smaller or larger than the purlins on the roof, then calculations and analysis will be conservative or non-conservative, respectively.

Design, Analysis & Results

EDSCO and East Warehouse Structures:

Many steel columns have been damaged, as shown in Figure 1. It is possible that these members are sufficient to support the loads according to the current building code. However, if the columns have yielded all the way through the cross section, they may prove unstable. The visible buckling of the flanges may also be problematic. It is therefore our recommendation to have these columns analyzed by a licensed structural engineer.

Figure 1. Damaged column in the EDSCO manufacturing facility.

Several analyses of the EDSCO structure were performed by the capstone team. The following results are simply preliminary analyses used to examine the general stability of certain areas. Analysis of the entire structure was beyond the scope of the project. The results are based upon preliminary measurements and are subject to error. Thus, they should be used for general reference only. Further measurements may be required for a more thorough and precise analysis. The preliminary measurements can be found in the structural drawings in Appendix A (Figure 17 to Figure 21). The results of the analyses were produced by unlicensed engineers in training and should thus be reviewed by licensed engineers before being used in design.

RISA 2D was used to analyze the steel Z-purlins supporting the metal deck roof in the EDSCO shed structure (shown below). A roof live load of 20 psf and a dead load of 3 psf were assumed. (Only supporting metal seam and weight of beam is included in RISA automatically.) Using ASCE 7-10, a ground snow load of 45 psf was reduced to a roof snow load of 33 psf (see Figure 22 in Appendix A). These loads were converted to linear loads of 70 plf for the roof live load (L), 10.5 plf for the dead load (D), and 116 plf for the snow load (S). Calculations for this conversion can be found in Figure 23 in Appendix A. The governing LRFD load combination was 1.2*D+1.6*S. With these loads, the Z-purlins of the roof structure in the EDSCO shed were found to be adequate to support the factored loads according to the International Building Code, 2015 and ASCE 7-10, supporting 86% of their factored capacity. The RISA analysis of these members can be seen in Figure 24 in Appendix A. Due to inadequate information, the supporting beams and columns of the EDSCO shed were not analyzed as a part of this project.

Figure 2. EDSCO shed.

For the open web roof structure in the south portion of the EDSCO building (Figure 3), an assumed dead load of 10 psf was used. Using ASCE 7-10, a ground snow load of 45 psf was reduced to a roof snow load of 28 psf (see Figure 22 in the appendix). With these loads, the open web roof structure in this section of the EDSCO warehouse building was found to be adequate to support the loads according to the span table provided by RedBuilt (shown in Table 1 in the appendix). Since building plans were not provided and we were unable to determine exactly which open web

truss type to use, we conservatively used the weakest open web joist type with the appropriate measured depth. From the table, it has been determined that even with these conservative estimates, the joists are adequate to support the existing loads. However, it is our recommendation to have a licensed structural engineer inspect these members as the trusses may have been manufactured by a different company other than RedBuilt and may therefore have less capacity.

Figure 3. EDSCO open web roof structure.

The north portion of the EDSCO Building was not analyzed due to insufficient measurement of the truss members. It should be noted that a failure occurred in the northwest corner of the roof structure of this section in recent years (exact location noted in Figure 18 in the appendix). It has since been reinforced as shown in Figure 4. This failure may have been an isolated event, but if the collapse occurred due to overall inadequacy of the roof structure, adequate reinforcement should be added to prevent further problems. As such, a more thorough analysis of this portion of the EDSCO warehouse, if not already done, should be performed to ensure the stability of the remainder of the roof structure in this area. The overall roof structure is shown in Figure 5.

Figure 4. Reinforcement at location of roof failure.

Figure 5. Roof structure in the northern portion of the EDSCO warehouse.

The East Warehouse portion of the building was not thoroughly inspected as the members were built-up and tapered and thus the analysis was beyond the expertise of the team members. This section of the building seemed to be in good condition and it is assumed that it, being newer, was built according to more current code than the rest of the building. However, it is recommended that a licensed structural engineer inspect the east warehouse to determine is structural stability.

Again, the results of the performed analyses should be used for reference only. It is recommended that a licensed structural engineer analyze the structure to assure that it is structurally stable and if retrofits will be required.

Wood Frame Structure:

Many of the wooden members in wood framed portion of the Arrowhead Center have been split, displaced, or experienced potential water damage, as shown in the figures below. It is our recommendation that these members be closely inspected and analyzed by a licensed structural engineer. Members that are determined insufficient should be retrofitted or replaced to meet the standard of the current building code.

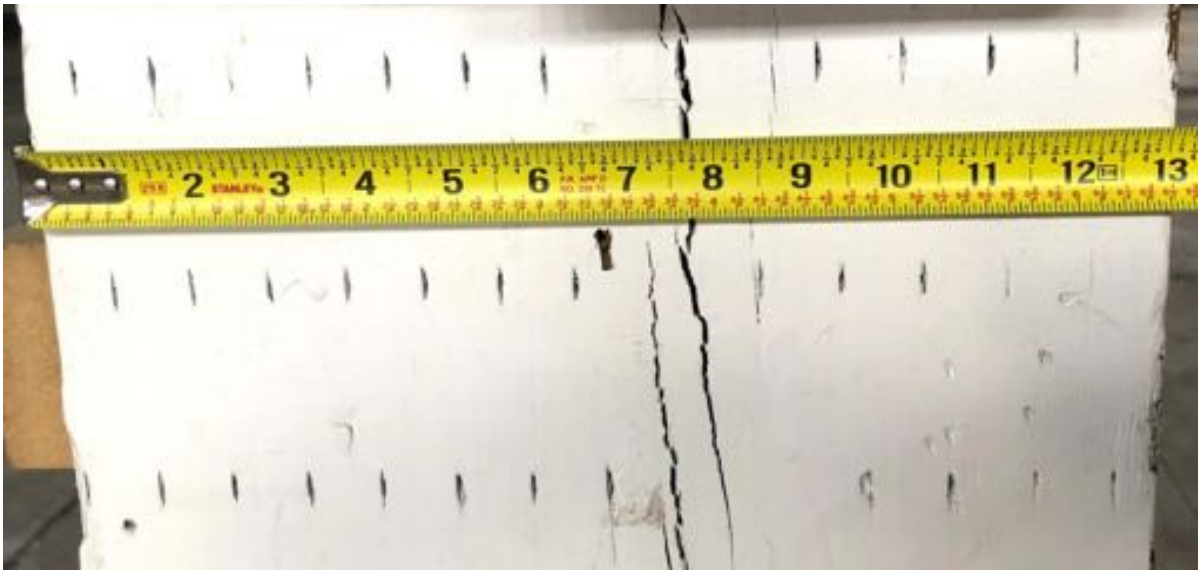

Figure 6. Split column in East Building.

Figure 7. Split beam in East Building.

Figure 8. Potential water damage in East Building.

Figure 9. Split bracing in East Building.

Figure 10. Potential Water Damage in East Building.

Figure 11. Split bracing in East Building.

Figure 12. Displaced column in West Warehouse.

There is evidence that the masonry walls are not reinforced, as shown in Figure 13. These walls may need to be retrofitted or replaced to include proper seismic reinforcement. Retrofits may include internal or external reinforcements. Internal reinforcement may include drilling holes in plane of the wall and filling with rebar and epoxy. External reinforcement may include attaching steel angles to the unreinforced walls. All walls should be analyzed and level of reinforcement should be determined before any adjustments are made.

Figure 13. Unreinforced masonry wall in the EDSCO portion of the building.

Geotechnical:

Geotechnical reports provided by AVEC have been reviewed and it has been determined that new structures placed on Parcel 1 will need to be placed on compacted fill. Heavier commercial buildings will need to have deeper compacted fill than residential structures. From the Spanish Fork Floodplain document shown in Figure 25 in the appendix, it has been determined that Parcel 1 is also located in a floodplain. This will need to considered before structural design. To account for the floodplain, soil can be added to this parcel to raise the ground level of any new structures. Other options include (but are not limited to) adding French Drains or a well to effectively lower the water table in this parcel. If this parcel of land is used as an open area or a park, no extra analysis or adjustments will need to be made. According to the geotechnical reports provided, the soil strength of parcels 2-4 is sufficient to support structural loads. All assumptions made regarding soil sufficiency should be verified by a licensed geotechnical or structural engineer. It has been determined that the geotechnical reports provided by AVEC meet the necessary requirements by the City of Spanish Fork as outlined in Figure 27 in the appendix.

Needed Reports and Studies

Reports and Studies Needed for Proposal 004

Parcel 1: Commercial – Additional geotechnical reports will be needed and drainage will need to be accounted for as this is the only parcel located in the floodplain. General structural reports needed.
Parcel 2: Commercial – General geotechnical and structural reports needed.
Parcel 3: Residential – General geotechnical and structural reports needed.
Parcel 4: Residential – General geotechnical and structural reports needed.

Reports and Studies Needed for Proposal 005

Parcel 1: Green Space – No reports or studies needed.
Parcel 2: Commercial – General geotechnical and structural reports needed.
Parcel 3: Commercial – General geotechnical and structural reports needed.
Parcel 4: Residential – General geotechnical and structural reports needed.

Reports and Studies Needed for Fritzi Realty's Proposal

Parcel 1: Mixed use – Additional geotechnical reports will be needed and drainage will need to be accounted for as this is the only parcel located in the floodplain. General structural reports needed.
Parcel 2: Commercial – General geotechnical and structural reports needed.
Parcel 3: Residential – General geotechnical and structural reports needed.
Parcel 4: Residential – General geotechnical and structural reports needed.

Lessons Learned

Some challenges encountered were setting up a site visit, obtaining building plans, and communication issues regarding expectations. To solve these issues, we worked with John Ashworth and scheduled a site visit. We continually reached out to Mitch, Fritzi Realty, LEI, and the city of Spanish Fork for more information. We were eventually able to obtain the needed information from the site visit and these other correspondences. Other challenges faced were determining what loads to use for structural analysis and determining necessary geotechnical information. To solve these issues, we used generic loads found in ASCE 7-10 and we found documents on the floodplains in Spanish Fork.

Valuable lessons were learned in the completion of this project. One of these lessons was how to effectively work with clients. We found that communication with clients is extremely important in understanding expectations and ensuring the project is done correctly. Because of difficulties in communication, changes needed to be made late in the project. However, the eventual communication that came lead to better met expectations and overall quality of the project. Valuable technical skills were also gained throughout the project, such as methods of analysis and inspection practices.

Conclusions

Preliminary inspection and analyses have been performed on the Arrowhead Center. It is our observation that the roof structures for the EDSCO shed, the south portion of the EDSCO manufacturing facility, and the East Warehouse seem to be in good shape structurally. The columns in the East Warehouse also seem sufficient. Some columns in the EDSCO portion of the building have been damaged and should be further analyzed by licensed structural engineers, as should the roof structure in the northern part of the EDSCO manufacturing facility. Some wooden members in the wood framed portion of the building have experienced splitting, displacement, or potential water damage. These members should also be inspected by licensed structural engineers. The masonry walls of the building are assumed to be reinforced and may require seismic retrofits.

The geotechnical reports provided by AVEC have been determined adequate for acceptance by the City of Spanish Fork. Any structures built on Parcel 1 that exceed 1,500 psf in bearing pressure will need to be built on compacted fill. Parcel 1 is located within a floodplain which will need to be considered during the planning phase of the development.

These conclusions have been reached by unlicensed engineers in training and should be reviewed by licensed engineers before being used in design.

Recommendations

Based upon our analyses and the conditions observed during the site visit, we suggest having a licensed structural engineer analyze all damaged members to determine structural adequacy. We also suggest having a licensed engineer analyze the structure to determine if the building is up to the standard of the current building code or if retrofitting is required. An attempt to retrofit the building would likely require extensive seismic retrofits for the unreinforced masonry.

In addition, Parcel 1 has been found to be contained within the floodplain. Adequate drainage or a water barrier will need to be provided if the land is used for industrial or residential purposes. Another option may be to reserve Parcel 1 for open space to avoid the need to adjust for the floodplain. Further research should be done by a licensed geotechnical engineer to develop a more specific recommendation for addressing the floodplain issue.

The recommendations, conclusions, and analyses provided in this report were made by unlicensed engineers in training from Brigham Young University. They are to be taken as preliminary and used for reference only. Any design based upon the results of this report should be verified by licensed engineers.

Appendix A

Figure 14. Capstone teams' land use proposals.

Figure 15. Fritzi Realty's land use proposal.

Figure 16. Arrowhead Center configuration.

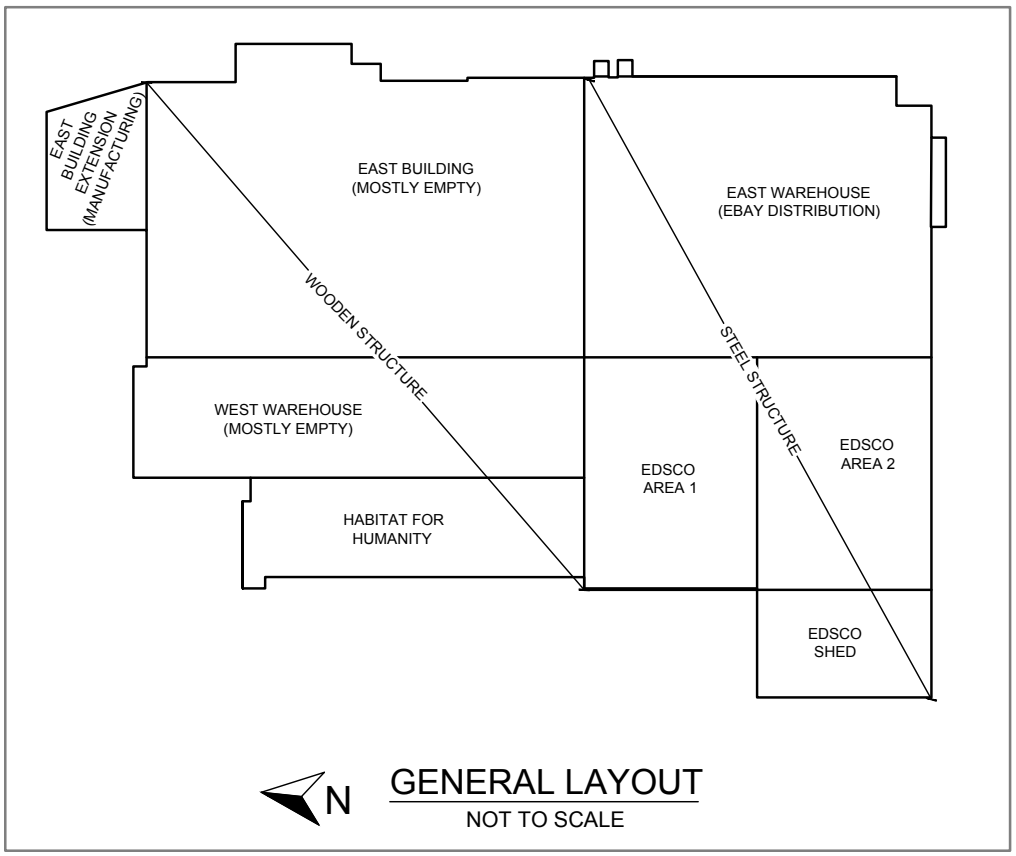

Figure 17. Arrowhead Development Center general layout.

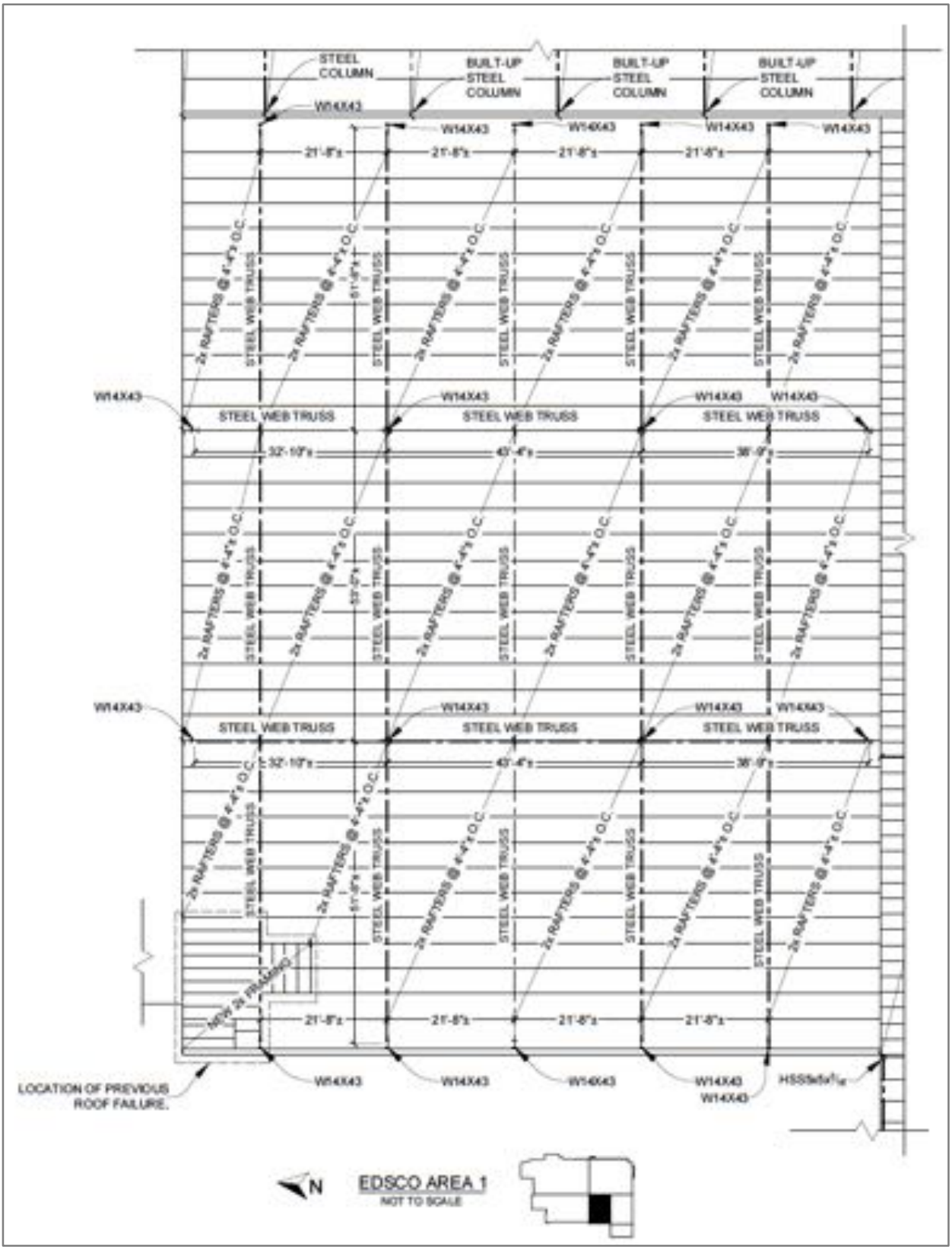

Figure 18. EDSCO Area 1 approximate structural plan.

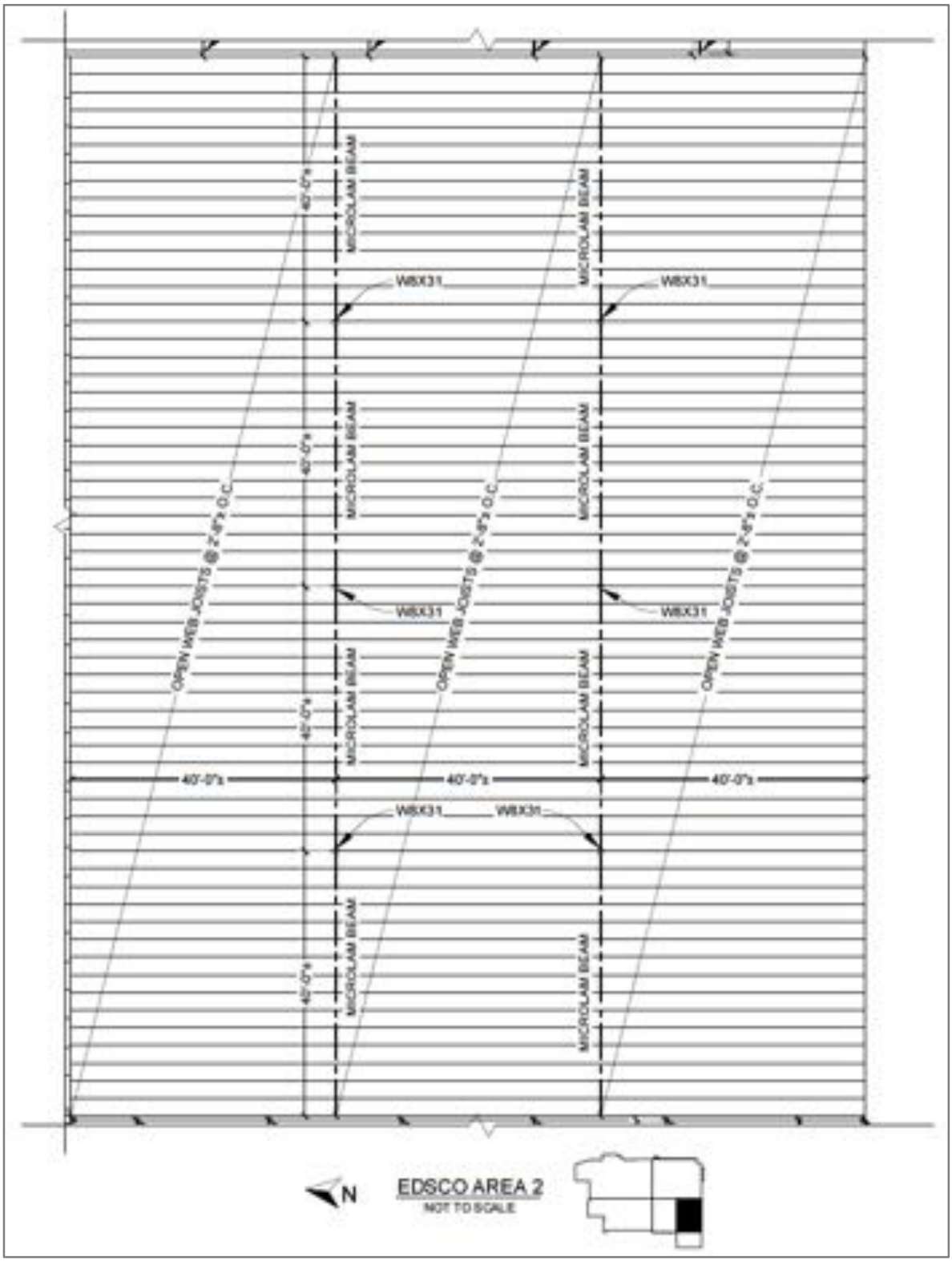

Figure 19. EDSCO Area 2 approximate structural plan.

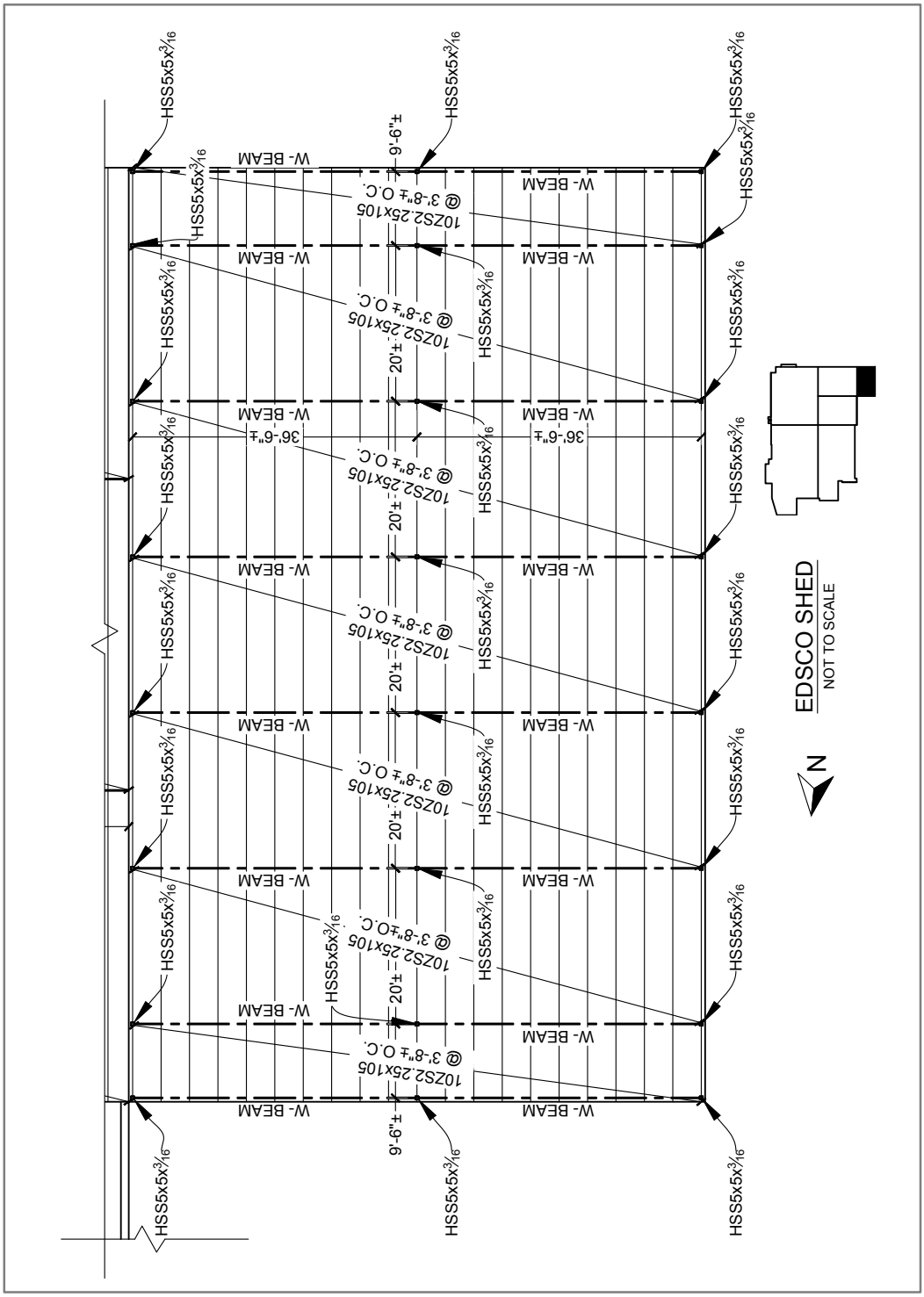

Figure 20. EDSCO Shed approximate structural plan.

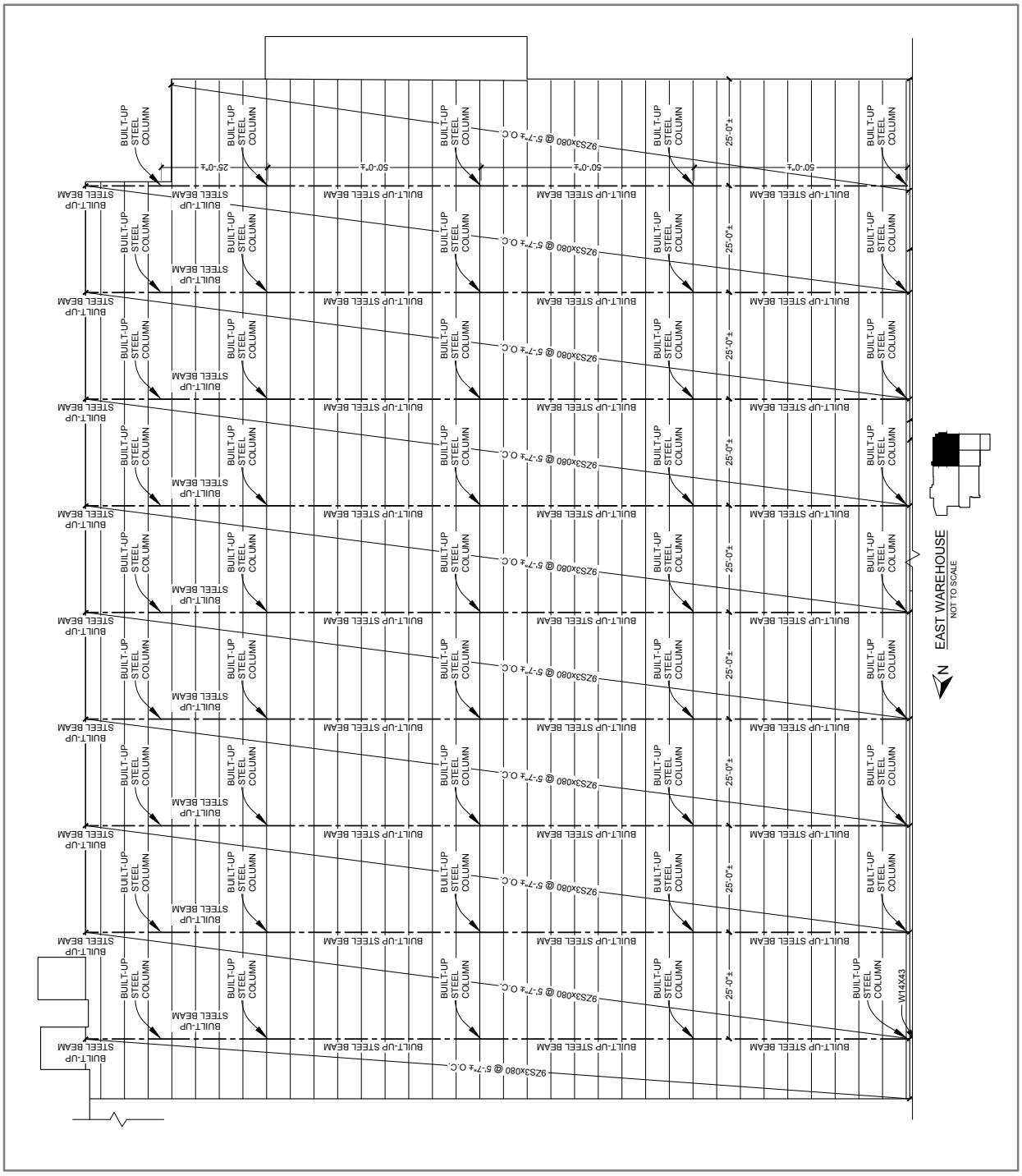

Figure 21. East Warehouse approximate structural plan.

P_0	43
S	63
A_0	4.5
Elevation	4642 ft

EDSCO Shed Snow Load		
C_e (ASCE 7-10 Table 7-2)	0.9	
C_t (ASCE 7-10 Table 7-3)	1.2	
I_s (ASCE 7-10 Table 1.5-2)	1	
p_g (for Spanish Fork, Utah	43.9	psf
p_f (ASCE 7-10 Eq. 7.3-1)	**33.2**	psf

EDSCO Area 1 Snow Load		
C_e (ASCE 7-10 Table 7-2)	0.9	
C_t (ASCE 7-10 Table 7-3)	1	
I_s (ASCE 7-10 Table 1.5-2)	1	
p_g (for Spanish Fork, Utah	43.9	psf
p_f (ASCE 7-10 Eq. 7.3-1)	**27.7**	psf

Figure 22. EDSCO area snow load calculations.

EDSCO Shed Linear Load Calculations

Area Loads (lb/ft²):

$$L_0 = 30\frac{lb}{ft^2} \qquad D_0 = 3\frac{lb}{ft^2} \qquad S_0 = 33\frac{lb}{ft^2}$$

Tributary Width (ft):

$$W_T = 3.5ft$$

Linear Loads (lb/ft):

$$L = L_0 \cdot W_T = 105 \cdot \frac{lb}{ft} \quad D = D_0 \cdot W_T = 10.5 \cdot \frac{lb}{ft} \quad S = S_0 \cdot W_T = 115.5 \cdot \frac{lb}{ft}$$

Figure 23. EDSCO shed linear load calculations.

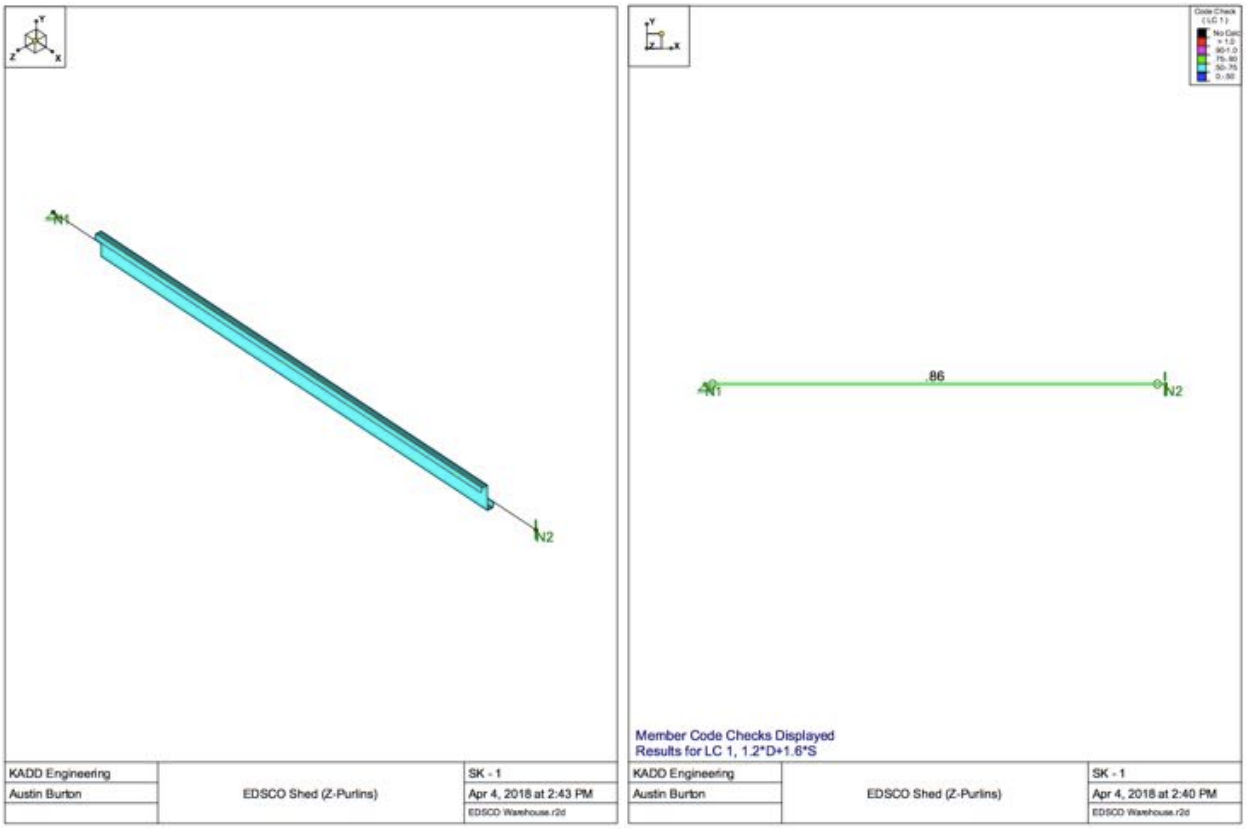

Figure 24. RISA analysis of the Z-purlins supporting the EDSCO shed roof.

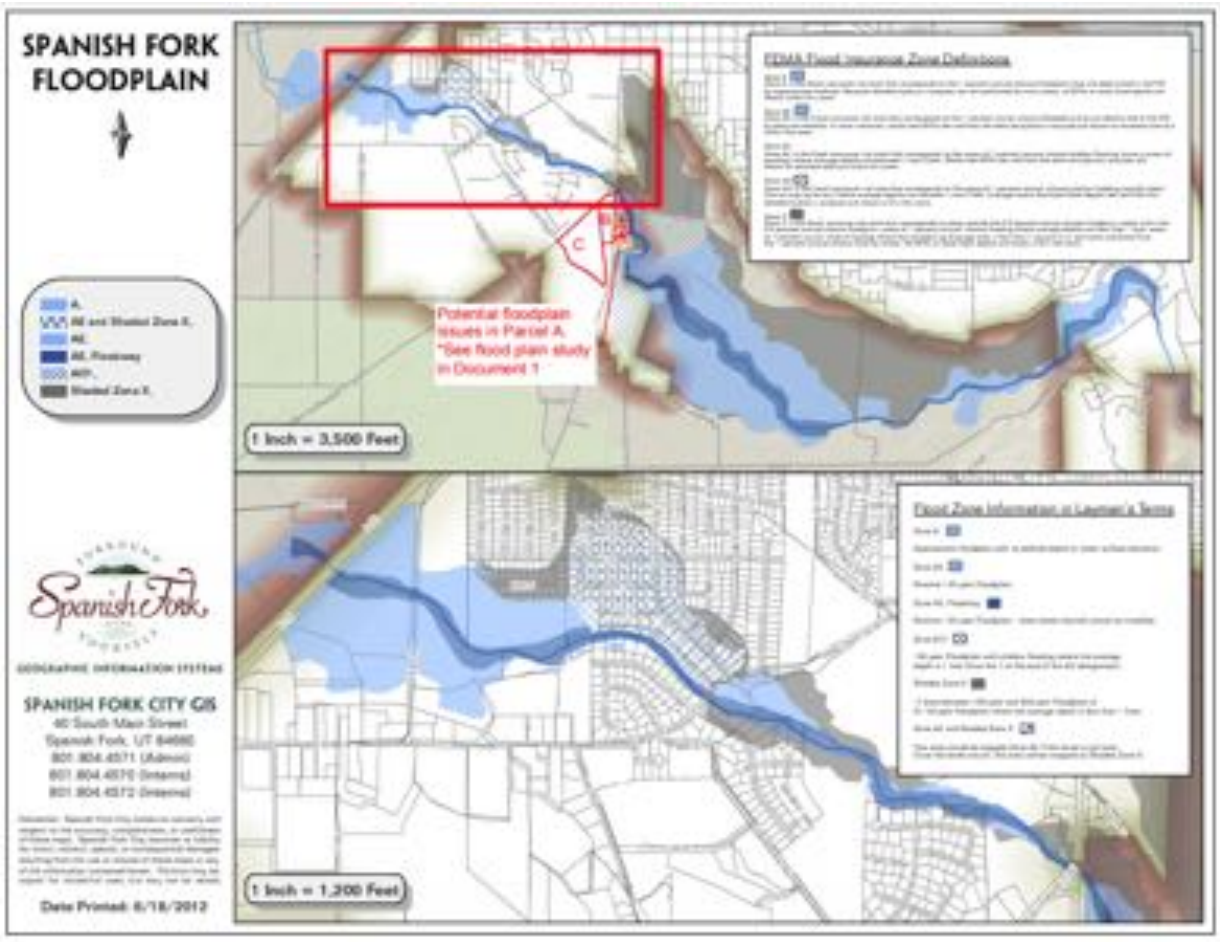

Figure 25. Spanish Fork floodplain.

Table 1: Open Web Joist Capacity Check.

RED-L™ TRUSS ALLOWABLE UNIFORM LOAD TABLE (PLF) / PARALLEL CHORD

Continued from page 6

SEE PAGE 4 FOR ECONOMICAL TRUSS DESIGN

Span	Depth 20"		30"		32"		34"		36"		38"		40"	
14'	307	354	296	338	291	333	275	315	262	304	264	305	244	280
		371		371		357		343		329		328		304
16'	333	351	331	338	283	326	286	332	261	296	257	292	240	277
		368		347		335		322		307		305		301
18'	278	308	276	315	276	303	261	289	258	280	252	286	235	264
		340		345		334		315		301		287		304
20'	271	321	264	312	259	296	257	279	259	260	234	264	236	256
	249	336	267	323		335		305		284		289		275
22'	260	305	263	287	238	279	236	259	241	258	229	256	224	238
	267	325	226	316		301		282		281		278		259
24'	229	288	253	291	243	287	222	272	227	261	218	234	213	246
	182	298	190	302	210	296		281		284		271		252
26'	195	275	217	272	237	272	228	266	222	256	222	255	212	233
	154	275	164	276	178	272	195	276	214	278		268		250
28'	177	233	214	253	220	253	220	253	208	251	198	235	208	232
	130	248	139	257	158	257	169	254	184	255	193	249		232
30'	164	196	172	216	200	217	206	216	204	216	206	218	205	218
	108	226	122	238	132	241	148	242	160	239	174	231	185	219
32'	151	184	158	197	170	212	180	207	193	207	193	215	193	203
	90	199	100	214	124	225	125	217	137	222	151	215	162	207
34'	137	162	147	174	157	187	165	190	181	208	182	200	182	190
	76	176	87	186	93	204	107	210	118	208	130	200	141	190
36'	123	146	132	159	146	166	151	171	161	180	172	187	172	179
	66	151	76	163	84	174	92	185	103	195	114	188	124	179
38'	113	134	119	134	127	144	136	152	144	163	152	167	163	171
	57	135	64	147	72	157	82	167	91	177	98	180	109	172
40'	99	121	109	122	117	130	125	139	125	146	140	153	148	162
	49	122	56	132	64	141	71	150	79	160	87	164	95	162
42'	92	110	99	104	107	117	114	125	121	133	128	141	133	147
	43	122	49	120	55	128	62	136	69	145	77	153	83	150
44'	78	92	90	98	98	107	105	114	109	121	116	129	121	131
	38	100	43	109	48	117	55	125	61	133	67	140	74	139
46'	76	84	82	92	86	98	93	105	99	112	105	118	112	124
	34	91	38	100	43	106	49	114	54	121	60	129	66	131
48'	76	79	73	84	81	90	86	96	91	102	96	108	103	113
	30	86	34	92	38	98	43	105	49	110	54	118	59	124
50'		72	69	78	73	83	80	89	85	94	90	100	95	103
		78	30	85	34	90	38	96	43	101	48	108	52	115
52'		66		72	70	77	76	82	78	87	83	93	88	97
		73		78	31	84	34	89	38	95	43	100	47	106
54'		62		68		73	69	76	73	81	75	86	82	90
		68		73		78	31	83	35	88	38	93	42	94
56'		58		62		69		69	68	76	72	81	78	83
		65		65		74		78	31	84	35	88	38	93
58'		55		57		65		64		68	67	77	75	82
		58		62		68		75		79	32	80	35	88
60'		50		55		60		64		67		75	66	75
		50		61		65		68		72		78	32	83

• See page 5 for available depths and profiles. For depths and profiles not shown, contact your Redbuilt technical representative for assistance.

• Red numbers refer to 125% Total Load (TL).

Snow Load	28	psf
Dead Load	10	psf
Total Load	38	psf
Roof Trib	3	ft
(TL)(Trib)	114	plf
Joist Capacity	129	plf

since TL < Joist capacity, the joists are sufficent

Figure 26. Open web joist loads and capacity.

3. Geotechnical Report Requirements. The results of the field and laboratory programs shall be evaluated by a Utah registered professional geotechnical engineer. Based on the results of their evaluation, an engineering report shall be prepared that details the results of the testing performed, provides logs of the borings and a diagram of the site/boring layout and provides geotechnical recommendations and information regarding following:

   a. General suitability of the site for the planned development
   b. Recommended precautions and limitations
   c. Subsurface exploration procedures
   d. Soil and rock conditions encountered
   e. Groundwater depth during and after drilling
   f. Geologic setting
   g. Geologic hazards
   h. Slope stability including provisions, recommendations and designs to mitigate the effects of unstable slopes and other geologic hazards that may adversely impact planned developments above and below the slope(s)
   i. Special design and construction provisions for footings or foundations near steep slopes, including type and depth of foundation system and set back distance from slopes
   j. Surface water runoff control and drainage
   k. Subsurface drainage
   l. Site grading and earthwork requirements, as appropriate

Detailed individual boring logs and graphical cross sections summarizing soil / rock profiles and slope stability analysis and results shall be included in the geotechnical report. The logs shall contain sufficient detail to render a clear description of the soil stratigraphy, soil descriptions and classifications, SPT blow counts, sample locations and depths, ground water depths and appropriate laboratory test results. Individual boring logs shall include a description of the boring location, exploration equipment used, relative or actual elevation, date of exploration and other pertinent information relative to the field exploration. The cross sections shall contain sufficient detail to render a clear description of the slope stability analysis results and any mitigation measures required. The cross sections shall contain soil profile data and a summary of engineering properties and parameters used in the analysis for each significant soil / rock layer.

The final geotechnical report shall bear the geotechnical engineer's stamp and seal. One (1) electronically submitted PDF copy of the report shall be delivered to the City of Spanish Fork within sufficient time for review and comment. The City will have the report reviewed by its own geotechnical engineer. The cost of that review will be borne by the applicant.

Figure 27. Spanish Fork City geotechnical report requirements.

Kendl Hansen

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Phone: 951-805-0474 E-Mail: kendlhansen92@gmail.com

Objective

Show experience and qualification in skills and education for Civil Engineering.

Experience (Reference contact info upon request)

BYU Men's Tennis Team – Assistant Coach

Fall 2014-Fall 2015

- Assisted in running practices, developing the games of our players from a technical and strategic approach. I also coached on court during our intercollegiate matches, helping to keep the players focused and developing the right strategies to win.

Riverside Country Club

Spring 2015-Present

- Designed and scheduled the tennis program at RCC as the head tennis professional.
- Led many groups of tennis players from competitive juniors, to recreational seniors and everywhere in between (ages 3-60+) My skills in communication helped me to adapt to all ages and skill levels leading to the most success Riverside Country Club's tennis program has ever experienced.
- Oversaw the hiring of a second coach to help bear the burden of the popularity of the program.

Vector Structural Engineers

Spring 2017-Present

- Analyzing a variety of roof structures to determine adequacy for solar installation.
- Performing foundation designs for ground-mounted solar arrays.
- Train new interns on methods for producing quality analyses on structures in order to determine adequacy for solar installation, both roof and ground mounted.
- Develop retrofit designs to enhance structural adequacy for increased loading by solar arrays.

Education

- Graduated from McKinney Boyd High School in 2010.
- Furthered my education at BYU, where I'm currently studying Civil Engineering, projected to graduate in April of 2018 with a Bachelor's degree in Civil Engineering.

Skills

I have found that many of the skills I have acquired through my tennis career transfer directly to engineering. I work very well with people, and help to unify and include individuals working toward a specific goal. I also have a strong background in mathematics and physics directly relating to structural analysis, and am able to assess basic problems. I have an entry-level understanding of engineering software such as CAD design, Revit, and RISA 3D. I am proficient in Microsoft Office, VBA, and Bluebeam.

David G. Davies

(385) 321-7704 · dgdavies33@gmail.com

EDUCATION

Brigham Young University- Ira. A Fulton College of Engineering & Technology
Pursuing a Bachelor of Science in Civil Engineering

EXPERIENCE

Project Manager (Internship)
Vector Structural Engineers
Sandy, UT · May 2016 – Present

- Perform structural analysis on roofs for solar panel set-up, residential and commercial.
- Perform structural analysis on foundations for ground-mounted solar panels.
- Study different design systems and decide which to implement based on safety, practicality, and cost efficiency.
- Work directly with clients: provide engineering letters, list retrofit options, answer questions, email, etc.
- Train new employees in solar analysis, RISA 3D analysis, office policies, using Bluebeam, etc.
- Design retrofitted roof systems to support excess loads using excel programs, AutoCAD, and RISA 3D.
- Design preliminary setup of monopole/monopine using tnxTower.

Teaching Assistant
Brigham Young University
Provo, UT · August 2015 – May 2016

- Work with 150+ students to understand key concepts of mechanics for statics (course ID: CEEn 103).
- Prepare students for exams by giving review lectures and answer conceptual questions.
- Grade weekly homework and exams for 50+ students.

Construction Worker
Cornerstone Concrete LLC.
Lehi, UT · May 2014 – September 2015

- Learned firsthand how to develop strong foundations and use necessary and cost-efficient materials for various sizes of structures.
- Teamed with other employees to complete various tasks (set up job site, designed and put together concrete forms, etc.).

SKILLS

- Proficient in building design software (RISA 3D, AutoCAD, Revit, tnxTower), Excel (Visual Basic), Word, and Bluebeam.

Austin Burton

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Objective

Present related experience and qualifications in civil engineering

Education

Civil and Environmental Engineering
January 2015-Present
Brigham Young University *Expected*
Graduation June 2018

- Current GPA 3.95/ 4.0
- Pursuing a degree in Civil and Environmental Engineering with a structural emphasis
- Related Coursework
  - Educated in Statics, Structural Analysis, Mechanics of Materials
  - Programming and Calculations in Excel and VBA
  - Modelling in CAD and Revit
- Participated in ASCE and SEAU in order to learn more about the civil engineering field as well as use my knowledge and skills to serve others

Experience

Structural Drafting February 2017-Present
Dean L. Webb & Associates

- Created structural/architectural drawings in AutoCAD
- Accompanied and aided engineers on site visits
- Worked closely under structural engineers

Construction Summer 2012
Private Contracting

- Aided in the construction of a cabin, including detail work
- Learned practical construction skills to better perform my tasks
- Labored closely alongside an experienced private contractor, providing a quick learning experience

Custodian- Lead Student January 2015-February 2017
Brigham Young University

- Cleaned and maintained the chemistry building on campus
- Trained new employees to help them understand their assignments
- Early hours (4:30 a.m.)

DANIEL SCHWICHT

dewschwicht@gmail.com | 385.204.3852

EDUCATION

- **Civil Engineering Master of Science** (Anticipated) April 2018
  Brigham Young University, mentored by Dr. Kyle Rollins
- **Civil Engineering Bachelor of Science** June 2017
  Brigham Young University; 3.01 GPA

RELEVANT EMPLOYMENT

- **High-speed Rail Abutment Graduate Research Assistant** 2017 - present
  Brigham Young University, mentored by Dr. Kyle Rollins
  - Organized and reported data for large-scale testing of earthquake loading of abutment
  - Reported findings for immediate implementation by Caltrans
- **Materials Testing Technician** 2016
  RBG Engineering; Provo, UT
  - Performed gradations (grain size), field and lab concrete tests, nuclear density tests, asphalt burn and rice tests, Atterbergs, etc.
  - Trained new employees in ASTM standards and lab and field procedures
- **Geotechnical Engineering, Materials Testing, and AutoCAD Intern** 2013 - 2015
  Hattenburg Dilley & Linnell Engineering Consultants; Anchorage, AK
  - Worked in certified lab, geotechnical drilling, and in field
  - Corrected and verified drawings in Autodesk, ArcGIS

VOLUNTEER AND LEADERSHIP EXPERIENCE

- **Full-time Religious and Service Missionary** 2010 - 2012
  Baltimore, MD
  - Two full years of unpaid, voluntary teaching and community service
  - Developed contacts by word of mouth and referrals
  - Trained other missionaries in teaching, contacting, etc.

AWARDS AND ACCOMPLISHMENTS

- **Benjamin B. Talley engineering scholarship recipient** 2014
  Society of American Military Engineers, Anchorage Alaska chapter
- **Eagle Scout** 2009
  Boy Scouts of America, Great Alaska Council
  - Coordinated Eagle Scout service project landscaping at Blood Bank of Alaska
  - Directed over 500 man hours of service and solicited donations of construction materials

SKILLS AND CERTIFICATIONS

- Professional experience with Autodesk, ArcGIS, Excel, Word, and some Visual Basic (VBA)
- Troxler Nuclear Gauge Operator certified, HAZMAT certified, 2013
- American Concrete Institute (ACI) Concrete Strength Testing certified, 2013
- ACI Concrete Field Testing certified, 2013
- Spanish translation experience, 2010 - 2012