TOWN OF JACKSON
PLANNING & BUILDING DEPARTMENT

TRANSMITTAL MEMO

Town of Jackson
- ☒ Public Works/Engineering
- ☐ Building
- ☐ Title Company
- ☒ Town Attorney
- ☐ Police

Joint Town/County
- ☐ Parks and Recreation
- ☐ Pathways
- ☒ Housing Department

Teton County
- ☐ Planning Division
- ☐ Engineer
- ☐ Surveyor- *Nelson*
- ☐ Assessor
- ☐ Clerk and Recorder
- ☐ Road and Levee

State of Wyoming
- ☐ Teton Conservation
- ☐ WYDOT
- ☐ TC School District #1
- ☐ Game and Fish
- ☐ DEQ

Federal Agencies
- ☐ Army Corp of Engineers

Utility Providers
- ☐ Qwest
- ☐ Lower Valley Energy
- ☐ Bresnan Communications

Special Districts
- ☐ START
- ☐ Jackson Hole Fire/EMS
- ☐ Irrigation Company

Date: April 16, 2019

Item #: P19-089, 090

Planner: Paul Anthony

Phone: 733-0440 ext. 1303

Fax: 734-3563

Email: panthony@jacksonwy.gov

Owner:
Jackson State Bank
PO Box 2609
Carlsbad, CA 92009

Applicant:
Crystal Creek Capital
PO Box 844
Jackson, WY 83001

REQUESTS:

The applicant is submitting a request for an Encroachment Agreement for the Shoring Plan for the property located at 112 Center St and 165 E. Deloney Ave.

For questions, please call Paul Anthony at 733-0440, x1303 or email to the address shown below. Thank you.

Please respond by: Comments: Monday May 6, 2019

RESPONSE: For Departments not using Trak-it, please send responses via email to:
tstolte@jacksonwy.gov

ENCROACHMENT AGREEMENT APPLICATION

Planning & Building Department
Planning Division

150 E Pearl Ave. | ph: (307) 733-0440
P.O. Box 1687 | fax: (307) 734-3563
Jackson, WY 83001 | www.townofjackson.com

OWNER OF PROPERTY:

Name: CCC's Center Street, LLC Phone: 307-733-4733

Mailing Address: PO Box 844, Jackson, WY ZIP: 83001

E-mail: jeanne@crystalcreekcapital.com

APPLICANT/AGENT:

Name: James Walter Phone: 307-733-4733

Mailing Address: (see above) ZIP: (see above)

E-mail:

DESIGNATED PRIMARY CONTACT:

Owner X Applicant/Agent

PROPERTY:

Physical Address of Property: 112 Center Street; 165 E Deloney Avenue

Lot, Subdivision: Lots 2-5, Blk.3, Clubhouse, PT SW1/4, SW 1/4, SEC. 27, TWP. 41, Ring 116 Also: PNID22-41-16-27-3-15-001

PIDN:

Description of Public Right-of Way: Shoring plan for Center Street Project - Center Street and Deloney Avenue

SUBMITTAL REQUIREMENTS. Three (3) hard copies and one (1) digital copy of the application package (this form, plus all applicable attachments) should be submitted to the Planning Department. Please ensure all submittal requirements are included. The Planning Department will not hold or process incomplete applications. Partial or incomplete applications will be returned to the applicant.

Have you attached the following?

N/A **Application Fee.** Fees are cumulative. Applications for multiple types of permits, or for multiple permits of the same type, require multiple fees. See the currently adopted Fee Schedule in the Administrative Manual for more information.

10/29/15

_____**Notarized Letter of Authorization**. A notarized letter of consent from the landowner is required if the applicant is not the owner, or if an agent is applying on behalf of the landowner. If the owner is a partnership or corporation, proof that the owner can sign on behalf of the partnership or corporation is also required. Please see the Letter of Authorization template in the Administrative Manual for a sample.

__X__**Narrative Description of the Request.** Provide a detailed narrative description explaining the use of the noted public right-of-way.

__X__**Exhibit.** Provide an exhibit (picture, drawings, maps, plans) of the use of the noted public right-of-way including dimensions of requested encroachment.

FORMAT:

The main component of any application is demonstration of compliance with all applicable Land Development Regulations (LDRs) and Resolutions.

Note: Information provided by the applicant or other review agencies during the planning process may identify other requirements that were not evident at the time of application submittal. Staff may request additional materials during review as needed to determine compliance with the LDRs.

Under penalty of perjury, I hereby certify that I have read this application and state that, to the best of my knowledge, all information submitted in this request is true and correct. I agree to comply with all county and state laws relating to the subject matter of this application, and hereby authorize representatives of the Town of Jackson to enter upon the abovementioned property during normal business hours, after making a reasonable effort to contact the owner/applicant prior to entering.

Jeanne Carruth
Signature of Owner or Authorized Applicant/Agent

4/14/19
Date

Jeanne Carruth
Name Printed

Office Manager Crystal Creek Capital
Title

Crystal Creek Capital Real Estate Advisors, LLC

P.O. Box 844 | 275 Veronica Lane, Suite 300 | Jackson, Wyoming 83001 | Telephone 307-733-4733

April 15, 2019

Tiffany Stolte
Planning Department, Office Manger
Town of Jackson
PO Box 1687
Jackson, WY 83001

Encroachment Agreement Application: Shoring Plan

Dear Tiffany,

Please accept this Encroachment Agreement Application for the Center Street Project located at 112 Center Street and 165 E. Deloney Avenue.

Per the requirements of the Town of Jackson, CCC's Center Street, LLC is applying for an Encroachment Agreement of the shoring plan for the construction of the Center Street project. This application is requesting an Encroachment Agreement specific to the Shoring Plan in the Town of Jackson PROW.

Attached are the Shoring Plans and Shoring Calcs for your review:

- Center Street Hotel Shoring Calcs
- Center Street Hotel Shoring Plans

Per our previous conversations, Crystal Creek Capital appreciates the consideration of appearing at the Town of Jackson Town Council hearing on May 6, 2019.

If you have any questions, please feel free to contact me at your convenience.

Regards,

Jeanne Carruth
Office Manager

GORDON GEOTECHNICAL ENGINEERING, INC.

Design Memorandum

Temporary Shoring and Permanent Micropile Foundations

Center Street Hotel

112 Center Street,

Jackson, Wyoming

Prepared for:

G2B Company, Inc.
P.O. Box 3402
Nampa, Idaho 83653

(Attention: Mr. Dan Turner)

Job No. 223-010-19
April 12, 2019

Gordon Geotechnical Engineering, Inc. 4426 South Century Drive Suite 100 Salt Lake City, Utah 84123 (801) 327-9600 phone

Project Description

Prepare the design of the temporary soil nail walls for ground and existing building support during construction of the new Center Street Hotel located at 112 Center Street in Jackson, Wyoming. The temporary shoring will be installed on the north, west, south and southeastern sides of the proposed structure. The shoring will vary up to a nominal 21 feet maximum in height and will support existing buildings on the north, southwest corner and east side of the sites.

As part of the new construction, permanent micropiles will be installed in the northeastern portion of the new structure to carry building loads. Required loads per project plans are 75 kips compression and 50 kips tension.

Professional Statements

Supporting data upon which our design and plan preparation are based are presented in subsequent sections of this design memorandum. If subsurface conditions other than those described in the geotechnical report are encountered and/or if design, layout, or loading changes are implemented, Gordon Geotechnical Engineering Inc. (G^2) must be informed so that our design and plans can be reviewed. No warranty is expressed or implied, only that these designs were prepared in general accordance with design principles and practices in use at the time the work was performed.

Design References

The design of the shoring and micropiles will be in conjunction with standard practice as outlined in many texts. The following is a partial list of references used for the project.

Design References:

- Lateral Support Systems and Underpinning, Volume II - Design Fundamentals, FHWA-RD-75-129, Goldberg, et al, April 1976.
- Geotechnical Engineering Circular No. 7, FHWA Publication No FHWAO-IF-03-017, dated March 2003
- “Manual for Design & Construction Monitoring of Soil Nail Walls”, FHWA Publication No. FHWA-SA-96-069, dated November 1996.
- “Micropile Design and Construction”, FHWA Publication No. FHWA-NHI-05-039, dated December 2005.
- Earth Support Systems & Retaining Structures, Pile Buck, 1975.
- International Building Code.
- Project Drawings Building Permit Submittal entitled “Center Street Hotel, 112 Center Street, Jackson, Wyoming,” by IBI Grout, dated February 15, 2019.
- “Geotechnical Investigation, Center Street Project, Jackson, Wyoming, by Nelson Engineering, Design Development Draft dated October 2018.

Subsurface Soil and Groundwater Conditions

From the geotechnical report, the site soils typically consist of a medium dense to very dense clayey gravel, sand and a cobble alluvial fan deposits interbedded with clays and silts of possible lacustrine origin. This granular soil will be the predominate material in which the soil nailing will occur. From the geotechnical interpretation, a surficial silt/clay layer was found more consistently on the eastern portion of the site overlying the gravel soils. The presence of this surficial layer required the use of micropile supported foundations in the northeastern portion of the structure, however, this layer should generally not be present for nailing operations.

The following soil parameters will be utilized in the soil nail design:

Gravels with Sand, Clayey Gravels and Cobbles
Moist Unit Weight (γ) = 135 pcf
Friction Angle = 36 degrees
Cohesion = 50 psf (interlock)

Groundwater varies from about 6220 to 6223 which is several feet below the base of excavation and will not be included in the temporary soil nail design. However, strip chimney drains will be installed behind the shotcrete and will daylight at the toe of the excavation.

If soils encountered during site grading operations are different than projected or groundwater is encountered, G^2 must be notified immediately to review the shoring design. Modifications to the shoring may be required.

Surcharge

The soil nail wall will be designed for a conventional surcharge of 250 psf area surcharge at roadways, parking lots and other general areas. It is also used under existing buildings to conservatively estimate live load surcharges in the buildings.

On the north side of the site, the soil nail wall will be designed for the existing Pebble building which is a two-story building with a basement that has been assumed to impose a line load of 7.5 kips per lineal foot (2,500 psf on a 3-foot wide strip footing). This is in addition to 3-feet of soil up to the basement floor slab grade.

On the southwest side of the site, the soil nail wall will support foundations of the existing Wells Fargo building which have been assumed to impose a line load of 6 kips per lineal footing (2,000 psf on a 3-foot wide strip footing). It would appear from provided cross-sections that the main level floor slab is significantly higher than the bottom of footing so an additional surcharge of 12 feet of soil will be included in the design.

Lastly, the Hawkins, Kominsky, Devries building is present east of the southern portion of the facility. This appears to be a home that has been remodeled into a business office. It is our understanding that the building has no basement but the footings are anticipated to be around 3 feet below existing site grade for frost protection. For design, a line load of 3 kips (1,500 psf on a 2-foot wide footing) has been assumed

for the loading which will occur approximately 8 feet minimum from the face of the soil nail wall.

Other than the surcharges noted, the shoring has not been designed for large surcharges such as cranes, etc., and would have to be evaluated on a case by case basis. Higher loading may require modification to the shoring.

Anchor Adhesion

Hollow core soil nails will be used for the project. For design, an ultimate anchor adhesion of 4.0 kips/ft of anchor (26.5 psi) will be utilized with a working adhesion of 2.67 kips/ft based upon a factor of safety of 1.5. Verification nails will be included to verify the adhesion. Additionally, periodic proof nail tests will be conducted during wall construction to confirm capacities.

Micropile Adhesion

Hollow core micropiles will be used for the project. The bottom of the micropile cap is approximately 4 to 5 feet below existing site grade. In this northeastern portion of the site, a surficial but somewhat variable sequence of silt and clay is present over the site gravels which are present about 13 feet or less below the bottom of the footing. Capacity in this silt/clay material has been ignored with all micropile capacity generated in the underlying gravel. For design, an ultimate anchor adhesion of 7.0 kips/ft of anchor (4,450 psf on a 6-inch diameter grouted body) will be utilized with a working adhesion of 3.5 kips/ft based upon a factor of safety of 2.0 minimum. A verification test will be performed on a micropile to confirm the ultimate adhesion. If capacity is not achieved, additional depth or larger bits will be required.

Summary of Results

The design was performed using the computer program SNAILWin (version 4.10) by Caltrans. Various cross-sections where analyzed with the results attached and partially summarized below.

The results of the analyses indicate that the factors of safety exceed 1.5 for the temporary wall for all the various load cases considered. In non-building support areas, the soil nails will consist of R32S soil nails installed on a 6 feet horizontal by 5 feet vertical spacing. Nail lengths will be 18 feet for the maximum cut of 21 feet and 13 feet for heights of approximately 15 feet and under. At building areas, the same soils nails will be utilized at the same horizontal nail spacing of 6 feet, however, the vertical spacing has been reduced to 3 feet due to geometry constraints.

Lateral and vertical movements are projected to be on the order of one-half to one inch. Actual movements will vary based upon construction techniques, consistency of the site soils at the wall location, face stability, etc.

The micropile design indicated that R51N hollow bar micropiles having an installed length of 38 feet provide adequate structural capacity as well as factors of safety in excess of 2.0 with regard to geotechnical capacity. Provided maximum micropile loading indicates 75 kips compression and 50 kips tension. All micropiles are considered friction elements and any end bearing capacity has been ignored.

Design Complete.

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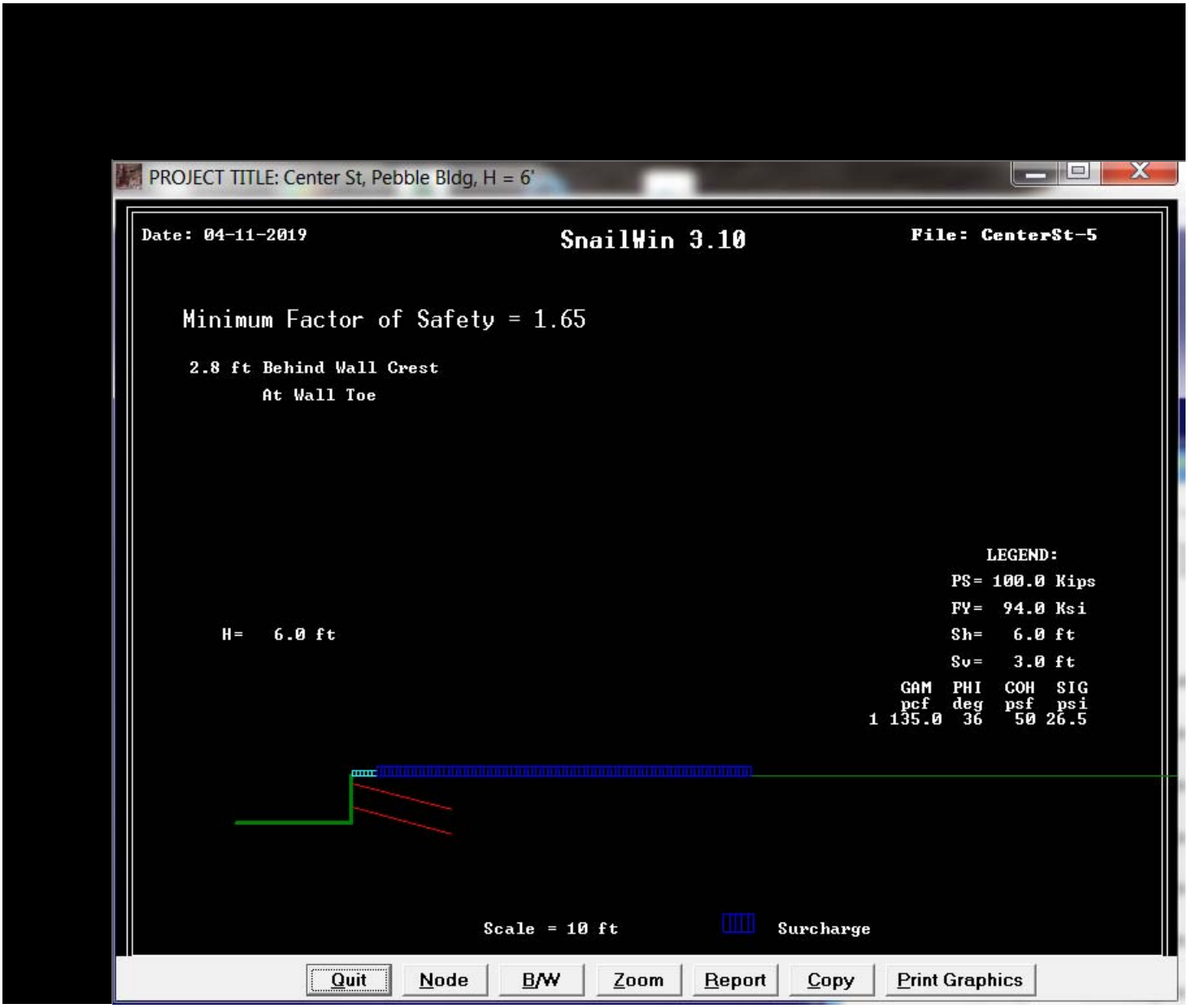
PROJECT TITLE: Center St, Pebble Bldg, H = 6'
Date: 04-11-2019
SnailWin 3.10
File: CenterSt-5
Minimum Factor of Safety = 1.65
2.8 ft Behind Wall Crest
At Wall Toe
LEGEND:
PS= 100.0 Kips
FY= 94.0 Ksi
Sh= 6.0 ft
Sv= 3.0 ft
H= 6.0 ft
GAM PHI COH SIG
pcf deg psf psi
1 135.0 36 50 26.5
Scale = 10 ft
Surcharge
Quit
Node
B/W
Zoom
Report
Copy
Print Graphics

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               ************************************************
               *    CALIFORNIA DEPARTMENT OF TRANSPORTATION   *
               *          ENGINEERING SERVICE CENTER          *
               *     DIVISION OF MATERIALS AND FOUNDATIONS    *
               *   Office of Roadway Geotechnical Engineering *
               *    Date: 04-11-2019          Time: 13:27:27  *
               ************************************************
```

Project Identification - Center St, Pebble Bldg, H = 6'

--- WALL GEOMETRY ---

Vertical Wall Height	=	6.0 ft	
Wall Batter	=	0.0 degree	
		Angle (Deg)	Length (Feet)
First Slope from Wallcrest.	=	0.0	50.0
Second Slope from 1st slope.	=	0.0	0.0
Third Slope from 2nd slope.	=	0.0	0.0
Fourth Slope from 3rd slope.	=	0.0	0.0
Fifth Slope from 3rd slope.	=	0.0	0.0
Sixth Slope from 3rd slope.	=	0.0	0.0
Seventh Slope Angle.	=	0.0	

--- SLOPE BELOW THE WALL ---

There is NO SLOPE BELOW THE TOE of the wall

--- SURCHARGE ---

THE SURCHARGES IMPOSED ON THE SYSTEM ARE:

Begin Surcharge - Distance from toe	=	0.0 ft
End Surcharge - Distance from toe	=	3.0 ft
Loading Intensity - Begin	=	2500.0 psf/ft
Loading Intensity - End	=	2500.0 psf/ft
Begin Second Surcharge - Distance from toe	=	3.0 ft
End Second Surcharge - Distance from toe	=	50.0 ft
Loading Intensity - Begin	=	625.0 psf/ft
Loading Intensity - End	=	625.0 psf/ft

--- OPTION #1 ---

Ultimate Punching shear, Bond & Yield Stress are used.

--- SOIL PARAMETERS ---

Soil Layer	Unit Weight (Pcf)	Friction Angle (Degree)	Cohesion Intercept (Psf)	Bond* Stress (Psi)	Coordinates of Boundary XS1 (ft)	YS1 (ft)	XS2 (ft)	YS2 (ft)
1	135.0	36.0	50.0	26.5	0.0	0.0	0.0	0.0

* Ultimate bond Stress values also depend on BSF (Bond Stress Factor.)

--------- WATER SURFACE ---------

NO Water Table defined for this problem.

--------- SEARCH LIMIT ---------

The Search Limit is from 1.0 to 10.0 ft

You have chosen NOT TO LIMIT the search of failure planes to specific nodes.

--------- REINFORCEMENT PARAMETERS ---------

Number of Reinforcement Levels	= 2
Horizontal Spacing	= 6.0 ft
Yield Stress of Reinforcement	= 94.0 ksi
Diameter of Grouted Hole	= 4.0 in
Punching Shear	= 100.0 kips

---------- (Varying Reinforcement Parameters) ---------

Level	Length (ft)	Inclination (degrees)	Vertical Spacing (ft)	Bar Diameter (in)	Bond Stress Factor
1	13.0	15.0	1.0	0.92	1.00
2	13.0	15.0	3.0	0.92	1.00

	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
Toe	1.707	1.9	72.4	6.3	89.9	0.0

Reinf. Stress at Level 1 = 40.455 Ksi (Pullout controls...)
Reinf. Stress at Level 2 = 43.647 Ksi (Pullout controls...)

	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
NODE 2						
	1.646	2.8	65.0	6.6	89.9	0.0

Reinf. Stress at Level 1 = 39.634 Ksi (Pullout controls...)
Reinf. Stress at Level 2 = 44.338 Ksi (Pullout controls...)

	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
NODE 3						
	1.750	3.7	58.3	7.0	89.9	0.0

Reinf. Stress at Level 1 = 35.248 Ksi (Pullout controls...)
Reinf. Stress at Level 2 = 40.895 Ksi (Pullout controls...)

	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
NODE 4						
	1.883	4.6	52.5	7.6	89.9	0.0

Reinf. Stress at Level 1 = 30.999 Ksi (Pullout controls...)
Reinf. Stress at Level 2 = 37.306 Ksi (Pullout controls...)

	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
NODE 5						
	2.008	5.5	47.5	8.1	89.9	0.0

Reinf. Stress at Level 1 = 27.511 Ksi (Pullout controls...)
Reinf. Stress at Level 2 = 34.352 Ksi (Pullout controls...)

	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
NODE 6						
	2.127	6.4	43.2	8.8	89.9	0.0

Reinf. Stress at Level 1 = 24.601 Ksi (Pullout controls...)
Reinf. Stress at Level 2 = 31.881 Ksi (Pullout controls...)

	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)

NODE 7

```
     2.245         7.3       39.4    9.4     89.9    0.0

  Reinf. Stress at Level  1 =  22.089 Ksi (Pullout controls...)
                          2 =  29.718 Ksi (Pullout controls...)

           MINIMUM    DISTANCE    LOWER FAILURE   UPPER FAILURE
           SAFETY      BEHIND         PLANE           PLANE
           FACTOR     WALL TOE    ANGLE  LENGTH   ANGLE  LENGTH
                        (ft)      (deg)   (ft)    (deg)   (ft)

NODE 8
     2.357         8.2       36.2   10.2     89.9    0.0

  Reinf. Stress at Level  1 =  19.952 Ksi (Pullout controls...)
                          2 =  27.876 Ksi (Pullout controls...)

           MINIMUM    DISTANCE    LOWER FAILURE   UPPER FAILURE
           SAFETY      BEHIND         PLANE           PLANE
           FACTOR     WALL TOE    ANGLE  LENGTH   ANGLE  LENGTH
                        (ft)      (deg)   (ft)    (deg)   (ft)

NODE 9
     2.465         9.1       33.4   10.9     89.9    0.0

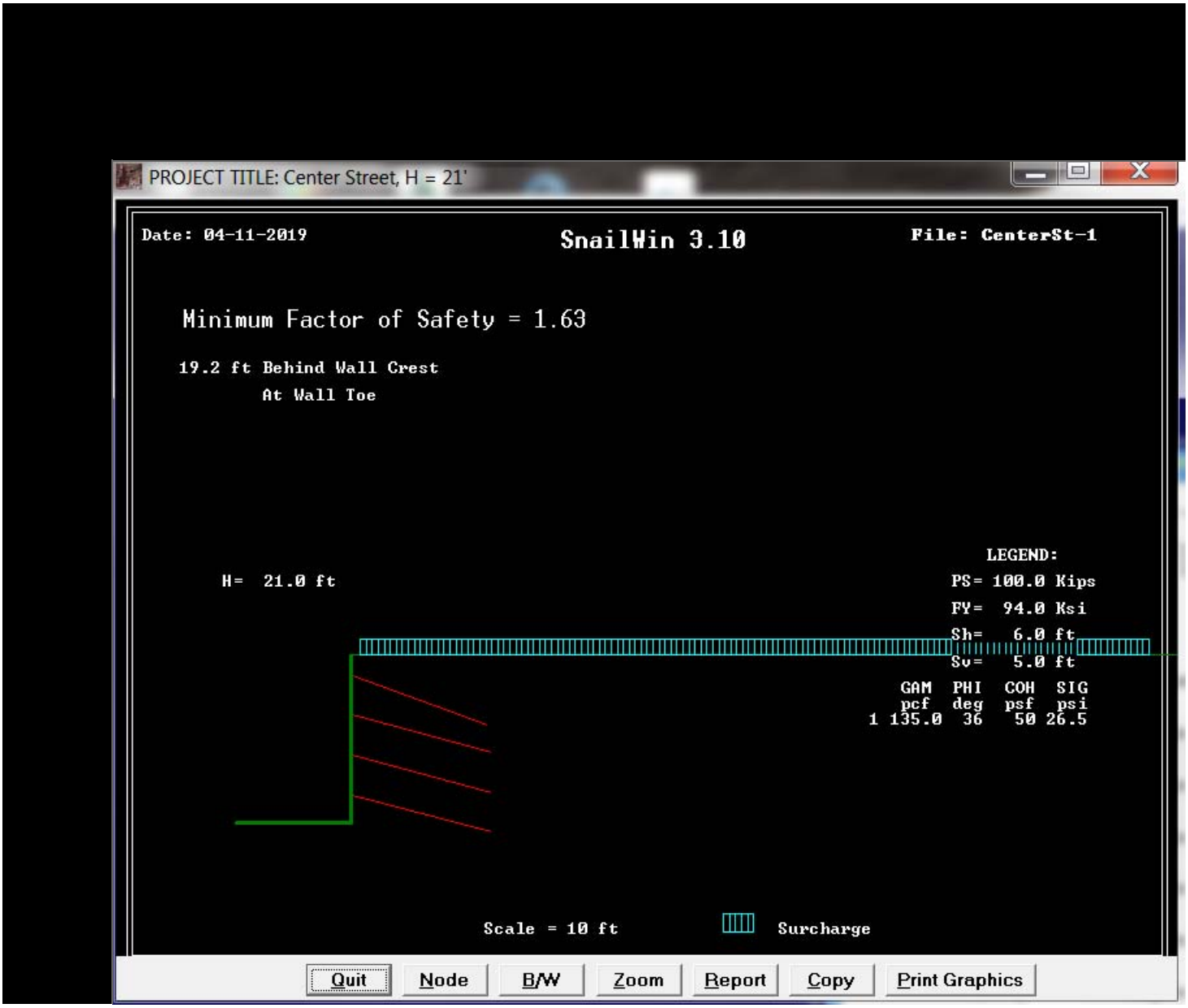
  Reinf. Stress at Level  1 =  18.092 Ksi (Pullout controls...)
                          2 =  26.262 Ksi (Pullout controls...)

           MINIMUM    DISTANCE    LOWER FAILURE   UPPER FAILURE
           SAFETY      BEHIND         PLANE           PLANE
           FACTOR     WALL TOE    ANGLE  LENGTH   ANGLE  LENGTH
                        (ft)      (deg)   (ft)    (deg)   (ft)

NODE10
     2.570        10.0       31.0   11.7     89.9    0.0

  Reinf. Stress at Level  1 =  16.460 Ksi (Pullout controls...)
                          2 =  24.832 Ksi (Pullout controls...)


      ********************************************************************
      *                For Factor of Safety = 1.0                        *
      *         Maximum Average Reinforcement Working Force:             *
      *                    15.316 Kips/level                             *
      ********************************************************************
```


PROJECT TITLE: Center Street, H = 21'
Date: 04-11-2019
SnailWin 3.10
File: CenterSt-1
Minimum Factor of Safety = 1.63
19.2 ft Behind Wall Crest
At Wall Toe
H= 21.0 ft
LEGEND:
PS= 100.0 Kips
FY= 94.0 Ksi
Sh= 6.0 ft
Sv= 5.0 ft
GAM PHI COH SIG
pcf deg psf psi
1 135.0 36 50 26.5
Scale = 10 ft
Surcharge
Quit
Node
B/W
Zoom
Report
Copy
Print Graphics

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               ************************************************
               *    CALIFORNIA DEPARTMENT OF TRANSPORTATION   *
               *          ENGINEERING SERVICE CENTER          *
               *     DIVISION OF MATERIALS AND FOUNDATIONS    *
               *   Office of Roadway Geotechnical Engineering *
               *    Date: 04-11-2019          Time: 13:24:15  *
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Project Identification - Center Street, H = 21'

--- WALL GEOMETRY ---

Vertical Wall Height	=	21.0 ft	
Wall Batter	=	0.0 degree	
		Angle (Deg)	Length (Feet)
First Slope from Wallcrest.	=	0.0	50.0
Second Slope from 1st slope.	=	0.0	0.0
Third Slope from 2nd slope.	=	0.0	0.0
Fourth Slope from 3rd slope.	=	0.0	0.0
Fifth Slope from 3rd slope.	=	0.0	0.0
Sixth Slope from 3rd slope.	=	0.0	0.0
Seventh Slope Angle.	=	0.0	

--- SLOPE BELOW THE WALL ---

There is NO SLOPE BELOW THE TOE of the wall

--- SURCHARGE ---

THE SURCHARGES IMPOSED ON THE SYSTEM ARE:

Begin Surcharge - Distance from toe	=	1.0 ft
End Surcharge - Distance from toe	=	100.0 ft
Loading Intensity - Begin	=	250.0 psf/ft
Loading Intensity - End	=	250.0 psf/ft

--- OPTION #1 ---

Ultimate Punching shear, Bond & Yield Stress are used.

--- SOIL PARAMETERS ---

Soil Layer	Unit Weight (Pcf)	Friction Angle (Degree)	Cohesion Intercept (Psf)	Bond* Stress (Psi)	Coordinates of Boundary XS1 (ft)	YS1 (ft)	XS2 (ft)	YS2 (ft)
1	135.0	36.0	50.0	26.5	0.0	0.0	0.0	0.0

* Ultimate bond Stress values also depend on BSF (Bond Stress Factor.)

--------- WATER SURFACE ---------

NO Water Table defined for this problem.

--------- SEARCH LIMIT ---------

The Search Limit is from 3.0 to 30.0 ft

You have chosen NOT TO LIMIT the search of failure planes to specific nodes.

--------- REINFORCEMENT PARAMETERS ---------

Number of Reinforcement Levels = 4
Horizontal Spacing = 6.0 ft
Yield Stress of Reinforcement = 94.0 ksi
Diameter of Grouted Hole = 4.0 in
Punching Shear = 100.0 kips

---------- (Varying Reinforcement Parameters) ---------

Level	Length (ft)	Inclination (degrees)	Vertical Spacing (ft)	Bar Diameter (in)	Bond Stress Factor
1	18.0	20.0	2.5	0.92	1.00
2	18.0	15.0	5.0	0.92	1.00
3	18.0	15.0	5.0	0.92	1.00
4	18.0	15.0	5.0	0.92	1.00

	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
Toe	1.908	5.7	74.8	21.8	89.9	0.0

Reinf. Stress at Level 1 = 41.382 Ksi (Pullout controls...)
2 = 45.562 Ksi (Pullout controls...)
3 = 49.259 Ksi (Yield Stress controls.)
4 = 49.259 Ksi (Yield Stress controls.)

NODE 2

MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
1.763	8.4	61.9	14.3	78.7	8.6

Reinf. Stress at Level 1 = 34.655 Ksi (Pullout controls...)
2 = 39.138 Ksi (Pullout controls...)
3 = 47.374 Ksi (Pullout controls...)
4 = 53.319 Ksi (Yield Stress controls.)

NODE 3

MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
1.711	11.1	54.8	15.4	75.2	8.7

Reinf. Stress at Level 1 = 27.629 Ksi (Pullout controls...)
2 = 34.124 Ksi (Pullout controls...)
3 = 44.903 Ksi (Pullout controls...)
4 = 54.927 Ksi (Yield Stress controls.)

NODE 4

MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
1.666	13.8	43.6	15.2	75.3	10.9

Reinf. Stress at Level 1 = 18.891 Ksi (Pullout controls...)
2 = 23.673 Ksi (Pullout controls...)
3 = 38.907 Ksi (Pullout controls...)
4 = 54.230 Ksi (Pullout controls...)

NODE 5

MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
1.640	16.5	46.7	14.4	57.8	12.4

Reinf. Stress at Level 1 = 18.590 Ksi (Pullout controls...)
2 = 27.703 Ksi (Pullout controls...)
3 = 41.703 Ksi (Pullout controls...)
4 = 55.985 Ksi (Pullout controls...)

NODE 6

MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
1.627	19.2	39.4	9.9	51.9	18.7

```
  Reinf. Stress at Level  1 =  13.764 Ksi (Pullout controls...)
                          2 =  24.395 Ksi (Pullout controls...)
                          3 =  36.784 Ksi (Pullout controls...)
                          4 =  54.215 Ksi (Pullout controls...)

          MINIMUM    DISTANCE    LOWER FAILURE   UPPER FAILURE
          SAFETY      BEHIND         PLANE           PLANE
          FACTOR     WALL TOE    ANGLE  LENGTH   ANGLE  LENGTH
                       (ft)      (deg)   (ft)    (deg)   (ft)

NODE 7
     1.628        21.9       25.6    4.9     47.2   25.8

  Reinf. Stress at Level  1 =   8.930 Ksi (Pullout controls...)
                          2 =  20.697 Ksi (Pullout controls...)
                          3 =  34.892 Ksi (Pullout controls...)
                          4 =  49.088 Ksi (Pullout controls...)

          MINIMUM    DISTANCE    LOWER FAILURE   UPPER FAILURE
          SAFETY      BEHIND         PLANE           PLANE
          FACTOR     WALL TOE    ANGLE  LENGTH   ANGLE  LENGTH
                       (ft)      (deg)   (ft)    (deg)   (ft)

NODE 8
     1.639        24.6       23.1    5.3     43.8   27.3

  Reinf. Stress at Level  1 =   3.759 Ksi (Pullout controls...)
                          2 =  16.171 Ksi (Pullout controls...)
                          3 =  31.627 Ksi (Pullout controls...)
                          4 =  47.083 Ksi (Pullout controls...)

          MINIMUM    DISTANCE    LOWER FAILURE   UPPER FAILURE
          SAFETY      BEHIND         PLANE           PLANE
          FACTOR     WALL TOE    ANGLE  LENGTH   ANGLE  LENGTH
                       (ft)      (deg)   (ft)    (deg)   (ft)

NODE 9
     1.670        27.3       37.6   34.4     89.9    0.0

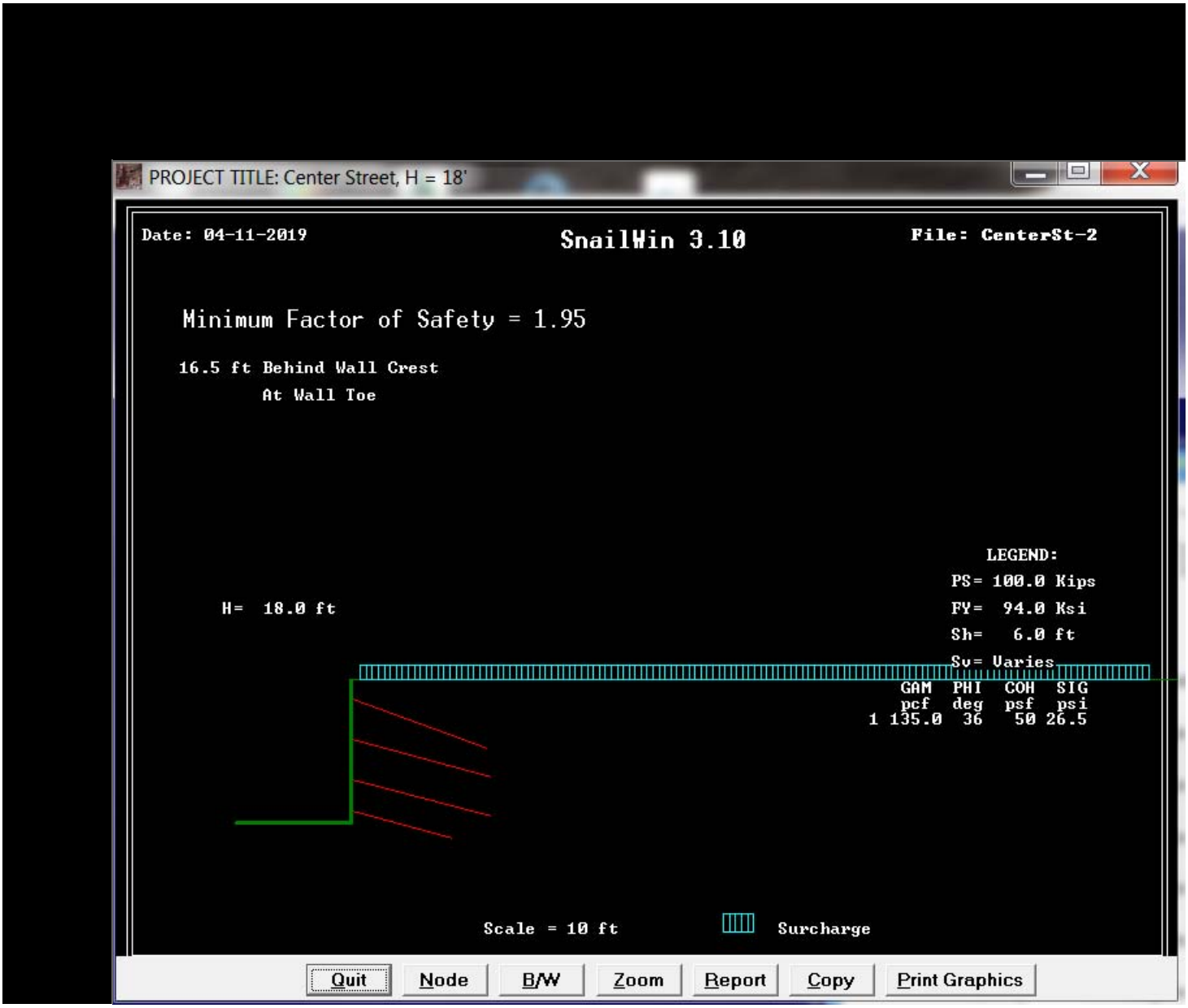
  Reinf. Stress at Level  1 =   2.257 Ksi (Pullout controls...)
                          2 =  16.292 Ksi (Pullout controls...)
                          3 =  34.261 Ksi (Pullout controls...)
                          4 =  52.231 Ksi (Pullout controls...)

          MINIMUM    DISTANCE    LOWER FAILURE   UPPER FAILURE
          SAFETY      BEHIND         PLANE           PLANE
          FACTOR     WALL TOE    ANGLE  LENGTH   ANGLE  LENGTH
                       (ft)      (deg)   (ft)    (deg)   (ft)

NODE10
     1.706        30.0       35.0   36.6     89.9    0.0

  Reinf. Stress at Level  1 =   0.000 Ksi
                          2 =  12.546 Ksi (Pullout controls...)
                          3 =  31.388 Ksi (Pullout controls...)
                          4 =  50.229 Ksi (Pullout controls...)


     ***************************************************************
     *                For Factor of Safety = 1.0                   *
     *         Maximum Average Reinforcement Working Force:        *
     *                    14.516 Kips/level                        *
     ***************************************************************
```


PROJECT TITLE: Center Street, H = 18'
Date: 04-11-2019
SnailWin 3.10
File: CenterSt-2
Minimum Factor of Safety = 1.95
16.5 ft Behind Wall Crest
At Wall Toe
LEGEND:
PS= 100.0 Kips
FY= 94.0 Ksi
Sh= 6.0 ft
Sv= Varies
H= 18.0 ft
GAM PHI COH SIG
pcf deg psf psi
1 135.0 36 50 26.5
Scale = 10 ft
Surcharge
Quit
Node
B/W
Zoom
Report
Copy
Print Graphics

```
*************************************************
*    CALIFORNIA DEPARTMENT OF TRANSPORTATION    *
*          ENGINEERING SERVICE CENTER           *
*     DIVISION OF MATERIALS AND FOUNDATIONS     *
*   Office of Roadway Geotechnical Engineering  *
*    Date: 04-11-2019          Time: 13:24:56   *
*************************************************
```

Project Identification - Center Street, H = 18'

--------- WALL GEOMETRY ---------

Vertical Wall Height	=	18.0 ft	
Wall Batter	=	0.0 degree	
		Angle (Deg)	Length (Feet)
First Slope from Wallcrest.	=	0.0	50.0
Second Slope from 1st slope.	=	0.0	0.0
Third Slope from 2nd slope.	=	0.0	0.0
Fourth Slope from 3rd slope.	=	0.0	0.0
Fifth Slope from 3rd slope.	=	0.0	0.0
Sixth Slope from 3rd slope.	=	0.0	0.0
Seventh Slope Angle.	=	0.0	

--------- SLOPE BELOW THE WALL ---------

There is NO SLOPE BELOW THE TOE of the wall

--------- SURCHARGE ---------

THE SURCHARGES IMPOSED ON THE SYSTEM ARE:

Begin Surcharge - Distance from toe	=	1.0 ft
End Surcharge - Distance from toe	=	100.0 ft
Loading Intensity - Begin	=	250.0 psf/ft
Loading Intensity - End	=	250.0 psf/ft

--------- OPTION #1 ---------

Ultimate Punching shear, Bond & Yield Stress are used.

--------- SOIL PARAMETERS ---------

Soil Layer	Unit Weight (Pcf)	Friction Angle (Degree)	Cohesion Intercept (Psf)	Bond* Stress (Psi)	Coordinates of Boundary XS1 (ft)	YS1 (ft)	XS2 (ft)	YS2 (ft)
1	135.0	36.0	50.0	26.5	0.0	0.0	0.0	0.0

* Ultimate bond Stress values also depend on BSF (Bond Stress Factor.)

--------- WATER SURFACE ---------

NO Water Table defined for this problem.

--------- SEARCH LIMIT ---------

The Search Limit is from 3.0 to 30.0 ft

You have chosen NOT TO LIMIT the search of failure planes to specific nodes.

--------- REINFORCEMENT PARAMETERS ---------

Number of Reinforcement Levels	= 4
Horizontal Spacing	= 6.0 ft
Yield Stress of Reinforcement	= 94.0 ksi
Diameter of Grouted Hole	= 4.0 in
Punching Shear	= 100.0 kips

---------- (Varying Reinforcement Parameters) ---------

Level	Length (ft)	Inclination (degrees)	Vertical Spacing (ft)	Bar Diameter (in)	Bond Stress Factor
1	18.0	20.0	2.5	0.92	1.00
2	18.0	15.0	5.0	0.92	1.00
3	18.0	15.0	5.0	0.92	1.00
4	13.0	15.0	4.0	0.92	1.00

	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
Toe	2.099	5.7	69.7	11.5	76.6	7.4

Reinf. Stress at Level 1 = 37.234 Ksi (Pullout controls...)
2 = 41.093 Ksi (Pullout controls...)
3 = 44.793 Ksi (Yield Stress controls.)
4 = 35.743 Ksi (Pullout controls...)

MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
NODE 2					
2.017	8.4	58.1	12.7	76.9	7.4

Reinf. Stress at Level 1 = 30.789 Ksi (Pullout controls...)
2 = 36.361 Ksi (Pullout controls...)
3 = 44.587 Ksi (Pullout controls...)
4 = 36.269 Ksi (Pullout controls...)

MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
NODE 3					
1.974	11.1	47.2	9.8	67.7	11.7

Reinf. Stress at Level 1 = 26.426 Ksi (Pullout controls...)
2 = 32.054 Ksi (Pullout controls...)
3 = 41.968 Ksi (Pullout controls...)
4 = 36.089 Ksi (Pullout controls...)

MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
NODE 4					
1.951	13.8	41.0	5.5	56.1	17.3

Reinf. Stress at Level 1 = 23.508 Ksi (Pullout controls...)
2 = 31.746 Ksi (Pullout controls...)
3 = 40.813 Ksi (Pullout controls...)
4 = 35.842 Ksi (Pullout controls...)

MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
NODE 5					
1.949	16.5	36.0	6.1	51.3	18.5

Reinf. Stress at Level 1 = 18.688 Ksi (Pullout controls...)
2 = 27.956 Ksi (Pullout controls...)
3 = 38.494 Ksi (Pullout controls...)
4 = 35.275 Ksi (Pullout controls...)

MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
NODE 6					
1.960	19.2	32.0	6.8	47.0	19.7

```
  Reinf. Stress at Level  1 =  14.118 Ksi (Pullout controls...)
                          2 =  24.223 Ksi (Pullout controls...)
                          3 =  36.079 Ksi (Pullout controls...)
                          4 =  34.545 Ksi (Pullout controls...)

          MINIMUM    DISTANCE    LOWER FAILURE   UPPER FAILURE
          SAFETY      BEHIND         PLANE           PLANE
          FACTOR     WALL TOE    ANGLE  LENGTH   ANGLE  LENGTH
                       (ft)      (deg)   (ft)    (deg)   (ft)

NODE 7
     1.979        21.9       28.7    7.5     43.2   21.0

  Reinf. Stress at Level  1 =   9.853 Ksi (Pullout controls...)
                          2 =  20.625 Ksi (Pullout controls...)
                          3 =  33.647 Ksi (Pullout controls...)
                          4 =  33.702 Ksi (Pullout controls...)

          MINIMUM    DISTANCE    LOWER FAILURE   UPPER FAILURE
          SAFETY      BEHIND         PLANE           PLANE
          FACTOR     WALL TOE    ANGLE  LENGTH   ANGLE  LENGTH
                       (ft)      (deg)   (ft)    (deg)   (ft)

NODE 8
     2.014        24.6       30.3   14.3     41.3   16.4

  Reinf. Stress at Level  1 =   4.880 Ksi (Pullout controls...)
                          2 =  15.709 Ksi (Pullout controls...)
                          3 =  33.813 Ksi (Pullout controls...)
                          4 =  33.374 Ksi (Pullout controls...)

          MINIMUM    DISTANCE    LOWER FAILURE   UPPER FAILURE
          SAFETY      BEHIND         PLANE           PLANE
          FACTOR     WALL TOE    ANGLE  LENGTH   ANGLE  LENGTH
                       (ft)      (deg)   (ft)    (deg)   (ft)

NODE 9
     2.052        27.3       33.4   32.7     89.9    0.0

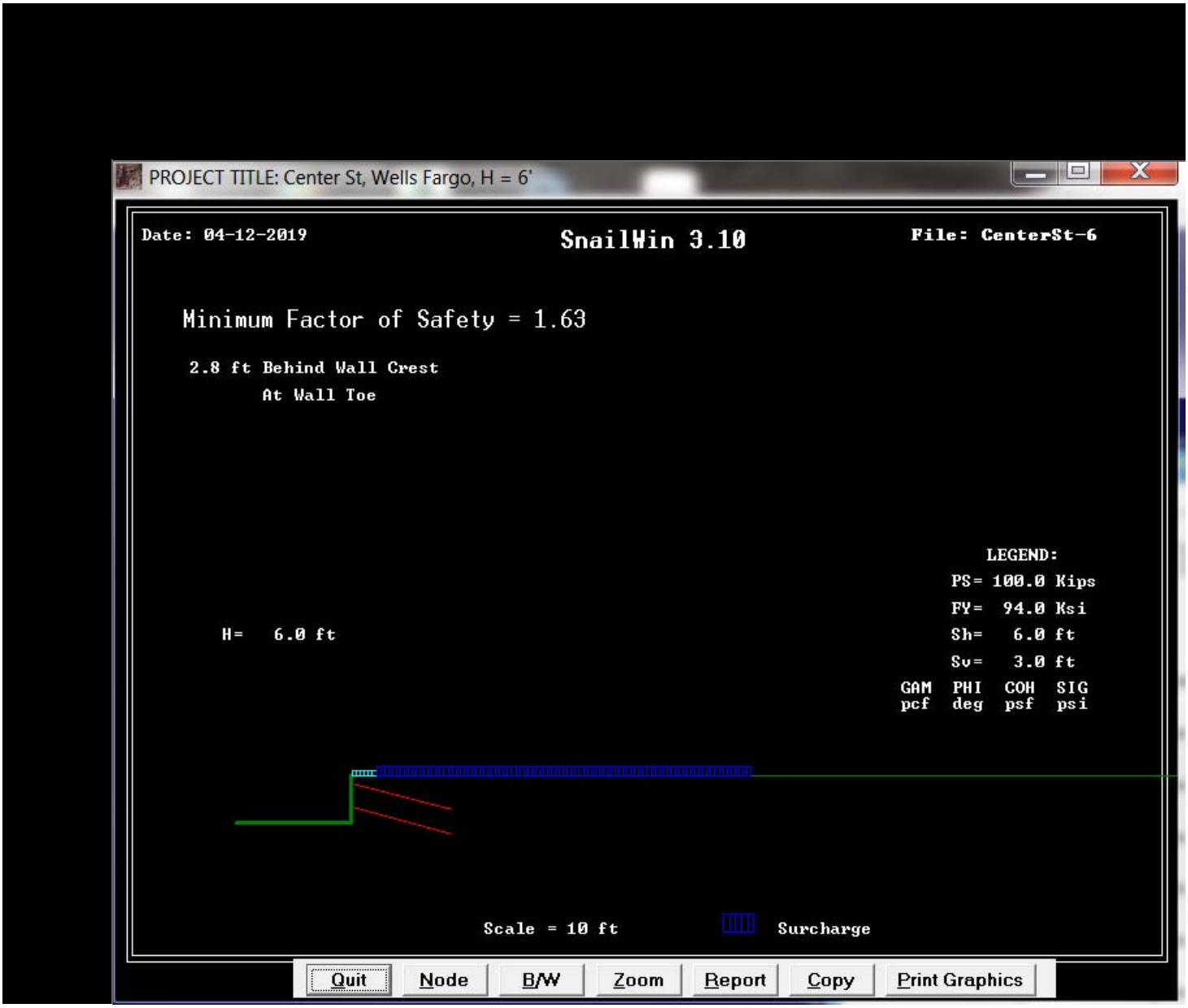
  Reinf. Stress at Level  1 =   5.511 Ksi (Pullout controls...)
                          2 =  18.390 Ksi (Pullout controls...)
                          3 =  34.744 Ksi (Pullout controls...)
                          4 =  33.179 Ksi (Pullout controls...)

          MINIMUM    DISTANCE    LOWER FAILURE   UPPER FAILURE
          SAFETY      BEHIND         PLANE           PLANE
          FACTOR     WALL TOE    ANGLE  LENGTH   ANGLE  LENGTH
                       (ft)      (deg)   (ft)    (deg)   (ft)

NODE10
     2.092        30.0       31.0   35.0     89.9    0.0

  Reinf. Stress at Level  1 =   2.554 Ksi (Pullout controls...)
                          2 =  15.738 Ksi (Pullout controls...)
                          3 =  32.879 Ksi (Pullout controls...)
                          4 =  32.221 Ksi (Pullout controls...)


     ***************************************************************
     *                For Factor of Safety = 1.0                   *
     *         Maximum Average Reinforcement Working Force:        *
     *                   10.732 Kips/level                         *
     ***************************************************************
```


PROJECT TITLE: Center St, Wells Fargo, H = 6'
Date: 04-12-2019
SnailWin 3.10
File: CenterSt-6
Minimum Factor of Safety = 1.63
2.8 ft Behind Wall Crest
At Wall Toe
LEGEND:
PS= 100.0 Kips
FY= 94.0 Ksi
Sh= 6.0 ft
Sv= 3.0 ft
GAM PHI COH SIG
pcf deg psf psi
H= 6.0 ft
Scale = 10 ft
Surcharge
Quit
Node
B/W
Zoom
Report
Copy
Print Graphics

```
               ************************************************
               *    CALIFORNIA DEPARTMENT OF TRANSPORTATION   *
               *          ENGINEERING SERVICE CENTER          *
               *     DIVISION OF MATERIALS AND FOUNDATIONS    *
               *   Office of Roadway Geotechnical Engineering *
               *    Date: 04-12-2019          Time: 09:54:21  *
               ************************************************
```

Project Identification - Center St, Wells Fargo, H = 6'

--------- WALL GEOMETRY ---------

Vertical Wall Height	=	6.0 ft	
Wall Batter	=	0.0 degree	
		Angle (Deg)	Length (Feet)
First Slope from Wallcrest.	=	0.0	50.0
Second Slope from 1st slope.	=	0.0	0.0
Third Slope from 2nd slope.	=	0.0	0.0
Fourth Slope from 3rd slope.	=	0.0	0.0
Fifth Slope from 3rd slope.	=	0.0	0.0
Sixth Slope from 3rd slope.	=	0.0	0.0
Seventh Slope Angle.	=	0.0	

--------- SLOPE BELOW THE WALL ---------

There is NO SLOPE BELOW THE TOE of the wall

--------- SURCHARGE ---------

THE SURCHARGES IMPOSED ON THE SYSTEM ARE:

Begin Surcharge - Distance from toe	=	0.0 ft
End Surcharge - Distance from toe	=	3.0 ft
Loading Intensity - Begin	=	2000.0 psf/ft
Loading Intensity - End	=	2000.0 psf/ft
Begin Second Surcharge - Distance from toe	=	3.0 ft
End Second Surcharge - Distance from toe	=	50.0 ft
Loading Intensity - Begin	=	1750.0 psf/ft
Loading Intensity - End	=	1750.0 psf/ft

--------- OPTION #1 ---------

Ultimate Punching shear, Bond & Yield Stress are used.

--------- SOIL PARAMETERS ---------

Soil Layer	Unit Weight (Pcf)	Friction Angle (Degree)	Cohesion Intercept (Psf)	Bond* Stress (Psi)	Coordinates of Boundary XS1 (ft)	YS1 (ft)	XS2 (ft)	YS2 (ft)
1	135.0	34.0	25.0	23.5	0.0	0.0	0.0	0.0

* Ultimate bond Stress values also depend on BSF (Bond Stress Factor.)

--------- WATER SURFACE ---------

NO Water Table defined for this problem.

--------- SEARCH LIMIT ---------

The Search Limit is from 1.0 to 10.0 ft

You have chosen NOT TO LIMIT the search of failure planes to specific nodes.

--------- REINFORCEMENT PARAMETERS ---------

Number of Reinforcement Levels	= 2
Horizontal Spacing	= 6.0 ft
Yield Stress of Reinforcement	= 94.0 ksi
Diameter of Grouted Hole	= 4.0 in
Punching Shear	= 100.0 kips

---------- (Varying Reinforcement Parameters) ---------

Level	Length (ft)	Inclination (degrees)	Vertical Spacing (ft)	Bar Diameter (in)	Bond Stress Factor
1	13.0	15.0	1.0	0.92	1.00
2	13.0	15.0	3.0	0.92	1.00

	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
Toe	1.686	1.9	72.4	6.3	89.9	0.0

Reinf. Stress at Level 1 = 36.322 Ksi (Pullout controls...)
Reinf. Stress at Level 2 = 39.188 Ksi (Pullout controls...)

NODE 2

MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
1.633	2.8	65.0	6.6	89.9	0.0

Reinf. Stress at Level 1 = 35.438 Ksi (Pullout controls...)
Reinf. Stress at Level 2 = 39.644 Ksi (Pullout controls...)

NODE 3

MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
1.638	3.7	58.3	7.0	89.9	0.0

Reinf. Stress at Level 1 = 33.385 Ksi (Pullout controls...)
Reinf. Stress at Level 2 = 38.733 Ksi (Pullout controls...)

NODE 4

MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
1.666	4.6	52.5	7.6	89.9	0.0

Reinf. Stress at Level 1 = 31.065 Ksi (Pullout controls...)
Reinf. Stress at Level 2 = 37.386 Ksi (Pullout controls...)

NODE 5

MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
1.707	5.5	47.5	8.1	89.9	0.0

Reinf. Stress at Level 1 = 28.695 Ksi (Pullout controls...)
Reinf. Stress at Level 2 = 35.831 Ksi (Pullout controls...)

NODE 6

MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
1.755	6.4	43.2	8.8	89.9	0.0

Reinf. Stress at Level 1 = 26.442 Ksi (Pullout controls...)
Reinf. Stress at Level 2 = 34.267 Ksi (Pullout controls...)

NODE 7

```
     1.803         7.3       35.2    6.3     47.6    3.2

  Reinf. Stress at Level  1 =  22.726 Ksi (Pullout controls...)
                          2 =  32.142 Ksi (Pullout controls...)

           MINIMUM    DISTANCE    LOWER FAILURE   UPPER FAILURE
           SAFETY      BEHIND         PLANE           PLANE
           FACTOR     WALL TOE    ANGLE  LENGTH   ANGLE  LENGTH
                        (ft)      (deg)   (ft)    (deg)   (ft)

NODE 8
     1.869         8.2       36.2   10.2     89.9    0.0

  Reinf. Stress at Level  1 =  22.310 Ksi (Pullout controls...)
                          2 =  31.172 Ksi (Pullout controls...)

           MINIMUM    DISTANCE    LOWER FAILURE   UPPER FAILURE
           SAFETY      BEHIND         PLANE           PLANE
           FACTOR     WALL TOE    ANGLE  LENGTH   ANGLE  LENGTH
                        (ft)      (deg)   (ft)    (deg)   (ft)

NODE 9
     1.933         9.1       33.4   10.9     89.9    0.0

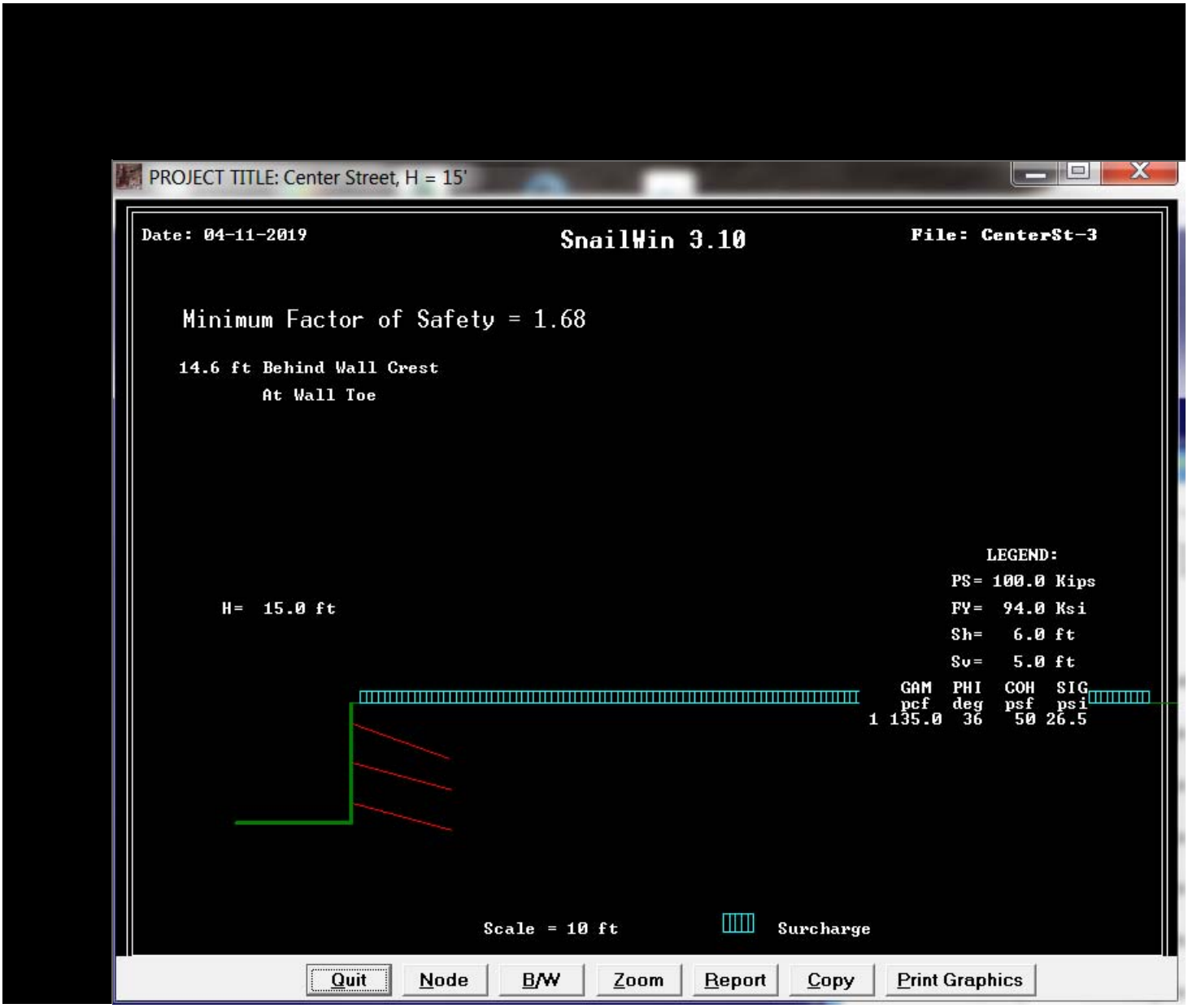
  Reinf. Stress at Level  1 =  20.460 Ksi (Pullout controls...)
                          2 =  29.699 Ksi (Pullout controls...)

           MINIMUM    DISTANCE    LOWER FAILURE   UPPER FAILURE
           SAFETY      BEHIND         PLANE           PLANE
           FACTOR     WALL TOE    ANGLE  LENGTH   ANGLE  LENGTH
                        (ft)      (deg)   (ft)    (deg)   (ft)

NODE10
     2.000        10.0       31.0   11.7     89.9    0.0

  Reinf. Stress at Level  1 =  18.757 Ksi (Pullout controls...)
                          2 =  28.296 Ksi (Pullout controls...)


      ********************************************************************
      *                For Factor of Safety = 1.0                        *
      *         Maximum Average Reinforcement Working Force:             *
      *                    14.374 Kips/level                             *
      ********************************************************************
```


PROJECT TITLE: Center Street, H = 15'
Date: 04-11-2019
SnailWin 3.10
File: CenterSt-3
Minimum Factor of Safety = 1.68
14.6 ft Behind Wall Crest
At Wall Toe
LEGEND:
PS= 100.0 Kips
FY= 94.0 Ksi
Sh= 6.0 ft
Sv= 5.0 ft
GAM PHI COH SIG
pcf deg psf psi
1 135.0 36 50 26.5
H= 15.0 ft
Scale = 10 ft
Surcharge
Quit
Node
B/W
Zoom
Report
Copy
Print Graphics

```
               ************************************************
               *    CALIFORNIA DEPARTMENT OF TRANSPORTATION   *
               *          ENGINEERING SERVICE CENTER          *
               *     DIVISION OF MATERIALS AND FOUNDATIONS    *
               *   Office of Roadway Geotechnical Engineering *
               *    Date: 04-11-2019          Time: 13:26:07  *
               ************************************************
```

Project Identification - Center Street, H = 15'

--------- WALL GEOMETRY ---------

Vertical Wall Height	=	15.0 ft	
Wall Batter	=	0.0 degree	
		Angle (Deg)	Length (Feet)
First Slope from Wallcrest.	=	0.0	50.0
Second Slope from 1st slope.	=	0.0	0.0
Third Slope from 2nd slope.	=	0.0	0.0
Fourth Slope from 3rd slope.	=	0.0	0.0
Fifth Slope from 3rd slope.	=	0.0	0.0
Sixth Slope from 3rd slope.	=	0.0	0.0
Seventh Slope Angle.	=	0.0	

--------- SLOPE BELOW THE WALL ---------

There is NO SLOPE BELOW THE TOE of the wall

--------- SURCHARGE ---------

THE SURCHARGES IMPOSED ON THE SYSTEM ARE:

Begin Surcharge - Distance from toe	=	1.0 ft
End Surcharge - Distance from toe	=	100.0 ft
Loading Intensity - Begin	=	250.0 psf/ft
Loading Intensity - End	=	250.0 psf/ft

--------- OPTION #1 ---------

Ultimate Punching shear, Bond & Yield Stress are used.

--------- SOIL PARAMETERS ---------

Soil Layer	Unit Weight (Pcf)	Friction Angle (Degree)	Cohesion Intercept (Psf)	Bond* Stress (Psi)	Coordinates of Boundary XS1 (ft)	YS1 (ft)	XS2 (ft)	YS2 (ft)
1	135.0	36.0	50.0	26.5	0.0	0.0	0.0	0.0

* Ultimate bond Stress values also depend on BSF (Bond Stress Factor.)

--------- WATER SURFACE ---------

NO Water Table defined for this problem.

--------- SEARCH LIMIT ---------

The Search Limit is from 2.0 to 20.0 ft

You have chosen NOT TO LIMIT the search of failure planes to specific nodes.

--------- REINFORCEMENT PARAMETERS ---------

Number of Reinforcement Levels	=	3
Horizontal Spacing	=	6.0 ft
Yield Stress of Reinforcement	=	94.0 ksi
Diameter of Grouted Hole	=	4.0 in
Punching Shear	=	100.0 kips

---------- (Varying Reinforcement Parameters) ---------

Level	Length (ft)	Inclination (degrees)	Vertical Spacing (ft)	Bar Diameter (in)	Bond Stress Factor
1	13.0	20.0	2.5	0.92	1.00
2	13.0	15.0	5.0	0.92	1.00
3	13.0	15.0	5.0	0.92	1.00

	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
Toe	1.967	3.8	73.1	7.8	78.5	7.7

Reinf. Stress at Level 1 = 29.760 Ksi (Pullout controls...)
2 = 33.065 Ksi (Pullout controls...)
3 = 37.513 Ksi (Pullout controls...)

NODE 2

MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
1.844	5.6	62.4	8.5	77.4	7.7

Reinf. Stress at Level 1 = 26.208 Ksi (Pullout controls...)
2 = 30.770 Ksi (Pullout controls...)
3 = 38.505 Ksi (Pullout controls...)

NODE 3

MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
1.769	7.4	50.6	5.8	70.6	11.1

Reinf. Stress at Level 1 = 23.285 Ksi (Pullout controls...)
2 = 28.888 Ksi (Pullout controls...)
3 = 38.256 Ksi (Pullout controls...)

NODE 4

MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
1.725	9.2	50.7	11.6	73.0	6.3

Reinf. Stress at Level 1 = 17.165 Ksi (Pullout controls...)
2 = 27.147 Ksi (Pullout controls...)
3 = 39.244 Ksi (Pullout controls...)

NODE 5

MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
1.709	11.0	49.5	11.8	61.2	6.8

Reinf. Stress at Level 1 = 15.712 Ksi (Pullout controls...)
2 = 26.725 Ksi (Pullout controls...)
3 = 39.401 Ksi (Pullout controls...)

NODE 6

MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
1.700	12.8	45.1	12.7	57.4	7.1

Reinf. Stress at Level 1 = 11.789 Ksi (Pullout controls...)
2 = 24.397 Ksi (Pullout controls...)
3 = 38.786 Ksi (Pullout controls...)

```
          MINIMUM    DISTANCE    LOWER FAILURE   UPPER FAILURE
          SAFETY      BEHIND         PLANE           PLANE
          FACTOR     WALL TOE    ANGLE  LENGTH   ANGLE  LENGTH
                       (ft)      (deg)   (ft)    (deg)   (ft)

NODE 7
     1.678        14.6       27.2    3.3     49.1   17.9

  Reinf. Stress at Level  1 =  10.514 Ksi (Pullout controls...)
                          2 =  22.154 Ksi (Pullout controls...)
                          3 =  35.180 Ksi (Pullout controls...)

          MINIMUM    DISTANCE    LOWER FAILURE   UPPER FAILURE
          SAFETY      BEHIND         PLANE           PLANE
          FACTOR     WALL TOE    ANGLE  LENGTH   ANGLE  LENGTH
                       (ft)      (deg)   (ft)    (deg)   (ft)

NODE 8
     1.688        16.4       24.6    3.6     45.8   18.8

  Reinf. Stress at Level  1 =   7.184 Ksi (Pullout controls...)
                          2 =  19.639 Ksi (Pullout controls...)
                          3 =  33.849 Ksi (Pullout controls...)

          MINIMUM    DISTANCE    LOWER FAILURE   UPPER FAILURE
          SAFETY      BEHIND         PLANE           PLANE
          FACTOR     WALL TOE    ANGLE  LENGTH   ANGLE  LENGTH
                       (ft)      (deg)   (ft)    (deg)   (ft)

NODE 9
     1.707        18.2       22.4    3.9     42.8   19.9

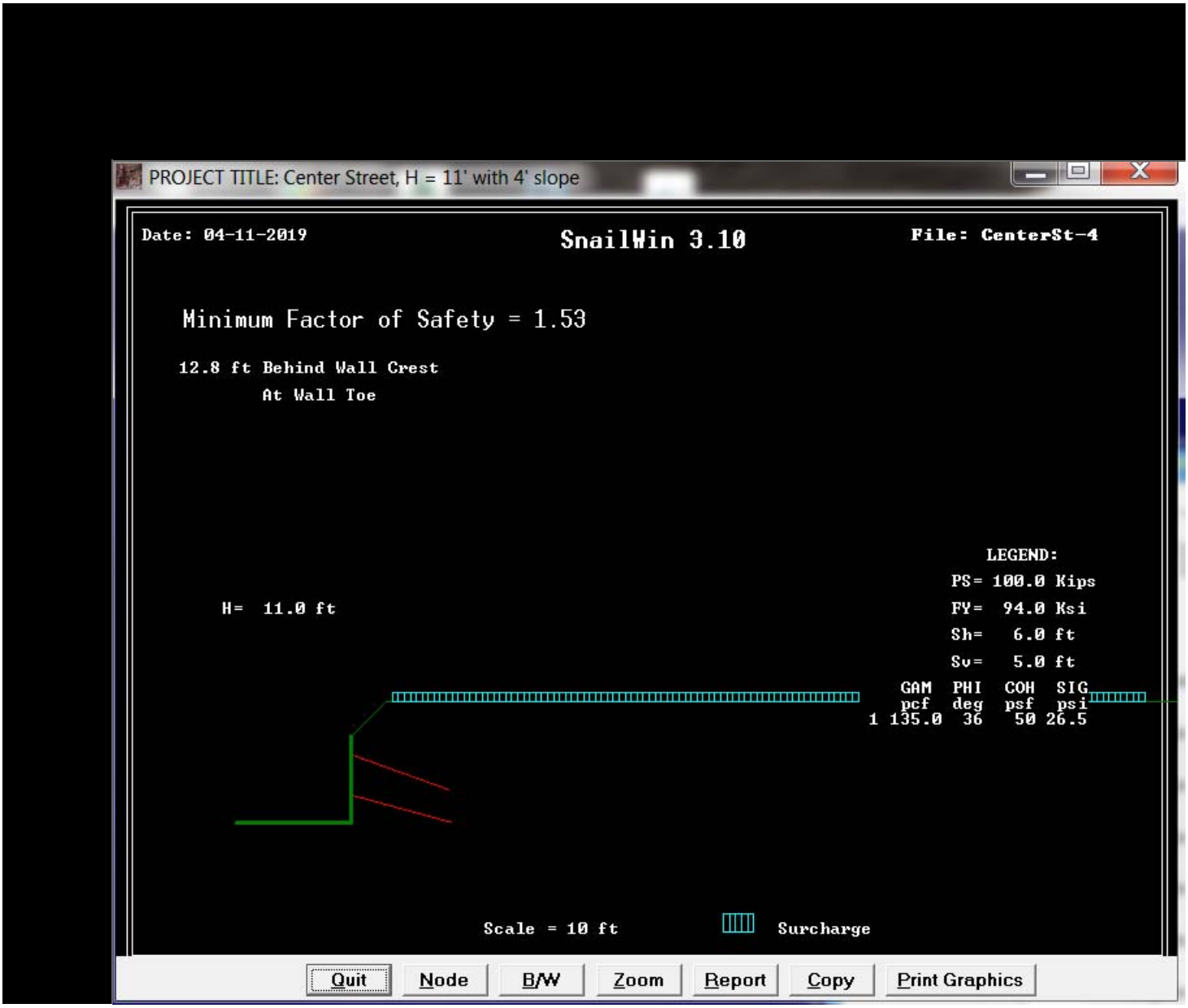
  Reinf. Stress at Level  1 =   4.059 Ksi (Pullout controls...)
                          2 =  17.187 Ksi (Pullout controls...)
                          3 =  32.444 Ksi (Pullout controls...)

          MINIMUM    DISTANCE    LOWER FAILURE   UPPER FAILURE
          SAFETY      BEHIND         PLANE           PLANE
          FACTOR     WALL TOE    ANGLE  LENGTH   ANGLE  LENGTH
                       (ft)      (deg)   (ft)    (deg)   (ft)

NODE10
     1.748        20.0       36.9   25.0     89.9    0.0

  Reinf. Stress at Level  1 =   3.641 Ksi (Pullout controls...)
                          2 =  18.474 Ksi (Pullout controls...)
                          3 =  35.961 Ksi (Pullout controls...)


     ***********************************************************************
     *                For Factor of Safety = 1.0                           *
     *         Maximum Average Reinforcement Working Force:                *
     *                     9.955 Kips/level                                *
     ***********************************************************************
```


PROJECT TITLE: Center Street, H = 11' with 4' slope
Date: 04-11-2019
SnailWin 3.10
File: CenterSt-4
Minimum Factor of Safety = 1.53
12.8 ft Behind Wall Crest
At Wall Toe
LEGEND:
PS= 100.0 Kips
FY= 94.0 Ksi
Sh= 6.0 ft
Sv= 5.0 ft
GAM PHI COH SIG
pcf deg psf psi
1 135.0 36 50 26.5
H= 11.0 ft
Scale = 10 ft
Surcharge
Quit
Node
B/W
Zoom
Report
Copy
Print Graphics

```
               ************************************************
               *    CALIFORNIA DEPARTMENT OF TRANSPORTATION   *
               *          ENGINEERING SERVICE CENTER          *
               *     DIVISION OF MATERIALS AND FOUNDATIONS    *
               *   Office of Roadway Geotechnical Engineering *
               *    Date: 04-11-2019          Time: 13:26:31  *
               ************************************************
```

Project Identification - Center Street, H = 11' with 4' slope

--------- WALL GEOMETRY ---------

Vertical Wall Height	=	11.0	ft
Wall Batter	=	0.0	degree
		Angle (Deg)	Length (Feet)
First Slope from Wallcrest.	=	45.0	6.0
Second Slope from 1st slope.	=	0.0	50.0
Third Slope from 2nd slope.	=	0.0	0.0
Fourth Slope from 3rd slope.	=	0.0	0.0
Fifth Slope from 3rd slope.	=	0.0	0.0
Sixth Slope from 3rd slope.	=	0.0	0.0
Seventh Slope Angle.	=	0.0	

--------- SLOPE BELOW THE WALL ---------

There is NO SLOPE BELOW THE TOE of the wall

--------- SURCHARGE ---------

THE SURCHARGES IMPOSED ON THE SYSTEM ARE:

Begin Surcharge - Distance from toe	=	5.0 ft
End Surcharge - Distance from toe	=	100.0 ft
Loading Intensity - Begin	=	250.0 psf/ft
Loading Intensity - End	=	250.0 psf/ft

--------- OPTION #1 ---------

Ultimate Punching shear, Bond & Yield Stress are used.

--------- SOIL PARAMETERS ---------

Soil Layer	Unit Weight (Pcf)	Friction Angle (Degree)	Cohesion Intercept (Psf)	Bond* Stress (Psi)	Coordinates of Boundary XS1 (ft)	YS1 (ft)	XS2 (ft)	YS2 (ft)
1	135.0	36.0	50.0	26.5	0.0	0.0	0.0	0.0

* Ultimate bond Stress values also depend on BSF (Bond Stress Factor.)

--------- WATER SURFACE ---------

NO Water Table defined for this problem.

--------- SEARCH LIMIT ---------

The Search Limit is from 2.0 to 20.0 ft

You have chosen NOT TO LIMIT the search of failure planes to specific nodes.

--------- REINFORCEMENT PARAMETERS ---------

Number of Reinforcement Levels	= 2
Horizontal Spacing	= 6.0 ft
Yield Stress of Reinforcement	= 94.0 ksi
Diameter of Grouted Hole	= 4.0 in
Punching Shear	= 100.0 kips

---------- (Varying Reinforcement Parameters) ---------

Level	Length (ft)	Inclination (degrees)	Vertical Spacing (ft)	Bar Diameter (in)	Bond Stress Factor
1	13.0	20.0	2.5	0.92	1.00
2	13.0	15.0	5.0	0.92	1.00

	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
Toe	2.051	3.8	71.1	4.7	77.6	10.6

Reinf. Stress at Level 1 = 31.127 Ksi (Pullout controls...)
Reinf. Stress at Level 2 = 34.765 Ksi (Pullout controls...)

	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
NODE 2						
	1.743	5.6	57.3	7.2	79.6	9.3

Reinf. Stress at Level 1 = 29.827 Ksi (Pullout controls...)
Reinf. Stress at Level 2 = 37.976 Ksi (Pullout controls...)

	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
NODE 3						
	1.630	7.4	49.6	8.0	76.4	9.4

Reinf. Stress at Level 1 = 27.168 Ksi (Pullout controls...)
Reinf. Stress at Level 2 = 38.706 Ksi (Pullout controls...)

	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
NODE 4						
	1.561	9.2	28.9	3.2	64.9	15.2

Reinf. Stress at Level 1 = 28.944 Ksi (Pullout controls...)
Reinf. Stress at Level 2 = 37.008 Ksi (Pullout controls...)

	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
NODE 5						
	1.543	11.0	24.8	3.6	60.7	15.7

Reinf. Stress at Level 1 = 25.811 Ksi (Pullout controls...)
Reinf. Stress at Level 2 = 35.194 Ksi (Pullout controls...)

	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
NODE 6						
	1.533	12.8	30.8	3.0	53.3	17.1

Reinf. Stress at Level 1 = 25.489 Ksi (Pullout controls...)
Reinf. Stress at Level 2 = 37.325 Ksi (Pullout controls...)

	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)

NODE 7

```
     1.544        14.6       27.6    3.3     49.6   18.0

  Reinf. Stress at Level  1 =  22.587 Ksi (Pullout controls...)
                          2 =  35.503 Ksi (Pullout controls...)

           MINIMUM    DISTANCE    LOWER FAILURE   UPPER FAILURE
           SAFETY      BEHIND         PLANE           PLANE
           FACTOR     WALL TOE    ANGLE  LENGTH   ANGLE  LENGTH
                        (ft)      (deg)   (ft)    (deg)   (ft)

NODE 8
     1.567        16.4       24.9    3.6     46.3   19.0

  Reinf. Stress at Level  1 =  19.736 Ksi (Pullout controls...)
                          2 =  33.530 Ksi (Pullout controls...)

           MINIMUM    DISTANCE    LOWER FAILURE   UPPER FAILURE
           SAFETY      BEHIND         PLANE           PLANE
           FACTOR     WALL TOE    ANGLE  LENGTH   ANGLE  LENGTH
                        (ft)      (deg)   (ft)    (deg)   (ft)

NODE 9
     1.600        18.2       22.7    3.9     43.3   20.0

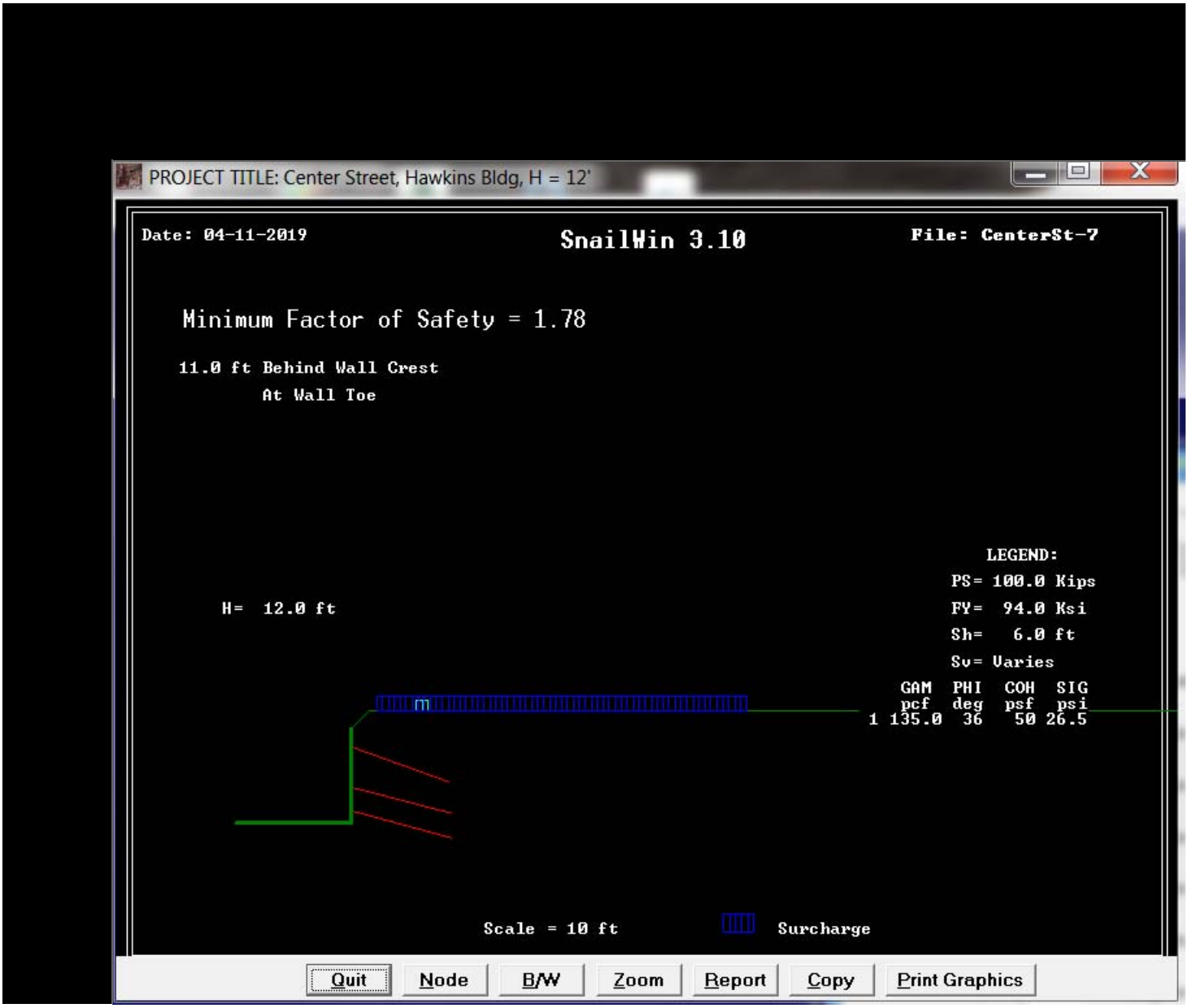
  Reinf. Stress at Level  1 =  16.995 Ksi (Pullout controls...)
                          2 =  31.476 Ksi (Pullout controls...)

           MINIMUM    DISTANCE    LOWER FAILURE   UPPER FAILURE
           SAFETY      BEHIND         PLANE           PLANE
           FACTOR     WALL TOE    ANGLE  LENGTH   ANGLE  LENGTH
                        (ft)      (deg)   (ft)    (deg)   (ft)

NODE10
     1.639        20.0       20.9    4.3     40.6   21.1

  Reinf. Stress at Level  1 =  14.424 Ksi (Pullout controls...)
                          2 =  29.433 Ksi (Pullout controls...)


      ********************************************************************
      *                For Factor of Safety = 1.0                        *
      *         Maximum Average Reinforcement Working Force:             *
      *                    11.409 Kips/level                             *
      ********************************************************************
```


PROJECT TITLE: Center Street, Hawkins Bldg, H = 12'
Date: 04-11-2019
SnailWin 3.10
File: CenterSt-7
Minimum Factor of Safety = 1.78
11.0 ft Behind Wall Crest
At Wall Toe
LEGEND:
PS= 100.0 Kips
FY= 94.0 Ksi
Sh= 6.0 ft
Sv= Varies
H= 12.0 ft
GAM PHI COH SIG
pcf deg psf psi
1 135.0 36 50 26.5
Scale = 10 ft
Surcharge
Quit
Node
B/W
Zoom
Report
Copy
Print Graphics

```
               ************************************************
               *    CALIFORNIA DEPARTMENT OF TRANSPORTATION   *
               *          ENGINEERING SERVICE CENTER          *
               *     DIVISION OF MATERIALS AND FOUNDATIONS    *
               *   Office of Roadway Geotechnical Engineering *
               *    Date: 04-11-2019          Time: 13:28:35  *
               ************************************************
```

Project Identification - Center Street, Hawkins Bldg, H = 12'

--------- WALL GEOMETRY ---------

Vertical Wall Height	=	12.0 ft	
Wall Batter	=	0.0 degree	
		Angle (Deg)	Length (Feet)
First Slope from Wallcrest.	=	45.0	3.0
Second Slope from 1st slope.	=	0.0	50.0
Third Slope from 2nd slope.	=	0.0	0.0
Fourth Slope from 3rd slope.	=	0.0	0.0
Fifth Slope from 3rd slope.	=	0.0	0.0
Sixth Slope from 3rd slope.	=	0.0	0.0
Seventh Slope Angle.	=	0.0	

--------- SLOPE BELOW THE WALL ---------

There is NO SLOPE BELOW THE TOE of the wall

--------- SURCHARGE ---------

THE SURCHARGES IMPOSED ON THE SYSTEM ARE:

Begin Surcharge - Distance from toe	=	8.0 ft
End Surcharge - Distance from toe	=	10.0 ft
Loading Intensity - Begin	=	1500.0 psf/ft
Loading Intensity - End	=	1500.0 psf/ft

Begin Second Surcharge - Distance from toe	=	3.0 ft
End Second Surcharge - Distance from toe	=	50.0 ft
Loading Intensity - Begin	=	250.0 psf/ft
Loading Intensity - End	=	250.0 psf/ft

--------- OPTION #1 ---------

Ultimate Punching shear, Bond & Yield Stress are used.

--------- SOIL PARAMETERS ---------

Soil Layer	Unit Weight (Pcf)	Friction Angle (Degree)	Cohesion Intercept (Psf)	Bond* Stress (Psi)	Coordinates of Boundary XS1 (ft)	YS1 (ft)	XS2 (ft)	YS2 (ft)
1	135.0	36.0	50.0	26.5	0.0	0.0	0.0	0.0

* Ultimate bond Stress values also depend on BSF (Bond Stress Factor.)

--------- WATER SURFACE ---------

NO Water Table defined for this problem.

--------- SEARCH LIMIT ---------

The Search Limit is from 2.0 to 20.0 ft

You have chosen NOT TO LIMIT the search of failure planes to specific nodes.

--------- REINFORCEMENT PARAMETERS ---------

Number of Reinforcement Levels	=	3
Horizontal Spacing	=	6.0 ft
Yield Stress of Reinforcement	=	94.0 ksi
Diameter of Grouted Hole	=	4.0 in
Punching Shear	=	100.0 kips

---------- (Varying Reinforcement Parameters) ---------

Level	Length (ft)	Inclination (degrees)	Vertical Spacing (ft)	Bar Diameter (in)	Bond Stress Factor
1	13.0	20.0	2.5	0.92	1.00
2	13.0	15.0	5.0	0.92	1.00
3	13.0	15.0	3.0	0.92	1.00

	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
Toe	2.311	3.8	61.7	3.2	78.6	11.5

Reinf. Stress at Level 1 = 26.419 Ksi (Pullout controls...)
2 = 29.065 Ksi (Pullout controls...)
3 = 31.912 Ksi (Pullout controls...)

NODE 2

MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
2.155	5.6	64.6	7.8	72.4	7.4

Reinf. Stress at Level 1 = 25.267 Ksi (Pullout controls...)
2 = 30.784 Ksi (Pullout controls...)
3 = 34.442 Ksi (Pullout controls...)

NODE 3

MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
2.082	7.4	57.8	8.3	67.3	7.7

Reinf. Stress at Level 1 = 22.977 Ksi (Pullout controls...)
2 = 30.302 Ksi (Pullout controls...)
3 = 35.128 Ksi (Pullout controls...)

NODE 4

MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
1.852	9.2	52.0	9.0	62.5	8.0

Reinf. Stress at Level 1 = 22.481 Ksi (Pullout controls...)
2 = 32.425 Ksi (Pullout controls...)
3 = 38.942 Ksi (Pullout controls...)

NODE 5

MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
1.781	11.0	46.9	9.7	58.1	8.3

Reinf. Stress at Level 1 = 20.109 Ksi (Pullout controls...)
2 = 32.132 Ksi (Pullout controls...)
3 = 39.970 Ksi (Pullout controls...)

NODE 6

MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
1.826	12.8	36.3	4.8	51.6	14.4

Reinf. Stress at Level 1 = 17.964 Ksi (Pullout controls...)
2 = 28.268 Ksi (Pullout controls...)
3 = 37.703 Ksi (Pullout controls...)

```
          MINIMUM    DISTANCE    LOWER FAILURE   UPPER FAILURE
          SAFETY      BEHIND         PLANE           PLANE
          FACTOR     WALL TOE    ANGLE  LENGTH   ANGLE  LENGTH
                       (ft)      (deg)   (ft)    (deg)   (ft)

NODE 7
     1.866        14.6       32.8    5.2     47.9   15.2

  Reinf. Stress at Level  1 =  15.009 Ksi (Pullout controls...)
                          2 =  26.054 Ksi (Pullout controls...)
                          3 =  36.401 Ksi (Pullout controls...)

          MINIMUM    DISTANCE    LOWER FAILURE   UPPER FAILURE
          SAFETY      BEHIND         PLANE           PLANE
          FACTOR     WALL TOE    ANGLE  LENGTH   ANGLE  LENGTH
                       (ft)      (deg)   (ft)    (deg)   (ft)

NODE 8
     1.910        16.4       29.9    5.7     44.5   16.1

  Reinf. Stress at Level  1 =  12.300 Ksi (Pullout controls...)
                          2 =  23.955 Ksi (Pullout controls...)
                          3 =  35.112 Ksi (Pullout controls...)

          MINIMUM    DISTANCE    LOWER FAILURE   UPPER FAILURE
          SAFETY      BEHIND         PLANE           PLANE
          FACTOR     WALL TOE    ANGLE  LENGTH   ANGLE  LENGTH
                       (ft)      (deg)   (ft)    (deg)   (ft)

NODE 9
     1.958        18.2       27.4    6.1     41.6   17.0

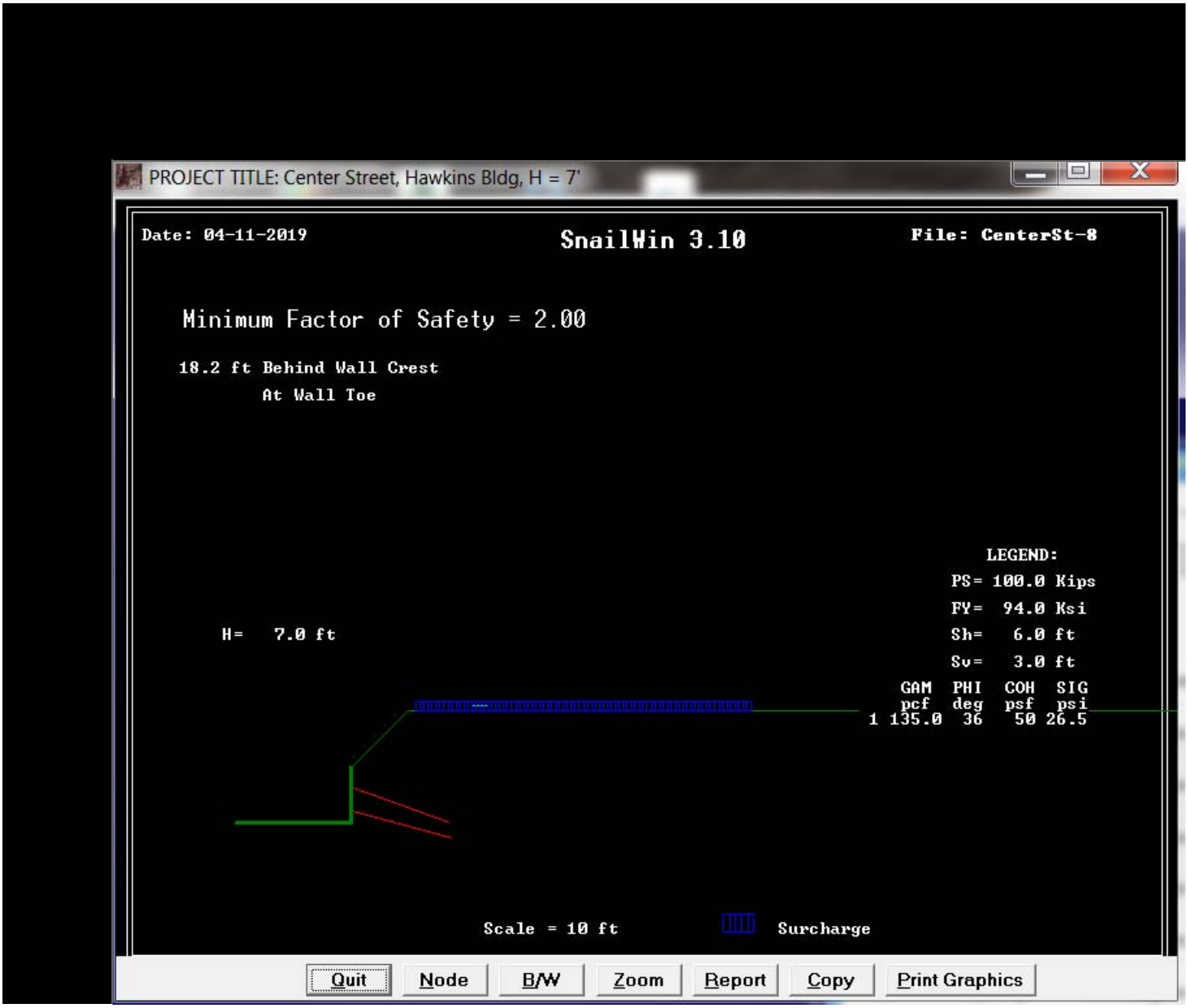
  Reinf. Stress at Level  1 =   9.828 Ksi (Pullout controls...)
                          2 =  21.977 Ksi (Pullout controls...)
                          3 =  33.848 Ksi (Pullout controls...)

          MINIMUM    DISTANCE    LOWER FAILURE   UPPER FAILURE
          SAFETY      BEHIND         PLANE           PLANE
          FACTOR     WALL TOE    ANGLE  LENGTH   ANGLE  LENGTH
                       (ft)      (deg)   (ft)    (deg)   (ft)

NODE10
     2.009        20.0       25.2    6.6     38.9   18.0

  Reinf. Stress at Level  1 =   7.579 Ksi (Pullout controls...)
                          2 =  20.121 Ksi (Pullout controls...)
                          3 =  32.615 Ksi (Pullout controls...)


     ********************************************************************
     *                For Factor of Safety = 1.0                        *
     *         Maximum Average Reinforcement Working Force:             *
     *                     8.925 Kips/level                             *
     ********************************************************************
```


PROJECT TITLE: Center Street, Hawkins Bldg, H = 7'
Date: 04-11-2019
SnailWin 3.10
File: CenterSt-8
Minimum Factor of Safety = 2.00
18.2 ft Behind Wall Crest
At Wall Toe
LEGEND:
PS= 100.0 Kips
FY= 94.0 Ksi
Sh= 6.0 ft
Sv= 3.0 ft
GAM PHI COH SIG
pcf deg psf psi
1 135.0 36 50 26.5
H= 7.0 ft
Scale = 10 ft
Surcharge
Quit
Node
B/W
Zoom
Report
Copy
Print Graphics

```
               ************************************************
               *    CALIFORNIA DEPARTMENT OF TRANSPORTATION   *
               *          ENGINEERING SERVICE CENTER          *
               *     DIVISION OF MATERIALS AND FOUNDATIONS    *
               *   Office of Roadway Geotechnical Engineering *
               *    Date: 04-11-2019          Time: 13:30:06  *
               ************************************************
```

Project Identification - Center Street, Hawkins Bldg, H = 7'

--------- WALL GEOMETRY ---------

Vertical Wall Height	=	7.0 ft	
Wall Batter	=	0.0 degree	
		Angle (Deg)	Length (Feet)
First Slope from Wallcrest.	=	45.0	10.0
Second Slope from 1st slope.	=	0.0	50.0
Third Slope from 2nd slope.	=	0.0	0.0
Fourth Slope from 3rd slope.	=	0.0	0.0
Fifth Slope from 3rd slope.	=	0.0	0.0
Sixth Slope from 3rd slope.	=	0.0	0.0
Seventh Slope Angle.	=	0.0	

--------- SLOPE BELOW THE WALL ---------

There is NO SLOPE BELOW THE TOE of the wall

--------- SURCHARGE ---------

THE SURCHARGES IMPOSED ON THE SYSTEM ARE:

Begin Surcharge - Distance from toe	=	15.0 ft
End Surcharge - Distance from toe	=	17.0 ft
Loading Intensity - Begin	=	1500.0 psf/ft
Loading Intensity - End	=	1500.0 psf/ft

Begin Second Surcharge - Distance from toe	=	8.0 ft
End Second Surcharge - Distance from toe	=	50.0 ft
Loading Intensity - Begin	=	250.0 psf/ft
Loading Intensity - End	=	250.0 psf/ft

--------- OPTION #1 ---------

Ultimate Punching shear, Bond & Yield Stress are used.

--------- SOIL PARAMETERS ---------

Soil Layer	Unit Weight (Pcf)	Friction Angle (Degree)	Cohesion Intercept (Psf)	Bond* Stress (Psi)	Coordinates of Boundary XS1 (ft)	YS1 (ft)	XS2 (ft)	YS2 (ft)
1	135.0	36.0	50.0	26.5	0.0	0.0	0.0	0.0

* Ultimate bond Stress values also depend on BSF (Bond Stress Factor.)

--------- WATER SURFACE ---------

NO Water Table defined for this problem.

--------- SEARCH LIMIT ---------

The Search Limit is from 2.0 to 20.0 ft

You have chosen NOT TO LIMIT the search of failure planes to specific nodes.

--------- REINFORCEMENT PARAMETERS ---------

Number of Reinforcement Levels	= 2
Horizontal Spacing	= 6.0 ft
Yield Stress of Reinforcement	= 94.0 ksi
Diameter of Grouted Hole	= 4.0 in
Punching Shear	= 100.0 kips

---------- (Varying Reinforcement Parameters) ---------

Level	Length (ft)	Inclination (degrees)	Vertical Spacing (ft)	Bar Diameter (in)	Bond Stress Factor
1	13.0	20.0	2.5	0.92	1.00
2	13.0	15.0	3.0	0.92	1.00

	MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
Toe	3.032	3.8	64.9	3.6	73.2	7.9

Reinf. Stress at Level 1 = 22.163 Ksi (Pullout controls...)
Reinf. Stress at Level 2 = 24.492 Ksi (Pullout controls...)

NODE 2

MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
2.809	5.6	60.9	11.5	89.9	2.5

Reinf. Stress at Level 1 = 23.088 Ksi (Pullout controls...)
Reinf. Stress at Level 2 = 26.218 Ksi (Pullout controls...)

NODE 3

MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
2.558	7.4	37.3	4.6	71.8	11.8

Reinf. Stress at Level 1 = 21.051 Ksi (Pullout controls...)
Reinf. Stress at Level 2 = 27.005 Ksi (Pullout controls...)

NODE 4

MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
2.304	9.2	31.5	5.4	67.8	12.2

Reinf. Stress at Level 1 = 21.134 Ksi (Pullout controls...)
Reinf. Stress at Level 2 = 29.311 Ksi (Pullout controls...)

NODE 5

MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
2.162	11.0	32.6	5.2	59.6	13.0

Reinf. Stress at Level 1 = 23.005 Ksi (Pullout controls...)
Reinf. Stress at Level 2 = 31.387 Ksi (Pullout controls...)

NODE 6

MINIMUM SAFETY FACTOR	DISTANCE BEHIND WALL TOE (ft)	LOWER FAILURE PLANE ANGLE (deg)	LOWER FAILURE PLANE LENGTH (ft)	UPPER FAILURE PLANE ANGLE (deg)	UPPER FAILURE PLANE LENGTH (ft)
2.125	12.8	36.2	4.8	51.5	14.4

Reinf. Stress at Level 1 = 24.680 Ksi (Pullout controls...)
Reinf. Stress at Level 2 = 32.386 Ksi (Pullout controls...)

NODE 7

```
     2.144        14.6       25.7    3.2     47.3   17.2

  Reinf. Stress at Level  1 =  23.549 Ksi (Pullout controls...)
                          2 =  30.636 Ksi (Pullout controls...)

           MINIMUM    DISTANCE    LOWER FAILURE   UPPER FAILURE
           SAFETY      BEHIND         PLANE           PLANE
           FACTOR     WALL TOE    ANGLE  LENGTH   ANGLE  LENGTH
                        (ft)      (deg)   (ft)    (deg)   (ft)

NODE 8
     2.022        16.4       40.6   21.6     89.9    0.0

  Reinf. Stress at Level  1 =  27.001 Ksi (Pullout controls...)
                          2 =  34.552 Ksi (Pullout controls...)

           MINIMUM    DISTANCE    LOWER FAILURE   UPPER FAILURE
           SAFETY      BEHIND         PLANE           PLANE
           FACTOR     WALL TOE    ANGLE  LENGTH   ANGLE  LENGTH
                        (ft)      (deg)   (ft)    (deg)   (ft)

NODE 9
     1.996        18.2       31.7   10.7     42.9   12.4

  Reinf. Stress at Level  1 =  24.472 Ksi (Pullout controls...)
                          2 =  33.876 Ksi (Pullout controls...)

           MINIMUM    DISTANCE    LOWER FAILURE   UPPER FAILURE
           SAFETY      BEHIND         PLANE           PLANE
           FACTOR     WALL TOE    ANGLE  LENGTH   ANGLE  LENGTH
                        (ft)      (deg)   (ft)    (deg)   (ft)

NODE10
     2.055        20.0       30.4   13.9     41.3   10.7

  Reinf. Stress at Level  1 =  23.287 Ksi (Pullout controls...)
                          2 =  32.711 Ksi (Pullout controls...)


      ********************************************************************
      *                For Factor of Safety = 1.0                        *
      *         Maximum Average Reinforcement Working Force:             *
      *                      5.149 Kips/level                            *
      ********************************************************************
```

Project :	**Center Street Hotel**
Location :	**112 Center Street**
Job Number :	**223-010-19**
Date :	**4/11/19**
Case :	**Max Soil Nail Loading**

Gordon Geotechnical Engineering, Inc
4426 South Century Drive, Suite 100
Salt Lake City, Utah 84123
801-327-9600

Shotcrete Evaluation

LOADS

Maximum Static Nail Load		25	kips
Maximum Seismic Nail Load		0	kips
Static Nail Head Load		19.3	kips
Seismic Nail Head Load		0.0	kips

NAIL SPACING

Horizontal nail spacing	S_H	6	ft
Vertical nail spacing	S_V	5	ft

SHOTCRETE & REINFORCING

Shotcrete overall thickness	h	0.333	ft	4-inches
Concrete compressive strength	f'_c	4000	psi	
Reinforcing yield strength	f_y	60	ksi	
Wire Mesh Reinforcing		0.12	in^2/ft	(double 6x6-W2.9xW2.9)
Vertical Walers		0.4	in^2	2 #4 bars
Horizontal Walers		0.4	in^2	2 #4 bars

Plate

Square Plate Width	Lbp	8	in
Plate Thickness	tp	0.5	in

FACTORS

Soil pressure factor (Table 5.1)	C_F	2

Table 5.1: Factors C_F.

Type of Structure	Nominal Facing Thickness mm (in.)	Factor C_F
Temporary	100 (4)	2.0
	150 (6)	1.5
	200 (8)	1.0
Permanent	All	1.0

Punching shear correction	Cp	1

FLEXURAL

STATIC

R_{FFv}=	55.9 kips	F.S. =	2.9	> 1.50 = OK
R_{FFh}=	40.5 kips	F.S. =	2.1	> 1.50 = OK

SEISMIC

F.S. =	#DIV/0!	#DIV/0!	
F.S. =	#DIV/0!	#DIV/0!	

REINFORCING RATIO

Horizontal reinforcing, middle	a_{hm}	0.120	in^2/ft
Horizontal reinforcing, nail head	a_{hn}	0.200	in^2/ft
Vertical reinforcing, middle	a_{vm}	0.120	in^2/ft
Vertical reinforcing, nail head	a_{vn}	0.187	in^2/ft

Minimum Ratio =	0.253	percent
Maximum Ratio =	2	percent

Allowable

As_{Max} =	0.480	in^2/ft
As_{Min} =	0.061	in^2/ft

Actual

As_{Max} =	0.200 in^2/ft	OK	[0.83 percent]
As_{Min} =	0.120 in^2/ft	OK	[0.5 percent]
Rn/Rm_H =	1.7	OK	
Rn/Rm_V =	1.56	OK	

PUNCHING SHEAR

D'c =	12.00	in		
hc =	4.00	in	STATIC	
R_{Fp} =	38.40	kips	F.S. =	2.0 > 1.50 = OK

SEISMIC

F.S. =	#DIV/0!	#DIV/0!

ACI PUNCHING SHEAR

STATIC

Equation 11-37	30.4	kips	Nail Load	19.3 OK

SEISMIC

34.7	Nail Load	0.0	OK

LRFD Checks

Facing Flexure

Strength Limit State 1, ϕ_{FF}	0.9	(Vertical) CDR =		1.93	> 1.0 = OK
Strength Limit State 1, γ_{FF}	1.35	(Horizontal) CDR =		1.40	> 1.0 = OK
Extreme Event Limit State 1, ϕ_{FF}	0.9	(Vertical) CDR =	#DIV/0!		#DIV/0!
Extreme Event Limit State 1, γ_{FF}	1.0	(Horizontal) CDR =	#DIV/0!		#DIV/0!

Punching Shear

Strength Limit State 1, ϕ_{FF}	0.9	CDR =		1.33	> 1.0 = OK
Strength Limit State 1, γ_{FF}	1.35				
Extreme Event Limit State 1, ϕ_{FF}	0.9	CDR =	#DIV/0!		#DIV/0!
Extreme Event Limit State 1, γ_{FF}	1.0				

Project :	**Center Street Hotel**
Location :	**112 Center Street**
Job Number :	**223-010-19**
Date :	**4/11/19**
Case :	**Max Soil Nail Loading @ Buildings**

Gordon Geotechnical Engineering, Inc
4426 South Century Drive, Suite 100
Salt Lake City, Utah 84123
801-327-9600

Shotcrete Evaluation

LOADS

Maximum Static Nail Load		18	kips
Maximum Seismic Nail Load		0	kips
Static Nail Head Load		13.9	kips
Seismic Nail Head Load		0.0	kips

NAIL SPACING

Horizontal nail spacing	S_H	6	ft
Vertical nail spacing	S_V	3	ft

SHOTCRETE & REINFORCING

Shotcrete overall thickness	h	0.333	ft	4-inches
Concrete compressive strength	f'_c	4000	psi	
Reinforcing yield strength	f_y	60	ksi	
Wire Mesh Reinforcing		0.12	in^2/ft	(double 6x6-W2.9xW2.9)
Vertical Walers		0.4	in^2	2 #4 bars
Horizontal Walers		0.4	in^2	2 #4 bars

Plate

Square Plate Width	Lbp	8	in
Plate Thickness	tp	0.5	in

FACTORS

Soil pressure factor (Table 5.1)	C_F	2

Table 5.1: Factors C_F.

Type of Structure	Nominal Facing Thickness mm (in.)	Factor C_F
Temporary	100 (4)	2.0
	150 (6)	1.5
	200 (8)	1.0
Permanent	All	1.0

Punching shear correction	Cp	1

FLEXURAL

			STATIC	
R_{FFv}=	93.1	kips	F.S. =	6.7 > 1.50 = OK
R_{FFh}=	28.3	kips	F.S. =	2.0 > 1.50 = OK
			SEISMIC	
			F.S. =	#DIV/0! #DIV/0!
			F.S. =	#DIV/0! #DIV/0!

REINFORCING RATIO

Horizontal reinforcing, middle	a_{hm}	0.120	in^2/ft
Horizontal reinforcing, nail head	a_{hn}	0.253	in^2/ft
Vertical reinforcing, middle	a_{vm}	0.120	in^2/ft
Vertical reinforcing, nail head	a_{vn}	0.187	in^2/ft

Minimum Ratio =	0.253	percent
Maximum Ratio =	2	percent

Allowable				
As_{Max} =	0.480	in^2/ft		
As_{Min} =	0.061	in^2/ft		
Actual				
As_{Max} =	0.253	in^2/ft	OK	[1.06 percent]
As_{Min} =	0.120	in^2/ft	OK	[0.5 percent]
Rn/Rm_H =	2.1		OK	
Rn/Rm_V =	1.56		OK	

PUNCHING SHEAR

D'c =	12.00	in			
hc =	4.00	in	STATIC		
R_{Fp} =	38.40	kips	F.S. =	2.8	> 1.50 = OK
			SEISMIC		
			F.S. =	#DIV/0!	#DIV/0!

ACI PUNCHING SHEAR

		STATIC		
Equation 11-37	30.4	kips	Nail Load	13.9 OK
		SEISMIC		
	34.7		Nail Load	0.0 OK

LRFD Checks

Facing Flexure

Strength Limit State 1, ϕ_{FF}	0.9	(Vertical) CDR =		4.47	> 1.0 = OK
Strength Limit State 1, γ_{FF}	1.35	(Horizontal) CDR =		1.36	> 1.0 = OK
Extreme Event Limit State 1, ϕ_{FF}	0.9	(Vertical) CDR =	#DIV/0!		#DIV/0!
Extreme Event Limit State 1, γ_{FF}	1.0	(Horizontal) CDR =	#DIV/0!		#DIV/0!

Punching Shear

Strength Limit State 1, ϕ_{FF}	0.9	CDR =		1.84	> 1.0 = OK
Strength Limit State 1, γ_{FF}	1.35				
Extreme Event Limit State 1, ϕ_{FF}	0.9	CDR =	#DIV/0!		#DIV/0!
Extreme Event Limit State 1, γ_{FF}	1.0				

MICROPILE DESIGN

Project :	**Center Street Project**
Location :	**Jackson, WY**
Job Number :	
Date :	**4/14/2019**
Case :	**Micropile**

Gordon Geotechnical Engineering, Inc
4426 South Century Drive, Suite 100
Salt Lake City, Utah 84123
801-327-9600

Micropile Data

Static Design Load (Compression)	75	kips	
Static Design Load (Tension)	50	kips	
Seismic Design Load (Compression)	75	kips	
Seismic Design Load (Tension)	50	kips	
Ultimate Design Load (Compression)	0	kips	
Ultimate Design Load (Tension)	0	kips	
			R51N hollow bar (epoxy coated / galvanized)
Grout Diameter	6	inches	6" diameter bit
Grout Strength	4000	psi	
Bar Diameter	2	inches	OD
Bar Area	1.46	in^2	
Bar Grade (fy)	87	ksi	Reduced from 97 ksi based upon Strain Compatibility
Length	38	ft	

Structural Design

Allowable Working Loads (IBC)

Compression (Static)	83.0	kips	>	75	kips	OK	{0.3 f'c (A_{conc}) + 0.4 fy (A_{bar})}
Tension (Static)	76.2	kips	>	50	kips	OK	{0.6 fy (A_{bar})}
Compression (Seismic)	83.0	kips	>	75	kips	OK	{0.3 f'c (A_{conc}) + 0.4 fy (A_{bar})}
Tension (Seismic)	76.2	kips	>	50	kips	OK	{0.6 fy (A_{bar})}

Ultimate Working Loads

Compression (Seismic)	205.5	kips	>	0	kips	OK	{0.85 f'c (A_{conc}) + 0.9 fy (A_{bar})}
Tension (Seismic)	114.3	kips	>	0	kips	OK	{0.9 fy (A_{bar})}

Projected Pile Displacement (Structural Components Only)

	Load (kips)	Grout Area (in^2)	G E (ksi)	Bar Area (in^2)	E	Estimated Mobilized Bond Length (ft)	Displacement (in)
Compression (Static)	75	28.27	3605	1.46	29000	25	0.16
Tension (Static)	50	0.00	0	1.46	29000	25	0.35
Compression (Seismic)	75	28.27	3605	1.46	29000	25	0.16
Tension (Seismic)	50	0.00	0	1.46	29000	25	0.35
Compression (Ultimate)	0	28.27	3605	1.46	29000	25	0.00
Tension (Ultimate)	0	0.00	0	1.46	29000	25	0.00

Geotechnical Capacity

* Use Friction Only, Ignore End Bearing

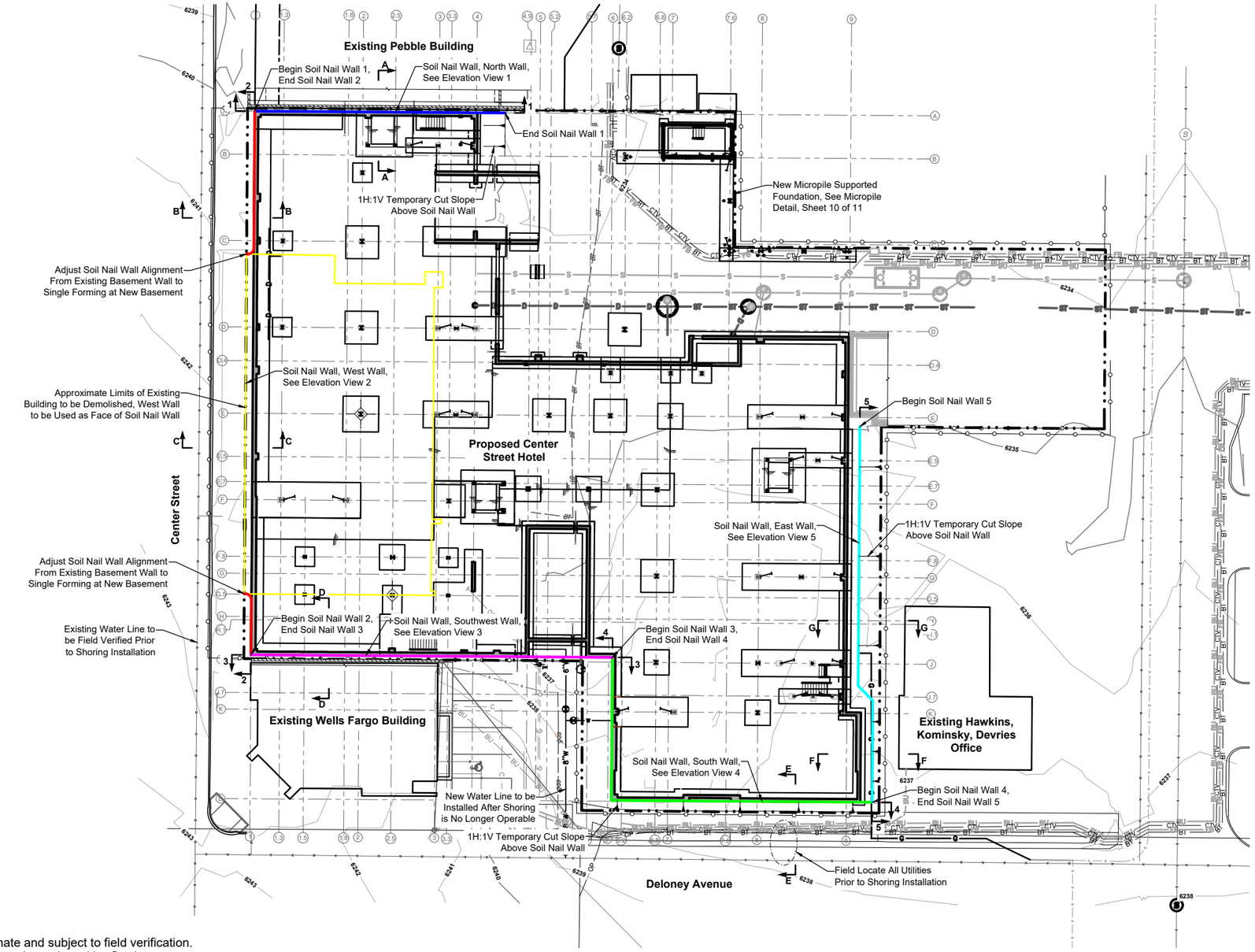
Soil Type	Depth to Top of Layer (ft)	Depth to Bottom of Layer (ft)	Layer Thickness (ft)	MP Diameter (in)	Ultimate Adhesion (psf)	Ultimate Capacity (kips/ft)	Ultimate Capacity (kips)
(Nelson BH-7 & 8)							
Silt	0	6	6	6	0	0.0	0.0
Sandy Clay	6	13	7	6	0	0.0	0.0
Gravelly Sand	13	20	7	6	4450	7.0	48.9
Sandy Clay	20	30	10	6	4450	7.0	69.9
? Dense Soils	30	38	8	6	4450	7.0	55.9
						Sum	174.8 kips

Static Compression Factor of Safety	2.33	>	2.00	OK
Static Tension Factor of Safety	3.50	>	2.00	OK
Seismic Compression Factor of Safety	2.33	>	1.50	OK
Seismic Tension Factor of Safety	3.50	>	1.50	OK
Ultimate Compression Factor of Safety	N/A	>	1.10	OK
Ultimate Tension Factor of Safety	N/A	>	1.10	OK

Projected Pile Displacement (Geotechnical Only) *

Static Design Load (Compression)	0.25	inches
Static Design Load (Tension)	0.5	inches
Seismic Design Load (Compression)	0.25	inches
Seismic Design Load (Tension)	0.5	inches

* to be confirmed through verification testing



Plan View

0 40 80

Scale: 1" = 40'

Notes:

1) All shoring locations and layouts are approximate and subject to field verification. Variations to the grading or geometry shown is to be reviewed by Gordon Geotechnical prior to shoring installation. The new building footing and wall location shall be used to determine shoring alignment.

2) Existing utilities and facilities to be potholed and located prior to shoring installation. The presence of utilities and other facilities may require modification to the shoring.

Professional Engineer
Bret A. DeBernardi
14478
Date
WYOMING

REFERENCE:
IBI Group, Crystal Creek Capital, Center Street Hotel, Building Permit Submittal, Project No./Code: 113760, Dated 02/15/2019

DATE	DESCRIPTION
04.12.19	Submitted for Review

DESIGNED FOR:
G2B Company Inc.
PO Box 3402, Nampa, Idaho

DESIGNED BY:
GORDON GEOTECHNICAL ENGINEERING, INC.
4426 South Century Drive, Ste 100, Salt Lake City, UT 84123
801-327-9600

Center Street Hotel
112 Center Street,
Jackson, Wyoming

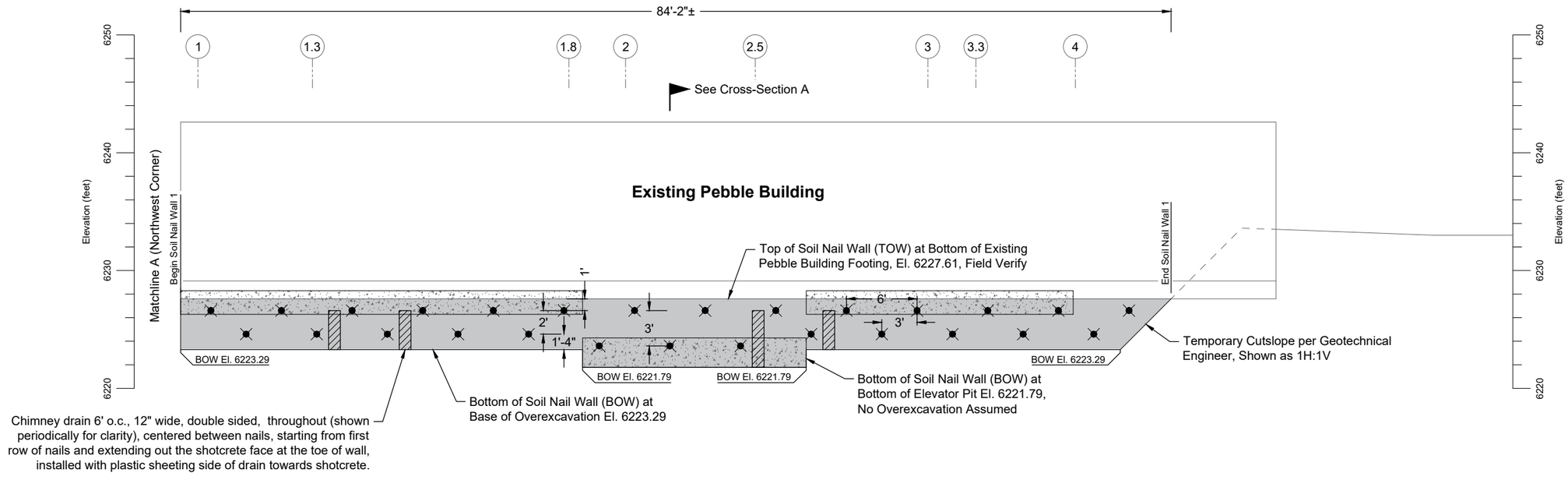
DESIGN BY: BD DRAWN BY: TT CHECKED BY: BD APPROVED BY: BD

Temporary Shoring and Permanent Micropile Foundations

Plan View

G² PROJECT NO.: **223-010-19**

SHEET NO.: **1 of 11**



Soil Nail Key	
●	R32S Hollow Bar Soil Nails, 18' Long, Typ.
✕	R32S Hollow Bar Soil Nails, 13' Long, Typ.

Approximately 382 Square Face Feet of North Soil Nail Wall Installed

Elevation View 1
North Wall

0 10 20
Scale: 1" = 10'

Professional Engineer
Bret A. DeBernardi
14478
Date
WYOMING

REFERENCE:

DATE	DESCRIPTION
04.12.19	Submitted for Review

DESIGNED FOR:
G2B Company Inc.
PO Box 3402, Nampa, Idaho

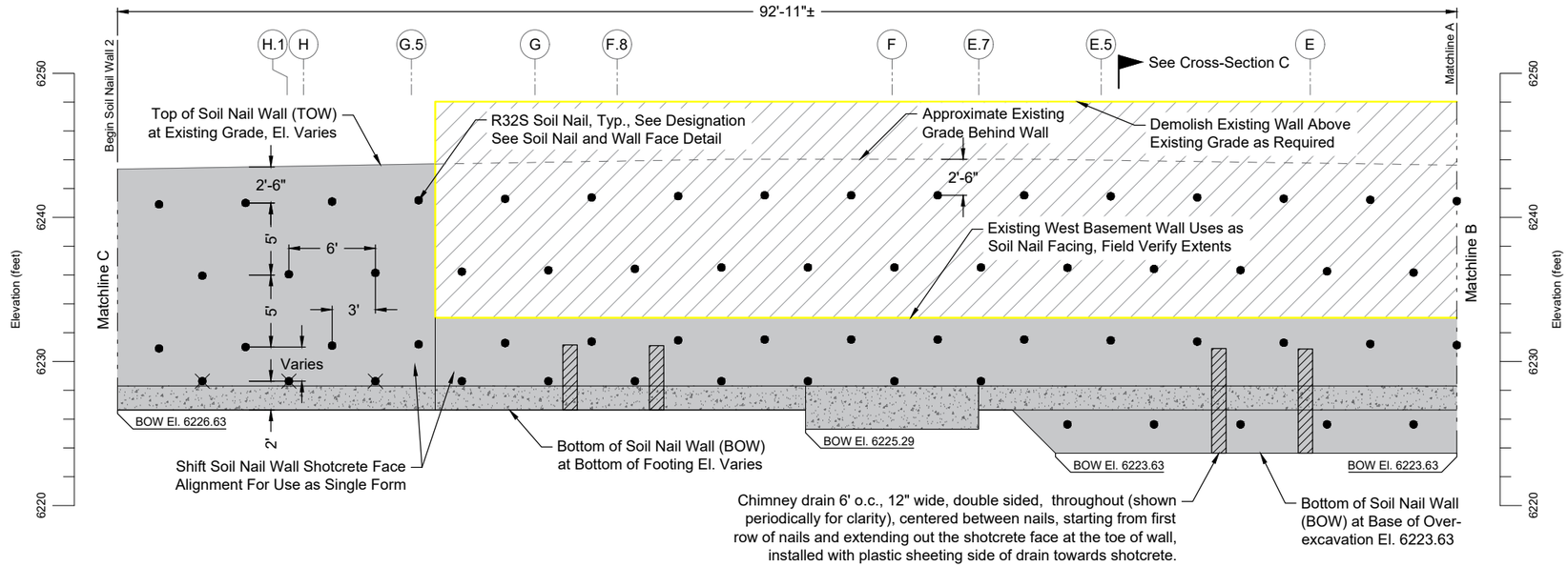
DESIGNED BY:
GORDON GEOTECHNICAL ENGINEERING, INC.
4426 South Century Drive, Ste 100, Salt Lake City, UT 84123
801-327-9600

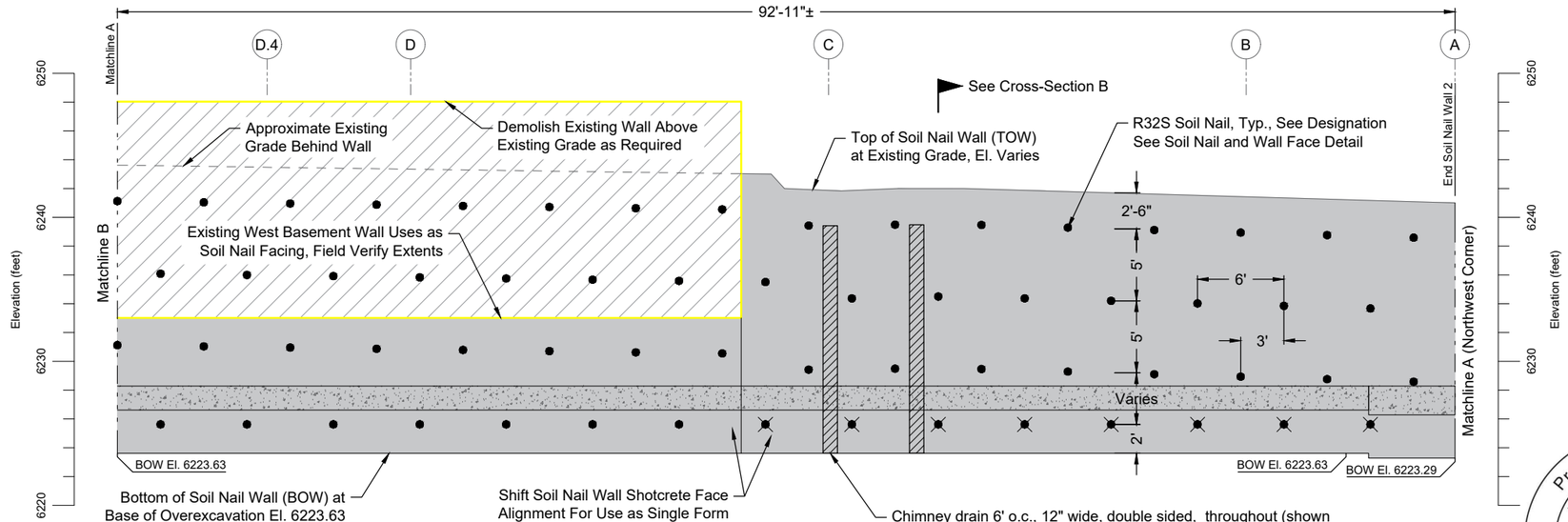
Center Street Hotel
112 Center Street,
Jackson, Wyoming

DESIGN BY: BD DRAWN BY: TT CHECKED BY: BD APPROVED BY: BD

Temporary Shoring and Permanent Micropile Foundations
Elevation View North Wall

G² PROJECT NO.: 223-010-19
SHEET NO.: 2 of 11





Soil Nail Key	
●	R32S Hollow Bar Soil Nails, 18' Long, Typ.
✕	R32S Hollow Bar Soil Nails, 13' Long, Typ.

Approximately 3,451 Square Face
Feet of West Soil Nail Wall Installed

Elevation View 2
West Wall

0 10 20
Scale: 1" = 10'

Professional Engineer
Bret A. DeBernardi
14478
Date
WYOMING

REFERENCE:

DATE	DESCRIPTION
04.12.19	Submitted for Review

DESIGNED FOR:
G2B Company Inc.
PO Box 3402, Nampa, Idaho

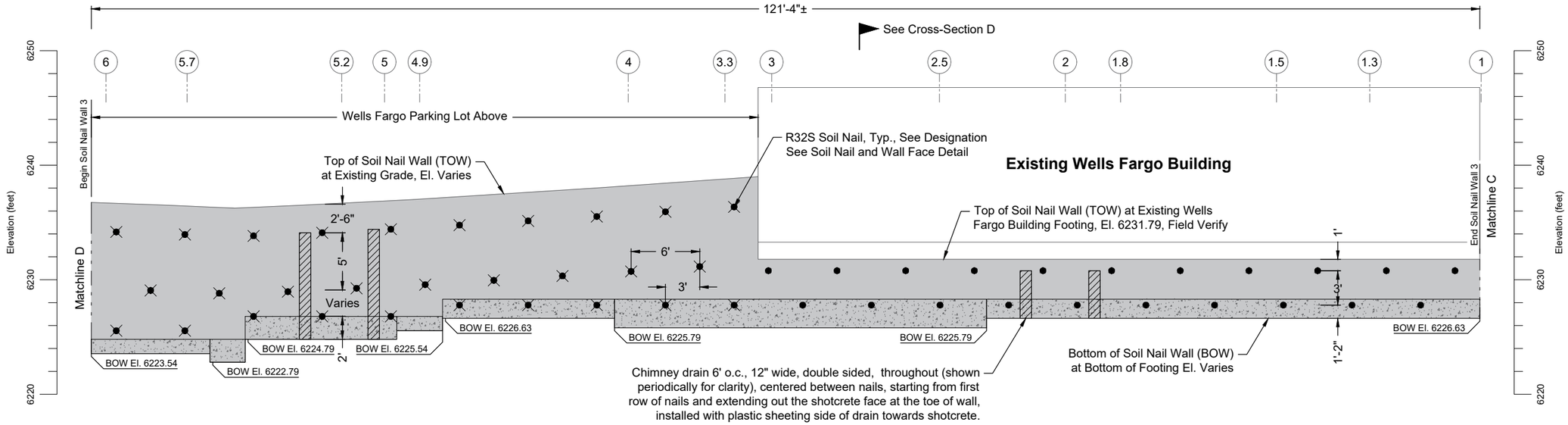
DESIGNED BY:
GORDON GEOTECHNICAL ENGINEERING, INC.
4426 South Century Drive, Ste 100, Salt Lake City, UT 84123
801-327-9600

Center Street Hotel
112 Center Street,
Jackson, Wyoming

DESIGN BY: BD DRAWN BY: TT CHECKED BY: BD APPROVED BY: BD

Temporary Shoring and Permanent
Micropile Foundations
Elevation View West Wall

G² PROJECT NO.: 223-010-19
SHEET NO.: 3 of 11



Soil Nail Key	
●	R32S Hollow Bar Soil Nails, 18' Long, Typ.
✕	R32S Hollow Bar Soil Nails, 13' Long, Typ.

Approximately 1,047 Square Face Feet
of Southwest Soil Nail Wall Installed

Elevation View 3
Southwest Wall

0 10 20
Scale: 1" = 10'

Professional Engineer
Bret A. DeBernardi
14478
Date
WYOMING

REFERENCE:

DATE	DESCRIPTION
04.12.19	Submitted for Review

DESIGNED FOR:
G2B Company Inc.
PO Box 3402, Nampa, Idaho

DESIGNED BY:
GORDON GEOTECHNICAL ENGINEERING, INC.
4426 South Century Drive, Ste 100, Salt Lake City, UT 84123
801-327-9600

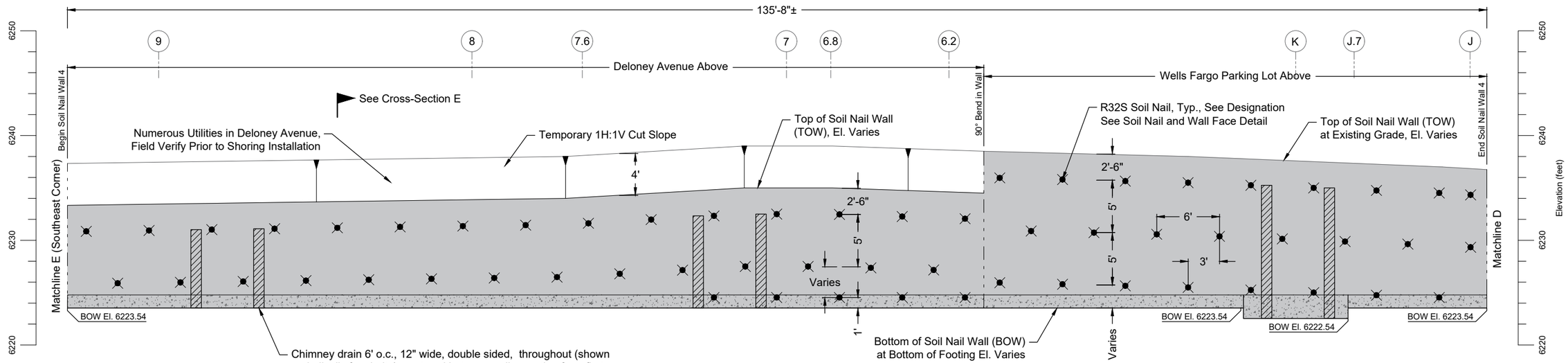
Center Street Hotel
112 Center Street,
Jackson, Wyoming

DESIGN BY: **BD** DRAWN BY: **TT** CHECKED BY: **BD** APPROVED BY: **BD**

Temporary Shoring and Permanent
Micropile Foundations
Elevation View Southwest Wall

G² PROJECT NO.: **223-010-19**

SHEET NO.: **4 of 11**



Soil Nail Key	
●	R32S Hollow Bar Soil Nails, 18' Long, Typ.
✕	R32S Hollow Bar Soil Nails, 13' Long, Typ.

Approximately 1,621 Square Face Feet of South Soil Nail Wall Installed

Elevation View 4
South Wall

0 10 20
Scale: 1" = 10'

Professional Engineer
Bret A. DeBernardi
14478
Date
WYOMING

REFERENCE:

DATE	DESCRIPTION
04.12.19	Submitted for Review

DESIGNED FOR:
G2B Company Inc.
PO Box 3402, Nampa, Idaho

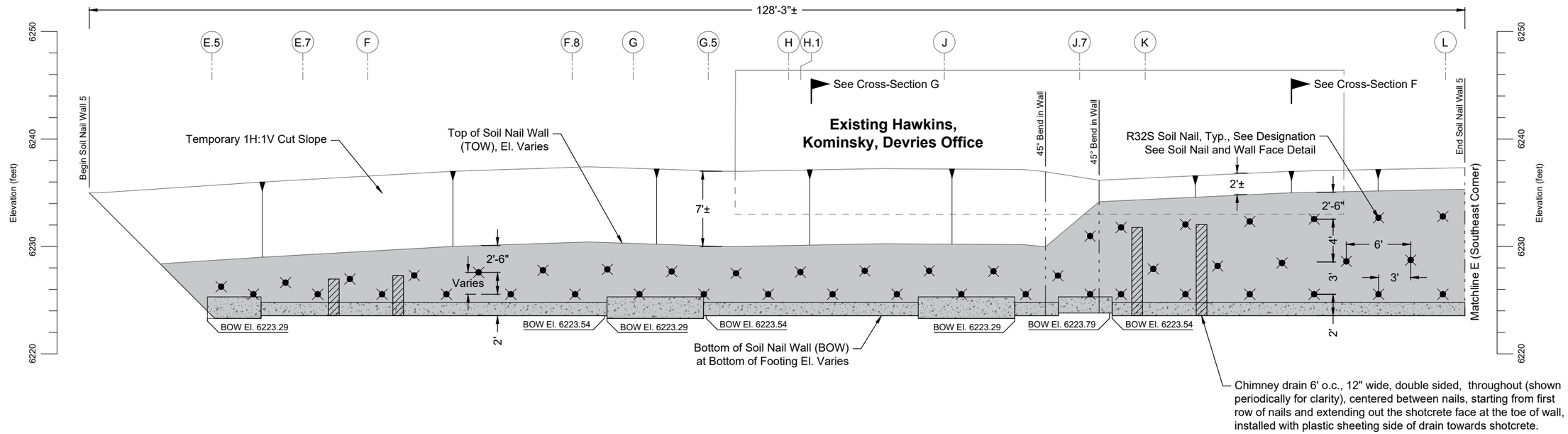
DESIGNED BY:
GORDON GEOTECHNICAL ENGINEERING, INC.
4426 South Century Drive, Ste 100, Salt Lake City, UT 84123
801-327-9800

Center Street Hotel
112 Center Street,
Jackson, Wyoming

DESIGN BY: **BD** DRAWN BY: **TT** CHECKED BY: **BD** APPROVED BY: **BD**

Temporary Shoring and Permanent Micropile Foundations
Elevation View South Wall

G² PROJECT NO.: **223-010-19**
SHEET NO.: **5 of 11**



Soil Nail Key	
●	R32S Hollow Bar Soil Nails, 18' Long, Typ.
✕	R32S Hollow Bar Soil Nails, 13' Long, Typ.

Approximately 943 Square Face Feet of East Soil Nail Wall Installed

Elevation View 5
East Wall

0 10 20
Scale: 1" = 10'

Professional Engineer
Bret A. DeBernardi
14478
Date
WYOMING

REFERENCE:

DATE	DESCRIPTION
04.12.19	Submitted for Review

DESIGNED FOR:
G2B Company Inc.
PO Box 3402, Nampa, Idaho

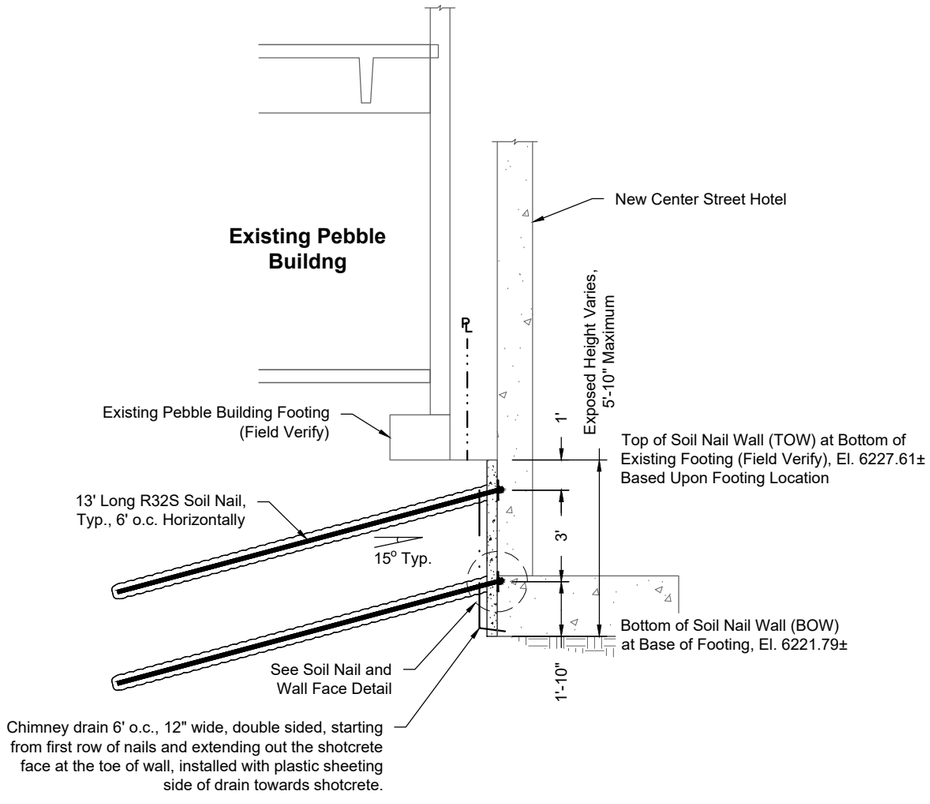
DESIGNED BY:
GORDON GEOTECHNICAL ENGINEERING, INC.
4426 South Century Drive, Ste 100, Salt Lake City, UT 84123
801-327-9600

Center Street Hotel
112 Center Street,
Jackson, Wyoming

DESIGN BY: **BD** DRAWN BY: **TT** CHECKED BY: **BD** APPROVED BY: **BD**

Temporary Shoring and Permanent Micropile Foundations
Elevation View East Wall

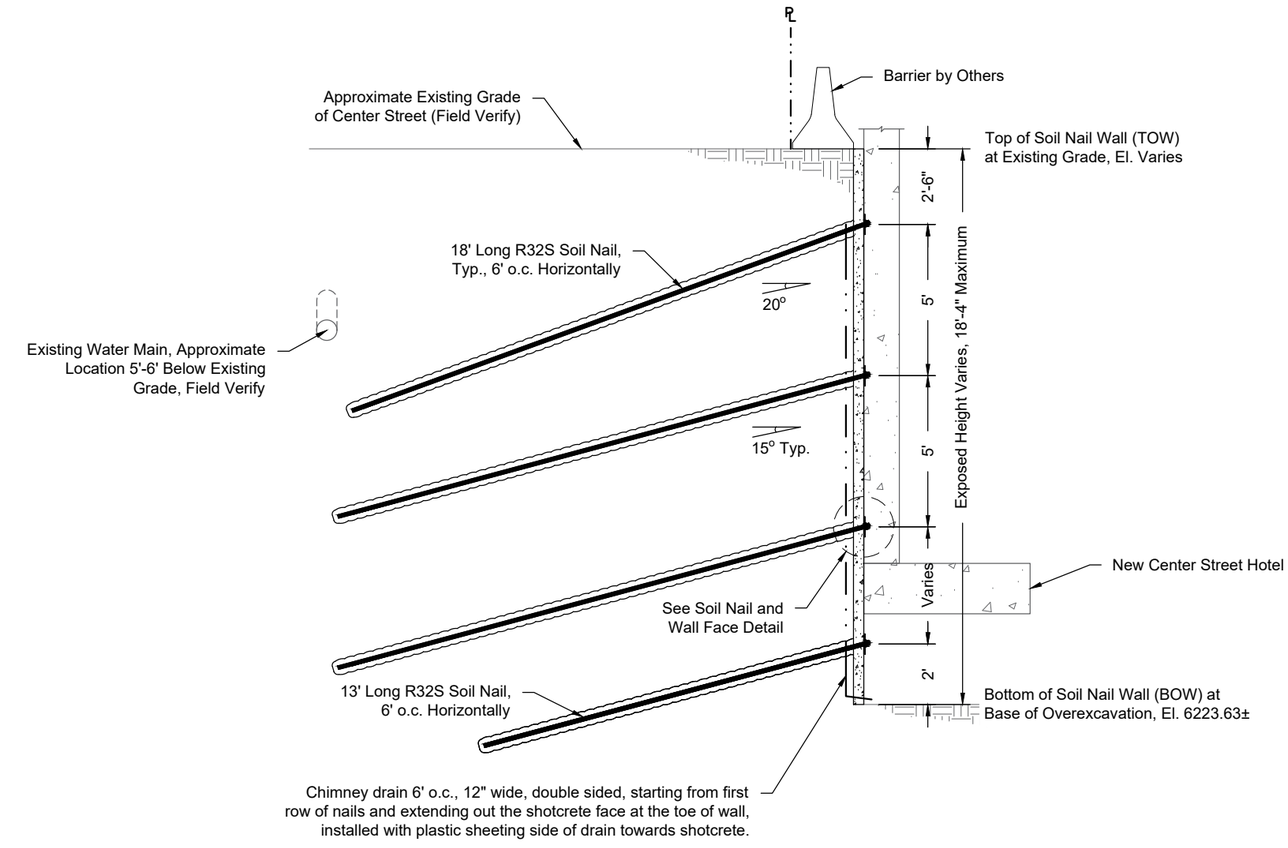
G² PROJECT NO.: **223-010-19**
SHEET NO.: **6 of 11**



Cross-Section A

0 5 10

Scale: 1" = 5'



Cross-Section B

0 5 10

Scale: 1" = 5'

Professional Engineer
Bret A. DeBernardi
14478
Date
WYOMING

REFERENCE:

DATE	DESCRIPTION
04.12.19	Submitted for Review

DESIGNED FOR:
G2B Company Inc.
PO Box 3402, Nampa, Idaho

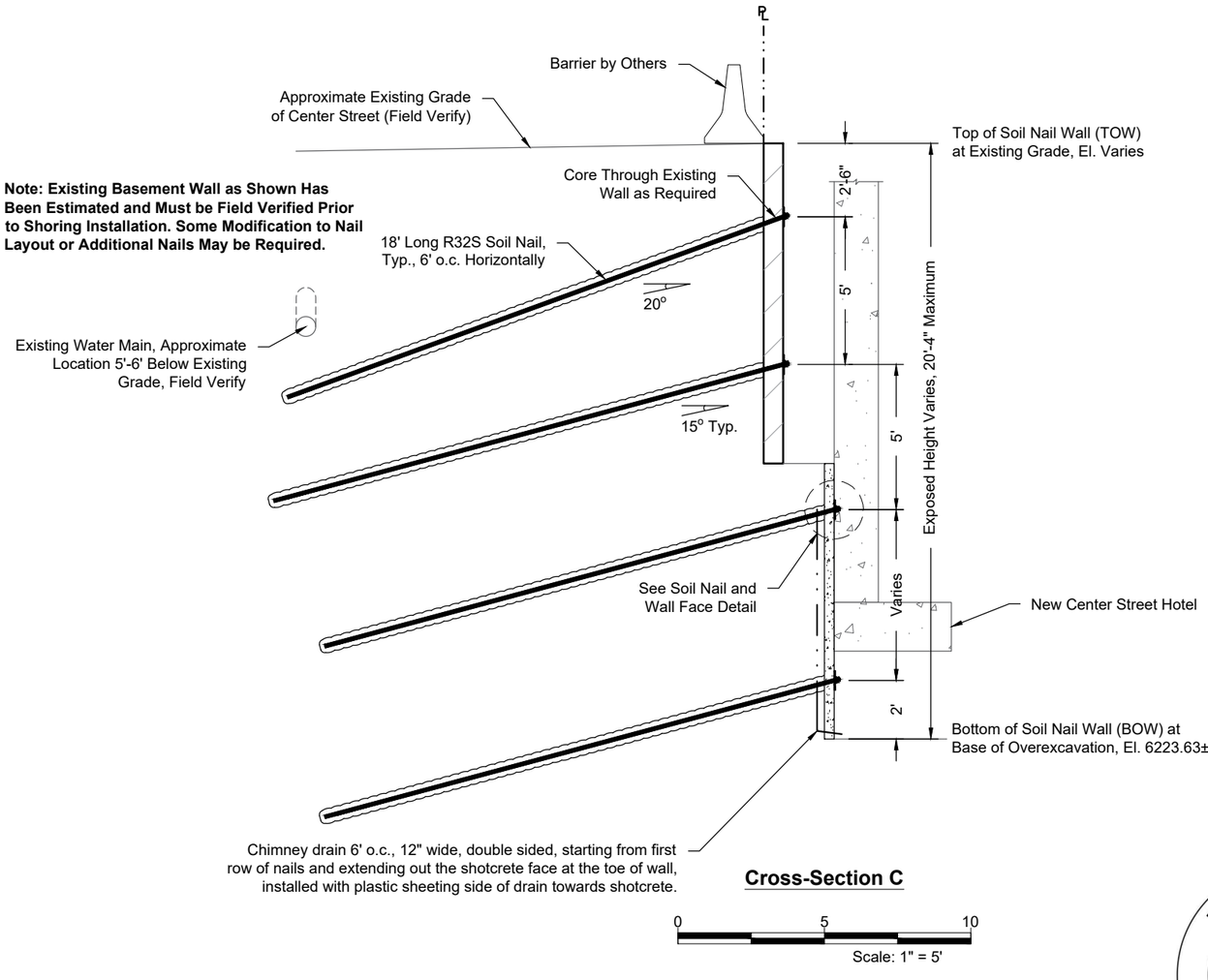
DESIGNED BY:
GORDON GEOTECHNICAL ENGINEERING, INC.
4426 South Century Drive, Ste 100, Salt Lake City, UT 84123
801-327-9600

Center Street Hotel
112 Center Street,
Jackson, Wyoming

DESIGN BY: BD DRAWN BY: TT CHECKED BY: BD APPROVED BY: BD

Temporary Shoring and Permanent Micropile Foundations
Cross-Sections

G² PROJECT NO.: **223-010-19**
SHEET NO.: **7 of 11**

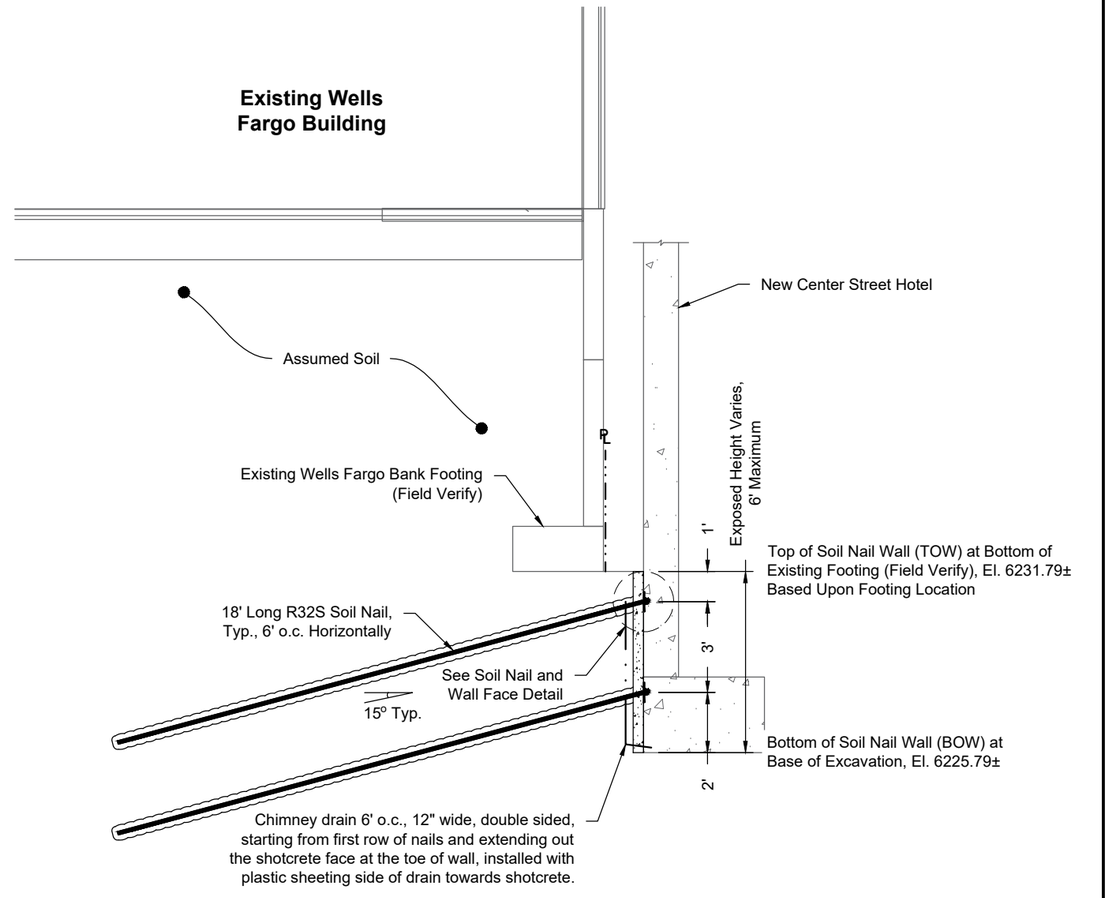


Note: Existing Basement Wall as Shown Has Been Estimated and Must be Field Verified Prior to Shoring Installation. Some Modification to Nail Layout or Additional Nails May be Required.

Cross-Section C

0 5 10

Scale: 1" = 5'



Cross-Section D

0 5 10

Scale: 1" = 5'

Professional Engineer
Bret A. DeBernardi
14478
Date
WYOMING

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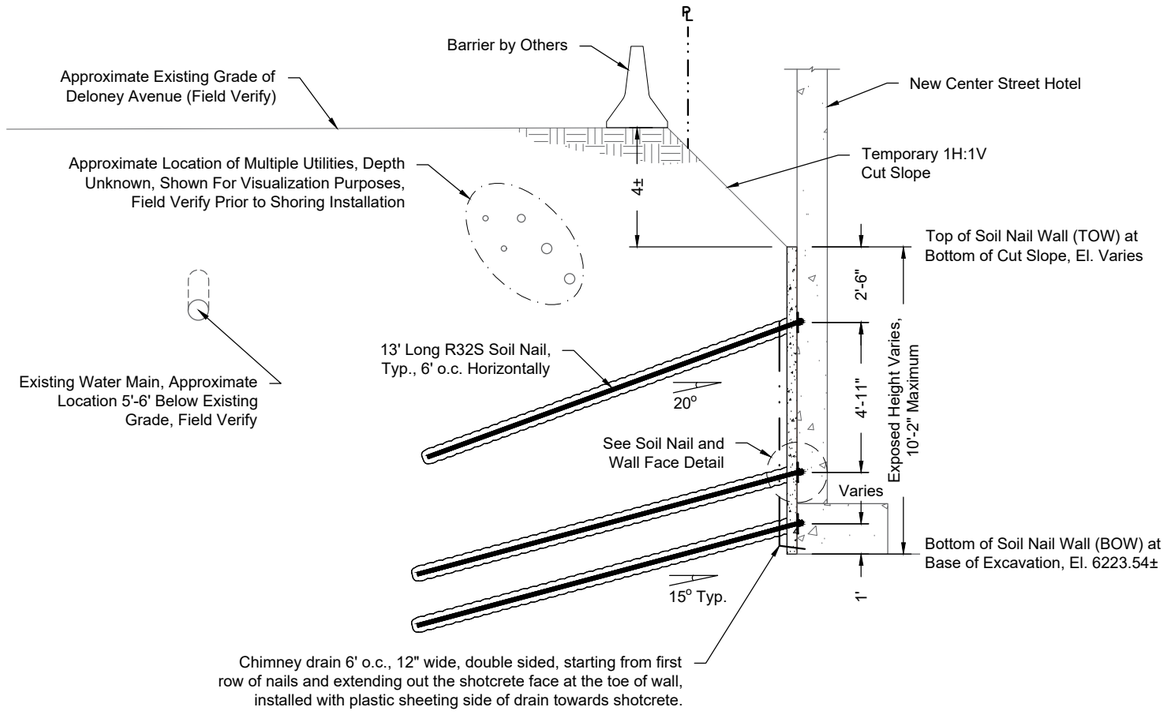
Temporary Shoring and Permanent Micropile Foundations
Cross-Sections

G² PROJECT NO.: **223-010-19**

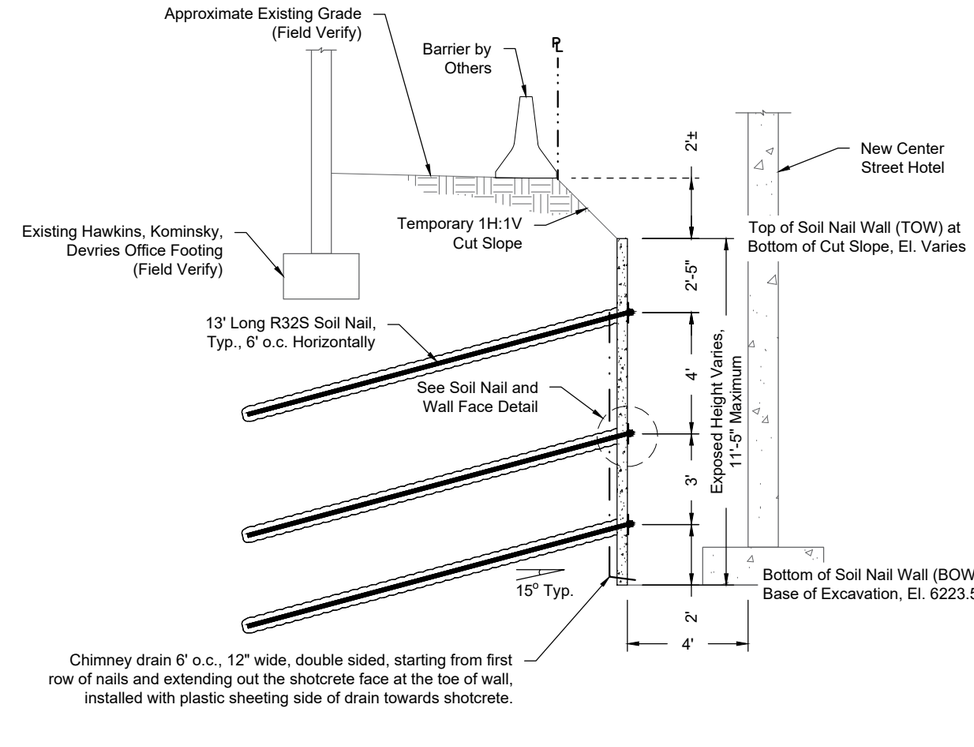
SHEET NO.: **8 of 11**



Cross-Section E

0 5 10

Scale: 1" = 5'



Cross-Section F

0 5 10

Scale: 1" = 5'

Professional Engineer
Bret A. DeBernardi
14478
Date
WYOMING

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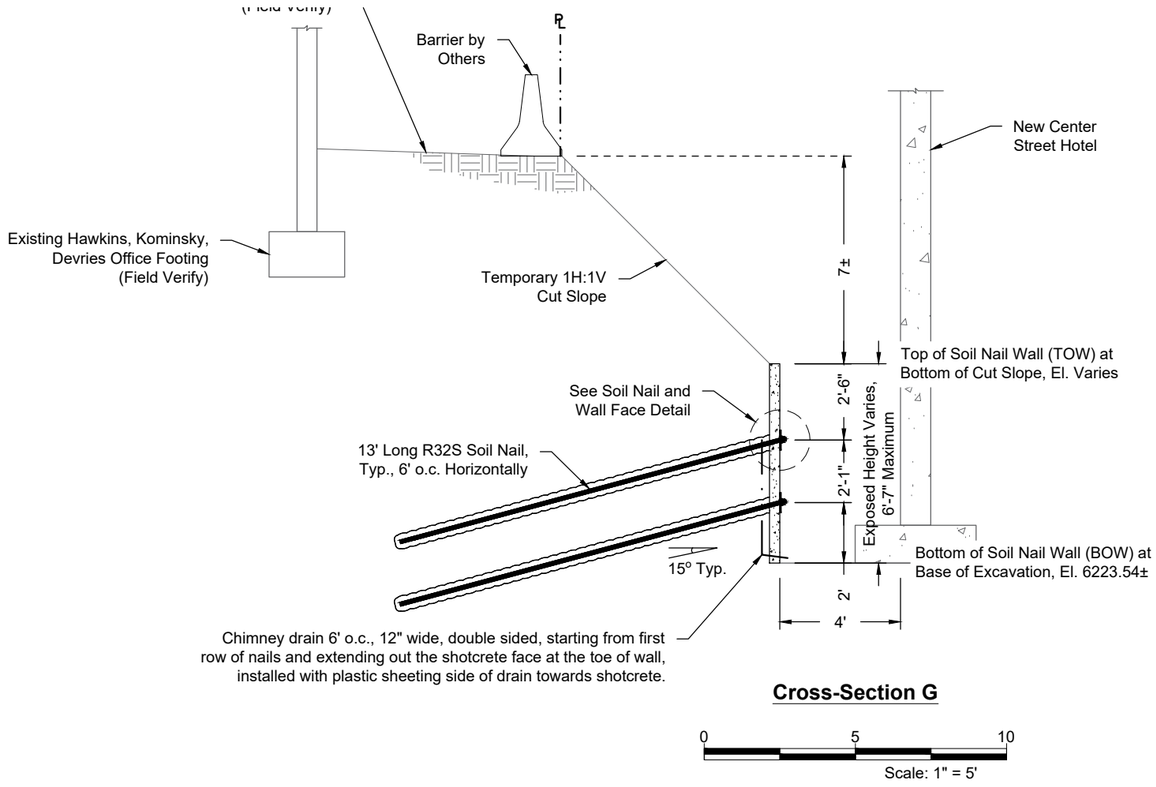
Temporary Shoring and Permanent Micropile Foundations

Cross-Sections

G² PROJECT NO.: **223-010-19**

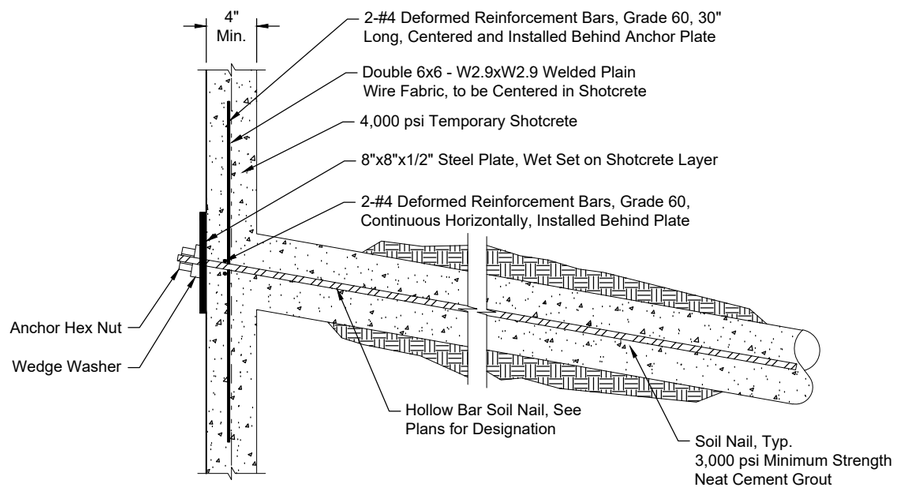
SHEET NO.: **9 of 11**



Cross-Section G

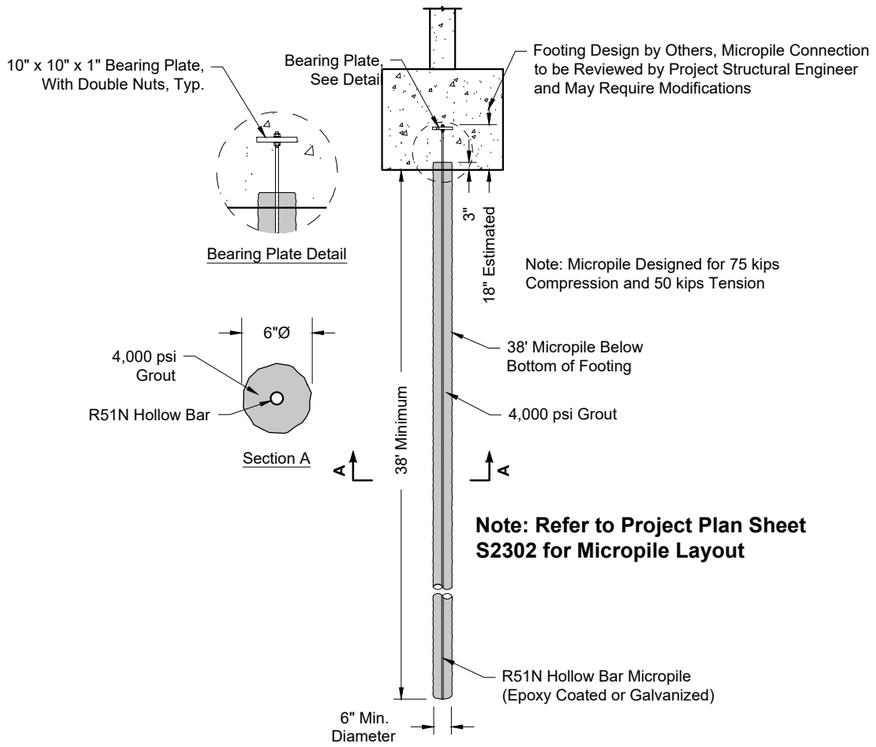
0 5 10

Scale: 1" = 5'



Soil Nail and Wall Face Detail

Not to Scale



Micropile Detail

Not to Scale

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DESIGN BY: **BD** DRAWN BY: **TT** CHECKED BY: **BD** APPROVED BY: **BD**

Temporary Shoring and Permanent Micropile Foundations

Cross-Section and Details

G² PROJECT NO.: **223-010-19**

SHEET NO.: **10 of 11**

General Notes

Introduction

1. These permanent micropile and temporary soil nail wall shoring drawings and design are based upon the following documents:

   a. Project Drawings Building Permit Submittal entitled "Center Street Hotel, 112 Center Street, Jackson, Wyoming," by IBI Grout, dated February 15, 2019.

   b. "Geotechnical Investigation, Center Street Project, Jackson, Wyoming," by Nelson Engineering, Design Development Draft dated October 2018.

   c. Desired shoring arrangement by General Contractor.

2. The shoring and micropiles to be installed to the approximate lines and grades indicated in these drawings subject to field verification. Layout and limits to be determined in the field by General Contractor in keeping with the intent and overall objectives of these plans. It is recommended that the proposed structure and facilities be surveyed to provide a basis for the shoring layout. Gordon Geotechnical Engineering, Inc. (G^2) to be notified immediately of potential conflicts with the shoring layout as shown. G^2 assumes no responsibility for damage to utilities or other structures.

3. Contractor is responsible for construction of the shoring/micropiles as detailed on these plans. Variations from the layouts and details as shown hereon may not be made except with the express written consent of the design engineer (G^2). Changes made in the field made without this consent shall be done solely at the risk of the contractor. Conflicts between these plans and the general project plans to be resolved by Gordon Geotechnical Engineering Inc., whose decision shall be final. No warranty is expressed or implied, only that these designs were prepared in general accordance with design principles in use at the time this work was performed.

4. Prior to shoring and micropile installation, all utilities shall be potholed and verified. Modifications to the shoring may be required.

Materials

1. Soil Nails to be DSI hollow core anchors (or engineer approved equivalent) as designated on these plans equipped with 3-inch nominal bit size. All bars shall be free of mill scale and rust at the time of installation.

2. Micropiles to be DSI hollow core anchors (or engineer approved equivalent) as designated on these plans equipped with 6-inch nominal bit size. Micropiles bars shall be epoxy coated in accordance with ASTM A775 (or ASTM A934) or hot-dipped galvanized in accordance with ASTM A153.

3. Metal bar centralizers shall be provided by the anchor manufacturer and shall be used at 10 feet centers throughout the bar length.

4. Grout for the soil nails shall have a minimum 28 day strength of 3000 psi, and shall be mixed on site using Type I, II or III Portland Cement. Mix to have a specific gravity (mud balance) of no less than 1.81, and/or a water-cement ratio of 0.45. Alternatively, if a colloidal mixer is used, a specific gravity of 1.75 and/or a water cement ratio of 0.5 may be employed. Mix and installation shall conform to all applicable ACI specifications.

5. Grout for the micropiles shall have a minimum 28 day strength of 4000 psi, and shall be mixed on site using Type I, II or III Portland Cement. Mix to have a specific gravity (mud balance) of no less than 1.81, and/or a water-cement ratio of 0.45. Alternatively, if a colloidal mixer is used, a specific gravity of 1.75 and/or a water cement ratio of 0.55 may be employed. Mix and installation shall conform to all applicable ACI specifications.

6. All plate and structural steel to be Grade 50, ASTM A572 unless otherwise stated and shall be detailed according to AISC Standards. Bearing plates for micropiles shall be epoxy coated in accordance with ASTM A775 (or ASTM A934) or hot-dipped galvanized in accordance with ASTM A153.

7. All welds to be with E70XX electrodes, in conformance with American Welding Society (AWS) "Structural Welding Code", AWS D1.1. Mill scale shall be removed prior to field welding.

8. Welded Wire Mesh to conform to ASTM A82 and A185. Minimum wire mesh overlap is 12 inches.

9. Shotcrete face for soil nail wall shall consist of an approved, pumpable mix having a 28 day strength of 4000 psi using Type I-II Portland Cement. Shotcrete shall be mixed and placed in accordance with ACI standards.

10. Rebar to have a yield strength of 60 ksi. Minimum No. 4 rebar overlap is 46 inches (Class B) and 35 inches (Class A).

Temporary Soil Nail Wall Shoring Installation

1. The face of the excavation shall be cut to within 1'-2' of the lines and grades as shown on these drawings for nail installation. After successful nail installation, the face may cut to the lines and grade shown on the plans and immediately shotcreted to the base of excavation. If excessive spalling or sluffing of soil from the face occurs during anchor installation, a flash coat of shotcrete shall be immediately sprayed to the base of the excavation immediately after the excavation is performed. If site soils are sufficiently stable, the excavation may be cut to the lines and grades shown. Alternatively, "splines" or micropiles using #4 bar on 18" centers may be utilized to provide additional face stability.

2. Allowable tolerances for nail and shotcrete placement shall be:

   Nail Position: +/- 6 inches in any direction.
   Nail Length: no less than length shown.
   Nail Inclination: +/- 2 degrees.
   Casing size: 6 inches minimum.
   Nail Horizontal Splay Angle: +/- 5 to 10 degrees.
   Shotcrete thickness (where applicable): no less than shown.
   Variations exceeding these values will require special consideration by G^2.

3. Nails shall be installed in a horizontal sequence as shown on the plans. Nails to be continuously grouted as it is advanced into the hole. Nails not to advance more than 5 feet per minute and shall be worked back and forth in the hole at least 5 times during continuous grout feed, for each 10 feet it is advanced. Grout return to be maintained.

4. 4-inch thick shotcrete to be placed and anchor plates to be wet set on the face.

5. Excavation shall not extend more than 2 feet below the soil nail level until nail grout and shotcrete have been in place for three days. Successive vertical lifts shall not exceed 6 feet.

Soil Nail Testing

1. Sacrificial Verification Nails: Four verification nails shall be installed around the site, two on the top row and two on the second row of nails. The verification test nails shall utilize the same installation methods as the production nails. The verification test nails shall be 15 feet in length with the outer 5 feet unbonded. Nail testing shall occur after the grout has set for 3 days. Contractor to utilize jack and pressure gauge calibrated within one year. Design load (DL) can be computed by multiplying the actual installed bond length by a working adhesion of 2.67 kips per lineal foot in soils (i.e. for 10' bond, DL = 10' x 2.67 kips/ft = 27 kips). Additional verification nails may be required at the discretion of the design engineer based upon different soil conditions or test results.

   The load increments and load sequence shall be:

   Seating load (2%-4% DL), 25% DL, 50% DL, 75% DL, 100% DL, 150% DL, with a Creep Test. Each incremental load up shall be held until stable with the deflection recorded. At 150% DL, a 10 minute creep test shall be performed with deflection measurements taken at 1, 3, 5, 6, 8, and 10 minutes. If the creep rate (movement between 1 and 10 minute readings) is less than or equal to 0.04 inches, the nail is considered acceptable. If creep movement exceeds 0.04 inches, the nail shall be held for an additional 50 minutes with readings taken at 20, 30, 40 and 60 minutes. If creep movement taken over a log cycle of time (movement between 6 and 60 minute readings) is less than 0.08 inches, the nail is considered acceptable. After creep test, the nail shall be further tested in increments of 25% DL to failure. Maximum load shall not exceed 56 kips for R32S bar. All test results shall be forwarded to G^2 for review.

   Verification testing will determine if the nails achieve the assumed design adhesion. If nails do not achieve necessary values, the nails may need to be lengthened, utilize larger bits, or other modifications as determined by the contractor and wall designer.

2. Proof Testing: A minimum of 5 percent of the production soil nails to be prooftested to 150% of the design load. The nails to be randomly placed throughout the wall. Nail length of nails shall be according to the appropriate production lengths indicated on the elevation view. All test nails shall utilize a 5 foot long PVC bondbreaker at the top of the shotcrete to extend the bar through the shotcrete. Cribbing to support the reaction plate and jack will be required. Nail testing shall occur after the grout has set for 3 days. Contractor to utilize jack and pressure gauge calibrated within one year. Design load (DL) can be computed by multiplying the actual installed bond length by a working adhesion of 2.67 kips per lineal foot in soils (i.e. for 10' bond, DL = 10' x 2.67 kips/ft = 27 kips). Additional verification nails, may be required at the discretion of the design engineer based upon different soil conditions or test results.

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Micropile Installation

1. Refer to Project Specifications (Section 31 62 00) for applicable information regarding micropile testing, installation, records of installation, etc.

2. Micropiles shall be installed at the locations indicated on the project structural foundation and footing plans.

3. Micropiles to be continuously grouted as it is advanced into the hole. Micropiles shall not to advance more than 5 feet per minute and shall be worked back and forth in the hole at least 5 times during continuous grout feed, for each 10 feet it is advanced. Grout return to be maintained.

4. Centralizers shall be utilized at 10 feet on center.

5. The micropile bar shall be left above top of micropile for connection to the footing at the desired location within the footing (double nuts with bearing plate or as required/specified by project structural engineer).

6. Allowable installation tolerances for micropile placement shall be:

   Position: +/- 3 inches in any direction.
   Inclination and Orientation: +/- 2 degrees.
   Vertical Elevation of Top of Pile: +/- 1 inch.
   Length: no less than length shown.

Micropile Testing

1. Micropile testing will include one verification (sacrificial) tests prior to production installation. Test pile shall be installed using the same equipment and techniques as the production piles.

2. Testing will be performed in tension to facilitate the procedure, however, loads will require the use of a larger hollow bar T76N or engineer approved equal. If possible, the same bit size as the production micropiles shall be utilized, otherwise modifications of the test "Design Load" would have to be prorated for the difference in test pile bit size and production pile bit size. Design load is 75 kips compression and 50 kips tension, however, the maximum load of 75 kips shall be used as the Design Load in all tension test unless bit size requires some variation.

3. All test results to be forwarded to Gordon Geotechnical Engineering Inc. for review. The micropile shall be tested in tension to 2xDL in accordance with Project Specification Section 31 62 00.

4. Micropile test shall include tension tests only to confirm design adhesions. These adhesions have been estimated based upon boring logs for the project. If test results are not satisfactory, modification of the design length may be required.

Other

1. The following parameters/assumptions have been assumed in the soil nail shoring design (refer to the accompanying design memorandum):

   a. Soils:

   Gravel Soils: Moist Unit Weight = 135 pcf, Friction Angle = 36 degrees, Cohesion = 50 psf.

   b. Existing Wells Fargo Foundation Loading (SW Corner): Line load = 6 kips/ft and 12' of grade change between bottom of footing and floor slab.

   c. Existing Pebble Commercial/Professional Building (North Side) Foundation Loading: Line load = 7.5 kips/ft and 3' of grade change between bottom of footing and floor slab.

   d. Existing Hawkins, Kominsky, Devries Office I Building (East Side) Foundation Loading: Line load = 3.0 kips/ft.

   e. Area surcharge of 125 psf for live load on floor slabs starting behind existing building walls.

   f. Traffic area surcharge loading of 250 psf beyond buildings.

   g. No groundwater.

   h. Projected shoring movements: Approximately 0.5" to 1" laterally and vertically. Actual movements will vary based upon installation techniques, soil consistency, etc.

   i. No other large surcharge loadings such as cranes, etc. on top of the shoring. These must be reviewed on a case by case basis for each loading and may require modification to the shoring.

2. Micropiles have been designed as friction piles with capacity generated in the gravel soils present approximately 13 feet below bottom of pile cap. An ultimate adhesion of 7 kips per lineal foot has been utilized in the gravel soils.

3. Fall protection on top of slopes and shoring is the responsibility of others.

REFERENCE:

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Center Street Hotel
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DESIGN BY: **BD** DRAWN BY: **TT** CHECKED BY: **BD** APPROVED BY: **BD**

Temporary Shoring and Permanent Micropile Foundations
General Notes

G^2 PROJECT NO.: **223-010-19**
SHEET NO.: **11 of 11**