

CLEARANCE: PORTAGE TO TUNNEL

THRU TRUSS BRIDGE 54.1

For close clearances from November to April, contact the District 1 Road Master to check on ice conditions within the tunnels

LOADED DIMENSIONS RULE

Project Memo

Subject: MP 52.14 Retaining Wall – Rock Anchor Testing		
To: Alaska Railroad Corporation	From: William Brooks, P.E.	
Project: Rock Anchor Testing at MP 52.14		
Date: 9/29/2020	Doc. No. 179034-MBI-SR-MMO-001	Project No. 179034

<i>Date</i>	<i>Version</i>	<i>Description</i>
9/29/2020	Rev 0	For Client Use

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1. Project Overview

Michael Baker International (Michael Baker) is designing two new retaining wall structures between the tunnels at MP 52 for the Alaska Railroad Corporation (ARRC). As part of the proposed scope of work, Michael Baker has subcontracted Advanced Blasting Services to drill and test rock anchors to support design.

The project site is located at MP 52, south of the Portage siding near the Spencer Glacier and adjacent to the Placer River.

1.1 Geology and Rock Properties

The MP 52 retaining wall will be constructed in the marine sedimentary rock of the Valdez Group in an extension of the Chugach Mountains on the Kenai Peninsula as shown in Figure 1.1. The Valdez Group includes medium- and thin-bedded graywacke turbidites, black argillite, and minor pebble to cobble conglomerate (Bradley, 2006). Turbidites describes a sediment or rock deposited by a turbidity current, suggesting that the grain structure is well mixed with little differentiation in layers or laminations. An argillite is a sedimentary rock that does not split easily; however, rock fall at the site is observed to split into thin to thick plate-like shapes. Based on these descriptions of geologic origin, the rock type at the MP 52 site most closely resembles greywacke.

Intact greywacke rock properties vary according to load application on or across the grain structure. Tested uniaxial compressive strengths for New Zealand greywacke varied from 24,000 to 44,000 pounds per square inch (psi) and tensile strengths varied from 2,900 to 5,000 psi (McNamara, Faulkner, & McCarney, 2014). Triaxial compression testing in this study resulted in an internal angle of friction of 43 to 44 degrees and 7,100 to 7,400 psi cohesion. Considering that these test results are not from the local Alaska rock, the strengths should be applied cautiously for design; they are presented here to establish that the intact greywacke is a high strength material.

The MP 52 rock formation has near vertical bedding with bedding planes oriented close to perpendicular to the track and wall alignment. Although rock fall from the face of the vertical and overhanging rock appears to coincide with separation along the bedding planes (evidently exacerbated by surface water drainage and freeze/thaw cycles), structural control along joints and fractures is not apparent.

2. Anchor Testing

Anchor testing required the drilling, installation and grouting, and proof tests to confirm the adequacy of the rock to support design loads, provide design information, and confirm competent rock was present at the site.

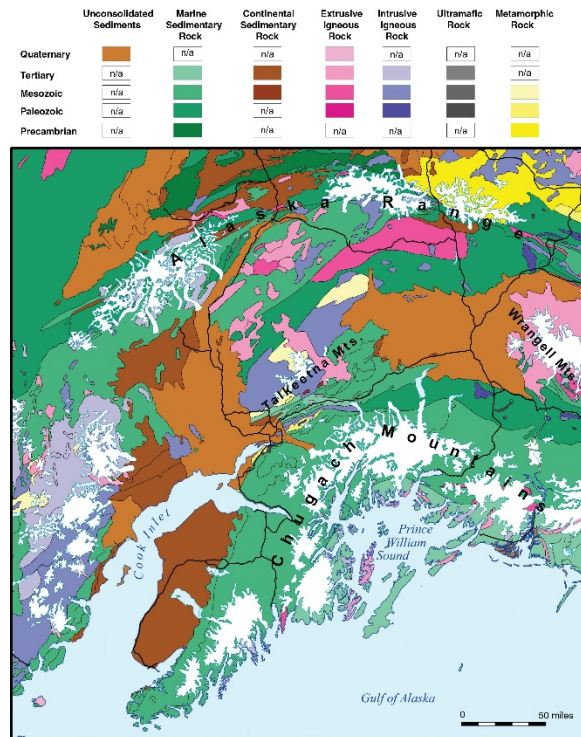


Figure 1.1 - Bedrock of Southcentral Alaska

2.1 Anchor Installation

Michael Baker Geotechnical Engineer Bill Burgess mobilized to the MP 52 site with equipment and crew from Advanced Blasting Services, LLC (ABS) on Wednesday June 10, 2020 to drill investigative holes for rock anchor tests. The ARRC provided a Hytracker low-bed rail equipment mover with operator to mobilize the drill and associated anchor bars and grouting equipment. The ARRC also provided Hi-Rail pickup trucks with operators to mobilize the field team to the site. Advanced Blasting provided an Atlas Copco ECM 660 rock drill (3.5-inch button bit), #8 and #9 threaded bars with fasteners, and high-flow, non-aggregate, non-shrink NA Grout to complete the rock anchors. The product sheets for the installed bars is included as Attachment 1.

Following mobilization to the site, anchor work commenced with drilling Bolt 1 below the south end of the south retaining wall. Drilling progressed from south to north with eight total holes completed as shown in Table 2.1.

Table 2.1: Rock Anchor Installation Records

Hole ID	Depth (ft)	Wet/Dry?	Bars	Bearing ¹	Dip ²	Orientation to bedding	Drilling Remarks
Bolt 1	30	Wet	30 ft, #9	258	44		Abundant seepage at shallow depth
Bolt 2	30.5	Dry	30 ft, #8	295	15		8-in soft zone at about 8 ft depth
Bolt 3	30.5 to 31	Wet	30 ft, #8	250	22		Fast drilling 13-19 ft, possible seepage zone
Bolt 4	30	Dry	30 ft, #9	275	19	¼ across bedding	
Bolt 5	30	Wet	30 ft, #9	264	16	About parallel	
Bolt 6	30	Wet	30 ft, #9	280	26	About parallel	
Bolt 7	30	Damp	30 ft, #9	264	31	¼ across bedding	
Bolt 8	31.5	Dry	30 ft, #9	315	24	Perpendicular to track/wall	

- Notes: 1. Bearing measured in degrees from magnetic north
2. Dip measured in degrees down from horizontal

With few exceptions noted in Table 2.1, drilling was consistent, smooth, and steady with only short breaks to add drill steel. Total time to drill ranged from 20 to 35 minutes per hole including occasional breaks for rig maintenance or to coordinate with the crew assembling anchor bars. The drilling action (pressure on the drill string, penetration rate, sound, dust or chip production, etc.) was consistent from hole to hole even though drill locations were chosen to sample the varied surficial conditions at the site.

2.2 Grouting

Anchor grouting was performed on Thursday, June 11, 2020 by ABS (Figure 2.1). Grouting results and conditions are shown in Table 2.2. The grout used was NA Grout, a blend of specialty cements and admixtures, with 7- and 28-day compressive strengths of 11,000 and 15,000 psi, respectively. Figure 2.2 shows the grout consistency prior to placement. The grout product sheet is included as Attachment 2.

Figure 2.1: Drilling Bolt 3 near drainage behind south wall



Table 2.2: Grouting Notes

Bolt	Wet or Dry?	Clean Out Method	Grout Take (gal)	Remarks
1	Wet	None	7	Very high water height, water displaced by grout
2	Wet	Air, Blow out	7	None
3	Wet	None	6	Water displaced by grout
4	Dry	None	6	Checked grout level, 6 gallons right around 10 ft
5	Wet	None	6	Water displaced by grout
6	Wet	None	6	Water displaced by grout
7	Wet	None	6	Water displaced by grout
8	Dry	None	6	Checked grout level, same as hole #4, 6 gallons puts grout at 10 ft

Figure 2.2: Grout consistency prior to installation



2.3 Anchor Testing

Michael Baker Geotechnical Engineer Bill Brooks was on-site for anchor testing on Thursday, June 18, 2020 along with ABS and a representative from ARRC who coordinated site access via hi-rail. An excavator was onsite to position the testing equipment, a 200-8 hydraulic jack.

Testing was conducted on each anchor and consisted of a proof test with three steps with loads relative to the steel properties of the bar. The three steps included a 10-minute test at 80% of the minimum yield strength of the steel; an increase in load to the minimum yield strength; and a final increase in load to the ultimate yield strength of the steel. A summary of the testing is presented in Table 2.3 below.

Table 2.3: Testing Summary

Anchor Bar	Bar Size	10 Min. Test at 80% of Minimum Yield Strength	Minimum Yield Strength	Ultimate Yield Strength
1	#9	60k	75k	100k
2	#8	48k	60k	80k
3	#8	48k	60k	80k
4	#9	60k	75k	100k
5	#9	60k	75k	100k
6	#9	60k	75k	100k
7	#9	60k	75k	100k
8	#9	60k	75k	100k

None of the tests appeared to yield the rock/grout bond. There was no apparent difference in tensile capacity or deformation for anchors roughly aligned with bedding, versus anchors installed across the bedding planes. Therefore, rock mass properties do not appear to control anchor performance at least to the extent tested. Deformations measured during testing closely aligned with the expected elongation associated with the steel properties and a grouted bond zone of approximately 10 feet.

3. Recommendations

The primary goal of the anchor testing was to characterize the quality of the rock mass at the site. The results indicate a competent rock mass. Elongation measurements of the anchor bar during testing matched the expected deformation associated with the steel properties and strengths of the #8 and #9 rebar, indicating the anchor testing failed to yield the rock/grout bond.

Given the loads tested in the field, a minimum rock/grout bond strength is estimated to be 120 psi for scaling to different bar sizes if desired.

Anchor orientation for design should be perpendicular to the face of the wall and at a dip angle of 15 to 20 degrees down from horizontal.

4. References

Southcentral Alaska Geology. <https://sites.google.com/a/piceageographics.com/alaskageography/home>.

McNamara, Faulkner, McCarney, 2014, Rock Properties of Greywacke Basement Hosting Geothermal Reservoirs, New Zealand: Preliminary Results, PROCEEDINGS, Thirty-Ninth Workshop on Geothermal Reservoir Engineering Stanford University, Stanford, California, February 24-26, 2014 SGP-TR-202

Bradley, 2006, Field Guide to South-Central Alaska's Accretionary Complex, Anchorage to Seward, Alaska Geological Society

5. Attachments

Attachment 1 – Grade 75/80 All Thread Rebar Product Sheet

Attachment 2 – NA Grout Product Sheet



Grade 75/80 All-Thread Rebar



Threads

Williams All-Thread Rebar has a cold rolled, continuous, rounded course thread form. Williams special thread (deformation) pattern projects ultra high relative rib area at 3 times that of conventional rebar. This provides for superior bond performance in concrete. Because of the high thread pitch and the full 360 degree concentric thread form, Williams All-Thread Rebar should only be bent under special provisions using larger bend diameters than typical ACI minimums. As an alternative to bending, Williams recommends use of a steel plate or a threaded terminator disc to reduce development length. Threads are available in both right and left hand. Grades up to 100 are available upon request.

Sizes

All-Thread Rebar is available in 11 diameters from #6 (20 mm) through #28 (89 mm). All diameters are available in continuous lengths up to 50' (15.2 m).

Welding

Welding of All-Thread Rebar should be approached with caution since no specific provisions have been included to enhance its weldability. Refer to ANSI/AWS D1.4 for proper selections and procedures.

R61 Grade 75/80 All-Thread Rebar

ASTM A615*

Bar Designation & Pitch	Minimum Net Area Thru Threads	Grade 75		Grade 80		Nominal Weight	Approx. Thread Major Diameter	Part Number
		Minimum Ultimate Strength	Minimum Yield Strength	Minimum Ultimate Strength	Minimum Yield Strength			
#6 - 5 (19 mm)	0.44 in ² (284 mm ²)	44 kips (196 kN)	33 kips (147 kN)	46 kips (205 kN)	35 kips (156 kN)	1.5 lbs/ft (2.4 kg/m)	7/8" (22 mm)	R61-06
#7 - 5 (22 mm)	0.60 in ² (387 mm ²)	60 kips (267 kN)	45 kips (200 kN)	63 kips (280 kN)	48 kips (214 kN)	2.0 lbs/ft (3.0 kg/m)	1" (25 mm)	R61-07
#8 - 3-1/2 (25 mm)	0.79 in ² (510 mm ²)	79 kips (351 kN)	59 kips (264 kN)	83 kips (369 kN)	63 kips (280 kN)	2.7 lbs/ft (3.9 kg/m)	1-1/8" (29 mm)	R61-08
#9 - 3-1/2 (29 mm)	1.00 in ² (645 mm ²)	100 kips (445 kN)	75 kips (334 kN)	105 kips (467 kN)	80 kips (356 kN)	3.4 lbs/ft (5.1 kg/m)	1-1/4" (32 mm)	R61-09
#10 - 3 (32 mm)	1.27 in ² (819 mm ²)	127 kips (565 kN)	95 kips (424 kN)	133 kips (592 kN)	102 kips (454 kN)	4.3 lbs/ft (6.5 kg/m)	1-3/8" (35 mm)	R61-10
#11 - 3 (36 mm)	1.56 in ² (1006 mm ²)	156 kips (694 kN)	117 kips (521 kN)	164 kips (730 kN)	125 kips (556 kN)	5.3 lbs/ft (7.9 kg/m)	1-1/2" (38 mm)	R61-11
#14 - 3 (43 mm)	2.25 in ² (1452 mm ²)	225 kips (1001 kN)	169 kips (750 kN)	236 kips (1050 kN)	180 kips (801 kN)	7.65 lbs/ft (11.8 kg/m)	1-7/8" (48 mm)	R61-14
#18 - 3 (57 mm)	4.00 in ² (2581 mm ²)	400 kips (1780 kN)	300 kips (1335 kN)	420 kips (1868 kN)	320 kips (1423 kN)	13.6 lbs/ft (19.6 kg/m)	2-7/16" (62 mm)	R61-18
#20 - 2-3/4 (64 mm)	4.91 in ² (3168 mm ²)	491 kips (2184 kN)	368 kips (1637 kN)	516 kips (2295 kN)	393 kips (1748 kN)	16.7 lbs/ft (24.8 kg/m)	2-3/4" (70 mm)	R61-20
#24 - 2-3/4 (76 mm) *	6.82 in ² (4400 mm ²)	682 kips (3034 kN)	512 kips (2277 kN)	716 kips (3185 kN)	546 kips (2429 kN)	24.0 lbs/ft (35.8 kg/m)	3-3/16" (81 mm)	R61-24
#28 - 2-3/4 (89 mm) *	9.61 in ² (6200 mm ²)	961 kips (4274 kN)	720 kips (3206 kN)	1009 kips (4488 kN)	769 kips (3421 kN)	32.7 lbs/ft (48.6 kg/m)	3-3/4" (95 mm)	R61-28

* The #24 and #28 diameter bars are not covered under ASTM A615.



All Couplings and Hex/Collar Nuts exceed 100% of the bar's published ultimate strength and meet ACI 318 Section 25.5.7.1 for mechanical rebar connections.



Hex Nut



Round Collar Nut

R62 Stop-Type Coupling

Bar Desig. & Nominal Dia.	Outside Diameter	Overall Length	Part Number
#6 - 3/4" (19 mm)	1-1/4" (32 mm)	3-1/2" (89 mm)	R62-06
#7 - 7/8" (22 mm)	1-3/8" (35 mm)	4" (102 mm)	R62-07
#8 - 1" (25 mm)	1-5/8" (41 mm)	4-1/2" (114 mm)	R62-08
#9 - 1-1/8" (29 mm)	1-7/8" (48 mm)	5" (127 mm)	R62-09
#10 - 1-1/4" (32 mm)	2" (51 mm)	5-1/2" (140 mm)	R62-10
#11 - 1-3/8" (36 mm)	2-1/4" (57 mm)	6" (152 mm)	R62-11
#14 - 1-3/4" (43 mm)	2-7/8" (73 mm)	6" (152 mm)	R62-14
#18 - 2-1/4" (57 mm)	3-1/2" (89 mm)	7-1/8" (181 mm)	R62-18
#20 - 2-1/2" (64 mm)	4" (102 mm)	8" (203 mm)	R62-20
#24 - 3" (76 mm)	5" (127 mm)	9-3/4" (248 mm)	R62-24
#28 - 3-1/2" (89 mm)	5-1/2" (140 mm)	12" (305 mm)	R62-28

R63 Hex Nut

Bar Desig. & Nominal Dia.	Across Flats	Across Corners	Thickness	Part Number
#6 - 3/4" (19 mm)	1-1/4" (32 mm)	1.44" (37 mm)	1-1/8" (29 mm)	R63-06
#7 - 7/8" (22 mm)	1-7/16" (37 mm)	1.66" (42 mm)	1-1/4" (32 mm)	R63-07
#8 - 1" (25 mm)	1-5/8" (41 mm)	1.88" (48 mm)	1-3/8" (35 mm)	R63-08
#9 - 1-1/8" (29 mm)	1-7/8" (48 mm)	2.17" (55 mm)	1-1/2" (38 mm)	R63-09
#10 - 1-1/4" (32 mm)	2" (51 mm)	2.31" (59 mm)	2" (51 mm)	R63-10
#11 - 1-3/8" (36 mm)	2-1/4" (57 mm)	2.60" (66 mm)	2-1/8" (54 mm)	R63-11
#14 - 1-3/4" (43 mm)	2-3/4" (70 mm)	3.18" (81 mm)	2-1/2" (64 mm)	R63-14
#18 - 2-1/4" (57 mm)	3-1/2" (89 mm)	4.04" (103 mm)	3-3/4" (95 mm)	R63-18
#20 - 2-1/2" (64 mm)	4" (102 mm)	4.62" (117 mm)	3-3/4" (95 mm)	R63-20
#24 - 3" (76 mm)	4-1/2" (114 mm)	OD 5" (127 mm)	4-3/8" (111 mm)	R64-24
#28 - 3-1/2" (89 mm) *	5-1/2" (140 mm)	OD 6" (152 mm)	5-1/2" (140 mm)	R64-28

* Round Collar Nut



NA Grout

High Flow, Non-Aggregate, Non-Shrink Grout

DESCRIPTION

NA Grout is a blend of specialty cements and admixtures. This material is designed to provide maximum flow, shrinkage compensation and extended working times in an aggregate free formulation where clearances are minimal, such as the grouting of tendon cables. **NA Grout** is non-metallic and contains no compounds which will produce hydrogen gas, carbon dioxide or oxygen.

USES

NA Grout is ideal for a wide variety of applications that include but are not limited to:

- Grouting of tight clearances between precast segments, beam and columns in contact with stressed steel tendons or cables
- Anchor bolts, rock anchors, dowels and rods where sanded grouts restrict complete encapsulation
- Pumping applications in areas around tensioned cables and tendons to encapsulate and maximize anchorage

BENEFITS

- Extreme fluidity: Can be pumped into areas that are virtually inaccessible with standard non-shrink grouts
- Working time: Extended for maximum pumping range
- Strength: Attains high compressive strengths at specified water ratios
- Thixotropic: High flow restored by agitation
- Corrosion Protection: Encapsulates tendons, bolts or bars to protect from corrosion
- Consistent: Strict Quality Control testing and standards

STANDARDS

NA Grout has been specifically formulated to exceed the requirements of AASHTO LRFD Bridge Construction Specifications Table 10.9.3-2. **NA Grout** is a Class C Grout in accordance with the Post-Tensioning Institutes Guide Specification of Post-Tensioned Structures. **NA Grout** complies with ASTM C-1107.

SURFACE PREPARATION

All surfaces in contact with **NA Grout** shall be free of dirt, oil, grease, laitance and other contaminants that may act as bondbreakers. All unsound concrete should be removed to ensure a good bond. Smooth, dense surfaces need to be mechanically abraded to provide necessary bonding requirements. Mechanically prepare the substrate to a minimum CSP 5 following ICRI Guideline 03732 to allow proper bonding. ACI recommends that the area to be grouted should be saturated for 24 hours before placement. Remove any standing water. Substrate should be saturated, surface dry (SSD). Maintain contact areas between 40°F (4°C) and 90°F (32°C) prior to grouting and during initial curing period.

FORMING

Method of forming must provide for rapid, continuous grout placement. For pourable grout, construct forms to retain grout without leakage. Forms should be coated with **US SPEC Slickote** for easy removal. Post-tension ducts should be leak free.

MIXING

Post-Tensioning Applications: Use a high-shear colloidal mixer capable of achieving a homogenous mixture. Pre-wet mixer and empty excess water. Mix at a water ratio of 7.75 quarts of cool, clean, potable water per 50 lb bag of **NA Grout**. Mix at approximately 1,500 RPM for 3 to 5 minutes or until desired flow has been achieved and determined using the Modified Flow Cone Method. Mix only enough grout that can be pumped continuously within the working time for mixed grout. Do not blend excess water as this will cause bleeding leading to segregation and sedimentation. Do not use any other admixtures or additives.

PHYSICAL PROPERTIES*

Compressive Strength (ASTM C-942 per PTI GS 4.4.2**)

SET	1 DAY	7 DAYS	28 DAYS
A FLUID	4,500 psi (31.02 MPa)	11,000 psi (75.84 MPa)	15,000 psi (103.42 MPa)

See reverse side for additional test data information.

MIXING [Cont.]

Non Post-Tensioning Applications: Use a mechanical mixer with rotating blades. Pre-wet mixer and empty excess water. Place 7.75 quarts of cool, clean potable water per 50 lb bag in the mixer, then add dry material. Mix for a total of 3 to 5 minutes to achieve desired consistency. Mix only enough grout that can be placed within working time. For placements greater than 3" depth, **NA Grout** must be extended by up to 30%, by weight, with clean, washed and dried 3/8" (1 cm) pea gravel. Do not blend excess water as this will cause bleeding leading to segregation and sedimentation. Do not use any other admixtures or additives.

PLACING

Post-Tensioning Applications: Post-Tensioning grouting applications should commence following grout approval in accordance with governing specifications such as Post-Tensioning Institute Guide Specification, AASHTO LRFD Bridge Construction Specifications Section 10.11, USDOT FHWA Post-Tensioning Tendon Installation and Grouting Manual or other applicable governing specifications.

Non Post-Tensioning Applications: Grout should be placed using established procedures according to American Concrete Institute recommendations. **NA Grout** can be placed by pumping, pouring, rodding or strapping. Mechanical vibration may cause segregation. Place grout on one side of area. Let grout flow to opposite and adjacent sides to avoid entrapment of air and uneven bearing of the grouted surface. When necessary, provide vent holes. Grout should continue to be placed until it protrudes from the entire perimeter area. Grout "head" and excess grout may be removed after initial set. **NA Grout** must be 100% encapsulated to prevent cracking.

FINISHING & CURING

Follow standard ACI curing practices. Do not disturb formwork or grout for 24 hours. Use wet rags or burlap to cure for 6 hours after placement. After 6 hours, remove rags from exposed surfaces and cure with a membrane forming curing compound such as **US SPEC Maxcure Resin Clear, Hydrasheen 15%** or **CS-25-1315**. For best results, exposed grout should extend downward at a 45° angle from edge of base.

STORAGE

Normal cement storage and handling practices should be observed. Store material in an interior, cool, dry place. Shelf life is 9 months in original, unopened container.

LIMITATIONS

In addition to limitations already mentioned, please note the following. Do not apply when the surface or ambient temperature is below 40°F (4°C) or when the temperature is expected to fall below 40°F within 48 hours. When grouting at minimum temperatures, ensure surfaces in contact with grout do not fall below 40°F until final set has been achieved and grout has reached 3,000 PSI. Do not apply over surfaces that are frozen or contain frost. Do not apply over any active faults or cracks in the substrate without addressing any movement that may occur. Do not use as a patching or overlay mortar or in unconfined areas. Normal conditions working time is 30 minutes. Setting time will speed up in hot weather and slow in cold weather. For hot and cold weather applications, contact your US SPEC manufacturer's representative.

Packaging: 50 lb (22.7 kg) bag, 40 bags per pallet



NA Grout

High Flow, Non-Aggregate, Non-Shrink Grout

PHYSICAL PROPERTIES*

Rate of Set (ASTM C-953 per PTI GS 4.4.1**)

SET	INITIAL
A FLUID	9:00

Note: W/C ratio: Less than .45 (per PTI GS Table 3.1)

Volume Change (ASTM C-1090 per PTI GS 4.4.4**)

AGE	% CHANGE
1 DAY	0.02%
28 DAYS	0.03%

Accelerated Corrosion Test (PTI Specification Appendix B**)

NA GROUT	CONTROL
> 3000 hours	302 hours

Wick Induced Bleed (ASTM C-940 modified per PTI GS 4.4.6.1**)

AGE	PERCENT BLEED
4 HOURS	0.0%

Schupack Pressure Bleed (PTI GS 4.4.6.2, Table 4.1 (b)**)

GELMAN PRESSURE	PERCENT BLEED
20 psi	0.0%
30 psi	1.0%
50 psi	1.1%

Permeability (ASTM 1202 modified per PTI GS Specification 4.4.3**)

AGE	APPLIED VOLTAGE	CHARGE PASSED
28 DAYS	30V	< 2500 coulombs

Chloride Ion Content (ASTM C-1152**)

PERCENTAGE
.07%

Initial Fluidity**

TEST	EFFLUX TIME
Flow Cone (ASTM C-939*)	15-30 seconds
Mod. Flow Cone-PTI Spec 4.4.5	6-20 seconds

30 Minutes Fluidity**

TEST	EFFLUX TIME
Flow Cone (ASTM C-939*)	15-30 seconds
Mod. Flow Cone-PTI Spec 4.4.5	6-20 seconds

Inclined Tube Test (EN445 per PTI 4.4.9**)

AGE	% BLEEDING
Immediately After Mixing	0.0%
30 min after mixing w/ 30 sec. remix	0.0%

*Notes: 73°F (22.8°C) 55% humidity

A = 7.75 qts

**PTI M55.1-12

REGULATORY

Read and follow application information, precautions and Material Safety Data Information.

Right-to-know

This product contains Portland Cement (CAS#65997-15-1) and Crystalline Silica (CAS# 14808-60-7)

HMIS

Health 1, Fire 0, Reactivity 0

Prop 65

Warning! This product contains Crystalline Silica, a chemical known to the State of California to cause cancer or reproductive toxicity.

VOC Content

0 g/L

CAUTION

EYE AND SKIN IRRITANT

Contains Portland Cement (CAS# 65997-15-1) and Crystalline Silica (CAS# 14808-60-7). Do not allow contact with eyes or skin. Avoid breathing dust - silica may cause serious lung problems. There is limited evidence silica is a carcinogen. The use of gloves, goggles, dust masks and other protective clothing is recommended. If cement or sand particles get into eyes, rinse immediately with clean water and seek prompt medical attention.

TECHNICAL SERVICE

Contact your US SPEC manufacturer's representative for the most current product information.

US MIX Co.

112 South Santa Fe Drive

Denver, CO 80223

Tel: 303.778.7227 Fax: 303.722.8426

Web Site: www.usspec.com

NOTICE OF LIMITED WARRANTY US MIX Co. (manufacturer) warrants to buyer that this product at the time and place of shipment is of good quality and conforms to the manufacturer's specifications in force on the date of manufacture when used in accordance with the instructions hereon. Manufacturer cannot warrant or guarantee any particular method of use, application or performance of the product under any particular condition. This limited warranty cannot be extended or amended by manufacturer's sales people, distributors or representatives or by any sales information, specifications of anyone other than the manufacturer. Liability under this warranty is expressly limited to refund of the purchase price.

LIMITATION OF WARRANTIES AND LIABILITY Buyer assumes all risks associated with the use of this product. Manufacturer expressly disclaims all warranties expressed or implied including the warranties of merchantability and fitness for a particular purpose and all other warranties otherwise arising by operation of the law, course of dealing, custom, trade or otherwise. Buyer's exclusive remedy if this product is proven to be defective is limited to refund of purchase price by the manufacturer. Refund shall only be available if the buyer notifies manufacturer in writing within thirty days following discovery of any defect. Written notice shall be forwarded to US MIX Co. at 112 South Santa Fe Drive, Denver, Colorado 80223. No claim can be made twelve months after purchase of the product. Twelve months after the purchase manufacturer's duties with respect to the product and limited warranty shall be presumed to have been satisfied. Manufacturer in no event is liable for consequential damages.

Yield: 50 lbs (22.7 kg) will fill approximately 0.53 ft³ (0.015 m³) when 7.75 qts mixing water is used.



ALASKA RAILROAD CORPORATION

CONSTRUCTION SPECIFICATIONS
FOR
REPLACEMENT
OF
MP-52.14: RETAINING STRUCTURES

SPENCER, ALASKA

ALASKA RAILROAD CAPITAL PROJECTS
ANCHORAGE, AK

SEPTEMBER 2020

PREPARED BY:

Michael Baker
INTERNATIONAL

**ALASKA RAILROAD CORPORATION
 SPECIFICATIONS FOR RETAINING WALL REPLACEMENT
 MP-52.14 – Spencer, Alaska
 SEPTEMBER 2020 – ISSUED FOR BID**



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I. SCOPE OF WORK

This Specification shall govern the ARRC MP-52.14 retaining wall replacements near Anchorage, Alaska. The existing retaining walls are comprised of steel piles and timber lagging and are located approximately 12 feet from the mainline track. Two sections of wall are to be replaced, the southern wall is approximately 105 feet long and the north wall is about 75 feet long. The walls are situated between Tunnel 2 (~MP 52.1) and Tunnel 3 (~MP 52.3). The existing walls are deteriorating and in need of replacement.

The Contractor's scope of work is to include excavation to install new drainage pipe, backfilling over the drainage pipe, and installing an anchored soldier pile and lagging retaining wall. Site clearing and replanting and soil erosion and sediment control are also included in this project.

II. GENERAL INFORMATION

- a. The general conditions listed in the current Alaska Railroad Corporation standard project contract shall govern the work performed under this Contract.
- b. Questions concerning the interpretation of the Plans and Specifications should be addressed to:

Brian O'Dowd
Project Manager- Capital Projects
327 W Ship Creek Avenue
Anchorage, AK 99501
(907) 265-2521
ODowdBA@akrr.com
- c. The Alaska Railroad Corporation will hereinafter be referred to as the "Railway".
- d. The Railway's bridge supervisor will hereinafter be referred to as the "Supervisor".
- e. "Engineer" shall mean the engineering officer of the Railway having jurisdiction over the work being done or the engineering officer's authorized representative.
- f. The bidder will hereinafter be referred to as the "Contractor".
- g. The American Railway Engineering and Maintenance of Way Association's Manual for Railway Engineering will hereinafter be referred to as the "AREMA Manual".
- h. All work done and materials furnished under this Contract shall be in accordance with the Plans, these Specifications, the current AREMA Manual and the 2020 edition of the Alaska Department of Transportation and Public Facilities Standard Specifications for Highway Construction . In the event of conflict, these Specifications shall govern.
- i. Prior to the start of the work, the Contractor shall submit to the Engineer for approval, the name of the manufacturer and the types of material to be used to complete the various items of work in this contract. Included with this submittal will be all applicable technical data.
- j. The Contractor is advised to familiarize himself with the AREMA Manual information contained in Chapter 8 - Concrete Structures and Foundations, Part 1 - Materials, Tests and Construction Requirements, Part 14 - Repair and Rehabilitation of Concrete Structures, and Part 28 - Temporary Structures for Construction; and Chapter 15 - Steel Structures, Part 3 - Fabrication and Part 4 - Erection.

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III. PERMITS AND ENVIRONMENTAL PROTECTION

- a. The Contractor shall obtain any and all permits as may be necessary to complete the work under this Contract. The Contractor shall determine what is required of them by such permits and shall provide copies of any and all such permits to the Railway's Engineer and Supervisor.
- b. The Contractor shall take sufficient precautions to prevent pollution of the natural environment with fuels, oils, bitumens, calcium chloride, or other harmful substances.
- c. The Contractor shall conduct his work in full compliance with all federal, state, and local regulations pertaining to remediation, water quality and soil erosion and sedimentation control.
- d. An Alaska Department of Fish and Game Title 16 Fish Habitat Permit may be required, and if so, shall be provided by the Railway.

IV. RAILWAY COORDINATION AND FLAG PROTECTION

- a. The Contractor shall notify the Railway of the proposed start of work with at least seven days of advance notice. This notice shall be made to the Railway's Engineer.
- b. When the Contractor desires to occupy any space above the top of rail within a horizontal distance of 10 feet on either side of an active track centerline, they must obtain permission from the Engineer with at least 7 days of advance notice. Flag protection service, when required in the judgment of the Railway, will be furnished at the Railway's sole cost and expense.
- c. The Contractor shall require their employees and agents to comply with any and all instructions and warnings issued by the Railway's Flagman, Supervisor or other Representative.
- d. The Contractor is expected to carry out the work with the minimum possible disruption of rail traffic. Rail traffic patterns are subject to change, therefore, details regarding train movements and anticipated daily track windows will be provided at the pre-bid meeting to insure up to date information.
- e. Certain segments of the work may require longer track outages than can be provided on a routine, daily basis. The number and duration of these major outages will be determined by the construction methods selected by the Contractor. Therefore, the Contractor must include the number and duration (in hours) of major track outages anticipated in the detailed plan and schedule submitted to the Railway for approval. The duration of the outage starts when the Contractor is given the segment of track and ends when the segment is restored to rail traffic.
- f. Due to the nature of the proposed repairs and the anticipated daily track windows to be provided, no provision for standby time is deemed necessary. Delays to the Contractors operations from rail traffic should be minimal and therefore will not be considered as a basis for claim for extra payment.
- g. The Contractor shall indemnify and save harmless the Railway from and against any and all liability for personal injury, death, and property damage occurring directly or indirectly from the Contractor's failure to comply with said coordination requirements.

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V. WORK SCHEDULE AND PROJECT COMPLETION

- a. It is intended that the construction of the entire project will proceed in a continuous and expeditious manner from the beginning to completion.
- b. The Contractor shall commence work under this contract within 10 calendar days after receipt of written notice to proceed and shall complete the entire work ready for use within the time periods shown in the proposal. Submission of the required work plan and the ordering of material will be considered as work begun on the project.
- c. The Contractor shall submit to the Engineer a detailed project plan and schedule showing the general procedures by which the Contractor proposes to perform the work, including calendar dates for the expected beginning and completion of the various work items. An estimated monthly payment schedule shall be included which closely matches the submitted work plan schedule and the bid proposal.
- d. The Contractor shall submit the proposed work plan and schedule at least 15 days prior to the beginning of any fieldwork. The information contained in the plan and schedule is required to safeguard the Railway's interests and coordinate any necessary work by the Railway's forces. It shall not in any way relieve the Contractor of his obligation or responsibility for the safe and proper conduct of his work.
- e. This project will require significant planning and coordination to avoid problems and/or delays during the scheduled closure periods of the work. The Contractor will provide the Railway a detailed written plan (similar to the general project plan outlined above) for each of the major track outages. These detailed written plans shall be provided to the Railway at least 120 days before the first outage.
- f. The Contractor shall conduct a review/progress meeting at least 90 days prior to the first outage to plan and coordinate the field work of this project. A final review/process meeting shall be held 30 days before the first outage. Additional meetings will be held should they be deemed necessary by the Engineer. The Contractor shall provide the Railway with the location and time of the meeting at least 14 days in advance of the meeting. The meetings shall be held at the Contractor's home office or other facility as appropriate.
- g. The Contractor shall designate a Project Manager/Project Engineer to direct all progress meetings. This individual shall be directly responsible for all aspects of the Contractor's work, including during the closure periods. In addition to the designated Project Manager, personnel directing the critical activities during the closures shall attend the meetings. Representatives of any subcontractors performing work during the outages shall also attend the progress meetings.
- h. The Contractor shall furnish sufficient work forces, construction plant and equipment to ensure the prosecution of the work in accordance with the approved schedule. If, in the opinion of the Engineer, the Contractor's progress falls behind the schedule, they shall take such steps as may be necessary to improve their progress, and the Engineer may require them to increase their forces, the number of work shifts, workdays and the equipment available.
- i. In general, the Contractor's work shifts and workdays shall be as arranged with the Railway's Engineer. The actual start of certain work activities may vary daily depending on Railway operations.
- j. The Contractor may encounter various obstructions and hindrances in carrying out their work, such as temporary flooding of the worksite or more frequent train movements than anticipated. There will be no extra compensation to the Contractor for encountering such obstructions and hindrances; rather, the costs thereof are to be included in the prices named in the Contract.
- k. It shall be the Contractor's responsibility to keep the railway line and adjacent slopes clear of construction debris and to repair damaged areas caused by construction to the satisfaction of the Engineer.

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VI. MEASUREMENT OF QUANTITIES

- a. All work completed under this Contract shall be measured by the Contractor, subject to the approval of the Engineer, in accordance with United States Standard Measures, by methods best adapted for each item of work as hereinafter described and according to generally accepted standard engineering practice. Payment will be made only for actual quantities within the designated limit as indicated on the Plans and Specifications.
- b. The Engineer shall be the final judge as to the accuracy of any measurements or quantities and the reasonableness of any approximations in lieu of accurate determinations and their decision shall be binding upon both parties.

VII. ENGINEERING, LINE AND GRADE, CONSTRUCTION SURVEYS

- a. The Contractor shall not proceed with the work until they have made timely demand upon the Engineer for, and have received from them, such information and/or instructions as may be necessary to lay out their work. The Contractor shall maintain survey control of the baseline as required during the work and at final acceptance. If further referencing and additional benchmarks are required to accomplish this, the Contractor shall do so.
- b. The Contractor shall at their expense furnish all stakes, templates, platforms, equipment, labor, registered surveyors and registered engineers that may be required for setting stakes or offset stakes as required and laying out any part of the work.
- c. Upon completion of the work, the Contractor shall furnish to the Railway a record of the survey used to determine final quantities.
- d. No separate payment will be made for engineering work performed by the Contractor. All engineering and surveying costs shall be included in the various pay items included in the Contract.

VIII. VERIFICATION OF EXISTING CONDITIONS

- a. The Plans and Specifications are based on original design plans and documents from predecessor railroads. The Contractor, upon request, will be provided with copies of the original plans. It must be noted that the existing conditions may be somewhat different due to unrecorded repairs performed since the original construction. The Contractor must familiarize himself with the actual condition of the existing structure. No extra payment will be allowed for any variances between the existing conditions and the plans furnished.

IX. TRANSPORTATION OF PERSONNEL, EQUIPMENT AND MATERIALS

- a. The Railway shall furnish transportation for their personnel, tools, equipment and materials to and from the worksite at their sole cost and expense.
- b. The Contractor will not be permitted to transport equipment and materials across or between the Railway's tracks except when authorized by the Flagman, or the Railway's designated Representative.

X. UTILITIES AND OTHER FACILITIES

- a. If electricity or other utilities are required by the Contractor, they shall be provided by the Contractor at their sole cost. All temporary lines shall be furnished, installed, connected and maintained by the Contractor in a workmanlike manner satisfactory to the Engineer and shall be removed by the Contractor in a like manner upon completion of the project.

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- b. The Contractor shall provide and maintain in a neat, sanitary condition, such accommodations for the exclusive use of his employees as may be necessary to comply with all local, state and federal regulations. Dug pit privies will not be acceptable.

XI. INTERFERENCE WITH RAILWAY TRAFFIC AND FACILITIES

- a. General traffic patterns, including anticipated daily work windows, will be discussed at the pre-bid site meeting. The Contractor is expected to ask sufficient questions to gain an understanding of rail operations through the structure prior to planning and submitting a bid for the work.
- b. The track will remain in service throughout construction except for necessary, specific outages arranged in advance by the Contractor. During these outages the Contractor shall work continuously until the track is restored to service.
- c. The Contractor shall request track outages through the Railway's Engineer or their designated Representative, providing at least 7 days of advance notice for track outages less than 4 hours. For track outages of 4 hours or greater, the Railway requires 30 days advance approval. The Contractor shall submit to the Engineer a detailed schedule of the work to be performed during the track outage, including an estimate of the number of minutes required for each work item. The Railway may alter the requested starting times and durations of these outages to meet the needs of Railway operations.
- d. The Contractor shall conduct their operations so as to minimize interference with rail traffic. The Contractor shall not proceed with any portion of the work until they have obtained specific authority and directions from the proper representative of the Railway and has the approval of the Engineer. If the Contractor fails to comply with the above and performs their work in a manner that causes unreasonable delays to the train operations of the Railway, they shall be liable for any additional operating costs incurred by the Railway for such delays and shall reimburse the Railway upon receipt of bills thereafter. If continual detention occurs to train operations, the Railway reserves the right to take the work from the Contractor, after written notice is given by the Engineer.
- e. No claim by the Contractor against the Railway will be allowed for delays caused by Railway operations. The Contractor shall reimburse any costs incurred by the Railway for repairing damage to track or other facilities resulting from the Contractor's work.
- f. The Contractor shall assume all responsibility for any and all damages to their work, men and equipment caused by the operations of the Railway.

XII. STABILITY OF TRACK, STRUCTURES, AND EARTH CUTS

- a. The Contractor shall maintain the stability of track, structures and earth cuts throughout construction operations, such as by sloping excavations, installing temporary supports, shoring, bracing or other measures as may be necessary.
- b. The Contractor shall submit all plans for maintaining the stability of track, structures and earth cuts to the Railway for the Engineer's review and acceptance. Such plans shall be submitted and approved at least 7 days prior to the installation or employment of the proposed measures. In addition, track outage notification and approval requirement discussed in Section XI of this specification must also be adhered to.
- c. The Railway's review and acceptance of the Contractor's measures for maintaining the stability of track, structures and earth cuts shall in no way relieve the Contractor of responsibility for the feasibility and safety of these measures.

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XIII. BRIDGE WORKER SAFETY

- a. The Contractor shall ensure that their entire work force, including employees, agents and subcontractors, fully comply with all applicable safety regulations of the Federal Railroad Administration (FRA). Attention is directed to the requirements for fall protection, protective footwear and headgear, eye and face protection and hi-viz reflective vests.
- b. Particular attention is directed to the requirements of the FRA Railroad Workplace Safety Rules, 49 C.F.R. Part 214. The Contractor must, at all times, maintain at the job site a copy of the Program Manual, along with referenced Operations Division Bulletins.
- c. It shall be the Contractor's sole responsibility to ensure that their entire work force has been properly trained in all applicable provisions of the Program. Particular attention is directed to the provision concerning the Roadway Worker in Charge (R.W.I.C.), and following instructions of the R.W.I.C. Each Worker must know, at all times, who is the designated R.W.I.C.
- d. Employees, agents and subcontractors who have not been properly trained may not enter the Railway's right of way.
- e. As information, The American Railway Engineering and Maintenance of Way Association (AREMA) has, from time to time, provided Railway Worker Protection Training Seminars for Contractors. For information regarding training through AREMA, you may contact Ms. Desiree Knight at (301) 459-3200, Extension 714. In addition, some private training organizations also provide this training. Contact the Railway Engineer for information regarding online training classes.
- f. The Contractor shall maintain documentation that each of their employees, agents and subcontractors has been properly trained and fully understands their responsibilities regarding their safety and the safety of their co-workers. This documentation must be available at all times for inspection by the Railway or FRA officers.

XIV. USE OF RAILWAY RIGHT OF WAY AND ADJACENT PROPERTY

- a. Subject to the approval of the Engineer, the Contractor may occupy any unused portion of the Railway's right of way for storage of materials and equipment. No material shall be stored within 15 feet of the centerline of the tracks. If the Contractor desires to use adjacent property, they shall make all necessary arrangements for its use with the property owner.
- b. The Contractor shall take care to prevent damage to the Railway's facilities, adjacent properties and existing utilities in carrying out this work. Any damage caused by the Contractor in the performance of their work shall be repaired to the owner's satisfaction at the Contractor's expense.
- c. Upon completion of the project, all property used by the Contractor shall be left in a condition satisfactory to the Supervisor and the adjacent property owners. The Contractor shall provide the Supervisor with a written release statement from each adjacent property owner affected by the work. Final payment will not be made to the Contractor unless these release statements have been provided.

XV. CAST-IN-PLACE CONCRETE

- a. The Contractor shall provide concrete for the work associated with this project as shown on the Plans, in accordance with these Specifications and as otherwise directed by the Engineer.
- b. The dimensions of the cast-in-place concrete are large enough to be considered mass concrete. The Contractor shall take appropriate measures in accordance with the latest versions of ACI 301 and ACI 207.1R to cope with the generation of heat from hydration of the cement and to minimize cracking. The Contractor shall submit their mass concrete procedures to the Engineer for review and approval prior to proceeding with the work.

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- c. The contractor performing the work shown in the Plans and described in these Specifications shall have installed mass concrete for a minimum of ten (10) years. At the time of bid, the Contractor shall submit a list containing at least five (5) transportation projects on which the Contractor has installed mass concrete. A brief description of each project and a reference shall be included for each project listed. As a minimum, the description shall include a description of the project and mass concrete procedure used and the reference shall include an individual's name and current phone number.
- d. Cement for concrete shall be standard Type I or air-entraining Type IA conforming to ASTM C150; alternatively, high early strength Type III or air-entraining Type IIIA cement may be used conforming to ASTM C150.
- e. Minimum compressive strength at 28 days shall be 4,000 pounds per square inch unless indicated otherwise on the Plans. Cast-in-place concrete shall have a minimum cement content of 6 1/2 bags (or 610 pounds) per cubic yard and a water-cement ratio of 0.46. Class F Fly Ash, Silica Fume and/or slag cement and any other admixtures, approved by the Engineer, shall be in addition to the minimum cement content indicated above, not in lieu of cement.
- f. Slump range shall be 2 to 4 inches prior to the addition of high range water reducing admixtures at the site. Pumped concrete should have a slump range of 5 to 6 inches prior to pumping. At least one slump test shall be made for each truckload of concrete delivered to the project for inclusion in the work. A record of the amount of slump shall be made and furnished to the Engineer.
- g. Fine aggregate for concrete shall be graded between the limits specified in AREMA Table 8-1-5. The amount of deleterious substances in fine aggregate shall not exceed the limits found in AREMA Table 8-1-6.
- h. Nominal size of coarse aggregate shall be 1" – No. 4 (Size 57).
- i. Concrete shall be air-entrained by the use of an air entraining admixture conforming to the requirements of ASTM C260, or by the use of air-entraining Portland cement meeting the requirements of ASTM C150. The concrete shall have an air content from 4.0% to 6.0%.
- j. Admixtures, except air-entraining agents, used to alter the normal properties of concrete for densifying, dispersing, retarding, acceleration, plasticizing, coloring or waterproofing, shall be used only upon written permission of the Engineer.
- k. Forms shall be constructed of smooth steel or other suitable material, and shall have moldings or bevels placed in their angles to produce a 1-inch chamfer on all exposed concrete surface edges. The inside surfaces of all forms that will be in contact with fresh concrete shall be coated with a thin film of non-staining form release agent. All face forms shall be smooth and watertight. If constructed of wood, the face boards shall be sized to a uniform thickness and all offsets or inequalities dressed to a smooth surface. They shall be tightly placed and all openings and cracks pointed flush to prevent leakage and the formation of fins.
- l. Tests of concrete shall be required as specified in the AREMA Manual, Chapter 8, Part 1 and in accordance with appropriate ASTM standards. The Contractor shall furnish all test materials and cylinder molds, shall perform all work to make and cure the test cylinders and after proper curing shall deliver the test cylinders to an independent laboratory conforming to ASTM E329, where they shall be tested at the Contractor's expense. The laboratory shall furnish the test results directly to the Railway's Engineer. Not less than four cylinders shall be made for each 20 cubic yards, or fraction thereof, of cast-in-place concrete. Two cylinders shall be tested at three days and the second pair at seven days for high early strength concrete and one pair of cylinders shall be tested at seven days and the second pair at 28 days for standard concrete.
- m. Surface preparation and anchorage shall be as specified in AREMA Manual, Chapter 8, Part 14, unless otherwise indicated on the Plans or these Specifications. Dowels shall be made of deformed bars, ASTM A615, Grade 60, and shall be spaced as shown on the Plans. Dowels shall be grouted in place with an Epoxy Grout intended for dowel bars and shall be applied in accordance with ASTM

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C881 and the manufacturer's recommendations. Horizontal dowel holes shall be drilled downward on a slope of approximately one inch per foot or as otherwise indicated on the Plans.

- n. The surfaces to which the concrete will be bonded shall first be cleaned by sandblasting or waterblasting to remove all laitance, dirt, grease, oil, and loose particles, followed by a thorough rinsing with potable water. Oil and grease shall be removed by scrubbing with a detergent if necessary.
- o. Concrete shall be handled from the mixer or transporting vehicle to the place of deposit as rapidly as practicable by methods that will prevent the separation or loss of the ingredients. Special care shall be taken to fill each part of the forms by depositing concrete as near its final position as possible, to work the coarser aggregates back from the face and to force the concrete under and around the reinforcement without displacing it. Concrete shall not have a free fall of more than 4 feet.
- p. Concrete shall be placed in horizontal layers, and each layer shall be placed and compacted before the preceding layer has taken initial set so as to prevent formation of a joint. Temporary braces or struts within the form shall be removed when the concrete has reached an elevation rendering their further service unnecessary. Under no circumstances shall concrete that has partially hardened be deposited in the form.
- q. When concrete is to be conveyed by chuting, all work shall be performed in accordance with AREMA Chapter 8, Article 1.14.3. When concrete is to be conveyed by pumping, all work shall be in accordance with AREMA Chapter 8, Article 1.14.5.
- r. Concrete shall be thoroughly consolidated during and immediately after depositing by vibrating the concrete internally using mechanical vibrating equipment. Internal mechanical vibrators shall be of sturdy construction, adequately powered, and capable of transmitting vibration to the concrete in frequencies of not less than 3,500 impulses per minute. The amplitude of vibration shall be sufficient to consolidate the concrete into place without separation of the ingredients.
- s. When deposited, concrete shall have temperatures within the limits shown in AREMA Table 8-1-13. The method of controlling the concrete temperature shall be subject to the Engineer's prior approval. In freezing weather, or when there is likelihood of freezing temperatures within the specified curing period, suitable and sufficient means must be provided for maintaining all concrete surfaces at a temperature of not less than 50 degrees Fahrenheit for a period of not less than seven days after the concrete is placed.
- t. Membrane curing compounds are permitted on all cast-in-place concrete surfaces except those that will abut other new concrete; the curing of such abutting surfaces shall be by means of wetted burlap. Membrane curing shall be compatible with the specified concrete surface sealant, or the membrane curing compound shall be removed to promote adhesion of the sealant to the concrete.
- u. No payment shall be made for Cast-In-Place Concrete as such. Rather, the cost of this work shall be included in the Contractor's bid prices for Soldier Pile Socket – 24" Diameter.

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XVI. MOBILIZATION AND DEMOBILIZATION (PAY ITEM 1)

- a. Mobilization shall consist of preparatory work and operations, including but not limited to those necessary for the movement of materials, personnel, tools and equipment to the work site; for the establishment of temporary facilities at the work site; and for all other work and operations which must be performed or costs which must be incurred prior to beginning work.
- b. Demobilization shall consist of the removal of materials, personnel, tools, equipment and temporary facilities from the work site.
- c. Payment for Mobilization and Demobilization will be at the Contractor's lump-sum bid price for this item, which shall be full compensation for furnishing all materials, personnel, tools and equipment required to complete the project. The Contractor will receive 50 percent of this lump-sum pay item with the initial progress payment and shall receive the balance with the final payment. Payment will not be made for the temporary relocation of materials, personnel, tools, and equipment.

XVII. SOIL EROSION AND SEDIMENT CONTROL (PAY ITEM 2)

- a. The Contractor shall provide a Storm Water Pollution Prevention Program (SWPPP) in accordance with the Alaska Department of Environmental Conservation – Division of Water latest revision of the Alaska Construction General Permit.
- b. This item shall consist of providing effective erosion and sediment pollution control procedures to minimize erosion and sedimentation for this construction project. All earthmoving activities must be completed as shown on the Plans and according to the guidelines of the Alaska Department of Environmental Conservation – Division of Water and these Specifications.
- c. All erosion and sediment pollution controls must be constructed, stabilized and functional before site disturbance commences within the tributary areas of the controls. In addition, all control devices will be in place at the end of each working day and will be maintained to assure compliance with the guidelines of the Alaska Department of Transportation and Public Facilities.
- d. Temporary Control Measures: The purpose of the following temporary control measures to be provided by the Contractor is to prevent accelerated erosion of the disturbed areas, to prevent sediment-laden water from exiting the project site and entering waters of the United States, and to assure that erosion is kept to a minimum due to the earth disturbance activities of this project. The temporary controls for this project include standard and reinforced filter fabric fences and inlet protection. The Contractor is directed to the Plans for the locations, details and notes pertaining to the control devices. Any additional requirements to adequately control erosion and sediment are also the responsibility of the Contractor, as shown on the Plans, as directed by the Engineer and as required by the Alaska Department of Transportation and Public Facilities.
 1. Filter Fabric Fence: The standard and reinforced filter fabric fences will provide sediment pollution protection throughout the duration of the construction activities. All surface water runoff from the project site will be intercepted and filtered by the filter fabric fences before leaving the site. The fences will remain in place until a uniform seventy-percent ground cover (minimum) is established.
 2. The standard and reinforced filter fabric fences will be installed as shown in the Plans. The filter fabric fences will be installed along the contour at level grade. Both ends of the fence section must extend at least 10 feet up-slope at 45-degrees to the main fence alignment. All segments of the filter fabric fences will be connected by having their respective ends twisted together to prevent a migrational pathway of sediment-laden water. Any fence section that is undermined or topped must be replaced immediately.

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3. Inlet Protection: Inlet protection shall be installed at all inlets as shown on the Plans prior to any disturbance of the site. The inlet protection shall meet all requirements of the City of Atlanta and the Contractor shall inspect the installations for damage. Any installation that is damaged or otherwise compromised must be replaced immediately.
- e. Permanent Control Measures – Seeding and Mulching: The purpose of permanent control measures is to check the accelerated erosion of the project site after construction activities have ceased and to prevent sediment-laden water from exiting the project site. Permanent erosion and sedimentation control measures will go into effect once all work on site is complete.
1. Disturbed areas, which either are at finished grade or will not be disturbed again within one year, must be stabilized by permanent seeding. All disturbed areas will be graded to the smoothest and most gradual possible contour, seeded and mulched. The permanent seed mixture listed below will be used for permanent cover.

MATERIALS	TYPE	APPLICATION RATE PER 1,000 SQUARE FEET
Grass Seed Mix*	Nortran – Tufted Hairgrass	0.60 lb
	Arctared – Red Fescue	0.45 lb
	Wainwright – Slender Wheatgrass	0.37 lb
	Annual Ryegrass	0.08 lb
	Total	1.50 lb
Fertilizer	20-20-10	10 lb
Mulch	Straw	180 lb

* Do not remove the required tags from the seed containers

2. Apply fertilizer prior to seeding at the rates specified. Method of seeding will be hydroseeding with tackifier and the seedbeds will be scarified perpendicular to the contour prior to planting. A mulch of dry and clean straw will follow the seeding at the rate specified. No anchoring devices or methods will be utilized.
- f. Maintenance Program: All erosion and sediment pollution control devices will be in place at the end of each working day. The devices will be maintained and inspected on a daily basis by the Contractor subject to the Engineer's supervision and approval, as well as after any storm or precipitation event. If any maintenance or repairs are needed, the approved erosion and sediment control devices will be repaired within a 24-hour period.
1. Filter Fabric Fence: Sediment will be removed by the Contractor from behind the filter fabric fences when accumulations reach one-half (1/2) of the above ground fence height.
 2. Vegetation Cover: Any failures in the vegetation cover will be reconditioned by the Contractor. All this work is to be carried out by the Contractor at no additional cost to the Railway.
- g. The standard and reinforced filter fabric fences and inlet protection will be removed when the vegetation has achieved at least a uniform 70 percent ground cover (minimum).
- h. Payment for Soil Erosion and Sediment Control will be at the Contractor's lump sum bid price for this item, which shall be full compensation for furnishing all materials, labor, tools and equipment required to complete the work as shown on the Plans and specified herein.

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XVIII. STRUCTURE EXCAVATION (PAY ITEM 3)

- a. This item shall consist of furnishing all materials, labor, tools and equipment necessary for excavating and backfilling associated with the construction. Excavation includes all materials whatever the character encountered in the work. May included rock, muck, or granular materials. The work shall include but not be limited to the removal and disposal of all excavated materials; the removal and disposal of piles, drains and other items encountered during the course of excavation; bailing, pumping, draining and backfilling and compacting with material to the top of subgrade as shown on the Plans or as directed by the Engineer and as specified herein.
- b. Disposal shall consist of the hauling and removal from the site of all excavated material that is in excess or unsuitable. Except as may otherwise be specified herein, all material removed from the structure shall become the property of the Contractor and shall be disposed by them to the satisfaction of the Engineer and in accordance with any applicable Local, State, Federal or Tribal requirements. Suitable excavated materials shall not be wasted without permission of the Engineer. The Contractor shall dispose of all unsuitable and unstable materials and organic waste, in such a manner that public or private property will not be damaged or endangered, and in accordance with any applicable Local, State, Federal, or Tribal codes and regulations. The Contractor is responsible for obtaining all necessary permits for the disposal of materials as may be required by law.
- c. The excavation will be performed in the areas as shown on the Plans and as instructed by the Engineer. Prior to placing backfill, the existing subgrade shall be benched and uniformly compacted to not less than 95% of the Standard Proctor maximum dry density, ASTM D698, determined for this material to a depth of at least one foot. All excavated material shall be disposed in accordance with any applicable Local, State or Federal requirements.
- d. Backfilling shall proceed in accordance with the Aggregate Base Course, Grading D-1 material conforming to Alaska Department of Transportation and Public Facilities Standard Specifications subsection 703-2.03; immediately after installation of the drainage pipe.
- e. Payment for Structure Excavation will be calculated based on the Contractor's lump sum bid price for Structure Excavation incorporated in the finished and accepted construction which shall be full compensation for all materials, labor, tools, equipment and material disposal required to complete the work as shown on the Plans and specified herein.

XIX. POROUS GRANULAR BACKFILL WITH FILTER FABRIC (PAY ITEM 4)

- a. This item shall consist of furnishing all materials, labor, tools and equipment necessary for the placing of porous granular backfill with filter fabric behind the north and south retaining walls as shown on the Plans or as directed by the Engineer and as specified herein.
- b. The Contractor shall backfill the area behind the proposed retaining walls, regardless of limit lines, with porous granular material with filter fabric as indicated in the Plans and by the Engineer. The top of porous granular backfill in the side slopes shall be 12 inches below final grade. Where applicable, backfill shall be carried up approximately even on all sides of the structure.
- c. Porous granular backfill material shall be clean 10-inch minus shot rock containing no muck frozen material, roots, sod or other deleterious matter. The maximum dimension of the shot rock shall not be more than twice the designated screen dimensions. Material shall meet the following gradation, ad determined by WAQTC FOP for AASHTO T 27/T11, in accordance with the following table:

Sieve Size: U.S. Standard Square Mesh	Percent by Weight Passing
10"	100
3"	30-70
No. 200	10 max

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- d. The Contractor shall submit porous granular backfill gradations to the Engineer for review and approval.
- e. The installation of porous granular backfill shall be performed in conjunction with placing and compaction of adjacent fill. The porous granular backfill shall be carefully placed so as not to mix with earth fill. If a form is used between the porous granular backfill material and other backfill, none of the form shall remain in the completed fill.
- f. Payment for Porous Granular Backfill will be calculated based on the Contractor's unit bid price per cubic yard installed as part of the finished and accepted work. The number of cubic yards will be computed from the dimensions shown on the Plans or established by the Engineer. This amount shall be full compensation for all materials, labor, tools and equipment required for furnishing, transporting, placing and compacting the material in place as shown on the Plans and as specified herein.

XX. SOLDIER PILE SOCKET – 24" DIAMETER (PAY ITEM 5)

- a. This item shall consist of furnishing all materials, labor, tools and equipment necessary for constructing the soldier pile sockets. This work shall include but not be limited to the excavation and disposal of all material encountered, both wet and dry, by machine drilling or by manual dug methods to the elevation and diameter as shown in the Plans or as determined by the Engineer; the furnishing and installation of steel casings and liners, and the removal or grouting in place of same; the pumping, bailing, removal and disposal of water and mud from the excavations; the removing of any abandoned utilities, wooden pilings, or other obstructions encountered; assisting the Engineer in arriving at the final elevations; the furnishing and placing of concrete, reinforcement and attachment dowel rods in the shaft excavation; and all other related and collateral work necessary to construct the soldier pile sockets as shown on the Plans or as directed by the Engineer and as specified herein.
- b. Material, Constructions and Testing shall be in accordance with the AREMA requirements in Chapter 8 Part 24, the Plans and Sections XIX of these Specifications.
- c. The concrete mix shall conform to the requirements of Section XIX and shall be designed with a slump between 6" and 8" for a dry hole condition and 7" to 9" for a slurry hole condition to be sufficiently fluid to fill the entire excavation. A water reducer and/or plasticizer should be added to the concrete. Air entrained concrete for the shafts will not be required. The use of Fly Ash is prohibited in the mix design.
- d. Payment for Soldier Pile Socket – 24" Diameter (Pay Item 5) will be calculated based on the Contractor's unit bid price per lineal foot of drilled shaft installed as part of the finished and accepted work. The number of linear feet will be computed from the dimensions shown on the Plans or established by the Engineer. This amount shall be full compensation for furnishing all material, labor, tools and equipment and performing all work required to complete the work as shown on the Plans and specified herein.

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XXI. STRUCTURAL STEEL – MILLED, FABRICATED & INSTALLED (PAY ITEM 6)

- a. These items shall consist of furnishing all materials, labor, tools and equipment necessary to fabricate, paint and erect steel members for the retaining wall replacement work. This work shall include but not be limited to the soldier piles, walers, earth anchor washers, HSS connections and wall caps as shown on the Plans or as directed by the Engineer and as specified herein.
- b. The Contractor shall furnish and install structural steel for the work associated with this project as shown on the Plans, in accordance with these Specifications and as otherwise directed by the Engineer.
- c. All work under this Contract relating to the fabrication and erection of structural steel shall be performed in accordance with AREMA Chapter 15, Parts 3 and 4. In addition, the Contractor shall be responsible for removing and disposing of the existing bridge components that are to be replaced as part of this work.
- d. Members shall be accurately assembled as shown on the Plans and in accordance with these Specifications and shall be carefully handled so that no parts will be bent, broken or otherwise damaged. Bearing surfaces and unpainted field contact surfaces shall be thoroughly wire-brush cleaned to remove loose rust and mill scale, and any grease or shop paint on such surfaces shall be removed with proper solvents.
- e. All structural steel plates and shapes shall be shop-fabricated and hot dipped galvanized.
- f. All structural steel plates and shapes shall conform to the requirements of ASTM A709 Grade 50, unless shown otherwise in the Plans or these Specifications.
- g. Except as noted otherwise on the Plans, open holes in fabricated components shall be 15/16-inch-diameter; these holes may be drilled full-size or sub-punched and reamed.
- h. Except as noted otherwise on the Plans, structural fasteners shall be 7/8-inch-diameter ASTM A325 high-strength bolts, which shall be tightened using the turn-of-nut method to obtain a minimum tension of 39 kips. Anchor bolts shall be 1 1/2-inch diameter threaded rods conforming to ASTM F1554 Grade 55. Nuts and washers shall conform to ASTM A563 and F436, respectively.
- i. Existing rivet heads shall be removed by shearing with a pneumatic breaker or by flame-cutting the rivet head 1/16-inch above the base metal with a rivet-scarfing tip. The rivet shanks shall be driven out with a pneumatic punch. If, in the opinion of the Supervisor and/or Engineer, the rivet shanks cannot be removed without damaging the base metal, the shanks shall be removed by drilling. If the new bolt cannot be inserted into the hole once occupied by the rivet, the hole shall be reamed to the proper size.
- j. High-strength bolts shall not be reused after having been fully torqued. These bolts may be used for both fitting up and final bolting if only snug-tightened during fitting up; “snug tight” is defined as the tightness attained by a few impacts of an impact wrench or the full effort of a man using an ordinary spud wrench.
- k. All welds and welding procedures shall meet the requirements of the AWS Bridge Welding Code D1.5. Only the submerged arc welding (SAW) process or shielded metal arc welding (SMAW) process may be used, and welders shall be AWS-certified in all welding positions. Flux core welds are allowed for the floor plate only. All welds shall be made with E7018 electrodes.
- l. Payment for Structural Steel – Milled, Fabricated and Installed (Pay Item 6) will be calculated based on the Contractor’s unit bid price per pound of structural steel milled, fabricated and installed as part of the finished and accepted work. The number of pounds will be computed from the dimensions shown on the Plans or established by the Engineer. The weight of the fasteners shall be considered incidental to that of the structural steel. This amount shall be full compensation for furnishing all material, labor, tools and equipment and performing all work required to complete the work as shown on the Plans and specified herein.

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XXII. ROCK ANCHORS (PAY ITEM 7)

- a. This item shall consist of furnishing all materials, labor, tools and equipment necessary to install rock anchors including but not limited to installing, testing and monitoring all rock anchors, connections, walers and other related work required to complete the work as detailed on the Plans or as directed by the Engineer and as specified herein.
- b. The rock anchor Contractor, Supplier and Testing Laboratory will furnish evidence and obtain the Railway's approval that they have been engaged in the successful installation, supply and testing (respectively) of rock anchors for at least five years.
- c. The Contractor is responsible for performing all specified tests associated with the rock anchors. The Contractor must inform the Railway prior to performing the tests so the Railway's representative can witness all such tests. The Contractor is responsible for the cost of all tests.
- d. The Contractor must prepare Shop Drawings for submittal showing details of the rock anchors. The Shop Drawings must also include details for support of utilities as shown on the Plans or directed by the Engineer within the area of excavation.
- e. The Contractor must submit two copies of the steel manufacturer's specifications including laboratory test reports and other data as may be required to show compliance with these Specifications. Required are certified copies of mill reports covering chemical and physical properties of the rock anchors.
- f. Any depression or settlement which develops in the track fill, embankment or backfill adjacent to the proposed retaining walls will be the responsibility of the Contractor. The Contractor must provide all necessary material and labor and must perform all necessary reconditioning and restoration work to bring such depressed areas to proper grade as approved by the Engineer. The Contractor will be responsible for all cost incurred by the Railway if settlement occurs as a result of failure of the Contractor's installation procedures.
- g. Rock anchor bars must consist of single element steel bars conforming to ASTM Designation A722 Grade 150, anchorage devices and, if required, couplers.
- h. Cement must be 03 60 00 NA Grout – high flow, non-aggregate Cement by US Spec conforming to ASTM C 50. Cement used for grouting must be fresh and must not contain any lumps or other indications of hydration or "pack set".
- i. Anchor bars must be fabricated as shown on the shop drawings. The bar must be sized so that the maximum test load does not exceed 80 percent of the minimum guaranteed ultimate strength of the bar. The unbonded length of the anchor bar must be a minimum of ten feet or as shown on the Plans or approved shop drawings.
- j. Centralizers, made from steel, plastic or any material non-detrimental to the high strength steel, must be placed along the bond length. They must be located at 10 feet maximum centers with the upper one located a maximum of 5 feet from the top of the bond length and the lower one located one foot from the bottom of the bond length.
- k. The Contractor must select the drilling method, the grouting procedure and grouting pressure to be used for the installation of the rock anchors as necessary to satisfy the load test requirements.
 1. The drilling method used may be core drilling, rotary drilling, or percussion drilling. The method of drilling used must be that which prevents loss of ground above the drilling hole that may be detrimental to the structure or tracks. Excessive amounts of water must not be used in the drilling operation. The location, inclination, and alignment of the drilled hole will be as shown on the Plans. Inclination and alignment must be within plus or minus 3 degrees of the planned angle at the bearing plate.

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The anchor bar must be inserted into the drilled hole to the desired depth without difficulty. When the bar cannot be completely inserted it must be removed and the drill hole cleaned or redrilled to permit insertion. Partially inserted anchor bars must not be driven or forced into the hole.

2. The grouting equipment must produce a grout free of lumps and undispersed cement. The grouting equipment must be sized to enable the grout to be pumped in one continuous operation. The mixer must be capable of continuously agitating the grout.

The grout must be injected from the lowest point of the drilled hole. The grout may be pumped through grout tubes or drill rods. The grout may be placed before or after insertion of the anchor bar. The quantity of the grout must be recorded.

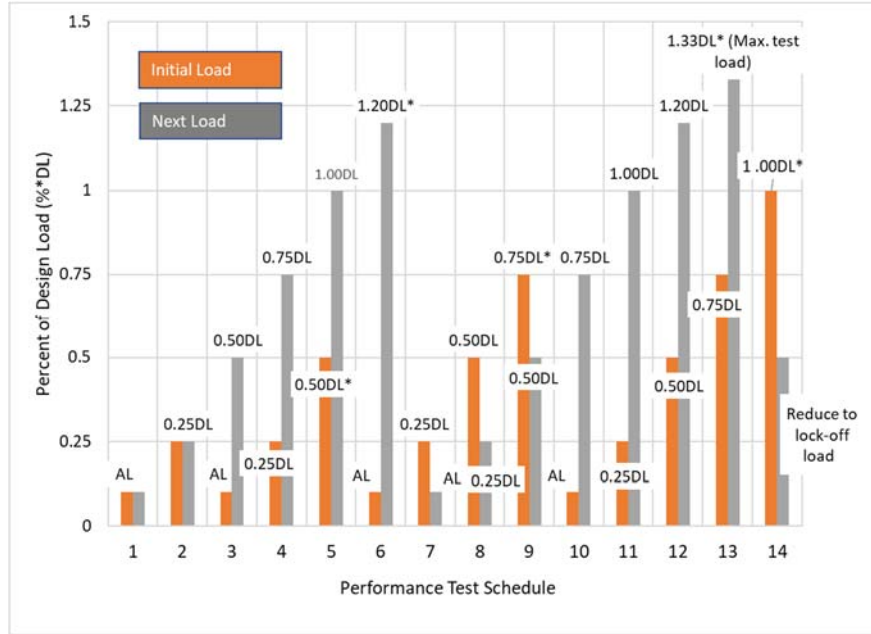
Upon completion of grouting, the grout tube may remain in the hole provided it is filled with grout. The anchor bar may be loaded after the grout sample compressive test reaches the specified strength.

Each rock anchor must be load tested by the Contractor. No load greater than 10% of the design load may be applied to the rock anchor prior to load testing. The test load must be simultaneously applied to the entire anchor bar.

3. A dial gauge or venire scale capable of measuring displacements to 0.001 inches must be used to measure rock anchor movement. It must have adequate travel so total rock anchor movement can be measured without resetting the device. A hydraulic jack and pump must be used to apply the test load. The jack and a calibrated pressure gauge must be used to measure the applied load. The pressure gauge must be graduated in 100-psi increments or less. When the theoretical elastic elongation of the total anchor length at the maximum test load exceeds the ram travel of the jack, the procedure for recycling the jack ram must be included in the shop drawings. Each increment of test load must be applied in one minute or less. A calibrated reference pressure gauge must be available at the site. The reference gauge must be calibrated with the test jack and pressure gauge. An electrical resistance load cell and readout must be provided when performing a creep test. The stressing equipment must be placed over the rock anchor bar in such a manner that the jack, bearing plates, load cell and stressing anchorage are axially aligned with the anchor bar and the anchor bar is centered within the equipment.
4. Five percent of the rock anchors or a minimum of two rock anchors, whichever is greater, must be performance tested in accordance with the following procedures. The Engineer will select the rock anchors to be performance tested. The remaining anchors must be tested in accordance with the proof test procedures. The performance test must be made by incrementally loading and unloading the rock anchor in accordance with the following schedule or as indicated on the Plans. The load must be raised from one increment to another immediately after recording the rock anchor movement. The rock anchor movement must be measured and recorded to the nearest 0.001 inches with respect to an independent fixed reference point at the alignment load and at each increment of load. The load must be monitored with a pressure gauge. The reference pressure gauge must be placed in series with the pressure gauge during each performance test. If the load determined by the reference pressure gauge and the load determined by the pressure gauge differ by more than 10%, the jack, pressure gauge and reference pressure gauge must be recalibrated. At load increments other than the maximum test load, the load must be held just long enough to obtain the stationary displacement reading.

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Performance Test Schedule



Where AL = Alignment Load

DL = Design load for rock anchor

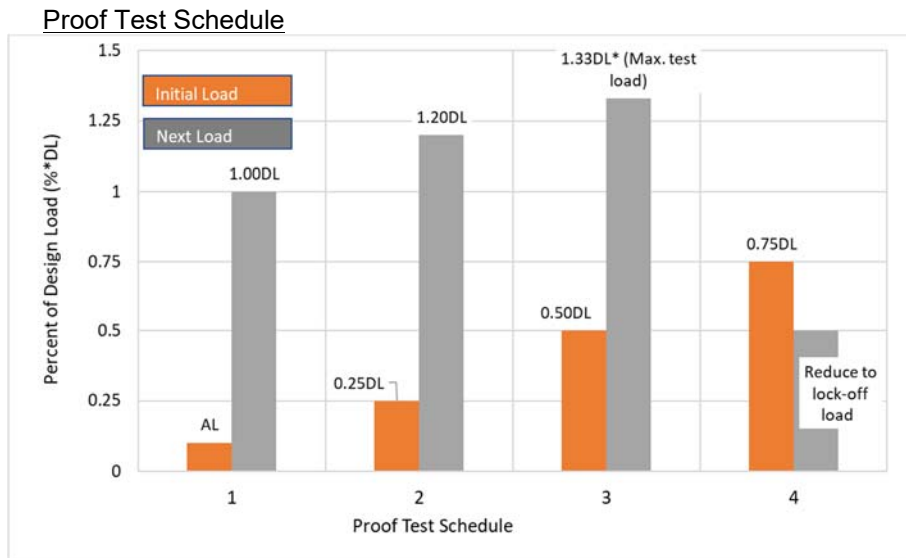
* = Graph required. See last paragraph in this subsection.

The maximum test load in a performance test must be held for 10 minutes. The jack must be repumped as necessary in order to maintain a constant load. The load-hold period must start as soon as the maximum test load is applied and the rock anchor movement measured and recorded at 1 minute, 2, 3, 4, 5, 6, and 10 minutes. If the rock anchor movements between 1 minute and 10 minutes, exceeds 0.04 inches, the maximum test load must be held for an additional 50 minutes. If the load hold is extended, the rock anchor movement must be recorded at 15 minutes, 20, 25, 30, 45 and 60 minutes.

A graph must be constructed showing a plot of rock anchor movement versus load for each load increment marked with the asterisk (*) in the performance test schedule and a plot of the residual rock anchor movement of the anchor bar at each alignment load versus the highest previously applied load. Graph must be approved by the Engineer prior to use.

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5. The proof test must be performed by incrementally loading the rock anchor in accordance with the following schedule unless a different maximum test load schedule is indicated on the Plans. The load must be raised from one increment to another immediately after recording the rock anchor movement. The rock anchor movement must be measured and recorded to the nearest 0.001 inches with respect to an independent fixed reference point at the alignment load and at each increment of load. The load must be monitored with a pressure gauge. At load increments other than the maximum test load, the load must be held just long enough to obtain the movement reading.

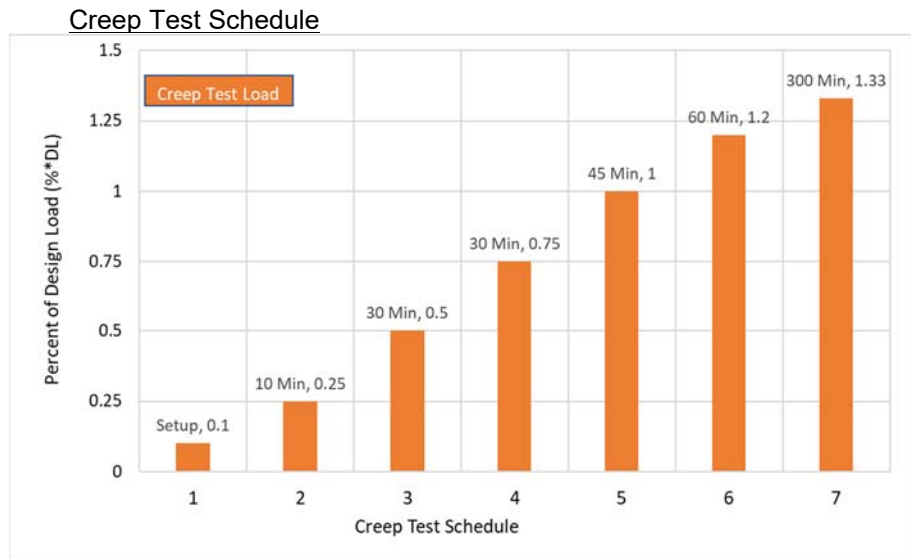


Where: AL = Alignment Load
 DL = Design load for rock anchor

The maximum test load in a proof test must be held for 10 minutes. The jack must be repumped as necessary in order to maintain a constant load. The load-hold period will start as soon as the maximum test load is applied and the rock anchor movement must be measured and recorded at 1 minute, 2, 3, 4, 5, 6 and 10 minutes. If the rock anchor movements between 1 minute and 10 minutes, exceeds 0.04 inches, the maximum test load must be held for an additional 50 minutes. If the load hold is extended, the rock anchor movement must be recorded at 15 minutes, 20, 25, 30, 45 and 60 minutes. A graph must be constructed showing a plot of rock anchor movement versus load for each load increment in the proof test. Graph format must be approved by the Engineer prior to use.

6. Creep tests must be performed on anchors that show continuous displacement at 10 min and 1.33 DL during performance or proof testing. The Engineer may also select rock anchors to be creep tested. The creep test must be made by incrementally loading and unloading the rock anchors in accordance with the performance test schedule used. At the end of each loading cycle, the load must be held constant for the observation period specified or as indicated on the Plans. The time for reading and recording the rock anchor movement during each observation period must be 1 minute, 2, 3, 4, 5, 6, 10, 15, 20, 25, 30, 45, 60, 75, 90, 100, 120, 150, 180, 210, 240, 270, and 300 minutes as appropriate. Each load hold period must start as soon as the test load is applied. In a creep test the pressure gauge and reference pressure gauge must be used to measure the applied load, and the load cell must be used to monitor small changes of load during a constant load hold period. The jack must be repumped as necessary in order to maintain a constant load.

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A graph must be constructed showing a plot of the rock anchor movement and the residual movement measured in a creep test as described for the performance test. Also, a graph must be constructed showing a plot of the rock anchor creep movement for each load hold as a function of the logarithm (base 10) of time in minutes. Graph formats must be approved by the Engineer prior to use.

- I. A performance-tested or proof-tested rock anchor with a 10-minute load hold is acceptable if the:
 1. Rock anchor resists the maximum test load with less than 0.04 inches of movement between 1 minute and 10 minutes.
 2. Total movement at the maximum test load exceeds 80% of the theoretical elastic elongation of the unbonded length.
 3. Total movement at the maximum test load may not exceed the theoretical elastic elongation of the unbonded length plus 50% of the theoretical elastic elongation of the bonded length.
- m. A performance-tested or proof-tested rock anchor with a 60-minute load is acceptable if the:
 1. Rock anchor resists the maximum test load with a creep rate does not exceed 0.08 inches in the last log cycle of time, and
 2. Total movement at the maximum test load exceeds 80% of the theoretical elastic elongation of the unbonded length.
 3. Total movement at the maximum test load may not exceed the theoretical elastic elongation of the unbonded length plus 50% of the theoretical elastic elongation of the bonded length.
- n. A creep-tested rock anchor is acceptable if the:
 1. Rock anchor carries the maximum test load with a creep rate that does not exceed 0.08 inches in the last log cycle of the time, and
 2. Total movement at the maximum test load exceeds 80% of the theoretical elastic elongation of the unbonded length.
 3. Total movement at the maximum test load may not exceed the theoretical elastic elongation of the unbonded length plus 50% of the theoretical elastic elongation of the bonded length.

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If the total movement of the rock anchor at the maximum test load does not exceed 80% of the theoretical elastic elongation of the unbonded length, the rock anchor must be replaced at the Contractor's expense.

An rock anchor which has a creep rate greater than 0.08 inches per log cycle of time can be incorporated into the structure at a design load equal to one-half of its failure load. The failure load is the load resisted by the rock anchor after the load has been allowed to stabilize for 10 minutes.

When a rock anchor fails, the Contractor must modify the design and/or the installation procedures. These modifications may include, but are not limited to, installing a replacement rock anchor, reducing the design load by increasing the number of rock anchors, modifying the installation methods, increasing the bond length or changing the rock anchor type. Any modification which requires change to the structure must be approved by the Engineer. Any modifications of design or construction procedures must be without additional cost to the Railway and without extension of contract time.

Retesting of an rock anchor will not be permitted, except the regouted anchors may be retested.

- o. Upon successful completion of the load testing, the rock anchor load must be reduced to the lock-off load indicated on the Plans and transferred to the anchorage device. The rock anchor may be completely unloaded prior to lock-off. After transferring the load and prior to removing the jack, a lift-off load reading must be made. The lift-off load must be within 10% of the specified lock-off load. If the load is not within 10% of the specified lock-off load, the anchorage must be reset, and another lift-off load reading must be made. This process must be repeated until the desired lock-off load is obtained.
- p. Lateral and vertical readings must be taken at the top of the retaining wall, at the walers, and at ground level immediately after rock anchors have been installed, tested and accepted. These readings will be dated, recorded, and reported to the Engineer. The frequency of readings will be dictated by the phase of current construction but must be sufficient to detect serious movements so that corrective measures can be initiated immediately. Reading must be made once per day until settlement is less than 0.125 inches, after which the frequency will be once per week.
- q. At the completion of the work, all equipment, debris, and surplus and salvaged material must be removed, and the site left clean and level.
- r. The Contractor must be responsible for and must protect existing structures, or other property and thoroughfares that are to be maintained during their operations.
- s. Payment for Rock Anchors will be calculated based on the Contractor's unit price for rock anchor installed as part of the finished and accepted work. This amount shall be full compensation for furnishing all material, labor, tools and equipment required to furnish, install, grout, test and tie-off the rock anchors as shown on the Plans and specified herein.

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XXIII. SHEET PILE LAGGING (PAY ITEM 8)

- a. This item shall consist of installing the sheet pile lagging at the locations shown in the Plans and as specified herein. The work under this section shall include furnishing all labor, materials, tools, equipment and incidentals necessary to install the sheet piling.
- b. Sheet piles shall be the PS31 section. The railway will provide the hot-dip galvanized sheet piling, but the Contractor is responsible for furnishing all required corners, transitions, accessories and other pieces required to install the sheet pile retaining walls to the lines and grades shown on the Plans.
- c. Steel sheet piling and all corners, transitions, accessories and other pieces shall conform to ASTM A572 Gr 50. Sheet piles shall be continuously interlocked through their entire length with adjacent units. The interlocks must provide a swing angle suitable for the intended installation, but not less than 6 degrees when interlocked.
- d. Piles shall be placed in a plumb position and shall be driven continuously until the penetration specified is reached, or as specified by the Engineer. All piles shall be placed as true to line as possible. Suitable temporary wales or guide structures shall be provided to ensure that the piles are driven to correct alignment.
- e. All piles shall be driven to the elevation shown on the Plans. Piles shall be driven by an approved method in such a manner as not to subject the piles to serious damage, and to ensure proper interlocking throughout the length of the piles.
- f. The Contractor shall exercise caution not to cause any damage to existing concrete foundations, tunnel structures, utilities and other site features.
- g. Pile hammers shall be maintained in proper alignment during driving operations by use of suitable leads or by guides attached to the hammer. A protecting cap shall be employed in driving if necessary, to prevent damage to the tops of the piles.
- h. The top of all steel sheet piling shall be cut off at the elevations specified on Plans, but not before the Railway's Engineer has given the Contractor approval. The amount of cut off shall be sufficient to remove any portion of the pile top trimmed for driving or bruised during driving.
- i. Payment for Sheet Pile Retaining Wall will be at the Contractor's unit bid price per lineal foot of driven PS31 sheet piling installed as part of the finished and accepted work. The number of lineal feet will be computed from the dimensions shown on the Plans or established by the Engineer. This amount shall be full compensation for furnishing all material, labor, tools and equipment required to furnish, install and cut off the piles as shown on the Plans and specified herein

XXIV. CULVERTS AND STORM DRAINS (PAY ITEM 9)

- a. Construct or reconstruct culverts and storm drains (pipe), to the lines and grades shown on the Plans.
- b. Furnish 36" diameter Steel Culvert (1/2" wall thickness) satisfying requirements of AKDOT&PF 2020 Standard Specifications Subsection 715-2.02, 1. Structural Steel for Piling.
- c. Install all pipes as shown on the plans or as directed by the Engineer. Use pipe segments as long as practical. If splices are needed, use additions with identical cross-sections to the original pipe. Use complete penetration butt welding to attach extensions. No sections used may be less than 10 feet long, unless approved by the Engineer. Welding must meet requirements of AKDOT&PF 2020 Standard Specifications Subsection 504-3.01 8.
- d. Bed and backfill each culvert in accordance with the plans and specifications.
- e. Payment for Culverts and Storm Drains will be made by the length of pipe, measured installed, at the inverts.

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XXV. ROLLED EROSION CONTROL PRODUCTS AND CELLULAR CONFINEMENT SYSTEMS (PAY ITEM 10 – AS NEEDED)

- a. This work consists of furnishing and installing Turf Reinforcement Mats (TRMs) in the locations and orientations specified in the plans. Install TRMs and associated soil anchors in accordance with the manufacturer's recommendations.
- b. A long term non-degradable Rolled Erosion Control Product composed of UV stabilized, non-degradable, synthetic fibers, filaments, nettings, or wire mesh processed into three dimensional reinforcement matrices designed for permanent and critical hydraulic applications where design discharges exert velocities and shear stresses that exceed the limits of mature, natural vegetation. Turf reinforcement mats provide sufficient thickness, strength and void space to permit soil filling and retention and the development of vegetation within the matrix. See the Erosion Control Technology Council website (ECTC.org) for commercially available products that may conform to these specifications. Cellular confinement system cell depths are designated according to the following table:

Permanent Turf Reinforcement Mats

Properties	Rolled Erosion Control Product			Test Method
	5.A	5.B	5.C	
Minimum Tensile Strength ⁽²⁾⁽³⁾ (psf)	125	150	175	ASTM D4595
UV Stability (minimum % tensile retention)	80	80	80	ASTM D4355 (500-hour exposure)
Minimum thickness ⁽²⁾ (inches)	1/4	1/4	1/4	ASTM D 6525
Minimum permissible shear stress ⁽⁴⁾ (psf)	6.0	8.0	10.0	ASTM D 6460 or other qualified independent test ⁽⁵⁾

(1) For turf reinforcement mats containing degradable components, obtain all property values on the nondegradable portion of the matting alone.

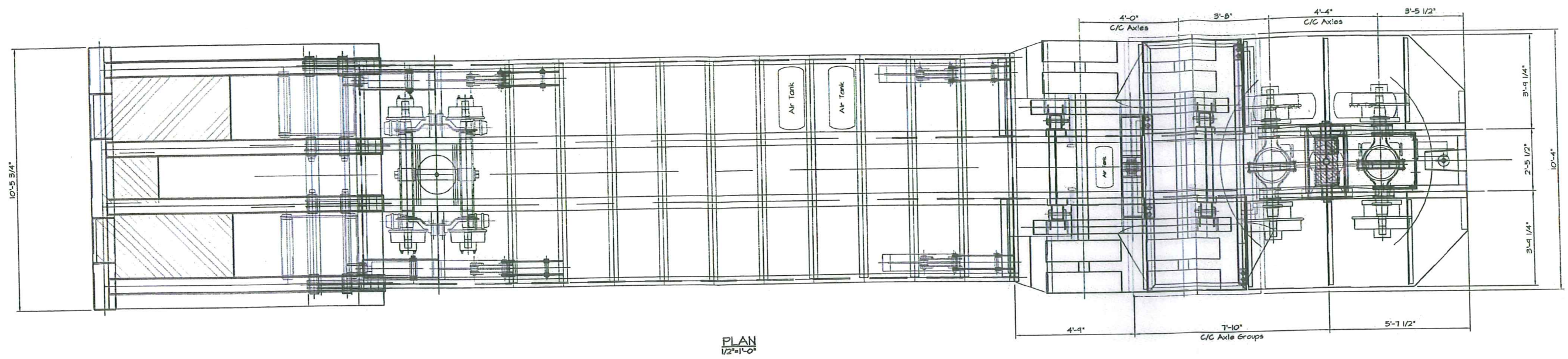
(2) Minimum average roll values, machine direction only.

(3) Field conditions with high loading and high survivability requirements may warrant the use of turf reinforcement mats with tensile strengths of 3,000 pounds per foot or greater.

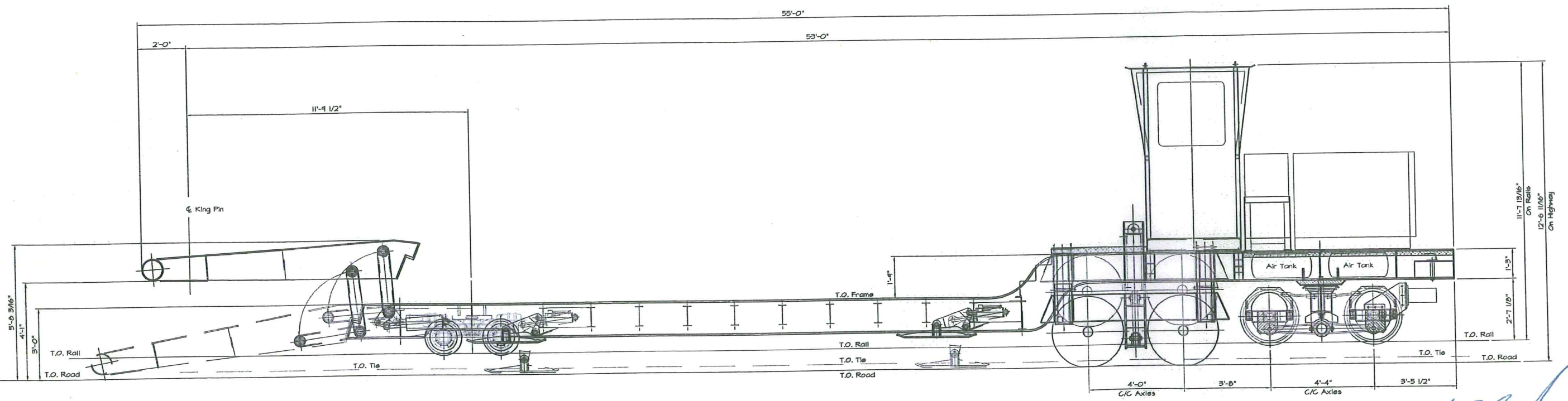
(4) Minimum shear stress the turf reinforcement mat (fully vegetated) can sustain without physical damage or excess erosion (>1/2-inch soil loss) during a 30-minute flow event in large-scale testing. These performance test values should be supported by periodic bench scale testing under similar test conditions and failure criteria using Erosion Control Technology Council Test Method #3.

(5) Other large-scale test methods determined acceptable by the CO.

- c. Furnish Type 5.C TRMs satisfying the following requirements: Type 5.C, permanent turf reinforcement mat. A non-degradable turf reinforcement mat with sufficient thickness, strength and void space for permanent erosion protection and void space for permanent erosion protection and vegetation reinforcement on geotechnically stable slopes up to 2V:1H, channels with design shear stresses up to 10.0 pounds per square foot, and other areas where design flow conditions exceed the limits of natural vegetation.



PLAN
1/2"=1'-0"



ELEVATION
1/2"=1'-0"

Reference Drawings
 06AT - II
 017-2010-02-830-01
 017-2010-03-830-01
 017-2011-04-820-01
 017-2012-01-820-01

VEHICLE CAPACITY	
HIGHWAY:	
Rear Axles	17,000 kg
King Pin	12,000 kg
Vehicle Payload	0 kg
ON RAILS:	
GVW	91,000kg
Payload	61,000kg

G. J. Schwab
 PROFESSIONAL ENGINEER
 G. J. SCHWAB
 BRITISH COLUMBIA
 ENGINEER
 MAR 16 2012

REV	BY	CHK	D	M	Y	DESCRIPTION
A	GS	16	03	12		Certified Drawing issued to Client

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Hytracker
 Manufacturing Ltd.
 Railway Equipment Manufacturers

KAMLOOPS, BC
 HYTRACKER LOWBED
 GENERAL LAYOUT
 VEHICLE CAPACITY

DWN.	DD	DATE	D	M	Y
		15	03	2012	
CHK.	HT	APPD.	GS	APPD.	GS
017-2012-01 801-01					

DAILY SAFETY MEETING / BRIEFING / DEBRIEFING PARTICIPANTS

PRINT NAME	SIGNATURE	ID #
Shane Dooley		
DAVE BANKE		
John Sommo		
Jason Davii		
Cole Petersen		
CHAD SCHONISSEL		
Joe Tougas		
Greg Zeiler		
SAUNDERS MIKE C		
AXEL BOBNAR		
Billy Rossier		
DESMOND D VFT		
Tim Cuyba		
PART HARRISON		
Daniel Peterson		
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BLAKE ADOLFAE		