



Board of Adjustment Staff Report

Meeting Date: March 7, 2019

Agenda Item: 8A

ADMINISTRATIVE PERMIT CASE NUMBER: WADMIN19-0001 (Matt and Angie Bussell Detached Accessory Structure)

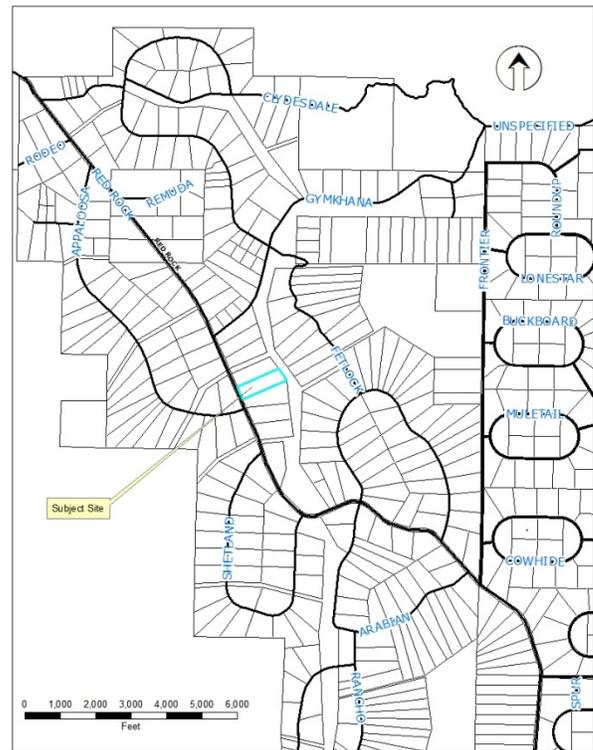
BRIEF SUMMARY OF REQUEST: Detached Accessory Structure 2000 square feet in size, that is larger than the main dwelling on the parcel, which is 1538 square feet in size.

STAFF PLANNER: Planner's Name: Roger Pelham, Senior Planner
Phone Number: 775.328.3622
E-mail: rpelham@washoecounty.us

CASE DESCRIPTION

For possible action, hearing, and discussion to approve an Administrative Permit to allow the construction of a Detached Accessory Structure 2000 square feet in size, that is larger than the main dwelling on the parcel, which is 1538 square feet in size. The proposed structure is a "Kit Pole Building for Agricultural and Storage Use." The structure is proposed to be located on the western portion of the parcel, to the south of the existing dwelling.

Applicant: Matt and Angie Bussell
Property Owner: Matt and Angie Bussell
Location: 16400 Red Rock Road, approximately 300 feet north of its intersection with Appaloosa Circle
APN: 078-212-02
Parcel Size: ± 11.98 Acres
Master Plan: Rural Residential (RR)
Regulatory Zone: Low Density Rural (LDR)
Area Plan: North Valleys
Citizen Advisory Board: North Valleys
Development Code: Authorized in Article 306, Accessory Uses and Structures
Commission District: 5 – Commissioner Herman



Vicinity Map

STAFF RECOMMENDATION

APPROVE

APPROVE WITH CONDITIONS

DENY

POSSIBLE MOTION

I move that, after giving reasoned consideration to the information contained in the staff report and information received during the public hearing, the Board of Adjustment approve Administrative Permit Case Number WADMIN19-0001 for Matt and Angie Bussell, having made all five findings in accordance with Washoe County Development Code Section 110.808.25.

(Motion with Findings on Page 8)

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Conditions of Approval Exhibit A

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Public Notice Exhibit C

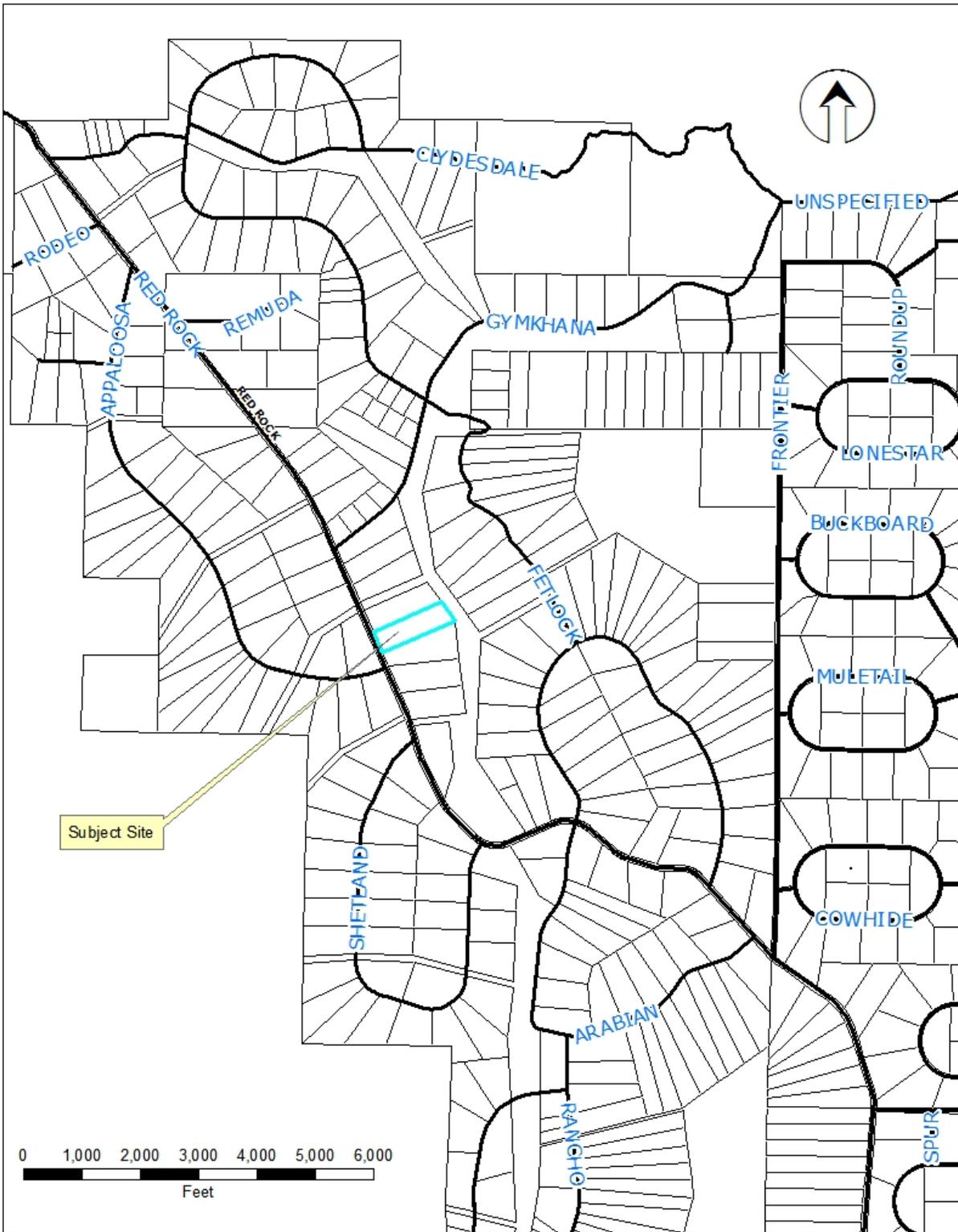
Project Application Exhibit D

Administrative Permit Definition

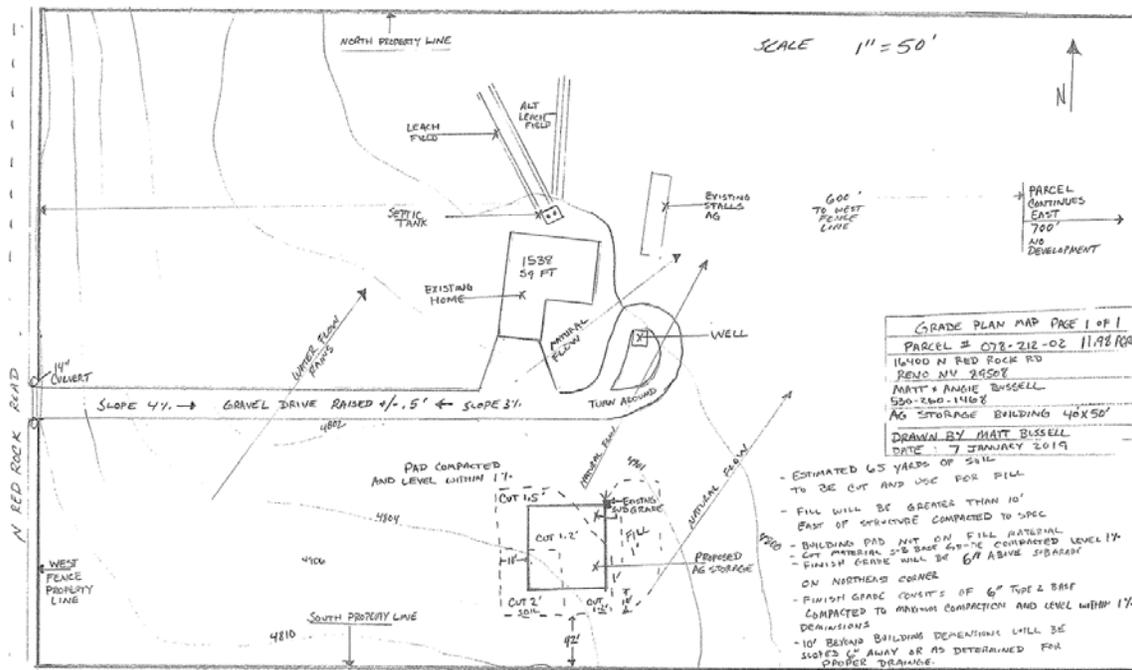
The purpose of an Administrative Permit is to provide a method of review for a proposed use which possess characteristics that requires a thorough appraisal in order to determine if the use has the potential to adversely affect other land uses, transportation or facilities in the vicinity. The Board of Adjustment or the Hearing Examiner may require conditions of approval necessary to eliminate, mitigate, or minimize to an acceptable level any potentially adverse effects of a use, or to specify the terms under which commencement and operation of the use must comply. Prior to approving an application for an administrative permit, the Board of Adjustment must find that all of the required findings, if applicable, are true.

The Conditions of Approval for Administrative Permit Case Number WADMIN19-0001 is attached to this staff report at Exhibit A, and will be included with the Action Order, if approval is granted.

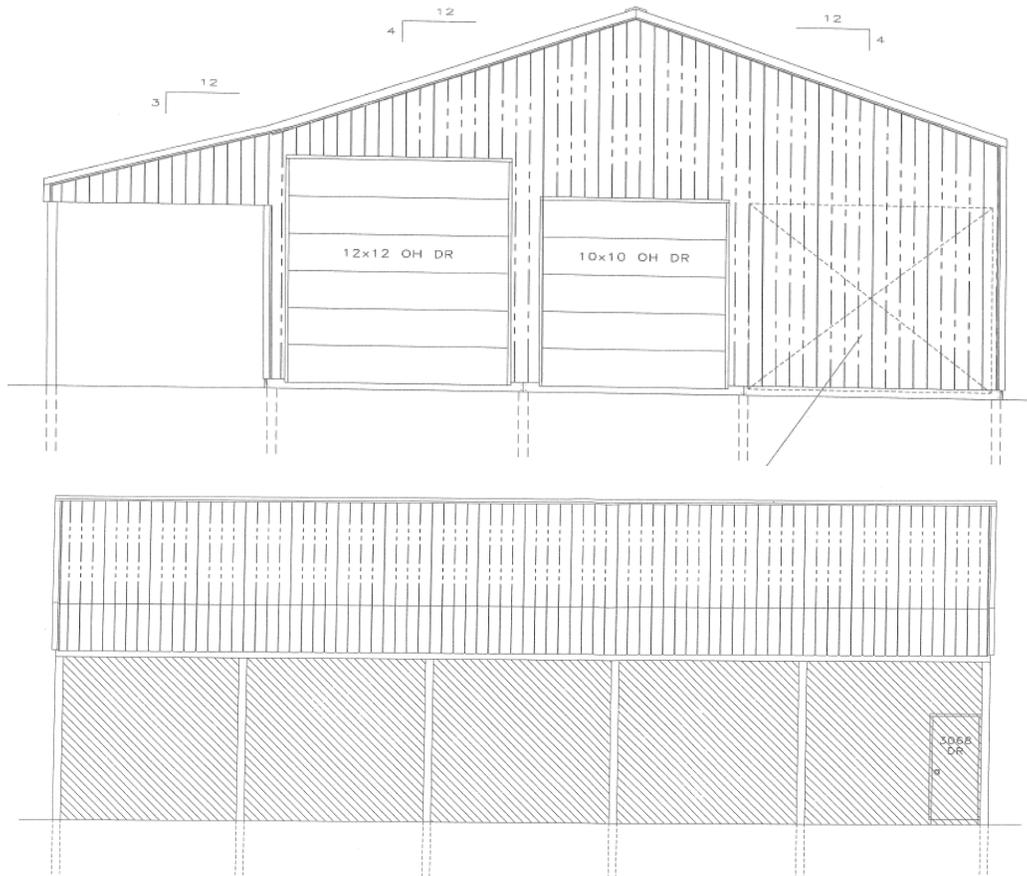
The subject property is designated as Low Density Rural (LDR). Detached accessory structures, larger than the main dwelling on the same parcel of land are permissible in the LDR zone, subject to the approval of an Administrative Permit in accordance with WCC 110.306.



VICINITY MAP



Site Plan



Building Elevations



Subject Site, Looking East From Red Rock Road

Project Evaluation

The section of the Washoe County Development Code that is relevant to this Administrative Permit request follows:

Section 110.306.10 Detached Accessory Structures. Detached accessory structures are defined in Article 304, Use Classification System, under Section 110.304.15, Residential Use Types. The following development requirements shall apply to detached accessory structures:

(d) Size. A proposal to establish a detached accessory structure that is larger (i.e. has more square footage or a larger building footprint) than the existing main structure shall require the approval of an Administrative Permit (pursuant to Article 808), to include review of building height and architectural compatibility with surrounding dwellings, prior to the issuance of a building permit. Parcels 40 acres in size or larger in the General Rural (GR) and General Rural Agricultural (GRA) Regulatory Zones, and all parcels in the Commercial and Industrial Regulatory Zones, are exempt from this requirement.

The proposed detached accessory structure is within the allowed building height for the LDR regulatory zone. The proposed detached accessory structure is architecturally compatible with surrounding development patterns and is proposed to be painted the same color as the dwelling on the same parcel of land. There is no significant topography that would create impacts upon surrounding dwellings due to construction of the proposed detached accessory structure.

North Valleys Citizen Advisory Board (NVCAB)

The proposed project was presented by the applicant's representative at the regularly scheduled Citizen Advisory Board meeting on February 11, 2019. The CAB took action to recommend approval of the administrative permit as requested. No concerns were expressed by the CAB.

Reviewing Agencies

The following agencies received a copy of the project application for review and evaluation.

- Washoe County Community Services Department
 - Engineering and Capital Projects Division
 - Planning and Building Division
- Washoe County Health District
 - Air Quality Management Division
 - Environmental Health Services Division
- Regional Transportation Commission
- Washoe-Storey Conservation District

Two of the six above-listed agencies/departments provided comments and/or recommended conditions of approval in response to their evaluation of the project application. A **summary** of each agency's comments and/or recommended conditions of approval and their contact information is provided. The Conditions of Approval document is attached to this staff report and will be included with the Action Order.

- Washoe County Planning and Building Division addressed technical requirements for Fire Code, and general requirements for Administrative Permits.
Contact – Dan Holly, 775.328.2027, dholly@washoecounty.us and Roger Pelham, 775.328.3622 rpelham@washoecounty.us
- Washoe County Engineering addressed technical requirements for grading and drainage in conjunction with submission of required building permits.
Contact – Leo Vesely, 775.328.2041, lvesely@washoecounty.us

Staff Comment on Required Findings

WCC 110.808.25 requires that all of the following findings be made to the satisfaction of the Washoe County Board of Adjustment before granting approval of the administrative permit request. Staff has completed an analysis of the application and has determined that the proposal is in compliance with the required findings as follows:

1. Consistency. That the proposed use is consistent with the action programs, policies, standards and maps of the Master Plan and the North Valleys Area Plan.
Staff Comment: There are no policies or action programs within the North Valleys Area Plan that prohibit the construction of a detached accessory structure that is larger than the main dwelling on the same parcel of land. The construction of a detached accessory structure that is larger than the main dwelling on the same parcel of land is permissible subject to the approval of this Administrative Permit within the LDR regulatory zone.
2. Improvements. That adequate utilities, roadway improvements, sanitation, water supply, drainage, and other necessary facilities have been provided, the proposed improvements are properly related to existing and proposed roadways, and an adequate public facilities determination has been made in accordance with Division Seven.

Staff Comment: There are utilities, roadway improvements, sanitation, water supply, drainage, and other necessary facilities existing at this time. The proposed detached accessory structure that is larger than the main dwelling on the same parcel of land will not create additional impact upon those facilities.

3. Site Suitability. That the site is physically suitable for a detached accessory structure that is larger than the main dwelling on the same parcel of land, and for the intensity of such a development.

Staff Comment: Detached accessory structures that are larger than the main dwelling on the same parcel of land are common in the surrounding area. The site is physically suitable for a detached accessory structure that is larger than the main dwelling on the same parcel of land, and for the intensity of such a development.

4. Issuance Not Detrimental. That issuance of the permit will not be significantly detrimental to the public health, safety or welfare; injurious to the property or improvements of adjacent properties; or detrimental to the character of the surrounding area.

Staff Comment: The location proposed for the detached accessory structure that is larger than the main dwelling on the same parcel of land, maintains a setback from all property lines that is greater than the minimum requirements of the LDR regulatory zone and thus issuance of the permit will not be significantly detrimental to the public health, safety or welfare; injurious to the property or improvements of adjacent properties; or detrimental to the character of the surrounding area.

5. Effect on a Military Installation. Issuance of the permit will not have a detrimental effect on the location, purpose or mission of the military installation.

Staff Comment: There is no military installation in the area required to be noticed for this administrative permit, therefore there is no detrimental effect on the location, purpose or mission of a military installation.

Recommendation

Those agencies which reviewed the application recommended conditions in support of approval of the project. Therefore, after a thorough analysis and review, Administrative Permit Case Number WADMIN19-0001 for Matt and Angie Bussell is being recommended for approval with conditions. Staff offers the following motion for the Board's consideration.

Motion

I move that, after giving reasoned consideration to the information contained in the staff report and information received during the public hearing, the Board of Adjustment approve Administrative Permit Case Number WADMIN19-0001 for Matt and Angie Bussell, having made all five findings in accordance with Washoe County Development Code Section 110.808.25:

1. Consistency. That the proposed use is consistent with the action programs, policies, standards and maps of the Master Plan and the North Valleys Area Plan;
2. Improvements. That adequate utilities, roadway improvements, sanitation, water supply, drainage, and other necessary facilities have been provided, the proposed improvements are properly related to existing and proposed roadways, and an adequate public facilities determination has been made in accordance with Division Seven;
3. Site Suitability. That the site is physically suitable for a detached accessory structure, larger than the dwelling on the same parcel of land, and for the intensity of such a development;

4. Issuance Not Detrimental. That issuance of the permit will not be significantly detrimental to the public health, safety or welfare; injurious to the property or improvements of adjacent properties; or detrimental to the character of the surrounding area;
5. Effect on a Military Installation. Issuance of the permit will not have a detrimental effect on the location, purpose or mission of the military installation.

Appeal Process

Board of Adjustment action will be effective 10 calendar days after the written decision is filed with the Secretary to the Board of Adjustment and mailed to the original applicant, unless the action is appealed to the Washoe County Board of County Commissioners, in which case the outcome of the appeal shall be determined by the Washoe County Board of County Commissioners. Any appeal must be filed in writing with the Planning and Building Division within 10 calendar days from the date the written decision is filed with the Secretary to the Board of Adjustment and mailed to the original applicant.

Applicant/Property Owner: Matt and Angie Bussell
16400 Red Rock Road
Reno, NV 89508

Representatives: Tom Hoyle
2336 Jacobsen Lane
Gardnerville, NV 89410



Conditions of Approval

Administrative Permit Case Number WADMIN19-0001

The project approved under Administrative Permit Case Number WADMIN19-0001 shall be carried out in accordance with the Conditions of Approval granted by the Board of Adjustment on March 7, 2019. Conditions of Approval are requirements placed on a permit or development by each reviewing agency. These Conditions of Approval may require submittal of documents, applications, fees, inspections, amendments to plans, and more. These conditions do not relieve the applicant of the obligation to obtain any other approvals and licenses from relevant authorities required under any other act or to abide by all other generally applicable Codes, and neither these conditions nor the approval by the County of this project/use override or negate any other applicable restrictions on uses or development on the property.

Unless otherwise specified, all conditions related to the approval of this Administrative Permit shall be met or financial assurance must be provided to satisfy the conditions of approval prior to issuance of a grading or building permit. The agency responsible for determining compliance with a specific condition shall determine whether the condition must be fully completed or whether the applicant shall be offered the option of providing financial assurance. All agreements, easements, or other documentation required by these conditions shall have a copy filed with the County Engineer and the Planning and Building Division.

Compliance with the conditions of approval related to this Administrative Permit is the responsibility of the applicant, his/her successor in interest, and all owners, assignees, and occupants of the property and their successors in interest. Failure to comply with any of the conditions imposed in the approval of the Administrative Permit may result in the initiation of revocation procedures.

Operational Conditions are subject to review by the Planning and Building Division prior to the renewal of a business license each year. Failure to adhere to the Operational Conditions may result in the Planning and Building Division recommending that the business license not be renewed until conditions are complied with to the satisfaction of Washoe County.

Washoe County reserves the right to review and revise the conditions of approval related to this Administrative Permit should it be determined that a subsequent license or permit issued by Washoe County violates the intent of this approval.

For the purpose of conditions imposed by Washoe County, “may” is permissive and “shall” or “must” is mandatory.

Conditions of Approval are usually complied with at different stages of the proposed project. Those stages are typically:

- Prior to permit issuance (i.e., grading permits, building permits, etc.).
- Prior to obtaining a final inspection and/or a certificate of occupancy.
- Prior to the issuance of a business license or other permits/licenses.
- Some “Conditions of Approval” are referred to as “Operational Conditions.” These conditions must be continually complied with for the life of the project or business.

FOLLOWING ARE CONDITIONS OF APPROVAL REQUIRED BY THE REVIEWING AGENCIES. EACH CONDITION MUST BE MET TO THE SATISFACTION OF THE ISSUING AGENCY.

Washoe County Planning and Building Division

1. The following conditions are requirements of the Planning and Building Division, which shall be responsible for determining compliance with these conditions.

Contact: Roger Pelham, Senior Planner, 775.328.3622, rpelham@washoecounty.us and Dan Holly, Plans Examiner, 775.328.2027, dholly@washoecounty.us

- a. The applicant shall demonstrate substantial conformance to the plans approved as part of this administrative permit. Planning and Building shall determine compliance with this condition.
- b. The applicant shall submit complete construction plans and building permits shall be issued within two (2) years from the date of approval by Washoe County. The applicant shall complete construction within the time specified by the building permits. Compliance with this condition shall be determined by Planning and Building.
- c. The applicant shall attach a copy of the Action Order approving this project to all administrative permit applications (including building permits) applied for as part of this administrative permit.
- d. A note shall be placed on all construction drawings and grading plans stating:

NOTE: Should any cairn or grave of a Native American be discovered during site development, work shall temporarily be halted at the specific site and the Sheriff's Office as well as the State Historic Preservation Office of the Department of Conservation and Natural Resources shall be immediately notified per NRS 383.170.

- e. This property is in a High fire risk area and the design must comply with those requirements at the time of submittal for building permits.
- f. The following **Operational Conditions** shall be required for the life of the business:
 - i. This administrative permit shall remain in effect until or unless it is revoked or is inactive for one year.
 - ii. Failure to comply with any of the conditions of approval shall render this approval null and void.

Washoe County Engineering and Capital Projects

2. The following conditions are requirements of the Engineering Division, which shall be responsible for determining compliance with these conditions.

Contact: Leo R. Vesely, P.E., 775.328.2041, ivesely@washoecounty.us

- a. A complete set of construction improvement drawings, including an on-site grading plan, shall be submitted when applying for a building/grading permit. Any necessary grading shall comply with County Code Article 438, Grading Standards and all drainage shall comply with County Code Article 420, Storm Drainage Standards. Silts shall be controlled on-site and not allowed onto adjacent property.

*** End of Conditions ***

From: [Holly, Dan](#)
To: [Pelham, Roger](#)
Subject: . Administrative Permit Case Number WADMIN19-0001 (Matt and Angie Bussell Detached Accessory Structure)
Date: Wednesday, January 23, 2019 12:11:15 PM
Attachments: [image001.png](#)
[image002.png](#)
[image003.png](#)
[image004.png](#)
[image005.png](#)

Roger: I have reviewed this application on behalf of building and have no major concerns. This property is in a High fire risk area and the design will need to comply with those requirements at the time of submittal. Thank You,



Dan Holly
Plans Examiner Supervisor, Planning and Building Division |Community Services Department

dholly@washoecounty.us | Office: (775) 328-2027

1001 E. Ninth St., Bldg. A, Reno, NV 89512



From: [Behmaram, Vahid](#)
To: [Pelham, Roger](#)
Subject: Administrative Permit Case Number WADMIN19-0001 (Matt and Angie Bussell Detached Accessory Structure)
Date: Friday, January 25, 2019 2:03:42 PM
Attachments: [Administrative Permit Case Number WADMIN19-0001 \(Matt and Angie Bussell Detached Accessory Structure\).docx](#)

Roger: my quick review did not indicate any water fixtures or water line extension to the Barn. Therefore, I have no conditions. If WRONG please let me know so that I can amend.



WASHOE COUNTY
COMMUNITY SERVICES DEPARTMENT
Engineering and Capital Projects

1001 EAST 9TH STREET
PO BOX 11130
RENO, NEVADA 89520-0027
PHONE (775) 328-3600
FAX (775) 328.3699

INTEROFFICE MEMORANDUM

DATE: February 6, 2019

TO: Roger Pelham, Senior Planner, Planning and Building Division

FROM: Leo R. Vesely, P.E., Engineering and Capital Projects Division

SUBJECT: **WADMIN19-0001**
APN 078-212-02
Matt and Angie Bussell Detached Accessory Structure

GENERAL PROJECT DISCUSSION

Washoe County Engineering staff has reviewed the above referenced application. The Engineering and Capital Projects Division recommends approval with the following comments and conditions of approval which supplement applicable County Code and are based upon our review of the application. The County Engineer shall determine compliance with the following conditions of approval.

For questions related to sections below, please see the contact name provided.

GENERAL CONDITIONS

Contact Information: Leo Vesely, P.E. (775) 328-2041

1. A complete set of construction improvement drawings, including an on-site grading plan, shall be submitted when applying for a building/grading permit. Any necessary grading shall comply with County Code Article 438, Grading Standards and all drainage shall comply with County Code Article 420, Storm Drainage Standards. Silts shall be controlled on-site and not allowed onto adjacent property.

LRV/lrv



INTEGRITY

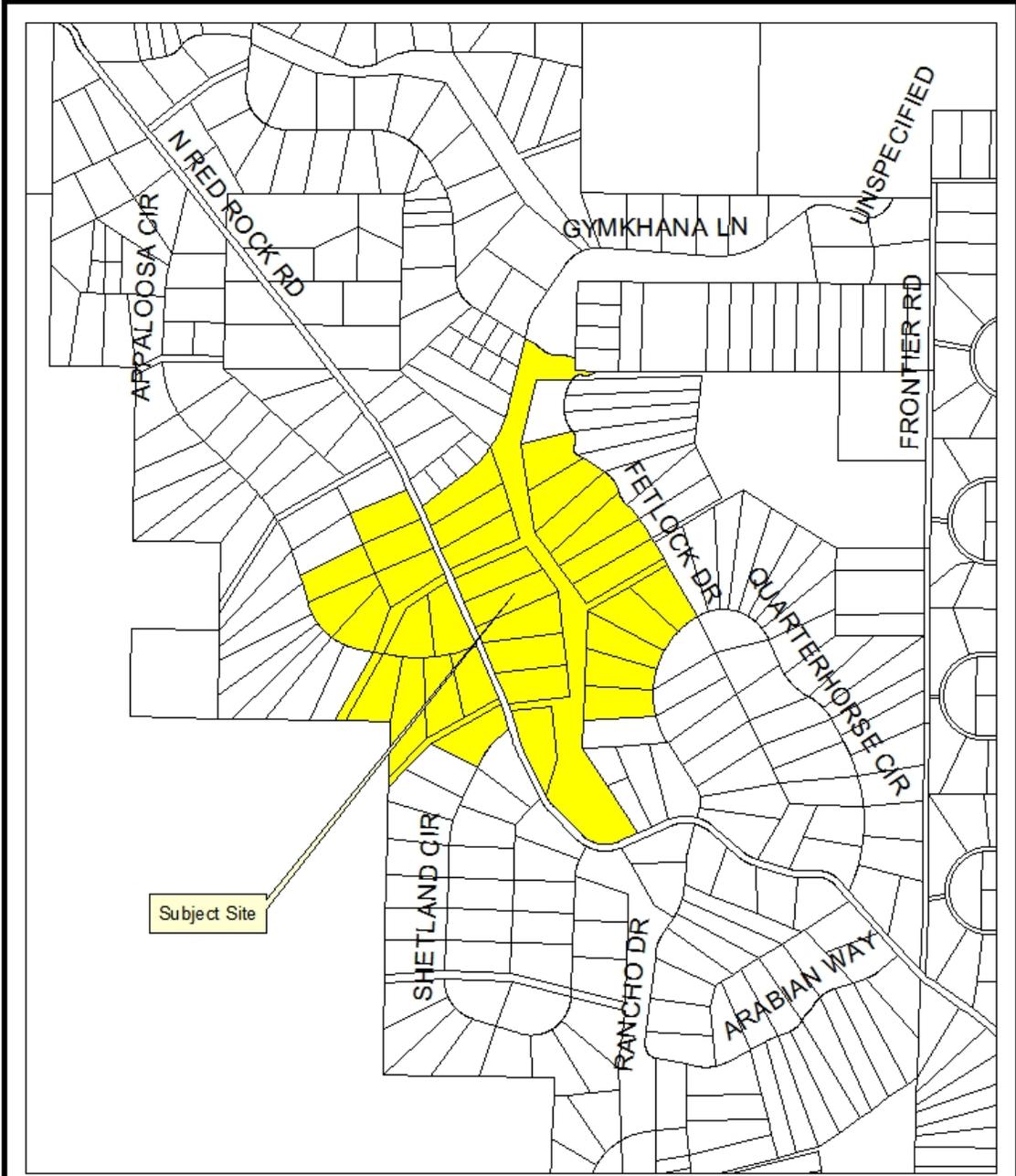


EFFECTIVE
COMMUNICATION



QUALITY
PUBLIC SERVICE

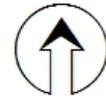
WWW.WASHOECOUNTY.NV.US



Mailing Label Map
 Admin. Permit Case Number WADMIN19-0001
 (Bussell Detached Accessory Structure)

37 Parcels selected at 1500 feet.

Source: Planning and Development Division



Date: February 2017

Community Services
 Department
 Planning and
 Development Division
 WASHOE COUNTY
 NEVADA
 Post Office Box 11130
 Reno, Nevada 89502
 (775) 335-2600

Community Services Department
Planning and Building
ADMINISTRATIVE PERMIT APPLICATION
(Care for the Infirm see page 8)



Community Services Department
Planning and Building
1001 E. Ninth St., Bldg. A
Reno, NV 89512-2845

Telephone: 775.328.6100

*44 1/2 c/c POST FOR
MAN DOORS*

Washoe County Development Application

Your entire application is a public record. If you have a concern about releasing personal information, please contact Planning and Building staff at 775.328.6100.

Project Information		Staff Assigned Case No.: _____	
Project Name: AG STORAGE BUILDING			
Project Description: 40'X50' POLE BARN / BUILDING			
Project Address: 16400 N RED ROCK RD RENO NV 89508			
Project Area (acres or square feet): 2000 SQ FT			
Project Location (with point of reference to major cross streets AND area locator): SOUTH WEST SECTION OF PARCEL # 078-212-02 WHICH IS LOCATED JUST EAST OFF OF N RED ROCK RD PARCEL IS DIRECTLY OFF RED ROCK RD,			
Assessor's Parcel No.(s):	Parcel Acreage:	Assessor's Parcel No.(s):	Parcel Acreage:
078-212-02	11.98		
Indicate any previous Washoe County approvals associated with this application: Case No.(s).			
Applicant Information (attach additional sheets if necessary)			
Property Owner:		Professional Consultant:	
Name: MATT & ANGIE BUSSELL		Name: TOM HOYLE	
Address: 16400 N RED ROCK RD		Address: 2336 JACOBSEN LANE	
RENO NV Zip: 89508		GARDNERVILLE NV Zip: 89410	
Phone: 530-260-1468 Fax:		Phone: 775 782 5022 Fax: 775-642	
Email: UNLIMITEDMOTO@GMAIL.COM		Email:	
Cell: 530-260-1468 Other: 775 722-1885		Cell: 775 781 1245 Other:	
Contact Person: MATT BUSSELL		Contact Person:	
Applicant/Developer: 1		Other Persons to be Contacted:	
Name: MATT & ANGIE BUSSELL		Name:	
Address: 16400 N RED ROCK RD		Address:	
RENO NV Zip: 89508		Zip:	
Phone: 530-260-1468 Fax:		Phone: Fax:	
Email: UNLIMITEDMOTO@GMAIL.COM		Email:	
Cell: 530-260-1468 Other: 775 722-1885		Cell: Other:	
Contact Person: MATT BUSSELL		Contact Person:	
For Office Use Only			
Date Received:	Initial:	Planning Area:	
County Commission District:		Master Plan Designation(s):	
CAB(s):		Regulatory Zoning(s):	

December 2018

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of California
County of Lassen

Subscribed and sworn to (or affirmed) before me on this 10th
day of January, 20 19, by Matthew Bussell

proved to me on the basis of satisfactory evidence to be the
person(s) who appeared before me.



(Seal)

Signature *Katie O'Sullivan*

This certificate is attached to a Property Owner Affidavit
dated 10 January 2019, of 10 pages, also signed by
(name of other signer if any)

Administrative Permit Application Supplemental Information

(All required information may be separately attached)

1. What is the type of project or use being requested?

KIT POLE BUILDING FOR AG / STORAGE USE

2. What section of the Washoe County code requires the Administrative permit required?

PLANNING DEPT

3. What currently developed portions of the property or existing structures are going to be used with this permit?

NONE

4. What improvements (e.g. new structures, roadway improvements, utilities, sanitation, water supply, drainage, parking, signs, etc.) will have to be constructed or installed and what is the projected time frame for the completion of each?

KIT POLE BARN ONLY
PROJECT COMPLETION BY OCT 2019

5. Is there a phasing schedule for the construction and completion of the project?

MARCH 2019 PREP GROUND, SITE PREP
MAY 2019 BEGIN CONSTRUCTION KIT - COMPLETION OCT 2019

6. What physical characteristics of your location and/or premises are especially suited to deal with the impacts and the intensity of your proposed use?

MAJORITY OF ADJOINING PARCELS ARE VACANT, PROPOSED PARCEL TOPOGRAPHY IS MAJORITY LEVEL. EXISTING BUILDINGS ON PARCEL AND ADJOINING PARCELS ARE FAR BETWEEN, EXT. COLOR WILL BE SIMILAR TO EXISTING STRUCTURES IN THIS AREA

7. What are the anticipated beneficial aspects or effect your project will have on adjacent properties and the community?

IMPROVED APPEARANCE OF PARCEL, ORDERLY STORAGE OF AG SUPPLIES. KEEPING ITEMS SECURED, WINDS BLOWING ITEMS TO OTHER PARCELS

8. What will you do to minimize the anticipated negative impacts or effect your project will have on adjacent properties?

ANY IMPACTS SHALL BE COMMUNICATED, ADDRESSED AND FOUND RESOLUTION CONSTRUCTION METHODS TO REDUCE ENVIRONMENTAL IMPACTS
EXTENSIVE COLOR WILL BE SIMILAR EXISTING HOMES BUILDINGS IN THIS AREA

9. Please describe any operational parameters and/or voluntary conditions of approval to be imposed on the administrative permit to address community impacts.

NONE

10. How many improved parking spaces, both on-site and off-site, are available or will be provided? (Please indicate on site plan.)

NONE

11. What types of landscaping (e.g. shrubs, trees, fencing, painting scheme, etc.) are proposed? (Please indicate location on site plan.)

NONE

12. What type of signs and lighting will be provided? On a separate sheet, show a depiction (height, width, construction materials, colors, illumination methods, lighting intensity, base landscaping, etc.) of each sign and the typical lighting standards. (Please indicate location of signs and lights on site plan.)

NONE

13. Are there any restrictive covenants, recorded conditions, or deed restrictions (CC&Rs) that apply to the area subject to the administrative permit request? (If so, please attach a copy.)

Yes No

14. Utilities:

a. Sewer Service	SEPTIC SYSTEM ON SITE
b. Water Service	WELL DOMESTIC ON SITE

For most uses, the Washoe County Code, Chapter 110, Article 422, Water and Sewer Resource Requirements, requires the dedication of water rights to Washoe County. Please indicate the type and quantity of water rights you have available should dedication be required:

c. Permit #		acre-feet per year	
d. Certificate #	NONE	acre-feet per year	NONE
e. Surface Claim #		acre-feet per year	
f. Other, #		acre-feet per year	

Title of those rights (as filed with the State Engineer in the Division of Water Resources of the Department of Conservation and Natural Resources):

NONE

Administrative Permit Application Supplemental Information for Care of the Infirm

(All required information, to include the physician's signed affidavit, is considered a public record and will be treated as such by Washoe County. Information may be attached separately)

1. Name of the Infirm:

N/A

2. Name of Nevada licensed physician identifying the need for on-premise care and the physician's estimate as to the length of on-premise care required (attach physician's signed affidavit, form on page 12):

N/A

3. Name(s) of the Caregiver(s):

N/A

4. Describe the type and size of recreational vehicle or self-contained travel trailer that is proposed for use as a temporary residence of the caregiver. (Attach a site map showing the proposed location.)

N/A

5. Describe the arrangements/methods proposed for the temporary provision of:

- a. Water Service:

N/A

b. Sewage (Sanitary Sewer) Service:

N/A

c. Garbage (Solid Waste) Service:

N/A

d. Electricity:

N/A

e. Natural Gas:

N/A

6. What will you do to minimize the anticipated negative impacts or effect your waiver will have on adjacent properties?

N/A

7. What types of landscaping (e.g. shrubs, trees, fencing, painting scheme, etc.) are proposed? (Please indicate location on site plan.)

N/A

8. Are there any restrictive covenants, recorded conditions, or deed restrictions (CC&Rs) that apply to the area subject to the administrative permit request? (If so, please attach a copy.)

Yes N/A No N/A

9. Community Services (provided and nearest facility):

a. Fire Station	
b. Health Care Facility	
c. Elementary School	
d. Middle School	N/A
e. High School	
f. Parks	
g. Library	
h. Citifare Bus Stop	

Washoe County Treasurer
Tammi Davis

Washoe County Treasurer
P.O. Box 30039, Reno, NV 89520-3039
ph: (775) 328-2510 fax: (775) 328-2500
Email: tax@washoecounty.us

Bill Detail

[Back to Account Detail](#)

[Change of Address](#)

[Print this Page](#)

Washoe County Parcel Information		
Parcel ID	Status	Last Update
07821202	Active	1/3/2019 2:06:48 AM
Current Owner: BUSSELL, MATTHEW 16400 N RED ROCK RD RENO, NV 89508		SITUS: 16400 N RED ROCK RD WCTY NV
Taxing District 9000	Geo CD:	
Legal Description		
Section 9 Lot 178 Block Range 18 SubdivisionName _UNSPECIFIED Township 23		

Installments						
Period	Due Date	Tax Year	Tax	Penalty/Fee	Interest	Total Due
INST 1	8/20/2018	2018	\$0.00	\$0.00	\$0.00	\$0.00
INST 2	10/1/2018	2018	\$0.00	\$0.00	\$0.00	\$0.00
INST 3	1/7/2019	2018	\$0.00	\$0.00	\$0.00	\$0.00
INST 4	3/4/2019	2018	\$393.67	\$0.00	\$0.00	\$393.67
Total Due:			\$393.67	\$0.00	\$0.00	\$393.67

Tax Detail			
	Gross Tax	Credit	Net Tax
State of Nevada	\$108.14	(\$9.00)	\$99.14
Washoe County	\$885.31	(\$73.72)	\$811.59
Washoe County Sc	\$724.25	(\$60.30)	\$663.95
Total Tax	\$1,717.70	(\$143.02)	\$1,574.68

Payment History				
Tax Year	Bill Number	Receipt Number	Amount Paid	Last Paid
2018	2018072879	B18.119995	\$393.67	10/3/2018
2018	2018072879	B18.1587	\$393.67	7/17/2018
2018	2018072879	B18.170252	\$393.67	12/31/2018

Pay By Check

Please make checks payable to:
WASHOE COUNTY TREASURER

Mailing Address:
P.O. Box 30039
Reno, NV 89520-3039

Overnight Address:
1001 E. Ninth St., Ste D140
Reno, NV 89512-2845

Change of Address

All requests for a mailing address change must be submitted in writing, including a signature (unless using the online form).

To submit your address change online [click here](#)

Address change requests may also be faxed to: (775) 328-2500

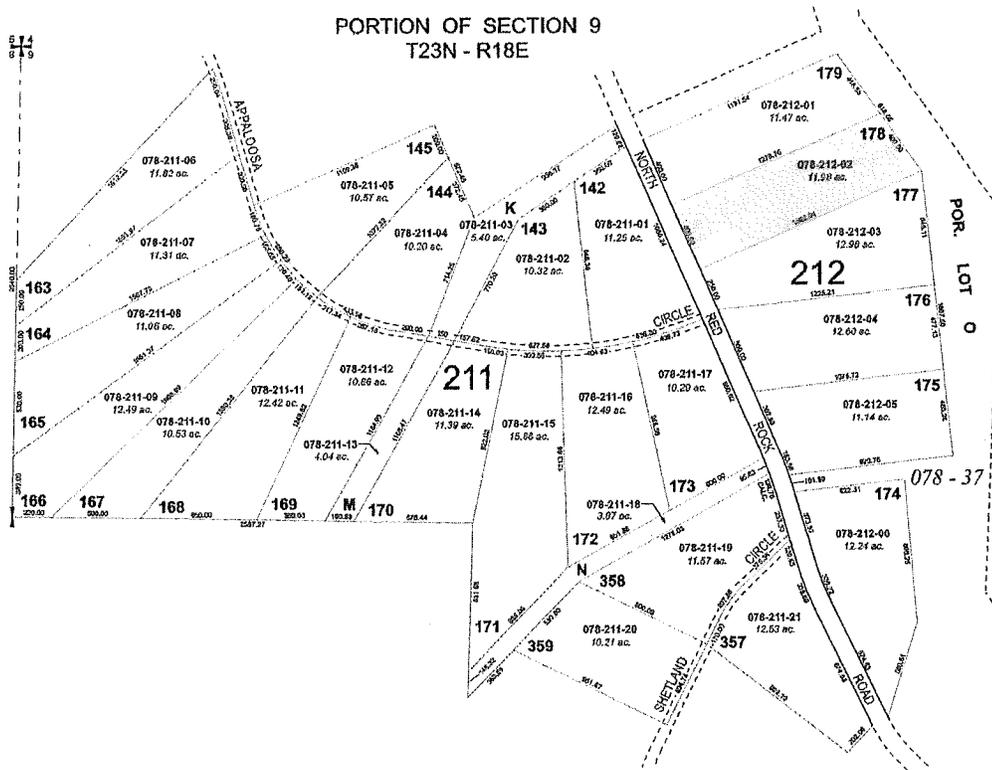
Address change requests may also be mailed to:
Washoe County Treasurer
P O Box 30039
Reno, NV 89520-3039

The Washoe County Treasurer's Office makes every effort to produce and publish the most current and accurate information possible. No warranties, expressed or implied, are provided for the data herein, its use, or its interpretation. If you have any questions, please contact us at (775) 328-2510 or tax@washoecounty.us

This site is best viewed using Google Chrome, Internet Explorer 11, Mozilla Firefox or Safari.

RECORD OF SURVEY # 687

PORTION OF SECTION 9
T23N - R18E



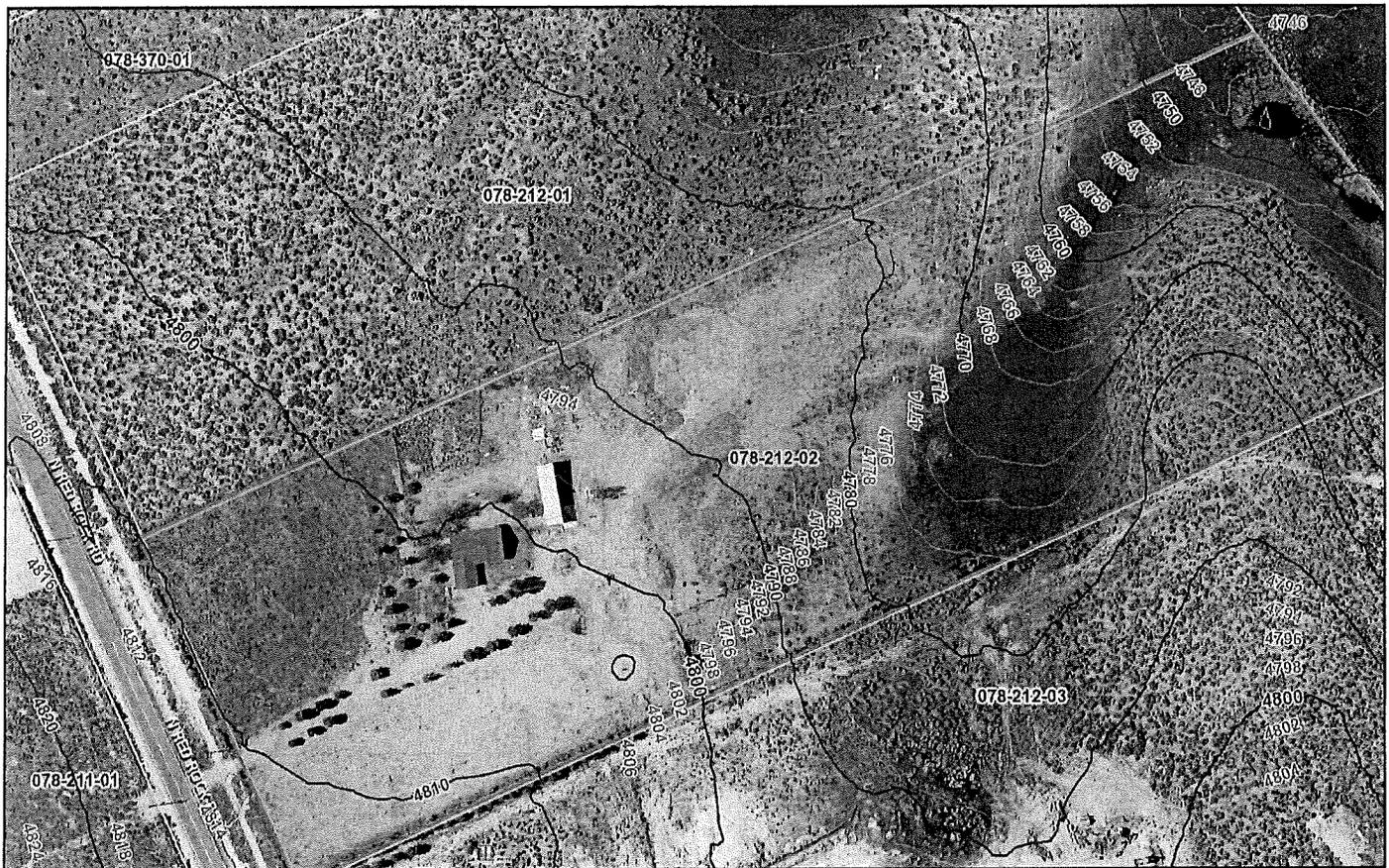
Assessor's Map Number
078-21
STATE OF NEVADA
WASHOE COUNTY
ASSESSOR'S OFFICE
Joshua G. Wilson, Assessor
1201 East 15th Street
Building D
Reno, Nevada 89512
(775) 228-2291

1 inch = 500 feet

created by: TWT 4/5/2011
last updated:
area previously shown on map(s)

NOTE: This map was prepared for the use of the Washoe County Assessor for assessment and licensing purposes only. It does not represent a survey of the premises. No liability is assumed as to the fullness or accuracy of the data delineated hereon.

PARCEL # 078-212-02 11.98 Acres
16400 N RED ROCK RD
RENO NV 89508
MATT & ANGIE BUSSELL
530-260-1468



December 31, 2018

polygonLayer

Override 1

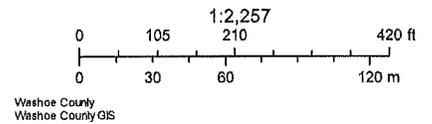
Reno Exerted SOI

Reno SOI

Reno City Boundary

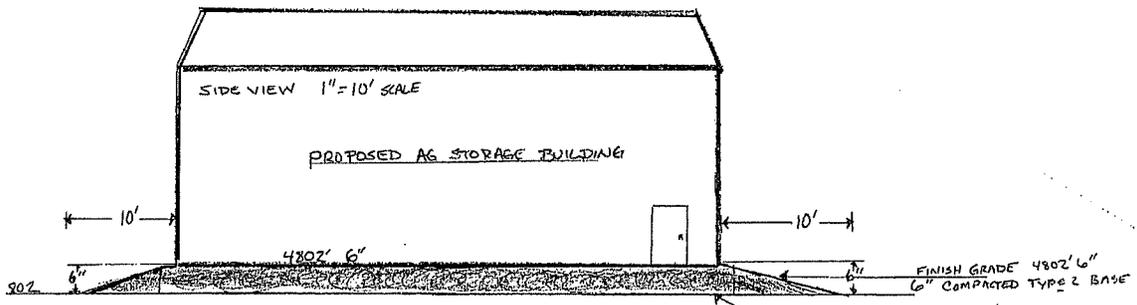
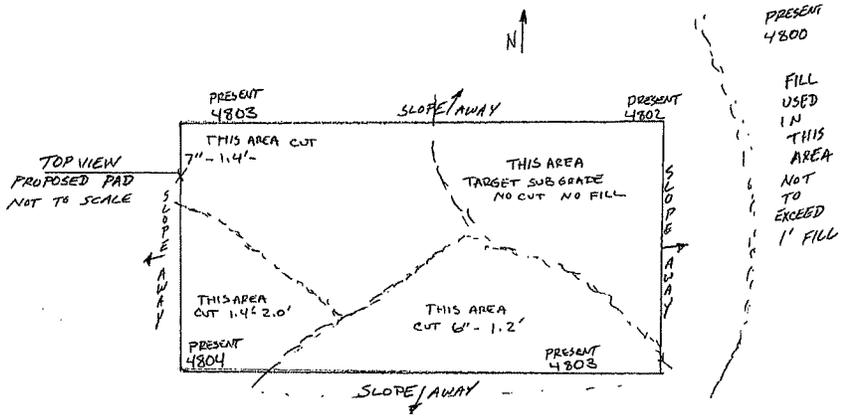
____ Reno City Boundary

APN

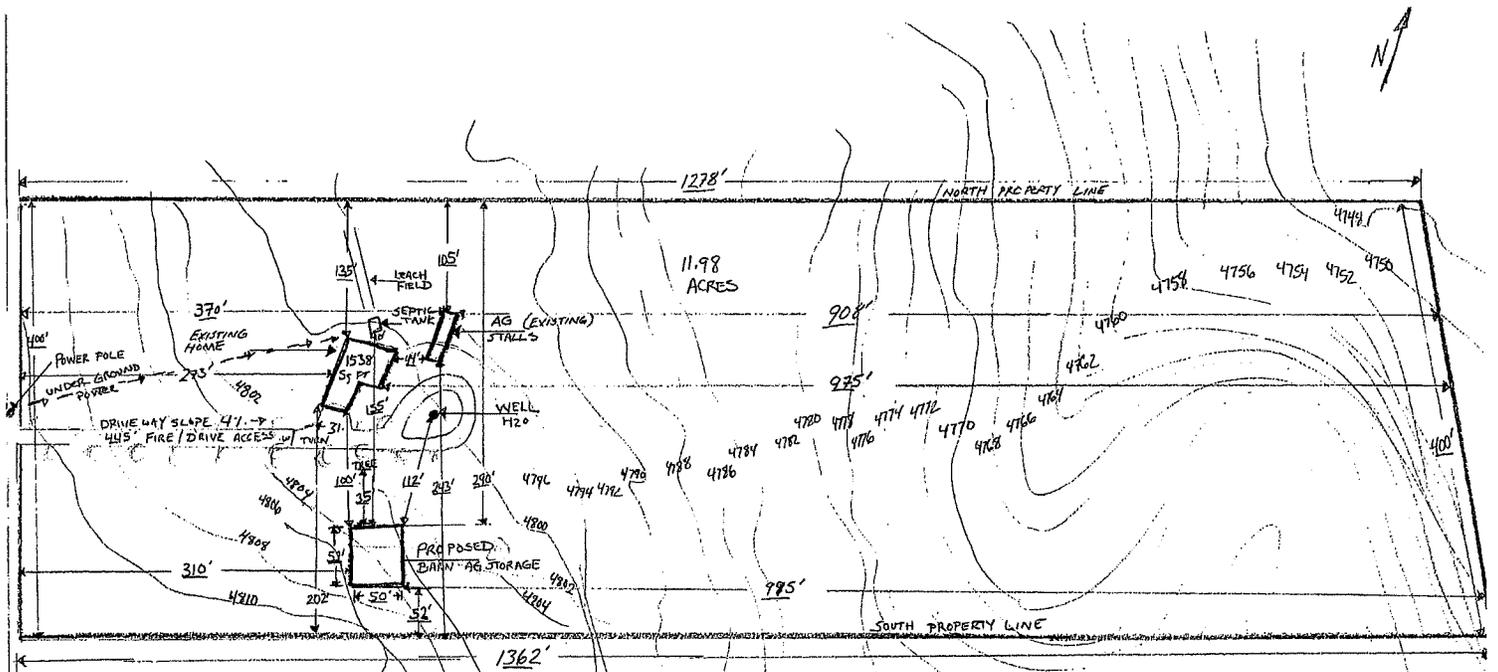


This information for illustrative purposes only. Not be used for boundary resolution or location and not intended to be used for measurement, calculation, or delineation.

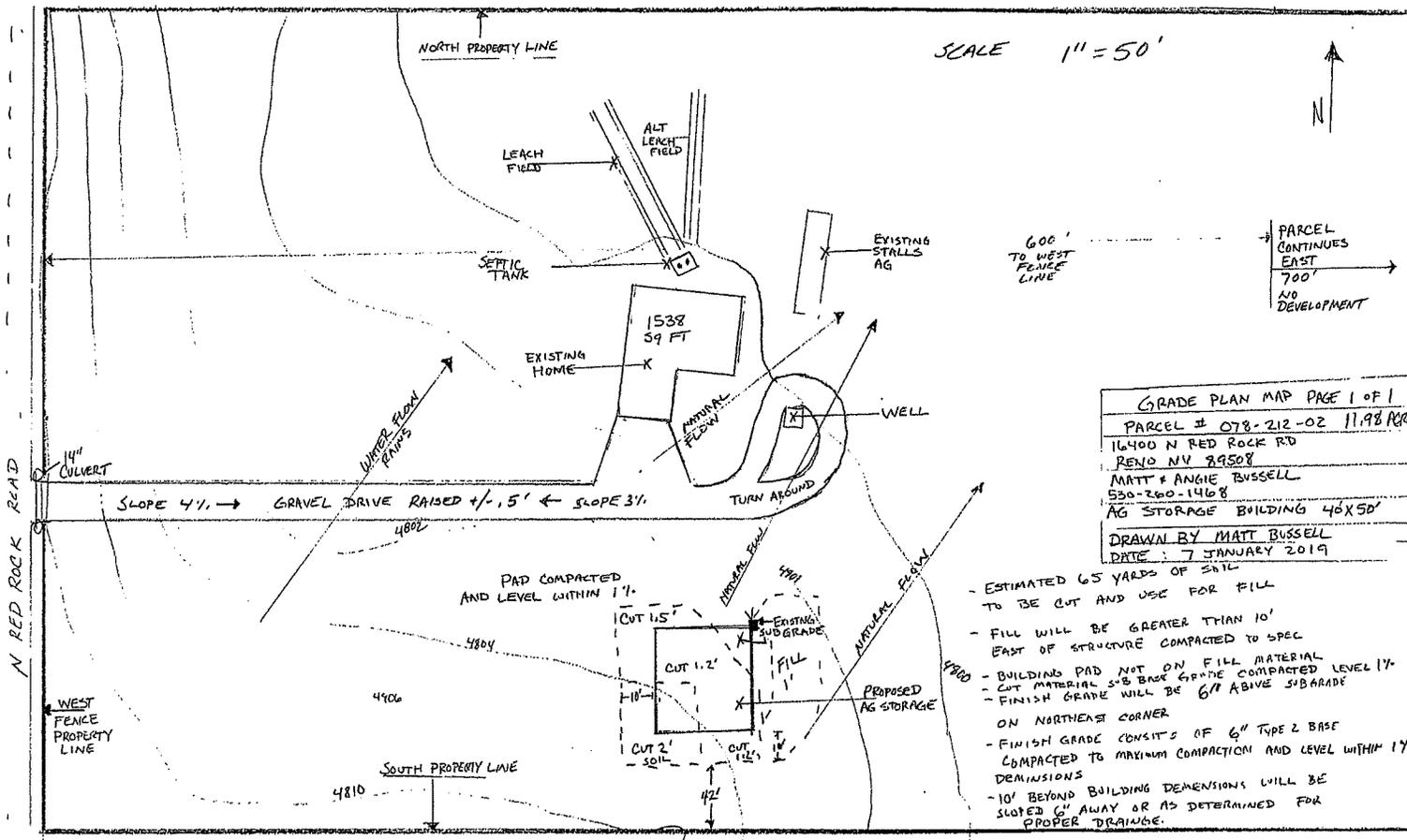
AG STORAGE BUILDING
 BUILDING PAD DESC PAGE 1 OF 1
 PARCEL # 078-212-02
 16400 N RED ROCK RD
 RENO, NV 89508
 11.98 ACRES PARCEL
 MATT & ANGIE BUSSELL
 530-260-1468
 DRAWN BY MATT BUSSELL
 DATE 9 JANUARY 2019



- PAD REQUIRES ALL CUTS TO LEVEL SUBGRADE COMPACTED WITH ATLEAST 10' EXPANSION ON BOTH ENDS, BOTH SIDES.
- BUILDING STRUCTURE ON CUT ONLY NO FILL MATERIAL
- FILL FROM CUT WILL BE USED GREATER THAN 10' EAST OF BUILDING TO REDUCE SLOPE DUE TO EXISTING TOP
- FILL WILL BE COMPACTED ALTHOUGH NOT IMPROVED UPON WITH STRUCTURE



PLOT MAP PAGE 1 OF 1
 2 JANUARY 2019
 PARCEL # 078-212-02
 16400 N RED ROCK RD
 RENO NV 89508
 AG STORAGE BUILDING
 MATT & ANGIE BUSSELL
 530-260-1468
 SCALE 1" = 100'
 DRAWN BY MATT BUSSELL



SCALE 1" = 50'

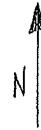
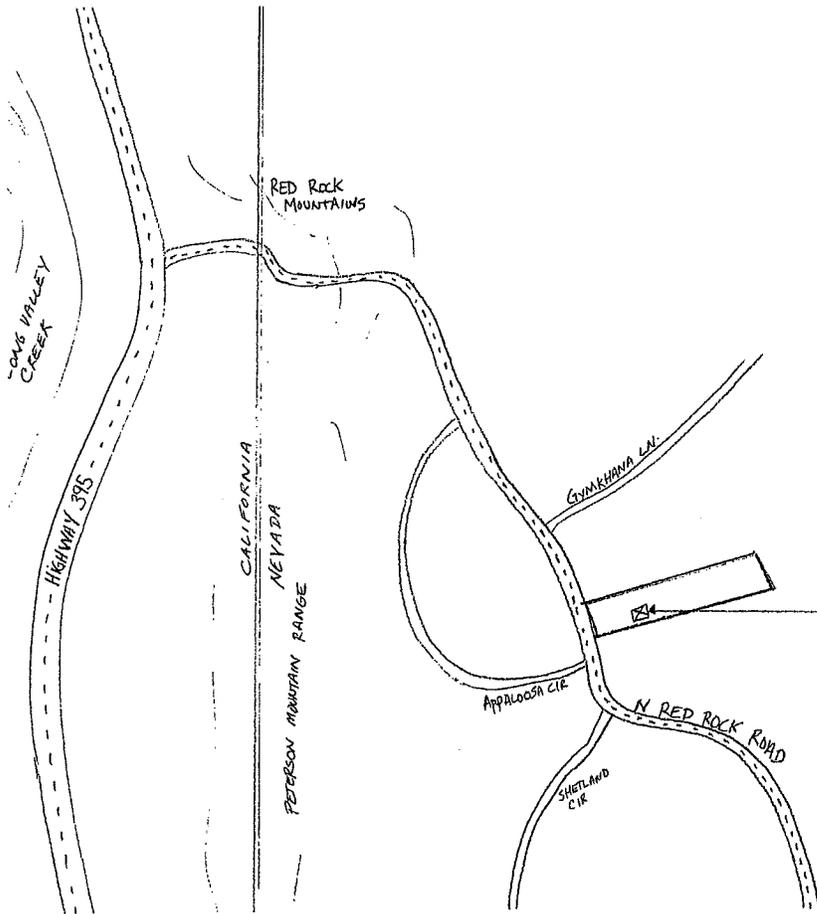


600'
TO WEST
FENCE
LINE

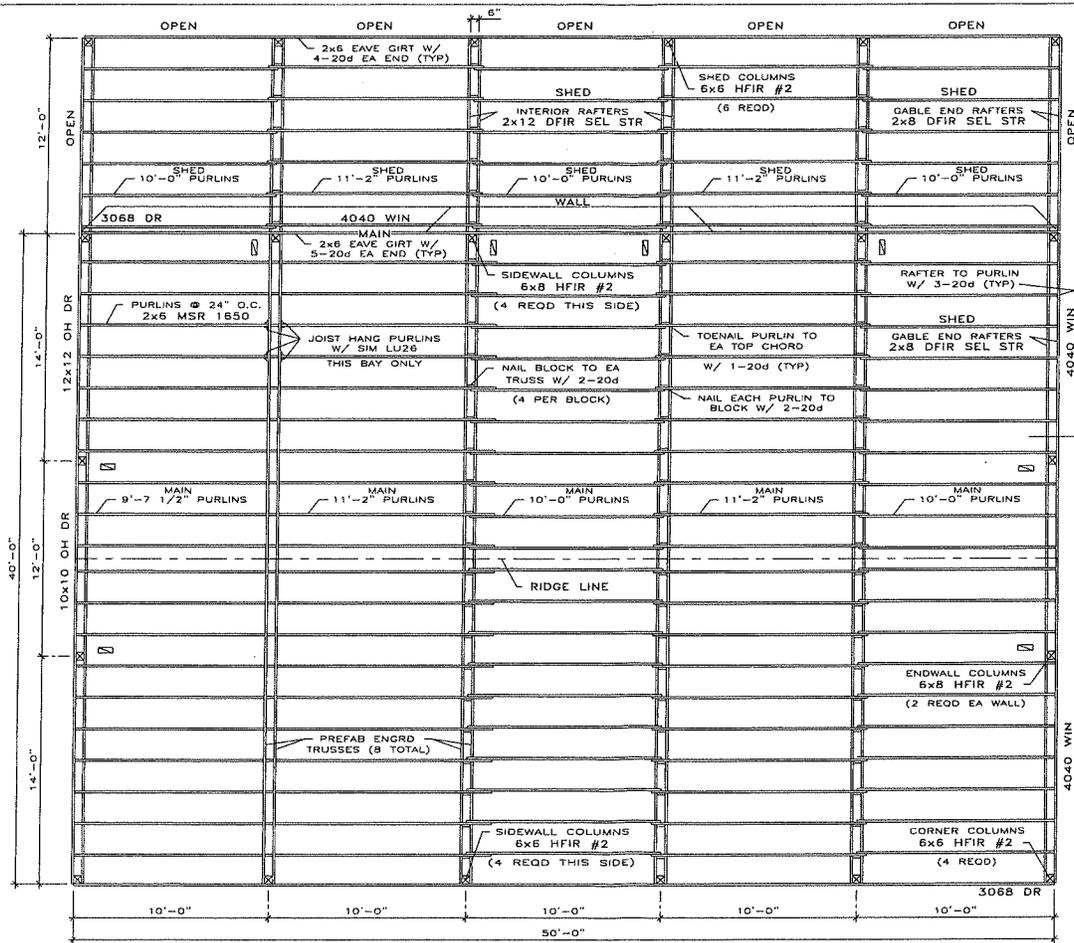
PARCEL
CONTINUES
EAST
700'
NO
DEVELOPMENT

GRADE PLAN MAP PAGE 1 OF 1
 PARCEL # 078-212-02 11.98 ACRES
 16400 N RED ROCK RD
 RENO NV 89508
 MATT & ANGIE BUSSELL
 530-260-1468
 AG STORAGE BUILDING 40X50'
 DRAWN BY MATT BUSSELL
 DATE: 7 JANUARY 2019

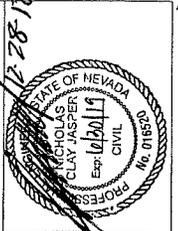
- ESTIMATED 65 YARDS OF Silt TO BE CUT AND USE FOR FILL
- FILL WILL BE GREATER THAN 10' EAST OF STRUCTURE COMPACTED TO SPEC
- BUILDING PAD NOT ON FILL MATERIAL
- CUT MATERIAL SUB BASE GRADE COMPACTED LEVEL 1% FINISH GRADE WILL BE 6" ABOVE SUBGRADE ON NORTHEAST CORNER
- FINISH GRADE CONSISTS OF 6" TYPE 2 BASE COMPACTED TO MAXIMUM COMPACTION AND LEVEL WITHIN 1% DIMENSIONS
- 10' BEYOND BUILDING DIMENSIONS WILL BE SLOPED 6" AWAY OR AS DETERMINED FOR PROPER DRAINAGE.



SITE MAP	PAGE 1 OF 1	NOT TO SCALE
PROPOSED BUILDING SITE	AG STORAGE BUILDING	
PARCEL #	078-212-03	
	11.98 ACRES	
	16400 N. RED ROCK ROAD	
	RENO NV 89508	
	MATT & ANGIE BUSSELL	
	ESD-260-1468	
	DRAWN BY MATT BUSSELL	
	DATE 8 JANUARY 2019	



SHEET of 6



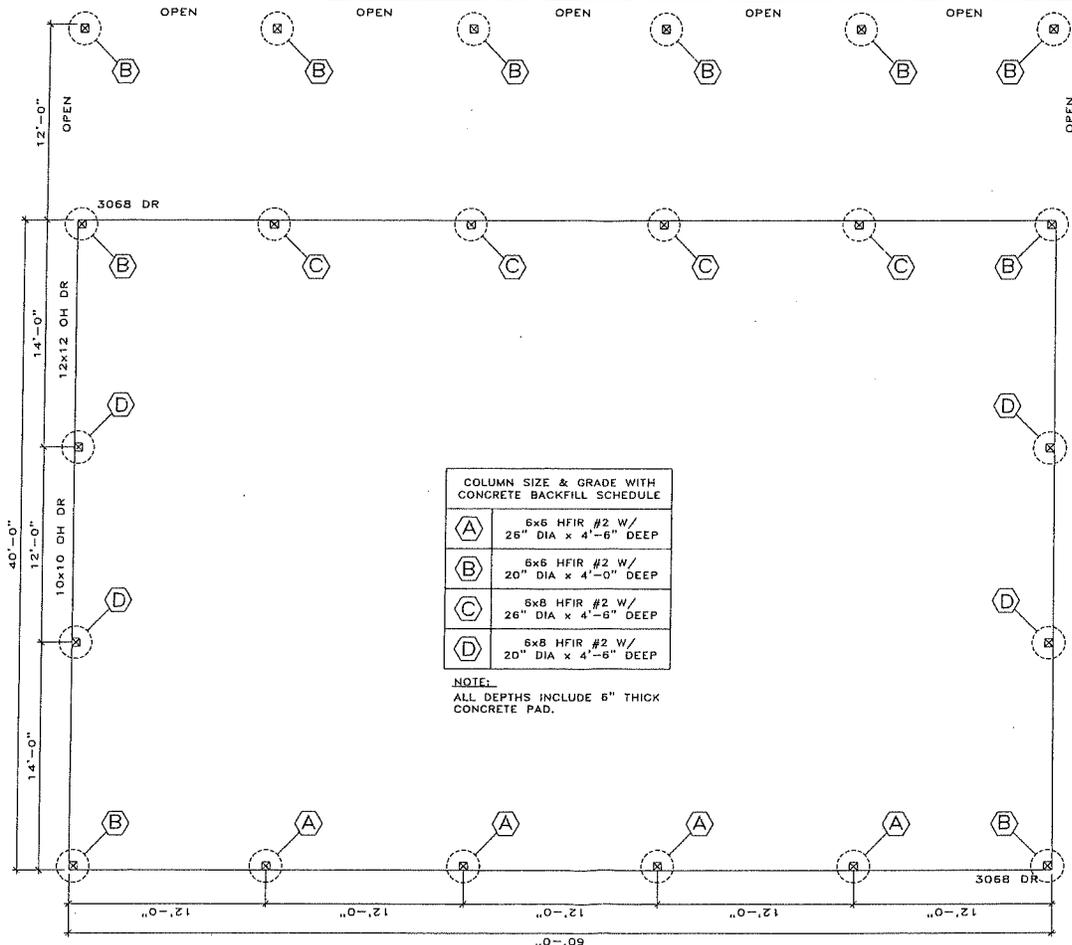
DATE	12/28/19
SCALE	NONE
RED/ARD	12/1/19
KIT	MV18233

HOYLE CONST. FOR BUSSEL
 16400 N. RED ROCK RD.
 RENO, NEVADA

ENGINEERS DESIGN RESPONSIBILITIES ARE LIMITED EXCLUSIVELY TO THE DESIGN OF THE STRUCTURE SHOWN ON THESE DRAWINGS. THE CLIENT IS RESPONSIBLE FOR THE DESIGN OF ALL OTHER STRUCTURES AND FOR THE PROVISION OF ALL NECESSARY PERMITS AND APPROVALS. ENGINEERS SHALL NOT BE HELD RESPONSIBLE FOR DAMAGE TO OR FAILURE OF MATERIALS SUBJECT TO DAMAGE OR FAILURE DUE TO LATERAL MOVEMENT.

M & W BUILDING SUPPLY
 40' V-JOIST TRUSSES @ 14" EAVE
 W/ 1" x 12" x 50' x 14" 10' 11" SHED

ROOF LOAD: LIVE 30 PSF
 DEAD LOAD: 10 PSF
 WIND: 100 MPH
 SEISMIC ZONE: D
 EXP. C
 FOUNDATION PRESSURE: 1500 PSF
 L.A.T. SOIL BEARING: 100 PSF
 BUILDING DESIGN: 2012 I.B.C.
 CLOSED BUILDING



SHT 3 of 6

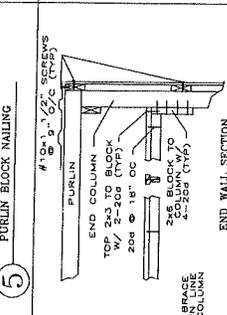
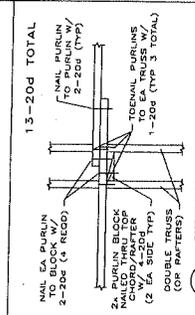
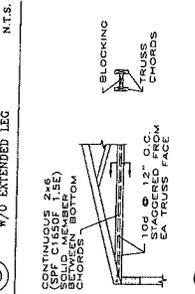
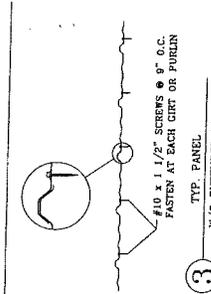
	2275 S. 10TH, 99B RENO, NV 89513 (775) 252-9923 (503) 266-7102 (FAX)	SCALE: NONE REDD/RD: 12/17/19	KIT: 618233
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FOUNDATION/FLOOR PLAN

**HOYLE CONST. FOR BUSSEL
16400 N. RED ROCK RD.
RENO, NEVADA**

ENGINEERS DESIGN RESPONSIBILITIES ARE LIMITED EXCLUSIVELY TO THE DESIGN OF THE FOUNDATION AND STRUCTURE IN ACCORDANCE WITH THE SPECIFICATIONS AND REQUIREMENTS OF THE BUILDING DEPARTMENT AND THE NATIONAL BUILDING CODE. THE ENGINEER DOES NOT WARRANT THE ACCURACY OF THE INFORMATION PROVIDED BY THE CLIENT. THE ENGINEER'S LIABILITY IS LIMITED TO THE DESIGN AND CONSTRUCTION OF THE FOUNDATION AND STRUCTURE. THE ENGINEER IS NOT RESPONSIBLE FOR THE DESIGN OF OTHER STRUCTURES OR FOR THE DESIGN OF FOUNDATION MATERIALS SUBJECT TO DAMAGE OR FAILURE DUE TO LATERAL MOVEMENT.

M & W BUILDING SUPPLY
 40' VIBRATED PIPE BUILDS 14' EAVE
 1/1 - 12' X 50' X 14' TO 11' SHED
 RDPD LOAD: LIVE 30 PSF
 DEAD LOAD: 9 PSF
 WIND LOAD: 20 MPH
 SEISMIC ZONE: D
 EXP. C
 FOUNDATION PRESSURE: 1500 PSF
 L.A.T. SOIL BEARING: 100 PSF
 BUILDING DESIGN: 2012 I.B.C.
 CLOSED BUILDING



1 NOTES

1. ALL MATERIALS SHALL BE USED W/O MANUFACTURER'S APPROVAL.
2. ALL MATERIALS SHALL BE USED W/O MANUFACTURER'S APPROVAL.
3. ALL MATERIALS SHALL BE USED W/O MANUFACTURER'S APPROVAL.
4. ALL MATERIALS SHALL BE USED W/O MANUFACTURER'S APPROVAL.
5. ALL MATERIALS SHALL BE USED W/O MANUFACTURER'S APPROVAL.
6. ALL MATERIALS SHALL BE USED W/O MANUFACTURER'S APPROVAL.
7. ALL MATERIALS SHALL BE USED W/O MANUFACTURER'S APPROVAL.
8. ALL MATERIALS SHALL BE USED W/O MANUFACTURER'S APPROVAL.
9. ALL MATERIALS SHALL BE USED W/O MANUFACTURER'S APPROVAL.
10. ALL MATERIALS SHALL BE USED W/O MANUFACTURER'S APPROVAL.
11. ALL MATERIALS SHALL BE USED W/O MANUFACTURER'S APPROVAL.
12. ALL MATERIALS SHALL BE USED W/O MANUFACTURER'S APPROVAL.
13. ALL MATERIALS SHALL BE USED W/O MANUFACTURER'S APPROVAL.

4 BRACING DETAIL

2x3 1/2" BRACE W/ END COLUMN

2x3 1/2" BRACE W/ END COLUMN

A END WALL SECTION (OPTIONAL)

PURLIN

END COLUMN

BOTTOM 2x3 TO COLUMN W/ 2-204 (TYP)

204 @ 18" OC

2x3 1/2" BRACE W/ END COLUMN

3 TYP. PANEL W/O EXTENDED LEG N.T.S.

6 BOTTOM CHORD SOLID BLOCKING

5 PURLIN BLOCK NAILING

4 BRACING DETAIL

A END WALL SECTION (OPTIONAL)

1 NOTES

SHT 4 of 6

STATE OF NEVADA

NICHOLAS CLAY JASPER

CIVIL

Exp. 12/19

No. 016570

M & W BUILDING SUPPLY

40" WIDE X 50" LONG X 14" EAVE

W/ 1" LE X 50" X 14" X 11" SLED

LOAD: 3 PSF

WIND LOAD: 130MPH EXP. C

SEISMIC ZONE: D

FOUNDATION PRESSURE: 1500 PSF

LAT. SOIL BEARING: 100 PSF

LOADING DESIGN: 2012 I.B.C.

CLOSED BUILDING

HOYLE CONST. FOR BUSSEL

16400 N. RED ROCK RD.

RENO, NEVADA

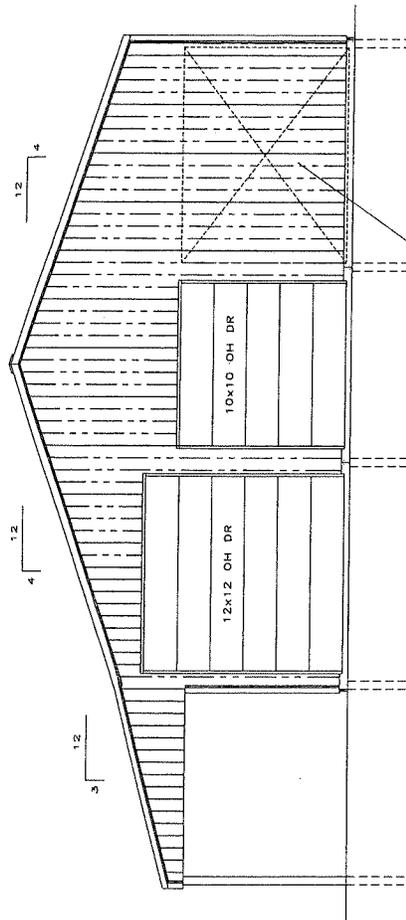
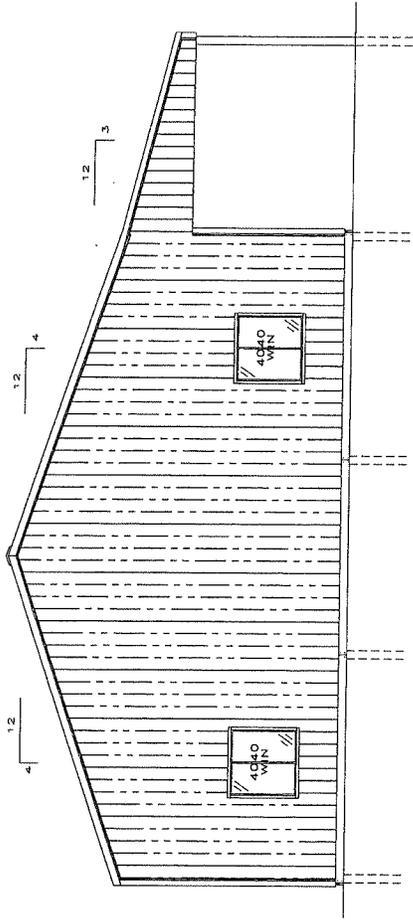
STATE OF NEVADA

NICHOLAS CLAY JASPER

CIVIL

Exp. 12/19

No. 016570



12-28-12
 SHT 5 of 6

12-28-12

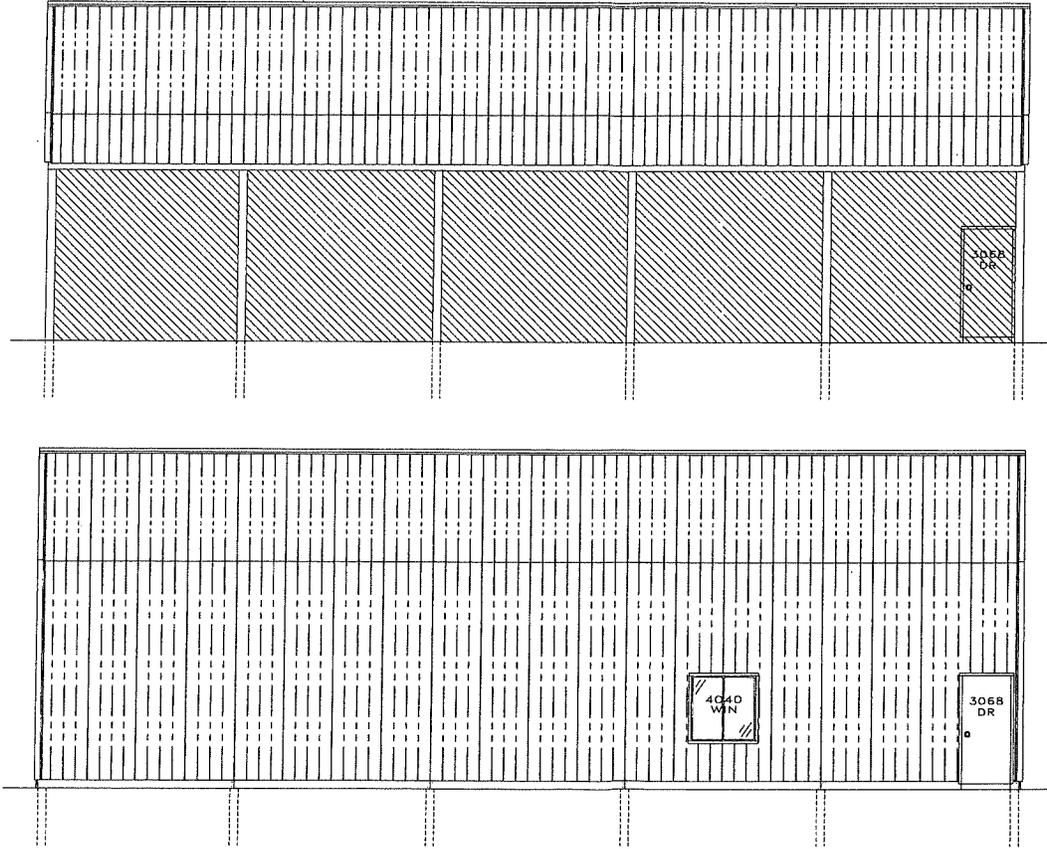
<p>M & W BUILDING SUPPLY 40' WIDE X 50' LONG X 14' EAVE W/ 1" - 12" X 50' X 14' TO 11' SHED ROOF LOAD: LIVE 30 PSF DEAD 15 PSF WIND LOAD: 130 MPH SEISMIC ZONE: D FOUNDATION PRESSURE: 1500 PSF LAT. SOIL BEARING: 100 PSF BUILDING DESIGN: 2012 I.B.C. CLOSED BUILDING.</p>	<p>HOYLE CONST. FOR BUSSEL 16400 N. RED ROCK RD. RENO, NEVADA</p>	<p>M & W BUILDING SUPPLY 9980 99803 CANYON BLVD (505) 883-6665 (505) 883-7102 (FAX) SCALE: NONE RBD/RD: 18/17 KIT: 010823</p>	<p>PROFESSIONAL ENGINEER STATE OF NEVADA NICHOLAS JOHN VASER Exp. 4/2019 CIVIL No. 016590</p>
---	--	---	---

12-28-12

SHT 5 of 6

122618
01.9221

SHT of 6



<p>M & W BUILDING SUPPLY 40' WIDE CUSTOM DOORWAYS 14' EAVE W/ 1" - 12" X 50' X 14" TO 11' SIED</p>	<p>HOYLE CONST FOR BUSSEL 16400 N. RED ROCK RD. RENO, NEVADA</p>	<p>ENGINEERS DESIGN RESPONSIBILITIES ARE LIMITED EXCLUSIVE TO THE DESIGN OF THE STRUCTURE SHOWN ON THESE DRAWINGS. THE CLIENT ASSUMES ALL OTHER RESPONSIBILITIES. THE ENGINEER DOES NOT WARRANT THE ACCURACY OF THE INFORMATION PROVIDED BY THE CLIENT. THE ENGINEER'S LIABILITY IS LIMITED TO THE DESIGN OF THE STRUCTURE SHOWN ON THESE DRAWINGS. THE ENGINEER DOES NOT WARRANT THE ACCURACY OF THE INFORMATION PROVIDED BY THE CLIENT. THE ENGINEER'S LIABILITY IS LIMITED TO THE DESIGN OF THE STRUCTURE SHOWN ON THESE DRAWINGS.</p>
<p>RD/FR. LIVE 30 PSF DEAD LOAD: 150 PSF SEISMIC ZONE: D FOUNDATION PRESSURE: 1500 PSF L.A.T. SOIL BEARING: 100 PSF BUILDING DESIGN 2012 I.B.C. CLOSED BUILDING</p>	<p>22175 S. HWY. 89E #7013 (503) 283-8583 (503) 286-7102 (FAX)</p>	<p>SCALE: NONE RD/FR: 12/17/18 KIT: M019033</p>
<p>STATE OF NEVADA NICHOLAS CLAY JASPER Exp. 12/31/19 CIVIL No. 01850</p>		

December 28, 2018

Washoe County Department of Building & Safety
1001 E 9th St
P.O. Box 11130
Reno, NV 89520-0027

Truss Submittal Certification Letter

Alliance Engineering Job No.: MW18233
Building Owner: Bussel
Building Address: 16400 N Red Rock Rd., Reno, NV 89508
Contractor: Hoyle Construction
Truss Manufacturer: Oregon Truss
Trusses: A-Bussel
Dated: 12/19/2018

To Washoe County Department of Building & Safety,

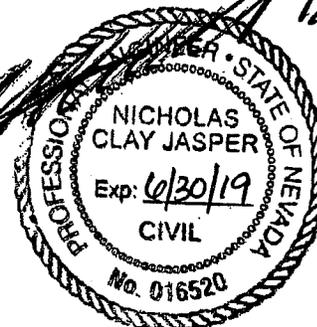
This letter is to certify that I have reviewed the attached truss calculations for the above address, prior to submitting to the building department, and find them to be in compliance with or exceeding the plans and specifications (including, but not limited to, connections, truss loads, load path, bearing points, etc).

Note: Any deviations from the approved plans must be submitted to the Washoe County Building and Safety Division for review.

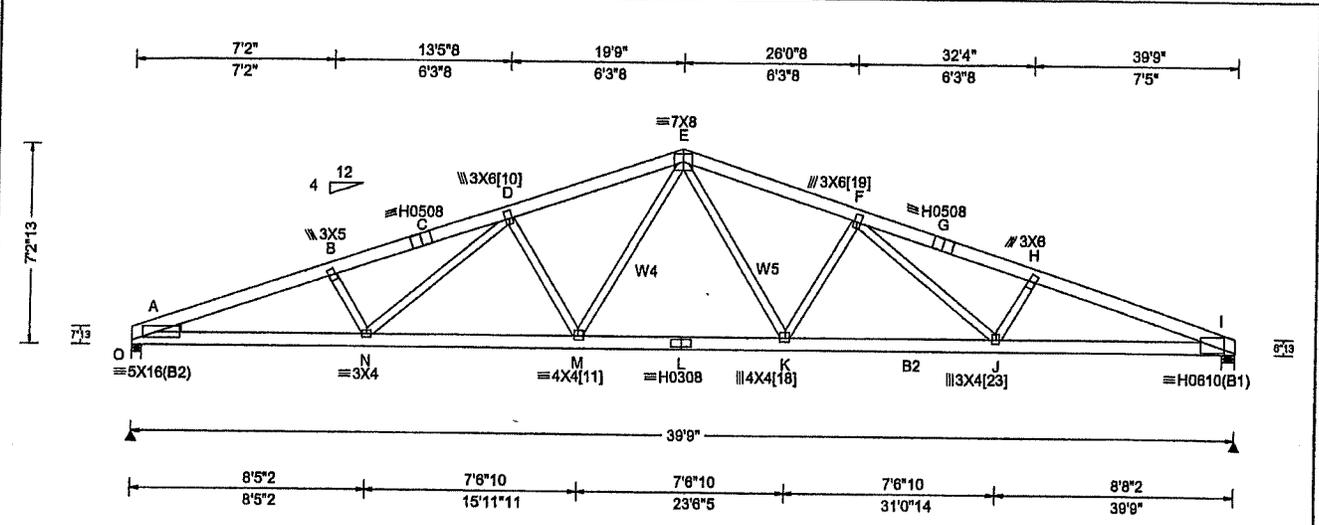
If you have any questions, please contact me.

Sincerely,


Nicholas Jasper, PE
Civil Engineer/Principal



SEQN: 41622 T1 COMN Ply: 1 Job Number: 1812153MWB Cust: R435 JRef: 1WH04350022
 FROM: Qty: 8 Bussel MW 182333 DrwNo: 353.18.1443.43223
 Truss Label: A-Bussel CY / GWH 12/19/2018



Loading Criteria (psf)

TCLL:	30.00
TCDL:	5.00
BCLL:	0.00
BCDL:	1.00
Des Ld:	36.00
NCBCLL:	10.00
Soffit:	2.00
Load Duration:	1.15
Spacing:	60.0"

Wind Criteria

Wind Std: ASCE 7-10
 Speed: 130 mph
 Enclosure: Closed
 Risk Category: II
 EXP: C Kzt: NA
 Mean Height: 15.00 ft
 TCCL: 3.0 psf
 BCDL: 0.6 psf
 MWFRS Parallel Dist: 0 to h/2
 C&C Dist a: 4.00 ft
 Loc. from endwall: Any
 GCpi: 0.18
 Wind Duration: 1.60

Snow Criteria (Pg, Pf in PSF)

Pg: 30.0 Ct: 1.2 CAT: II
 Pf: 25.2 Ce: 1.0
 Lu: - Cs: 1.00
 Snow Duration: 1.15

Code / Misc Criteria

Bldg Code: IRC 2015
 TPI Std: 2014
 Rep Fac: No
 FT/RT/PT: 6(0)/3(0)/1(0)
 Plate Type(s):
 WAVE, HS

Defl/CSI Criteria

PP Deflection in loc L/defl L/#
 VERT(LL): 0.607 K 780 315
 VERT(CL): 0.734 K 645 236
 HORZ(LL): 0.180 J - -
 HORZ(TL): 0.217 J - -
 Creep Factor: 2.0
 Max TC CSI: 0.816
 Max BC CSI: 0.971
 Max Web CSI: 0.829

VIEW Ver: 18.02.00.1016.21

Maximum Reactions (lbs)

Loc	Gravity		Non-Gravity	
	R+	/Rh	/Rw	/U
O	3604	-	1964	1379
I	3604	-	1972	1379

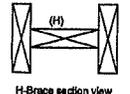
Wind reactions based on MWFRS
 O Brg Width = 4.0 Min Req = 3.8
 I Brg Width = 5.5 Min Req = 3.8
 Bearings O & I are a rigid surface.
 Members not listed have forces less than 375#
Maximum Top Chord Forces Per Ply (lbs)

Chords	Tens.Comp.	Chords	Tens. Comp.
A - B	5910 - 8639	E - F	4867 - 6656
B - C	5809 - 8196	F - G	5979 - 8257
C - D	5825 - 8015	G - H	5964 - 8438
D - E	4852 - 6631	H - I	6080 - 8948

Lumber

Top chord 2x6 DF-L 1800f-1.8E
 Bot chord 2x6 DF-L 2100f-1.8E :B2 2x6 DF-L 1800f-1.8E:
 Webs 2x4 DF-L Standard :W4, W5 2x4 DF-L 1800f-1.8E:
 :Lt Wedge 2x4 DF-L Standard:

In lieu of purlins on the bottom chord at 47" o/c, the bottom chords of trusses placed each side of supporting poles may be braced with purlins at 19'9" o/c maximum spacing and H-brace blocking: (H) 2X6 DF-L #2 or better continuous reinforcing member (match pole width). Attach to each truss ply with 10D common nails (0.148"x3.0") at 12" o/c.



Maximum Bot Chord Forces Per Ply (lbs)

Chords	Tens.Comp.	Chords	Tens. Comp.
A - N	8032 - 5313	L - K	5297 - 3212
N - M	6891 - 4412	K - J	6948 - 4452
M - L	5297 - 3212	J - I	8313 - 5496

Maximum Web Forces Per Ply (lbs)

Webs	Tens.Comp.	Webs	Tens. Comp.
B - N	738 - 867	E - K	1799 - 1274
N - D	1012 - 868	K - F	1271 - 1727
D - M	1230 - 1675	F - J	1237 - 1014
M - E	1757 - 1239	J - H	832 - 997

Plating Notes

Handling stresses not considered for plates. Handling of this truss requires special care by truss manufacturer and installation contractor to prevent plate damage.

Plate Shift Table

JT No	Plate Size	Shift	Chord Bite	JT No	Plate Size	Shift	Chord Bite
[10]	3X6	1.75 L	3.50	[11]	4X4	1.75 L	1.75
[18]	4X4	1.75 R	1.75	[19]	3X6	2.00 R	3.50
[23]	3X4	1.25 R	1.75				

Loading

Bottom chord checked for 10.00 psf non-concurrent bottom chord live load applied per IRC-15 section 301.5.

Purlins

In lieu of structural panels or rigid ceiling use purlins to brace TC @ 24" OC, BC @ 47" OC.

Wind

Member design based on both MWFRS and C&C.



12/19/2018

****WARNING** READ AND FOLLOW ALL NOTES ON THIS DRAWING!**
****IMPORTANT** FURNISH THIS DRAWING TO ALL CONTRACTORS INCLUDING THE INSTALLERS**
 Trusses require extreme care in fabricating, handling, shipping, installing and bracing. Refer to and follow the latest edition of BCSI (Building Component Safety Information, by TPI and SBCA) for safety practices prior to performing these functions. Installers shall provide temporary bracing per BCSI. Unless noted otherwise, top chord shall have properly attached structural sheathing and bottom chord shall have a properly attached rigid ceiling. Locations shown for permanent lateral restraint of webs shall have bracing installed per BCSI sections B3, B7, or B10, as applicable. Apply plates to each face of truss and position as shown above and on the Joint Details, unless noted otherwise. Refer to drawings 180A-Z for standard plate positions.
 Alpine, a division of ITW Building Components Group Inc. shall not be responsible for any deviation from this drawing, any failure to build the truss in conformance with ANSI/TPI 1, or for handling, shipping, installation and bracing of trusses. A seal on this drawing or cover page listing this drawing, indicates acceptance of professional engineering responsibility solely for the design shown. The suitability and use of this drawing for any structure is the responsibility of the Building Designer per ANSI/TPI 1 Sec.2.
 For more information see this job's general notes page and these web sites: ALPINE: www.alpinetw.com; TPI: www.tpinet.org; SBCA: www.sbcaindustry.com; ICC: www.iccsafe.org

Oregon Truss
 17900 SE Wallace Rd.
 Dayton OR 97114
 (503) 891-8787 Ext



8801 Folsom Blvd., Suite 107
 Sacramento, CA 95828



22175 S. Highway 99E, Canby, Oregon 97013
Phone: (503) 263-6953 Fax: (503) 266-7102

POST FRAME BUILDING STRUCTURAL CALCULATION

(This structure has been analyzed and designed for structural adequacy only.)

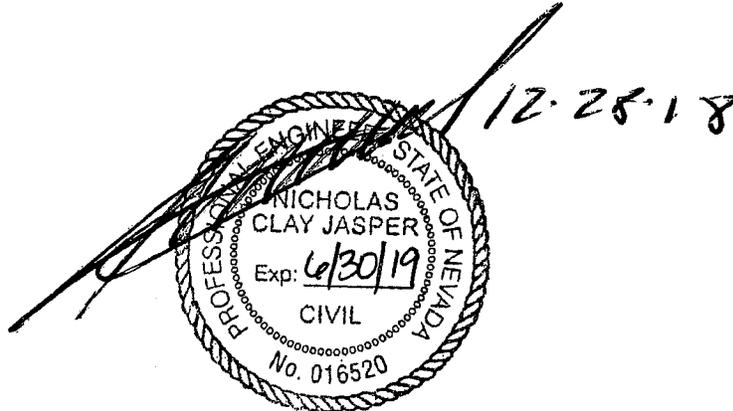
PROJECT No.

MW18233

OWNER:

**Hoyle Const for Bussel
16400 N Red Rock Rd
Reno, NV 89508**

ENGINEER:



POST FRAME BUILDING

REFERENCES:

1. 2012 Edition of the International Building Code
2. ASCE 7-10 - Minimum Design Loads for Buildings and Other Structures
American Society of Civil Engineers, 2011
3. 2012 Edition, National Design Specification (NDS) Supplement For Wood
Construction, American Wood Council, 2011
4. ASABE EP486.2 - Shallow Post and Pier Foundation Design
American Society of Agricultural and Biological Engineers, 2012

DESIGN INPUT VALUES:**Building Dimensions**

$W_{\text{bldg}} := 40\text{-ft}$	Width of Building	$W_{\text{shed}} := 12\text{-ft}$	Width of Eave Shed Roof
$L_{\text{bldg}} := 50\text{-ft}$	Length of Building	$L_{\text{shed}} := 50\text{-ft}$	Length of Eave Shed Roof
$H_{\text{bldg}} := 14\text{-ft}$	Eave Height of Building	$H_{\text{shed}} := 11\text{-ft}$	Eave Height of Shed Roof
$O_{\text{verhang}} := 0\text{-in}$	Length of Eave Overhang		
$R_{\text{pitch}} := 4 / 12$	Roof pitch	$R_{\text{pitchS}} := 3 / 12$	Roof pitch
$B_{\text{ay}} := 10\text{-ft}$	Greatest nominal spacing between eave wall posts		
$WL_{\text{gableopenings}} := 26\text{-ft}$	Total width of openings in left gable wall		
$WR_{\text{gableopenings}} := 10\text{-ft}$	Total width of openings in right gable wall		
$WF_{\text{eaveopenings}} := 10\text{-ft}$	Total width of openings in front eave wall		
$WR_{\text{eaveopenings}} := 20\text{-ft}$	Total width of openings in rear eave wall		

Design Loads for Building:

Risk_Category :=

Wind Design Values:

Wind Speed: $V_{\text{wind}} = 130\text{ mph}$ Wind Exposure: $E_{\text{xposure}} :=$

Seismic Design Values:

Site_class :=

$S_s := 1.337$ Mapped spectral acceleration for short period
 $S_1 := 0.462$ Mapped spectral acceleration for 1 second period
 $R_a := 2.5$ Response modification factor

Roof Load Design Values:

$p_g := 30\text{-psf}$ Ground snow load
 $p_d = 3\text{-psf}$ Roof dead load Roof type is = "metal sheathing"
 $p_{Lr} = 20\text{-psf}$ Roof live load
 $p_{d2} := 1\text{-psf}$ Additional truss bottom chord dead load (if applicable)

DESIGN INPUT VALUES (Continued):

Structural Members for Building:

Eave Post Properties: (Solid rough-sawn post unless otherwise specified)

S_{post} := Post Species := Post Grade :=

Purlin Properties:

S_{purlin} :=
 Purlin_{species} :=
 Purlin_{grade} := Purlin_{spacing} := 24-in

Girt Properties:

S_{girt} :=
 Girt_{species} :=
 Girt_{grade} := Girt_{spacing} = 24 in

Post Hole and Footing Design Values:

q_{soil} := 1500-psf Assumed soil vertical bearing capacity
 S_{soil} = 100-psf Assumed soil lateral bearing capacity
 d_{ia_footing} := 26in Main eave post footing diameter

Slab and backfill information

Concrete_slab :=
 Backfill_type := Main eave post hole backfill

(GO TO LAST PAGE FOR SUMMARY OF RESULTS)

SNOW LOAD ANALYSIS:

For roof slopes greater than 5 degrees, and less than 70 degrees.

$$p_g = 30 \cdot \text{psf} \quad \text{Ground Snow Load (from above)}$$

$$R_{\text{angle}} = 18.43 \cdot \text{deg} \quad \text{Angle of roof}$$

$$C_e = 1.00 \quad \text{Exposure factor}$$

$$C_t = 1.10 \quad \text{Thermal Factor}$$

$$C_s = 1.00 \quad \text{Roof slope factor}$$

$$I_s = 1.00 \quad \text{Importance factor}$$

1. Determine Roof Snow Loads:

$$p_f := 0.7 \cdot C_e \cdot C_t \cdot I_s \cdot p_g \quad \text{Equation 1}$$

$$p_f = 23.1 \cdot \text{psf} \quad \text{Flat roof snow load; Roof_slope} \leq 5 \text{deg}$$

$$p_s := C_s \cdot p_f \quad \text{Equation 2}$$

$$p_s = 23.1 \cdot \text{psf} \quad \text{Sloped roof (balanced) snow load}$$

2. Determine final snow load, p_{su}

$$p_{su} = 30 \cdot \text{psf} \quad \text{Final roof snow load}$$

WIND ANALYSIS:

Method 2 - Analytical Procedure

$$V_{\text{wind}} = 130 \text{ mph} \quad \text{Wind Speed}$$

$$k_d = 0.85 \quad \text{Wind Directionality Factor}$$

$$k_{zt} = 1.0 \quad \text{Topographic Factor}$$

$$k_z = 0.849 \quad \text{Wind Exposure Factor (windward)}$$

$$I_w = 1.00 \quad \text{Importance factor}$$

$$q_h := 0.00256 \cdot k_z \cdot k_{zt} \cdot k_d \cdot V_{\text{asd}}^2 \cdot I_w$$

$$q_h = 18.73 \cdot \text{psf} \quad \text{Velocity Pressure}$$

Calculated Wind Pressures:**Windward Eave Wall:**

$$q_{\text{ww}} := q_h \cdot GC_{\text{pffww}}$$

$$q_{\text{ww}} = 9.67 \cdot \text{psf}$$

Leeward Eave Wall:

$$q_{\text{lw}} := q_h \cdot GC_{\text{pflw}}$$

$$q_{\text{lw}} = -7.78 \cdot \text{psf}$$

Windward Gable Wall:

$$q_{\text{wwg}} := q_h \cdot GC_{\text{pffwg}}$$

$$q_{\text{wwg}} = 7.49 \cdot \text{psf}$$

Leeward Gable Wall:

$$q_{\text{lwg}} := q_h \cdot GC_{\text{pflwg}}$$

$$q_{\text{lwg}} = -5.43 \cdot \text{psf}$$

Windward Roof:

$$q_{\text{wr}} := q_h \cdot GC_{\text{pfr}}$$

$$q_{\text{wr}} = -12.92 \cdot \text{psf}$$

Leeward Roof:

$$q_{\text{lr}} := q_h \cdot GC_{\text{pflr}}$$

$$q_{\text{lr}} = -8.78 \cdot \text{psf}$$

Wall Elements:

$$q_{\text{we}} := q_h \cdot GC_{\text{pfr}}$$

$$q_{\text{we}} = -14.98 \cdot \text{psf}$$

Roof Elements:

$$q_{\text{r}} := q_h \cdot GC_{\text{pfr}}$$

$$q_{\text{r}} = -14.98 \cdot \text{psf}$$

Internal Wind Pressure (+/-):

$$q_i := q_h \cdot GC_{\text{pi}}$$

$$q_i = 3.37 \cdot \text{psf}$$

SEISMIC CALCULATIONS:

$S_s = 1.34$ Mapped spectral acceleration for short periods (from above)

$S_1 = 0.46$ Mapped spectral acceleration for 1-second period (from above)

$I_e = 1.0$ Importance factor

$R_a = 2.5$ Response modification factor (from above)

1. Determine the Seismic Design Category

a. Calculate S_{DS} and S_{D1}

For S_{DS} :

For $S_s = 1.34$

$F_a = 1.00$

$S_{MS} := S_s \cdot F_a$

$S_{MS} = 1.34$

$S_{DS} := \left(\frac{2}{3}\right) \cdot S_{MS}$

$S_{DS} = 0.89$

For S_{D1} :

For $S_1 = 0.46$

$F_v = 1.54$

$S_{M1} := S_1 \cdot F_v$

$S_{M1} = 0.711$

$S_{D1} := \left(\frac{2}{3}\right) \cdot S_{M1}$

$S_{D1} = 0.47$

Seismic_Design_Category = "D"

$H_{roof} = 6.667$ ft

2. Determine the building parameters

$H_{roof,S} = 3$ ft

Building dead load weight, W :

$$W := \left[W_{bldg} \cdot L_{bldg} \cdot \left[(P_{f,s} \cdot 2) + P_d \right] + \left[\left[2 \cdot (W_{bldg} + L_{bldg}) \cdot \frac{H_{bldg}}{2} + (H_{roof} \cdot W_{bldg}) \right] \cdot P_d \right] \right]$$

$W = 10580.0$ lb

$$W_S := \left[W_{shed} \cdot L_{shed} \cdot \left[(P_{f,s} \cdot 2) + P_d \right] + \left[(H_{roof,S} \cdot W_{shed}) \cdot P_d \right] \right]$$

$W_S = 1908.0$ lb

Building area, A_b :

$$A_b := L_{bldg} \cdot (W_{bldg} + W_{shed})$$

$A_b = 2600$ ft²

3. Determine the shear force to be applied

a. Determine the fundamental period, T

$$T_a := .02 \cdot \left(\frac{H_{\text{bldg}} + \frac{H_{\text{roof}}}{2}}{\text{ft}} \right)^{0.75} \quad T := T_a \quad T = 0.17 \text{ s}$$

b. Determine the Seismic Response Coefficient, C_s :

C_s is calculated as:

But need not exceed:

$$C_{s2} := \frac{S_{DS}}{\frac{R_a}{I_e}}$$

$$C_{s3} = 1.115$$

$$C_{s2} = 0.357$$

But shall not be less than:

$$C_{s1} = 0.039$$

$C_s = 0.357$ Seismic Response Coefficient to used in determination of seismic base shear

c. Determine the Seismic Base Shear:

$$V_{\text{base_shear}} := C_s \cdot W \quad V_{\text{base_shear}} = 3772 \cdot \text{lb}$$

$$V_{\text{base_shear2}} := C_s \cdot W_S \quad V_{\text{base_shear2}} = 680 \cdot \text{lb}$$

4. Determine the seismic load on the building:

Since Seismic_Design_Category = "D" , $\rho = 1.3$

$E = 3433 \cdot \text{lb}$ Seismic load on building

$E_S = 619 \cdot \text{lb}$ Seismic load on eave shed roof

BUILDING MODEL:**STEP 1: DETERMINE THE SHEAR STIFFNESS OF THE TEST PANEL**

This procedure relies on tests conducted by the National Frame Builders Association.

The test was conducted using 29 gauge ribbed steel panels. These ribbed steel panels are similar to Strongpanel, Norclad, and Delta-Rib which are in common use by builders in this area. The material and section properties for the test panels are thus reasonable and will be used throughout.

The stiffness of the test panel was calculated to be: $c = 2166 \text{ lb/in}$

STEP 2: CALCULATED ROOF DIAPHRAGM STIFFNESS OF THE TEST PANEL

$$c' = (E \times t) / (2 \times (1+V) \times (g/p) + (K_2 / (b' \times t)^2))$$

Where: $E_{\text{steel}} = 27.5 \times 10^6 \text{ psi}$ (modulus of elasticity for steel)
 $t = 0.017 \text{''}$ (thickness of 29 gauge steel)
 $V = 0.3$ (Poisson's Ratio for steel)
 $g/p = 1.139$ ratio of sheathing corrugation length to corrugation pitch
 $b' = 144 \text{''}$ (12'-0" length of test panel)

STEP 2.1

This equation was set equal to the stiffness of the test panel (2166 lb/in) and the unknown value (K_2) was solved for.

$$K_2 = 1275 \text{ in}^4 \text{ sheet edge purlin fastening constant}$$

STEP 2.2:

Use new building width to determine stiffness of new roof diaphragm (c_b):

$$b_{\text{new}} := \frac{\frac{W_{\text{bldg}}}{2}}{\cos(\Theta)}$$

$$K_2 := 1275 \text{ in}^4 \quad \Theta = 18.43 \cdot \text{deg} \quad \text{Angle of roof pitch from horizontal}$$

$$t := 0.017 \cdot \text{in} \quad E_{\text{steel}} := 27500000 \cdot \text{psi}$$

$$b_{\text{new}} = 253 \cdot \text{in}$$

$$c := \frac{E_{\text{steel}} \cdot t}{2.961 + \frac{K_2}{(b_{\text{new}} \cdot t)^2}} \quad c = 6503 \cdot \frac{\text{lb}}{\text{in}}$$

STEP 2.3 & 2.4:

Calculate the equivalent horizontal roof stiffness (c_h) for the full roof:

Since c_h is for the full roof, the roof length must be ratioed by the aspect ratio of the roof panel (b / a) where "a" is the truss spacing in inches.

$$a := B_{\text{ay}} \quad c_h := 2 \cdot c \cdot \cos(\Theta)^2 \cdot \frac{b_{\text{new}}}{a}$$

$$a = 120 \cdot \text{in} \quad c_h = 24675 \cdot \frac{\text{lb}}{\text{in}}$$

STEP 3: DETERMINE THE STIFFNESS OF THE POST FRAME (k):

Since the connection between the posts and the rafters can be assumed to be a pinned joint, the model for the post frame can be assumed to be the sum of two cantilevers (the posts) that act in parallel. The stiffness of the post frame can be calculated from the amount of force required to deflect the system one inch. The spring constant (k) in pounds per inch of deflection results directly.

$$k = 188 \cdot \text{pli}$$

STEP 4: DETERMINE THE TOTAL SIDE SWAY FORCE (R):

Apply wind loads to the walls to determine the moment, fiber stress and end reaction at prop point R.

Calculate Total Wind Load:

$$q_e = 17.45 \cdot \text{psfwind load}$$

$$q_{wwpost} := q_e \cdot a$$

$$q_{wwpost} = 14.54 \cdot \text{pli}$$

$$M_{wind} := \left(q_{wwpost} \cdot \frac{L_{post_bndg}^2}{8} \right)$$

$$M_{wind} = 44245 \cdot \text{in} \cdot \text{lb}$$

$$f_{wind} := \frac{M_{wind}}{S_{xeavepost}}$$

$$f_{wind} = 615 \cdot \text{psi}$$

$$R := \left(3 \cdot q_{wwpost} \cdot \frac{L_{post_bndg}}{8} \right)$$

$$R = 851 \text{ lb}$$

STEP 5: DETERMINE THE RATIO OF THE FRAME STIFFNESS TO THE ROOF STIFFNESS:

This ratio (k/c_h) will be used to determine the side sway force modifiers.

$$\frac{k}{c_h} = 0.008$$

STEP 6: DETERMINE SIDE SWAY RESISTANCE FORCE:

$$mD = 0.978$$

STEP 7: DETERMINE THE ROOF DIAPHRAGM SIDE SWAY RESISTANCE FORCE:

$$Q := mD \cdot R$$

$$Q = 832 \text{ lb}$$

Since not all of the total side sway force (R) is resisted by the roof diaphragm, some translation will occur at the top of the post. The distributed load that is not resisted by the roof diaphragm will apply additional moment and fiber stress to the post.

$$M_{dff} = 3964 \cdot \text{in} \cdot \text{lb}$$

$$f_{dff} = 55 \cdot \text{psi}$$

Calculate the total moment and the total fiber stress in the post.

$$M_{tot} := mD \cdot M_{wind} + M_{dff}$$

$$M_{tot} = 47218 \cdot \text{in} \cdot \text{lb}$$

$$f_{tot} := mD \cdot f_{wind} + f_{dff}$$

$$f_{tot} = 656 \cdot \text{psi}$$

MAIN POST DESIGN: (Worst Case)Calculate allowable unit compression stress, F_{cc} .

$$F_{c1} = 575 \cdot \text{psi} \quad F_c := F_{c1} \cdot C_{Me\text{post}} \cdot C_{t\text{post}} \cdot C_{F\text{cpost}} \cdot C_{i\text{post}}$$

$$F_c = 575 \cdot \text{psi} \quad \text{Allowable compression stress including load factors}$$

$$L_{\text{post_bndg}} = 156 \cdot \text{in} \quad \text{Bending length of post}$$

$$d_{\text{post}} = 6 \cdot \text{in} \quad \text{Minimum unbraced dimension of post}$$

$$K_c = 0.8 \quad c = 0.8 \quad E_{\text{min_wood}} = 400000 \cdot \text{psi} \quad E'_{\text{min}} := E_{\text{min_wood}} \cdot C_{ME\text{post}} \cdot C_{t\text{post}} \cdot C_{i\text{post}}$$

$$I_c := K_c \cdot L_{\text{post_bndg}} \quad I_c = 124.8 \cdot \text{in} \quad E'_{\text{min}} = 400000 \cdot \text{psi}$$

$$F_{cE} := \frac{0.822 \cdot E'_{\text{min}}}{\left(\frac{I_c}{d_{\text{post}}}\right)^2}$$

$$F_{cE} = 760 \cdot \text{psi}$$

Load duration factors (C_D):

$$C_{D\text{const}} = 1.25 \quad C_{D\text{wind}} = 1.60$$

$$C_{D\text{snow}} = 1.15$$

Calculate Column Stability Factor, C_p :

$$C_p := \left(\frac{1 + \frac{F_{cE}}{F_c \cdot C_D}}{2 \cdot c} \right) - \sqrt{\left(\frac{1 + \frac{F_{cE}}{F_c \cdot C_D}}{2 \cdot c} \right)^2 - \frac{F_{cE}}{F_c \cdot C_D}}$$

$$C_{p_Lr} = 0.71 \quad C_{p_Snow} = 0.74 \quad C_{p_Wind} = 0.62$$

$$F_{cc_Lr} := F_c \cdot C_{D\text{const}} \cdot C_{p_Lr} \quad F_{cc_Lr} = 510 \cdot \text{psi}$$

Allowable compression stress on the post;
load case 1

$$F_{cc_Snow} := F_c \cdot C_{D\text{snow}} \cdot C_{p_Snow} \quad F_{cc_Snow} = 487 \cdot \text{psi}$$

Allowable compression stress on the post;
load case 2

$$F_{cc_Wind} := F_c \cdot C_{D\text{wind}} \cdot C_{p_Wind} \quad F_{cc_Wind} = 572 \cdot \text{psi}$$

Allowable compression stress on the post;
all load cases except load cases 1 and 2

$$W_{\text{roof}} = 34 \cdot \text{psf} \quad \text{Total roof loading}$$

$$P_{\text{deadpost}} = 1040 \cdot \text{lb} \quad \text{Axial loading per post due to roof dead load}$$

$$P_{L\text{roofpost}} = 5200 \cdot \text{lb} \quad \text{Axial loading per post due to live roof load}$$

$$P_{\text{snowpost}} = 7800 \cdot \text{lb} \quad \text{Axial loading per post due to roof snow load (load case 2)}$$

$$P_{\text{snowpost_fs}} = 6006 \cdot \text{lb} \quad \text{Axial loading per post due to roof snow load (load case 5)}$$

$$F_b := F_{b1} \cdot C_{D\text{wind}} \cdot C_{Mb\text{post}} \cdot C_{t\text{post}} \cdot C_{L\text{post}} \cdot C_{Fb\text{post}} \cdot C_{f\text{post}} \cdot C_{i\text{post}}$$

$$F_b = 920 \cdot \text{psi} \quad \text{Allowable bending stress per post including load factors}$$

Check Load Cases:

Load Case 1: Dead Load + Live Roof Load

$$f_{b1} := 0 \qquad f_{b1} = 0 \cdot \text{psi} \qquad \text{Actual bending stress on post}$$

$$f_c := \frac{P_{\text{deadpost}} + P_{\text{Lroofpost}}}{A_{\text{post}}} \qquad f_c = 173 \cdot \text{psi} \qquad \text{Actual compression stress per post}$$

$$\text{CCFALI1} := \left(\frac{f_c}{F_{\text{cc_Lr}}} \right) \qquad \text{CCFALI1} = 0.34$$

Load Case 2: Dead Load + Snow Load

$$f_{b1} := 0 \qquad f_{b1} = 0 \cdot \text{psi} \qquad \text{Actual bending stress on post}$$

$$f_c := \frac{P_{\text{deadpost}} + P_{\text{snowpost}}}{A_{\text{post}}} \qquad f_c = 246 \cdot \text{psi} \qquad \text{Actual compression stress per post}$$

$$\text{CCFALI2} := \left(\frac{f_c}{F_{\text{cc_Snow}}} \right) \qquad \text{CCFALI2} = 0.50$$

Load Case 3: Dead Load + 0.6 * Wind Load

$$f_{b1} := f_{\text{tot}} \qquad f_{b1} = 656 \cdot \text{psi} \qquad \text{Actual bending stress on post}$$

$$f_c := \frac{P_{\text{deadpost}}}{A_{\text{post}}} \qquad f_c = 29 \cdot \text{psi} \qquad \text{Actual compression stress per post}$$

$$\text{CCFALI3} := \left[\left(\frac{f_c}{F_{\text{cc_Wind}}} \right)^2 + \frac{f_{b1}}{F_b \cdot \left(1 - \frac{f_c}{F_{\text{cB}}} \right)} \right] \qquad \text{CCFALI3} = 0.74$$

Check Load Cases - cont'd:**Load Case 4: Dead Load + 0.75 * (0.6 * Wind Load) + 0.75 * Live Roof Load**

$$f_{b1} := 0.75 \cdot (f_{tot}) \quad f_{b1} = 492 \cdot \text{psi} \quad \text{Actual bending stress on post}$$

$$f_c := \frac{P_{\text{deadpost}} + 0.75 \cdot P_{\text{Lroofpost}}}{A_{\text{post}}} \quad f_c = 137 \cdot \text{psi} \quad \text{Actual compression stress per post}$$

$$\text{CCFALI4} := \left[\left(\frac{f_c}{F_{cc_Wind}} \right)^2 + \frac{f_{b1}}{F_b \cdot \left(1 - \frac{f_c}{F_{cE}} \right)} \right] \quad \text{CCFALI4} = 0.71$$

Load Case 5: Dead Load + 0.75 * (0.6 * Wind Load) + 0.75 * Snow Load

$$f_{b1} := 0.75 \cdot (f_{tot}) \quad f_{b1} = 492 \cdot \text{psi} \quad \text{Actual bending stress on post}$$

$$f_c := \frac{P_{\text{deadpost}} + 0.75 \cdot P_{\text{snowpost_fs}}}{A_{\text{post}}} \quad f_c = 154 \cdot \text{psi} \quad \text{Actual compression stress per post}$$

$$\text{CCFALI5} := \left[\left(\frac{f_c}{F_{cc_Wind}} \right)^2 + \frac{f_{b1}}{F_b \cdot \left(1 - \frac{f_c}{F_{cE}} \right)} \right] \quad \text{CCFALI5} = 0.74$$

Load Case 6: 0.6 * Dead Load + 0.6 * Wind Load

$$f_{b1} := f_{tot} \quad f_{b1} = 656 \cdot \text{psi} \quad \text{Actual bending stress on post}$$

$$f_c := \frac{0.6 \cdot P_{\text{deadpost}}}{A_{\text{post}}} \quad f_c = 17 \cdot \text{psi} \quad \text{Actual compression stress per post}$$

$$\text{CCFALI6} := \left[\left(\frac{f_c}{F_{cc_Wind}} \right)^2 + \frac{f_{b1}}{F_b \cdot \left(1 - \frac{f_c}{F_{cE}} \right)} \right] \quad \text{CCFALI6} = 0.73$$

CCFALI = 0.74 Less than or equal to 1.00 thus OK

DETERMINE GABLE WALL SHEAR LOADS:**1. Determine the wind load on the eave wall to be resisted by the gable wall in shear:** $q_e = 17.5 \cdot \text{psf}$ Eave wall wind pressure from above $q_{\text{roof}} = 4.8 \cdot \text{psf}$ roof wind

$$V_{\text{eave_wind}} := \frac{(0.375 \cdot mD \cdot H_{\text{bldg}} \cdot L_{\text{bldg}} \cdot q_e) + (H_{\text{roof}} \cdot L_{\text{bldg}} \cdot q_{\text{roof}})}{2}$$

 $V_{\text{eave_wind}} = 3039 \text{ lb}$ **2. Determine the seismic load to be resisted by the gable wall in shear:**

$$V_{\text{eave_seismic}} := \frac{E}{2} + \frac{E_s}{2}$$

 $V_{\text{eave_seismic}} = 2026 \text{ lb}$ **3. Determine the controlling load to be resisted by the gable wall in shear:**The controlling load = " $V_{\text{eave_wind}}$ ". Therefore, $V_{\text{gable_shear}} = 3039 \text{ lb}$

$V_{\text{gable_shear}}$ is the shear load that is transmitted through the roof diaphragm to each gable wall.
Normalize the load to a per foot basis.

$$v_{\text{Lgablewall}} := \frac{V_{\text{gable_shear}}}{W_{\text{bldg}} - WL_{\text{gableopenings}}}$$

 $v_{\text{Lgablewall}} = 217 \cdot \text{plf}$ Left gable shear load

$$v_{\text{Rgablewall}} := \frac{V_{\text{gable_shear}}}{W_{\text{bldg}} - WR_{\text{gableopenings}}}$$

 $v_{\text{Rgablewall}} = 101 \cdot \text{plf}$ Right gable shear load

The gable wall diaphragms can resist the shear loads as follows:

$v_{\text{Lgablewall}} \leq 300 \text{ plf}$

Then install 7/16" OSB, 1/2" CDX plywood or 5/8" T1-11 exterior wood sheathing with 6d nails at 4" o.c. boundary and 12" o.c. field. Provide 2X blocking at all panel edges.

$v_{\text{Rgablewall}} \leq 142 \text{ plf}$

Use 29 gauge metal sheathing. Install per the Typical Panel detail as shown on the the engineered drawing package.

DETERMINE EAVE WALL SHEAR LOADS:**1. Determine the wind load on the gable wall to be resisted by the eave wall in shear:**

$$q_g = 12.9 \text{ psf} \quad \text{Gable wall wind pressure}$$

$$H_{\text{roof}} = 6.7 \text{ ft}$$

$$V_{\text{gable_wind}} := \frac{0.375 \cdot mD \cdot H_{\text{bldg}} \cdot W_{\text{bldg}} \cdot q_g + 0.5 \cdot H_{\text{roof}} \cdot W_{\text{bldg}} \cdot q_g}{2}$$

$$V_{\text{gable_wind}} = 2188 \text{ lb}$$

2. Determine the seismic load to be resisted by the eave wall in shear:

$$V_{\text{gable_seismic}} := \frac{E}{2} + E_s$$

$$V_{\text{gable_seismic}} = 2335 \text{ lb}$$

3. Determine the controlling load to be resisted by the eave wall in shear:

The controlling load = "Vgable_seismic". Therefore, $V_{\text{eave_shear}} = 2335 \text{ lb}$

$V_{\text{eave_shear}}$ is the shear load that is transmitted through the roof diaphragm to each eave wall. Normalize the load to a per foot basis.

$$v_{\text{f_cavewall}} := \frac{V_{\text{eave_shear}}}{L_{\text{bldg}} - WF_{\text{caveopenings}}}$$

$$v_{\text{f_cavewall}} = 58 \text{ plf}$$

Front eave shear load

$$v_{\text{r_cavewall}} := \frac{V_{\text{eave_shear}}}{L_{\text{bldg}} - WR_{\text{caveopenings}}}$$

$$v_{\text{r_cavewall}} = 78 \text{ plf}$$

Rear eave shear load

The eave wall diaphragms can resist the shear loads as follows:

$$v_{\text{f_cavewall}} \leq 142 \text{ plf}$$

$$v_{\text{r_cavewall}} \leq 142 \text{ plf}$$

Use 29 gauge metal sheathing. Install per the Typical Panel detail as shown on the the engineered drawing package.

EMBEDMENT FOR MAIN POST:

Calculate the minimum required post embedment depth for lateral loading for the main posts.

Post_is = "not constrained by a concrete slab"

$V_a = 773 \text{ lb}$ Lateral shear load at the ground line

$M_a = 1967 \text{ lb-ft}$ Moment at the ground line

$d_{\text{ia_footing}} = 2.17 \text{ ft}$ Main post footing diameter

$S_{\text{soil}} = 100 \text{ psf}$ Lateral capacity of soil

Trial depth = 1.5 ft.- The starting depth of the post hole depth. The final post hole depth is determined by iterating to a final depth.

$d_{\text{epth_post}} = 2.6 \text{ ft}$ This is the minimum required post embedment depth for lateral loading

Gable wall uplift due to shear loading on gable wall shear panel:

Calculate uplift pullout of the gable wall posts due to shear loads on the gable walls.

$V_{\text{eave_wind}} = 3039 \text{ lb}$ Calculated from above

$$C_{\text{post}} := \frac{V_{\text{eave_wind}} \cdot H_{\text{bldg}}}{W_{\text{bldg}} - W_{\text{gableopenings}}} \quad C_{\text{post}} = 3039 \text{ lb} \text{ This is the uplift load on one gable wall post}$$

Assume a dead load weight of roof and wall area to be 2.0 psf. The area of the roof and wall that will tend to keep the gable wall post in the ground will be as follows:

$$R_{\text{roof}} := \frac{B_{\text{ay}}}{2} \cdot W_{\text{bldg}} \cdot 2 \text{ psf} \quad R_{\text{roof}} = 400 \text{ lb} \quad \text{Dead load of roof}$$

$$G_{\text{able_wall}} := \left[H_{\text{bldg}} \cdot (W_{\text{bldg}} - W_{\text{gableopenings}}) + \left(H_{\text{roof}} \cdot \frac{W_{\text{bldg}}}{2} \right) + \left(H_{\text{bldg}} \cdot \frac{2 \cdot B_{\text{ay}}}{2} \right) \right] \cdot 2 \cdot \text{psf}$$

$G_{\text{able_wall}} = 939 \text{ lb}$ Dead load of gable wall

$$P_{\text{osts}} := (H_{\text{bldg}} + d_{\text{epth_gable_footing}}) \cdot W_{\text{post}} \quad d_{\text{epth_gable_footing}} = 4.0 \text{ ft} \quad \text{gable post embedment depth}$$

$$P_{\text{osts}} = 157 \text{ lb} \quad \text{Weight of post} \quad d_{\text{ia_gable_footing}} = 1.5 \text{ ft} \quad \text{Diameter of gable wall posthole footing}$$

Concrete backfill in the gable end posts is = "required" to resist gable wall panel uplift.

Backfill = 910 lb Gable post backfill weight if gable end post hole is backfilled with concrete (0 if granular or native soil backfill. Concrete backfill may or may not be required to resist gable wall panel uplift).

$$W_{\text{tot}} := G_{\text{able_wall}} + R_{\text{roof}} + P_{\text{osts}} + \text{Backfill} + P_{\text{skinGU}}$$

$W_{\text{tot}} = 3290 \text{ lb}$ Total resistance for gable wall panel uplift. Since W_{tot} is greater than the gable wall panel uplift, C_{post} , the gable wall footing is adequate.

FOOTING DESIGN FOR MAIN POST: (With Shed Loads)

Determine the footing size and depth for vertical bearing for the main posts.

$$q_{\text{soil}} = 1500 \cdot \text{psf} \quad \text{Soil bearing capacity for footing}$$

$$d_{\text{ia_footing}} = 2.2 \text{ ft} \quad \text{Footing diameter}$$

$$A_{\text{footing}} := \pi \cdot \left(\frac{d_{\text{ia_footing}}^2}{4} \right) \quad A_{\text{footing}} = 3.69 \text{ ft}^2 \quad \text{Footing area}$$

$$P_{\text{ost_depth}} = 4.0 \text{ ft} \quad \text{Minimum required post embedment depth}$$

$$P_{\text{footing}} := A_{\text{footing}} \cdot q_{\text{soil}} \cdot d_{\text{factor}} \quad P_{\text{footing}} = 9402 \text{ lb} \quad \text{End bearing capacity of footing}$$

$$P_{\text{snow}} = 8840 \text{ lb} \quad \text{Total footing load}$$

Note that the end bearing capacity (P_{footing}) is greater than the snow load (P_{snow}). This is OK.

GIRT DESIGN:

The girts will simple span between posts and loaded horizontally for wind. Calculate bending stress due to wind loading and determine the adequacy of the girts.

$$q_{\text{wegirt}} = 3.06 \cdot \text{pli} \quad L_{\text{girt_span}} = 114 \cdot \text{in} \quad \text{Orientation} = \text{"Commercial"}$$

$$M_{\text{girt}} := q_{\text{wegirt}} \cdot \frac{L_{\text{girt_span}}^2}{8} \quad M_{\text{girt}} = 4970 \cdot \text{in} \cdot \text{lb} \quad \text{Bending moment in the girt}$$

$$f_{\text{bgirt}} := \frac{M_{\text{girt}}}{S_{\text{girt}}} \quad f_{\text{bgirt}} = 657 \cdot \text{psi} \quad \text{Stress applied to the girt}$$

Determine the allowable member stress including load factors.

$$F_{\text{bGirt}} = 1650 \cdot \text{psi} \quad C_{\text{Dwind}} = 1.60 \quad C_{\text{Mbgirt}} = 1.00 \quad C_{\text{tgirt}} = 1.00 \quad C_{\text{LGirt}} = 0.99$$

$$C_{\text{FGirt}} = 1.00 \quad C_{\text{fugirt}} = 1.00 \quad C_{\text{rgirt}} = 1.15$$

$$F_{\text{bgirt}} := F_{\text{bGirt}} \cdot C_{\text{Dwind}} \cdot C_{\text{Mbgirt}} \cdot C_{\text{tgirt}} \cdot C_{\text{LGirt}} \cdot C_{\text{FGirt}} \cdot C_{\text{fugirt}} \cdot C_{\text{rgirt}} \quad F_{\text{bgirt}} = 2999 \cdot \text{psi} > f_{\text{bgirt}} \quad \text{This is OK.}$$

PURLIN DESIGN: (Worst Case)

The purlins simply span between pairs of trusses or rafters. Determine the adequacy of the purlins.

$$\text{Purlin} = \text{"2x6"} \quad \text{Purlin}_{\text{spacing}} = 24 \cdot \text{in o.c.}$$

$$L_{\text{purlin_span}} = 111 \cdot \text{in}$$

$$w_{\text{purlin}} = 5.34 \cdot \text{pli} \quad \text{Maximum combined distributed roof load along top edge of purlin}$$

$$M_{\text{purlin}} := \frac{w_{\text{purlin}} \cdot L_{\text{purlin_span}}^2}{8} \quad M_{\text{purlin}} = 8218 \cdot \text{in} \cdot \text{lb} \quad \text{Bending moment in the purlin}$$

$$f_{\text{bpurlin}} := \frac{M_{\text{purlin}}}{S_{\text{purlin}}} \quad f_{\text{bpurlin}} = 1087 \cdot \text{psi} \quad \text{Bending stress applied to the purlin}$$

Determine the allowable member stress including load factors

$$F_{\text{bPurlin}} = 1650 \cdot \text{psi} \quad C_{\text{Dsnow}} = 1.15 \quad C_{\text{Mburlin}} = 1.00 \quad C_{\text{tpurlin}} = 1.00 \quad C_{\text{LPurlin}} = 1.00$$

$$C_{\text{FPurlin}} = 1.00 \quad C_{\text{fupurlin}} = 1.00 \quad C_{\text{rpurlin}} = 1.15$$

$$F_{\text{bpurlin}} := F_{\text{bPurlin}} \cdot C_{\text{Dsnow}} \cdot C_{\text{Mburlin}} \cdot C_{\text{tpurlin}} \cdot C_{\text{LPurlin}} \cdot C_{\text{FPurlin}} \cdot C_{\text{fupurlin}} \cdot C_{\text{rpurlin}}$$

$$F_{\text{bpurlin}} = 2182 \cdot \text{psi} > f_{\text{bpurlin}} \quad \text{This is OK}$$

MAIN POST CORBEL BLOCK DESIGN:

Determine the required number and size of bolts required in the main post corbel block.

Allowable fastener shear capacities

$Z_{Tbolt_58} = 1590$ lb Shear capacity for 5/8" dia. bolts

$Z_{Tbolt_34} = 2190$ lb Shear capacity for 3/4" dia. bolts

$Z_{Tbolt_10} = 3600$ lb Shear capacity for 1" dia. bolts

$Z_{Tnail_16d} = 122$ lb Shear capacity for 16d nails

$Z_{Tnail_20d} = 147$ lb Shear capacity for 20d nails

$P_{Tcorbel} = 6800$ lb Combined snow, or live roof, and dead loads on corbels

If 5/8 dia. bolts are used:

$N_{bolts58} = 3.7$ Number of 5/8" dia. bolts required in the corbel block, if used.

If 3/4 dia. bolts are used:

$N_{bolts34} = 2.7$ Number of 3/4" dia. bolts required in the corbel block, if used.

If 1 dia. bolts are used:

$N_{bolts10} = 1.6$ Number of 1" dia. bolts required in the corbel block, if used.

If 20d nails are to be used:

$N_{ails20d} = 20.1$ Number of 20d nails required in each corbel block, if used.

If 16d nails are to be used:

$N_{ails16d} = 24.2$ Number of 16d nails required in each corbel block, if used.

SHED RAFTER DESIGN:

Determine the required section for intermediate building or shed rafters. The rafters will simple span between posts. It will be assumed that both ends are pinned.

Rafter_style := S_rafter := Rafter_grade :=

Rafter_species := L_rafter_span = 138.0 in

w_rafter = 27.5 pli Maximum combined distributed roof load along top edge of rafter

$$M_{\text{rafter}} := \frac{w_{\text{rafter}} \cdot L_{\text{rafter_span}}^2}{8} \quad M_{\text{rafter}} = 65464 \text{ in}\cdot\text{lb} \quad \text{Bending moment in the rafter}$$

$$f_{\text{brafter}} := \frac{M_{\text{rafter}}}{S_{\text{xrafter}} \cdot \text{Rafter_qty}} \quad f_{\text{brafter}} = 1034 \text{ psi} \quad \text{Bending stress applied to the rafter}$$

Determine the allowable member stress including load factors

$$F_{\text{bRafter}} = 1500 \text{ psi} \quad C_{\text{Dsnow}} = 1.15 \quad C_{\text{Mbrafter}} = 1.00 \quad C_{\text{trafter}} = 1.00 \quad C_{\text{Lrafter}} = 0.95$$

$$C_{\text{Frafter}} = 1.00 \quad C_{\text{furafter}} = 1.00 \quad C_{\text{rrafter}} = 1.00$$

$$F_{\text{brafter}} := F_{\text{bRafter}} \cdot C_{\text{Dsnow}} \cdot C_{\text{Mbrafter}} \cdot C_{\text{trafter}} \cdot C_{\text{Lrafter}} \cdot C_{\text{Frafter}} \cdot C_{\text{furafter}} \cdot C_{\text{rrafter}}$$

$$F_{\text{brafter}} = 1646 \text{ psi} > f_{\text{brafter}} \quad \text{This is OK}$$

RAFTER CORBEL BLOCK DESIGN:

Determine the required number and size of bolts required in the rafter corbel block.

Allowable fastener shear capacities

$Z_{Rbolt_58} = 1590 \text{ lb}$	Shear capacity for 5/8" dia. bolts
$Z_{Rbolt_34} = 2190 \text{ lb}$	Shear capacity for 3/4" dia. bolts
$Z_{Rbolt_10} = 3600 \text{ lb}$	Shear capacity for 1" dia. bolts
$Z_{Rnail_16d} = 122 \text{ lb}$	Shear capacity for 16d nails
$Z_{Rnail_20d} = 147 \text{ lb}$	Shear capacity for 20d nails
$P_{snow_eave} = 2040 \text{ lb}$	Combined snow, or live roof, and dead loads on eave corbels
$P_{snow_int} = 2040 \text{ lb}$	Combined snow, or live roof, and dead loads on interior corbels

If 5/8 dia. bolts are used:

$N_{bolts58_eave} = 1.1$	Number of 5/8" dia. bolts required in the rafter corbel block at the eave
$N_{bolts58_int} = 1.1$	Number of 5/8" dia. bolts required in the rafter corbel block at the interior post

If 3/4 dia. bolts are used:

$N_{bolts34_eave} = 0.8$	Number of 3/4" dia. bolts required in the rafter corbel block at the eave
$N_{bolts34_int} = 0.8$	Number of 3/4" dia. bolts required in the rafter corbel block at the interior post

If 1 dia. bolts are used:

$N_{bolts10_eave} = 0.5$	Number of 1" dia. bolts required in the rafter corbel block at the eave
$N_{bolts10_int} = 0.5$	Number of 1" dia. bolts required in the rafter corbel block at the interior post

If 20d nails are to be used:

$N_{ails20d_eave} = 6.0$	Number of 20d nails required in each corbel block at the eave
$N_{ails20d_int} = 6.0$	Number of 20d nails required in each corbel block at the interior post

If 16d nails are to be used:

$N_{ails16d_eave} = 7.3$	Number of 16d nails required in each corbel block at the eave
$N_{ails16d_int} = 7.3$	Number of 16d nails required in each corbel block at the interior post

FOOTING DESIGN FOR SHED EAVE POST:

Determine the footing size and depth for vertical bearing for the shed posts.

$$q_{\text{soil}} = 1500 \text{ psf} \quad \text{Soil bearing capacity for footing}$$

$$d_{\text{ia_footing_SE}} = 1.7 \text{ ft} \quad \text{Footing diameter}$$

$$A_{\text{footing_SE}} := \pi \cdot \left(\frac{d_{\text{ia_footing_SE}}^2}{4} \right) \quad A_{\text{footing_SE}} = 2.18 \text{ ft}^2 \quad \text{Footing area}$$

$$P_{\text{ost_depth_SE}} = 3.5 \text{ ft} \quad \text{Minimum required post embedment depth}$$

$$P_{\text{footing_SE}} := A_{\text{footing_SE}} \cdot q_{\text{soil}} \cdot d_{\text{factor_SE}} \quad P_{\text{footing_SE}} = 4909 \text{ lb} \quad \text{End bearing capacity of footing}$$

$$P_{\text{snow_eave}} = 2040 \text{ lb} \quad \text{Total footing load}$$

Note that the end bearing capacity ($P_{\text{footing_SE}}$) is greater than the snow load ($P_{\text{snow_eave}}$). This is OK.

Check uplift on shed eave post:

$$P_{\text{ul_SE}} := \left(\frac{W_{\text{shed}}}{2} + O_{\text{verhang}} \right) \cdot B_{\text{ay}} \cdot |q_{\text{ul}}| \quad P_{\text{ul_SE}} = 978 \text{ lb} \quad \text{This is the uplift on one shed eave post}$$

Assume a total weight of roof and wall area to be 2.0 psf. The area of the roof and wall that will tend to keep the truss post in the ground will be as follows:

$$W_{\text{t_post_hole_SE}} := 150 \cdot \text{pcf} \cdot P_{\text{ost_depth_SE}} \cdot (A_{\text{footing_SE}} - A_{66}) \quad W_{\text{t_post_hole_SE}} = 1014 \text{ lb} \quad \text{Weight of concrete in post hole}$$

$$W_{\text{ulr_SE}} := \left[\left(\frac{W_{\text{shed}}}{2} + O_{\text{verhang}} \right) + H_{\text{shed}} \right] \cdot B_{\text{ay}} \cdot 2 \cdot \text{psf} + W_{\text{t_post_hole_SE}} \quad W_{\text{ulr_SE}} = 1354 \text{ lb} \quad \text{Total uplift resistance}$$

Note that the total uplift resistance ($W_{\text{ulr_SE}}$) is greater than the uplift load ($P_{\text{ul_SE}}$). This is OK.

SUMMARY OF RESULTS:

Building Dimensions

W_{bdg} = 40 ft Width of Building
 L_{bdg} = 50 ft Length of Building
 H_{bdg} = 14 ft Eave Height of Building
 O_{verhang} = 0-in Length of Eave Overhang
 R_{pitch} = 4 / 12 Roof pitch

Building Design Loads

Ground_snow_load = 30-psf
 Roof_dead_load = 3-psf
 Wind_speed = 130-mph
 Wind_exposure = "C"
 Seismic_Design_Category = "D"

Post Details

Post_size = "6x6"
 Post_grade = "#2 Hem-Fir"
 Usage = 74 % Combined stress usage of post

Footing Details:

Post_is = "not constrained by a concrete slab"
 Postdepth = 4.0 ft Design Post Depth
 d_{1a_footing} = 2.2 ft Design Footing Diameter
 Footingusage = 94 % Stress usage of footing

Shear Wall Details:

v_{gablewall} = 217-plf Max. shear in gable wall
 v_{eavewall} = 78-plf Max. shear in eave wall

Girt Details:

Girt_usage = "22 % Stress usage of wall girt"
 Orientation = "Commercial"

Purlin Details:

Purlin_usage = 50 % Stress usage of roof purlin

Corbel Block Bolts:

N_{bolts58} = 3.7 Number of 5/8" dia. bolts required in the corbel block, if used.
 N_{bolts34} = 2.7 Number of 3/4" dia. bolts required in the corbel block, if used.
 N_{bolts10} = 1.6 Number of 1" dia. bolts required in the corbel block, if used.
 N_{ails20d} = 20.1 Number of 20d nails required in each corbel block, if used.
 N_{ails16d} = 24.2 Number of 16d nails required in each corbel block, if used.

SPECIAL NOTE:

The drawings attendant to this calculation shall not be modified by the builder unless authorized in writing by the engineer. No special inspections are required. No structural observation by the design engineer is required.