Exhibit VGS-AG-044

1 Hospitals and Emergency Contacts

FLETCHER ALLEN HOSPITAL

Emergency Department
Medical Center Campus
West Pavilion, Level 1
111 Colchester Avenue
Burlington, VT, 05401
Phone: 802-847-2434
Open 24 hours; 7 days

From the Rutland area.
Follow Route 7 North to Burlington until you reach the Shelburne Street rotary. At the rotary, bear slightly right and up the hill on to Willard Street. Stay on Willard Street for about one mile until it intersects with Pearl Street. At that traffic light, turn right on to Pearl Street. Stay on Pearl Street (which becomes Colchester Avenue) for approximately one mile. Fletcher Allen's Medical Center Campus will be on your right. Turn right to enter the campus. At the first stop sign, go straight (the McClure Building will be on your right). Proceed up the hill and around the bend to the next stop sign. At that stop sign, turn left, and then take the next left into the entrance to the underground parking garage.

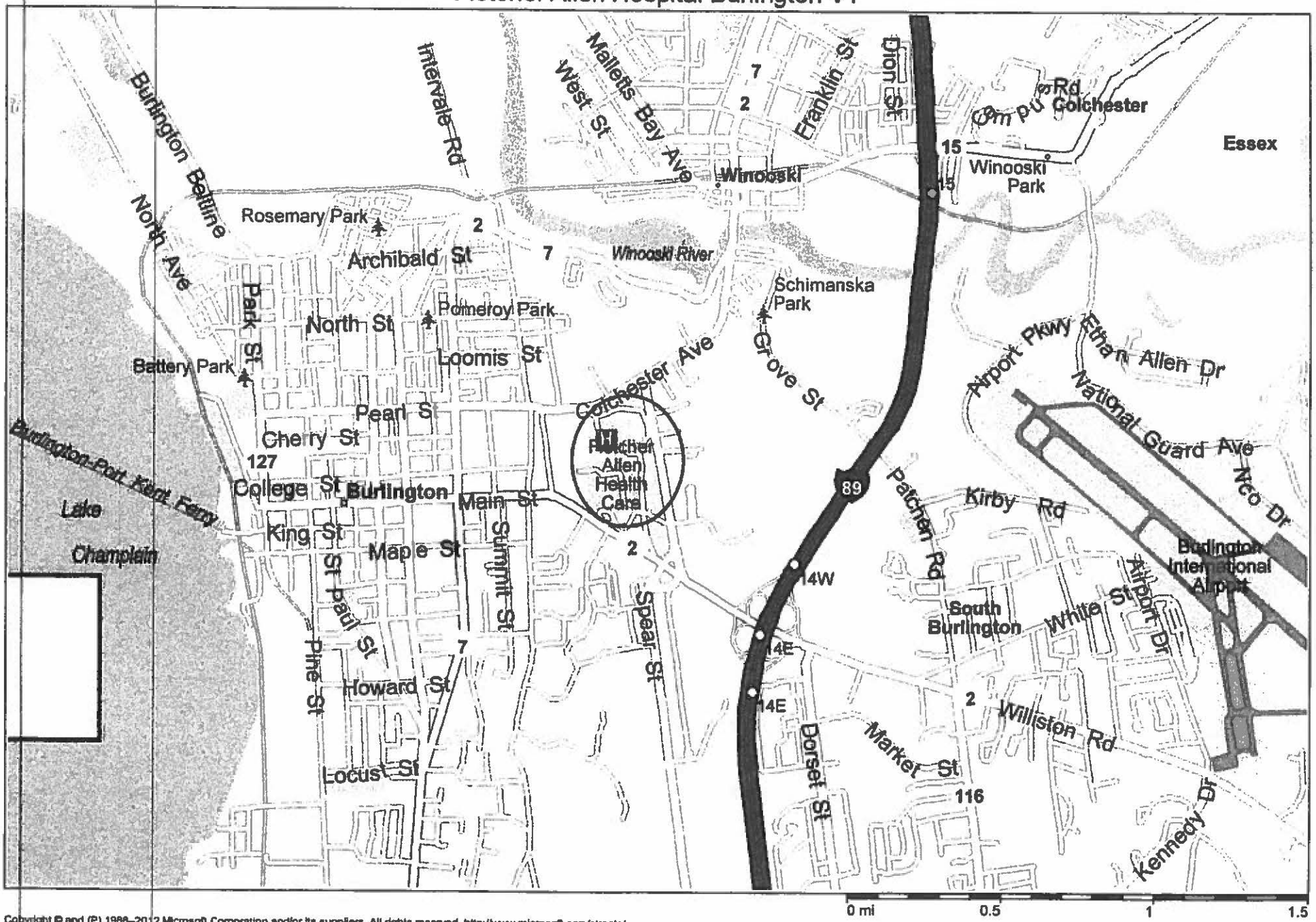
From St.Albans and points North.
Take I-89 South to Exit 14W. (see directions below from Exit 14W to the Medical Center Campus)

From the Montpelier/White River Junction areas.
Take I-89 North to Exit 14W. (see directions below from Exit 14W to the Medical Center Campus)

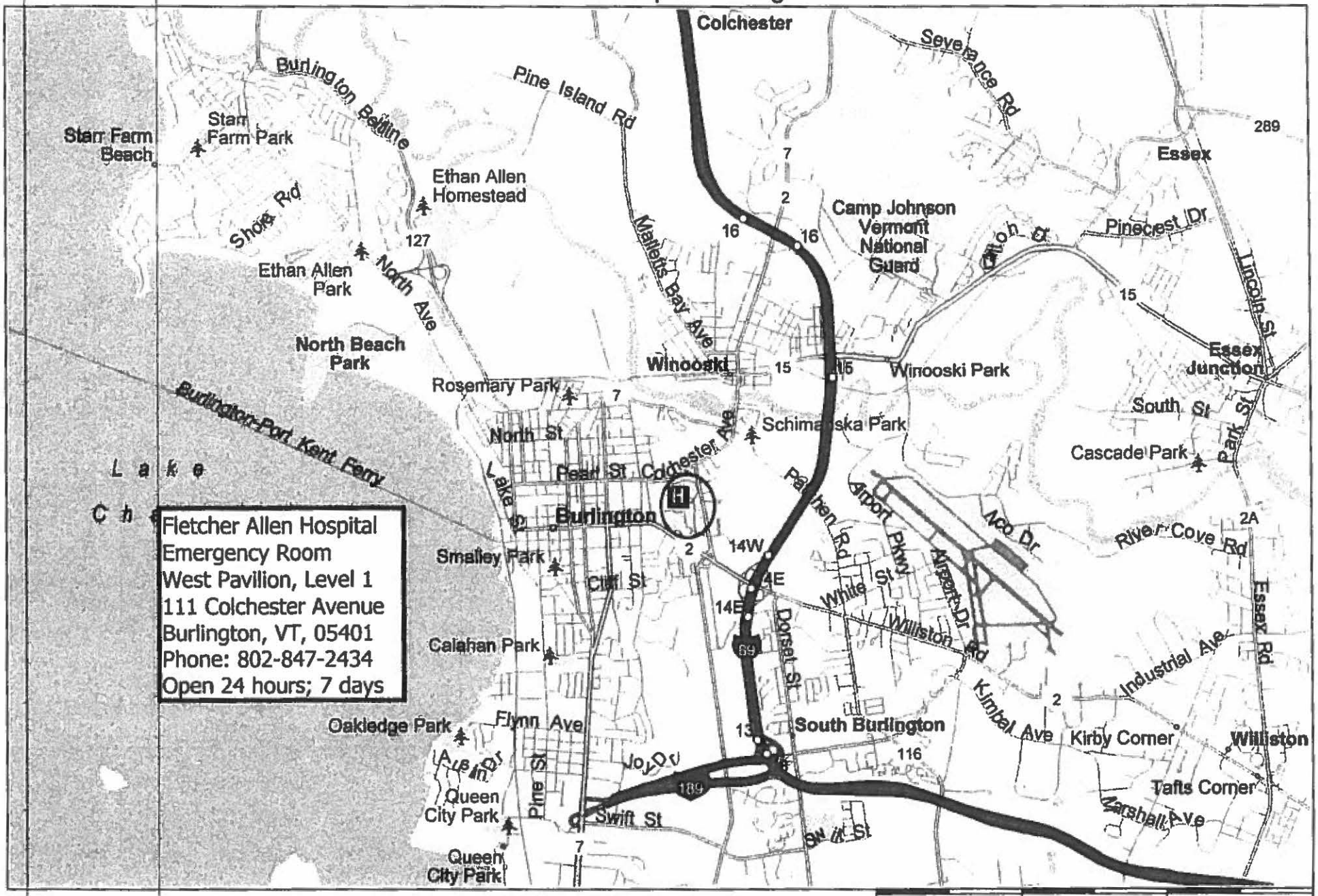
From the Plattsburgh,NY/Massena, NY /Malone, NY areas.
Take Cumberland Head/Grand Isle Ferry. Follow Route 314 to Route 2. Turn right onto Route 2 and travel east about 10 miles to I-89 South. Take Exit 14W. Alternate route: Cross Rouses Point Bridge. Take Route 2 south to I-89 South to Exit 14W. (see directions below from Exit 14W to the Medical Center Campus)

From Exit 14W.
Stay on Williston Road. The Sheraton Burlington Hotel & Conference Center will be on your right. After you pass the traffic light at the Sheraton entrance, Williston Road becomes Main Street. Immediately, after the next set of traffic lights, turn right onto Beaumont Avenue. Continue on Beaumont Avenue to traffic light. Continue straight on Beaumont Avenue, the entrance to the underground parking garage will be on your right.

Fletcher Allen Hospital Burlington VT



Fletcher Allen Hospital Burlington VT



PORTER MEDICAL CENTER

Porter Hospital, Inc.
115 Porter Drive
Middlebury, Vermont 05753
802.388.4701

From Points NORTH

•From Burlington, VT--

Route 7 runs north to south straight through Middlebury. From Burlington, follow Route 7 South approximately 45 miles. As you enter Middlebury, you will go through a set of traffic lights, then make a right hand turn onto Main Street just past the large white Congregational Church. Follow Main Street through town, over a bridge. Look for the blue "H" signs. At the fork in the road bear left onto South Street. Follow South Street less than a mile to where the Porter Campus and entrances will be visible on your left.

• From Montpelier, VT--

◦**"Summer" Route (over the mountains):** Follow Route 89 North to Route 100 south (approx. 8 miles). Follow Route 100 to Route 125 East (approx. 28 miles) in Hancock which goes over the Middlebury Gap. At the end of Route 125 (approx. 14 miles) take a right onto Route 7 North. Route 7 leads into Middlebury (approx. 4 miles). Follow the Rotary, past the Middlebury Inn (a large brick building on the right) bearing left onto Main Street (look for the blue "H" signs). Follow Main Street through town, over a bridget. At the fork in the road, bear left onto South Street. Follow South Street less than a mile to where the Porter Campus and entrances will be visible on your left.

◦**"Winter" Route:** Follow Route 89 North to Exit 12 or Route 2A South (approx. 23 miles). Follow 2A into Route 116 (approx. 3 miles). South on Route 116 to Bristol (approx. 12 miles). Take Route 17 West to Route 7 (approx. 3 miles). Take Route 7 South into Middlebury (approx. 5 miles). Turn right onto Main Street at the large white Congregational Church. Follow Main Street through town, over a bridge. Llook for the blue "H" signs. At the fork in the road bear left onto South Street. Follow South Street less than a mile to where the Porter Campus and entrances will be visible on your left.

From Points SOUTH

•From Rutland, VT--

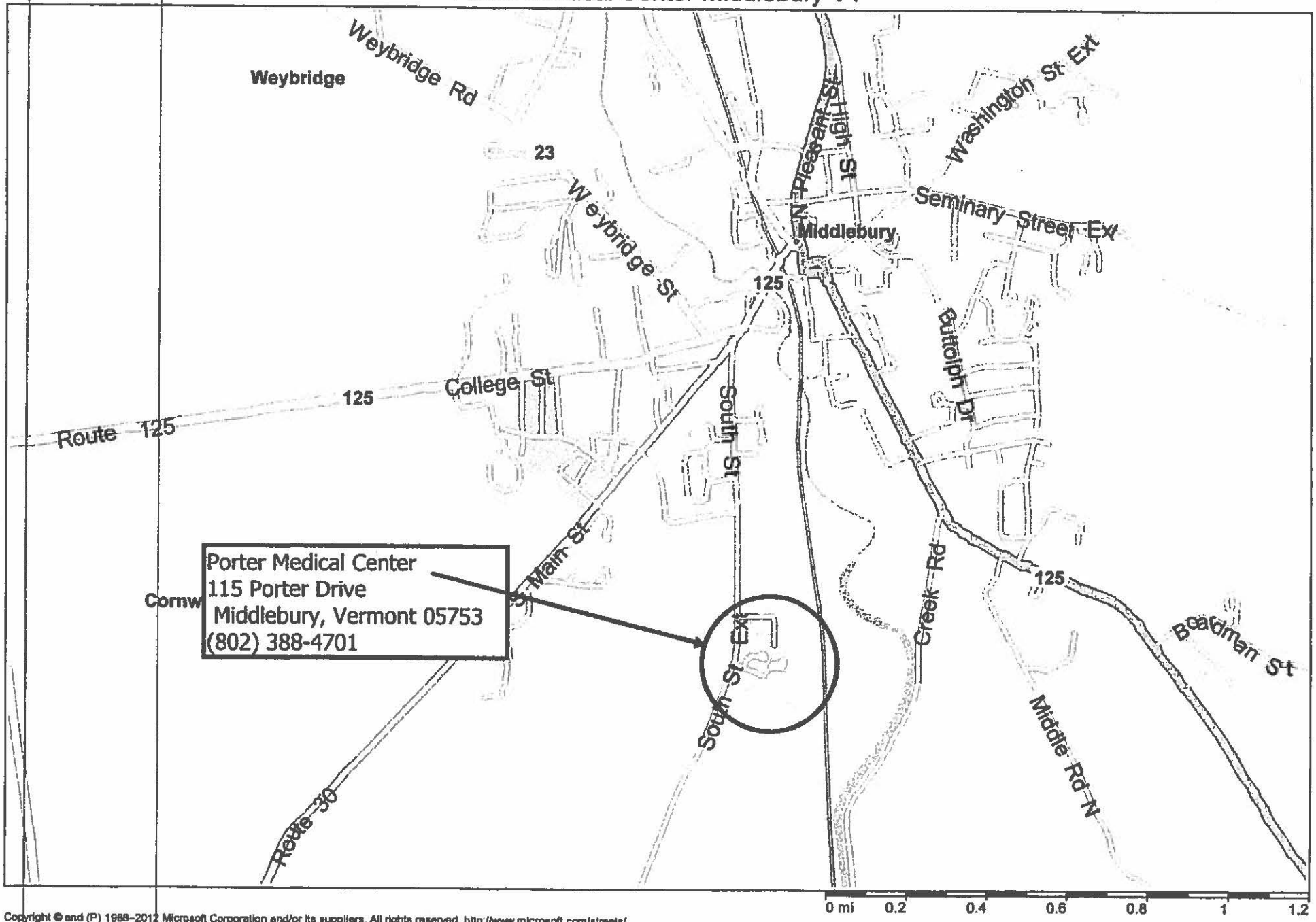
Route 7 runs north to south straight through Middlebury. From Rutland, follow Route 7 North approximately 40 miles into Middlebury. Follow the Rotary, past the Middlebury Inn (a large brick building on the right) bearing left onto Main Street (look for the blue "H" signs). Follow Main Street through town, over a bridge. At the fork in the road bear left onto South Street. Follow South Street less than a mile to where the Porter Campus and entrances will be visible on your left.

From Points WEST

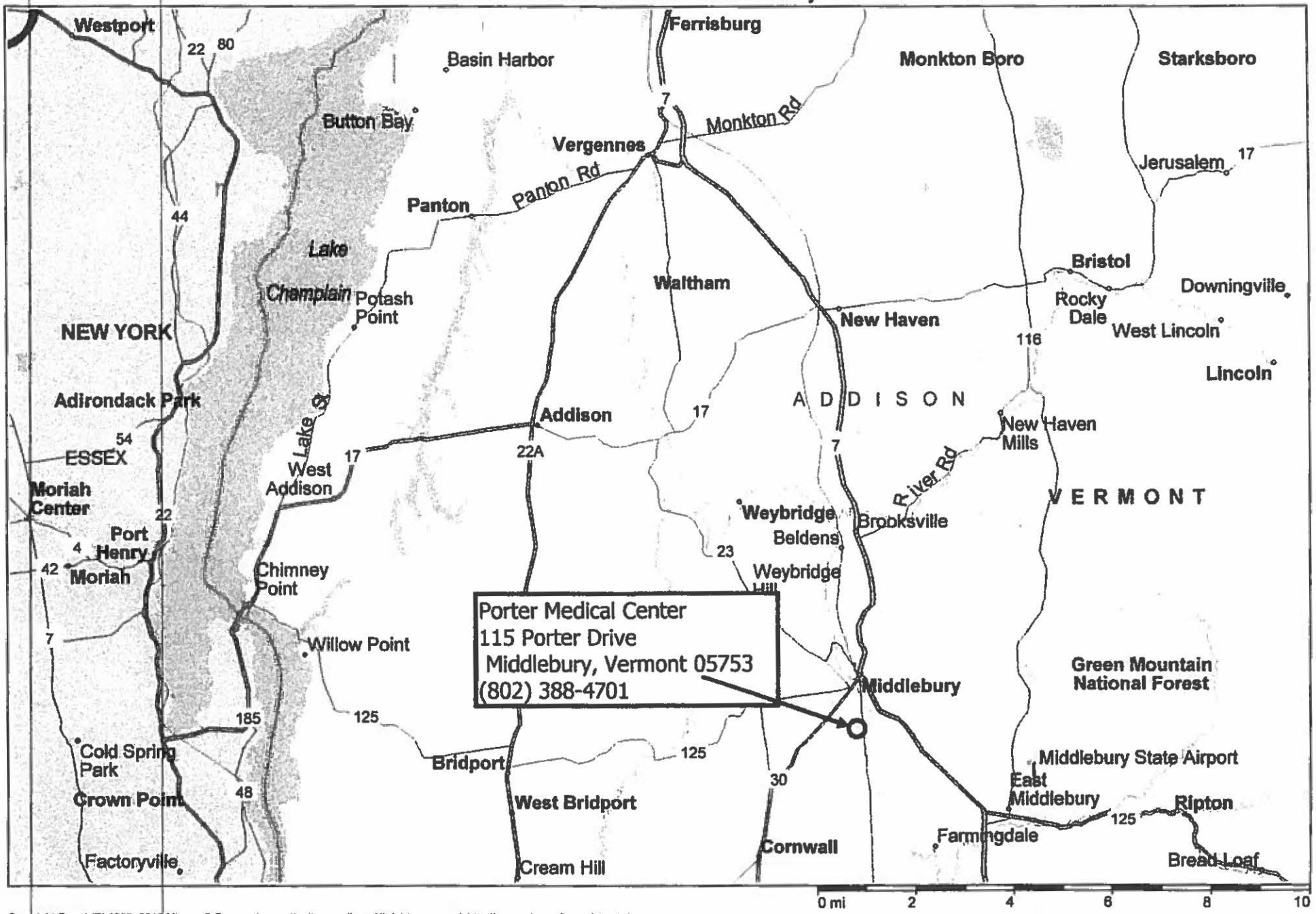
•From Ticonderoga Ferry, NY to Larabees Point, VT--

Follow west on Route 74 approximately 12 miles to Route 30. Turn left onto Route 30 and follow approximately 6 miles into Middlebury. Double back to your right onto South Street before entering town (look for the blue "H" signs). Follow South Street less than a mile to where the Porter Campus and entrances will be visible on your left.

Porter Medical Center Middlebury VT



Porter Medical Center Middlebury VT



Vermont Gas
CLEAN ENERGY CLEAN AIR

VERMONT GAS
Addison Natural Gas Project
Phase I

FIRE/POLICE/SCHOOL DISTRICTS

Call 911 For All Emergencies
(Non-emergency #'s listed below are often Volunteer Fire Depts. w/out manned stations)

SHELBURNE DISPATCH CENTER	
Dispatches for Williston, Hinesburg, Monkton, Vergennes, Bristol and New Haven Fire Depts	802-985-8051
COLCHESTER DISPATCH CENTER	802-875-2035
ESSEX DISPATCH CENTER	802-264-5556
FIRE	
Hinesburg	802-482-2455
Middlebury & East Middlebury	802-453-4462
Middlebury Town	802-462-2990
Monkton	802-453-3869
New Haven	802-453-3654
S. Burlington Fire	802-846-4110
Shoreham	802-897-5841
St. George (served by Williston or Hinesburg)	802-878-5622 or 802-482-2455
Vergennes	802-877-3201
Williston	802-878-5622
POLICE	
STATE	
New Haven Barracks (Addison County)	802-878-7111
Williston Barracks (Chittenden Co.)	802-388-4919
Rutland Barracks (Rutland County)	802-773-9101
COUNTY	
Addison County Sheriff's	802-388-2981
Chittenden Co. Sheriff's Office	802-863-4341
Rutland County Sheriff's Office	802-775-8002
MUNICIPALITIES	
Bristol Police	802-453-2533
Burlington Police	802-658-2704
Colchester Police	802-875-2035
Essex Police	802-264-5556
Hinesburg Police	802-482-3397
Middlebury Police	802-388-3191
S. Burlington Police	802-846-4111
Vergennes Police	802-877-2201
Williston Police	802-878-6611
SCHOOL DISTRICTS	
Chittenden Central: Essex Schools	802-857-7000
Chittenden South: Williston, Hinesburg, St. George, Shelburne Schools	802-383-1234
Colchester District: Colchester Schools	802-878-2117

JOB SAFETY ANALYSIS

Vermont Gas

Addison Natural Gas Project - Phase I Section I		EMERGENCY INFORMATION
Date:		For Medical Emergencies, Call 911 First
Job Location:		911 Address-Coordinates & Nearest Intersection - Note primary & Secondary Cross Roads:
Contractor:		
Foreman:		
Completed by:		
Additional Contractors or Sub-Contractors Onsite		Contractor Safety Contact:
Contractor:		VGS Inspector Name & Number:
Foreman:		Location of AED & First Aid Kits:
Job Description:		
Contractor:		VGS Gas Control: 802.951.0337
Foreman:		VELCO Control: 802.770.6260
Job Description:		
☐ Digsafe	Ticket Number:	Exp. Date:
☐ Digsafe	Ticket Number:	Exp. Date:

PPE (Check All That Apply)

☐	Hard Hats	☐	Face Shield
☐	Safety Glasses	☐	Life Vest
☐	Steel Toe Boots	☐	Fall Protection
☐	Gloves	☐	FRC
☐	Hearing Protection	☐	Other:
☐	High Visibility Vests	☐	Other:

HAZARDS (Check All That Apply)

☐ Biological/Chemical	☐ Extreme Weather	☐ Overhead Lines	☐ Slips/Trips/Falls	Air Monitoring (if required)	
☐ Confined Space	☐ Hazard Atmo/Contaminated Soil	☐ Personal Lifting	☐ Traffic	Calibration Date	
☐ Cutting/Grinding	☐ Housekeeping	☐ Pinch Points	☐ Underground Utilities	Bump Test Date	
☐ Dewatering	☐ Ladders/Scaffolding	☐ Power Tools	☐ Welding	Serial Number:	
☐ Dust/Vapors	☐ Moving Equipment	☐ Protesters	☐ Working above 6 Ft	Station Number:	
☐ Electrical/Shock	☐ Night Work	☐ Railroads	☐ Working Over Water	Time:	
☐ Excavation/Trenching	☐ Open Flame/Hot Work	☐ Rigging/Hoisting	☐ Other:	Readings:	

ACTIVITY	HAZARD	CORRECTIVE ACTION

JOB SITE AND ENVIRONMENTAL PROTECTION (Check All That Apply)

☐ Lookahead Complete	☐ Permits Reviewed and Onsite	☐ Landowner Restrictions Understood
☐ Work Area Secure	☐ Erosion Controls Properly Installed	☐ Spill Kits and Absorbent Materials Onsite
☐ Barriers Installed at LOD	☐ Wetland Matting Restrictions Understood	☐ Traffic Control Devices Installed
☐ Resources Marked Out	☐ Rare Plant Matting Restrictions Understood	☐ Good Housekeeping

SIGN-IN (PRINT *AND* SIGN YOUR NAME)

PRINT	SIGNATURE	PRINT	SIGNATURE

INCIDENT NOTES	
Time and Weather Conditions:	
Detailed Event Description:	
VGS Personnel Present:	
Contractor Personnel Present:	
Other Parties Present:	
Follow Up Actions:	
Time VGS Gas Control Was Notified:	
Time VELCO Was Notified (If on VELCO RoW)	

SPILL RESPONSE NOTES	
Time and Weather Condition:	
Product Spilled and Estimated Quantity:	
Steps Taken to Stop Spill:	
Steps Taken to Prevent Spill From Reaching Protected Resource/Water:	
VGS Personnel Present:	
Contractor Personnel Present:	
Other Parties Present:	
Follow Up Actions:	
Time EPSC/Env. Inspector Was Notified:	

PROTESTOR/TRESPASSER RESPONSE PROCESS

1. At the first sign of trespassing or protest activity, call VGS Gas Control (802-951-0337).
2. Secure work area. Stop work if necessary to protect public safety.
3. Politely ask trespassers/protestors to leave work area.
4. If you see a protest forming or taking place, immediately call VGS Gas Control (802-951-0337)
5. **Call 911 immediately** if you feel threatened, if trespassers/protestors are taking actions that are potentially dangerous to themselves or others, or public safety is compromised.
6. Document activities. Take photographs/video of trespassers and protestors. If possible also take photographs of trespasser vehicles and vehicle license plates.
7. Do not engage protestors in debate or attempt to physically prevent them from protesting. This will be done by law enforcement

NOTES

Vermont Gas
Addison Natural Gas Project
Phase I

Vermont Gas
CLEAN ENERGY. CLEAN AIR.

INCIDENT AND ACCIDENT REPORT

Section: _____ Contractor: _____
Date: _____ Super/Foreman: _____
W.O.: _____ Weather/Temp: _____
Inspector: _____ County/Town: _____
Station: _____ Time: _____
Parcel: Landowner:

911 Location/Coordinates:

Type of Incident or Accident

☐ Environmental	☐ Injury - Recordable	☐ Security
☐ Equipment	☐ Non-Compliance	☐ Spill**
☐ Fire	☐ Property Damage	☐ Vehicle
☐ Injury - First Aid	☐ Protest	☐ Other

**If Spill - notate type of product and estimated volume:

911 called: ☐ Yes ☐ No ☐ N/A

Regulatory Agency Non-Compliance (permit violation) ☐ Yes ☐ No If Yes fill out below info:

Agency	Contact Name	Title	Number

Description of Occurrence:

Safety Standdown Conducted ☐ Yes ☐ No

Corrective Action:

Date: Signature:

2 Acronyms & Abbreviations

Vermont Gas

Addison Natural Gas Project

Acronyms and Abbreviations

Acronym/Abbreviation	Full name	Comments
VGS	Vermont Gas Systems, Inc.	
ANGP	Addison Natural Gas Project	
ARNGP	Addison Rutland Natural Gas Project	
AAFM	VT Agency of Agriculture, Food & Market	
ACRPC	Addison County Regional Planning Commission	
RRPC	Rutland Regional Planning Commission	
ANR	Agency of Natural Resources	(incl.VTDEC, Fish and Wildlife and Forest, Parks& Rec.
CPG	Certificate of Public Good	Permit issued by Public Service Board
CSWD	Chittenden Solid Waste District	
EPSC		
MOU	Memorandum of Understanding	
PSB	Public Service Board	Supervises activities of Vermont Public Utilities
DPS	Department of Public Service	Represents public interest in utility matters... Dig Safe
VELCO	VT Electric Power Company	
VHB	Vanasse Hangen Brustlin, Inc	VGS Consultant - natural resources
VHCB	VT Housing & Conservation Board	
VLT	VT Land Trust	
Vtrans	Vermont Agency of Transportation	
VWP	Vermont Wetland Permit	
DRM	Downs Rachlin Martin	VGS Attorneys
CLF	Conservation Law Foundation	
NEPA	National Environmental Policy Act	
ACOE	Army Corps of Engineers	

3 Report and Picture Numbering Protocol

	Date: 6-16-2014 Rev: A	Page: 1 of 1
Vermont Gas CLEAN ENERGY. CLEAN AIR.	VERMONT GAS	
	ADDISON NATURAL GAS PROJECT	

Report Numbering Protocol

- Date (MMDDYYYY)
- Phase (Current project phase)
- Section (Current project section)
- Area (Gate, ML, HDD)
- Initials and number of days working in that area (ex: JR10)
    - If you work two areas in one day, you will have two different reports.
        - So if you have worked 10 days on Gate stations your gate report will reflect JR10, and you have worked 2 days on the Mainline that report will be numbered JR2.
        - If you go don't go back to Gate stations for a month, you will pick up numbering at JR11 and so on.

Example: 06162014_Phase1Sec1_Gate_JR1

Then as you go forward just "save as" for the next day's report and change the date and the number after your initials on the report number.

If you have problems or need changes made to the report form please contact Kay Peebles at VGS Field Office.

Note: In the narrative box if you want to move down to the next line (but haven't reached the end of the box), hold down the Alt key and hit Enter.

	Date: 6-16-2014 Rev: B	Page: 1 of 1
Vermont Gas CLEAN ENERGY. CLEAN AIR	VERMONT GAS	
	ADDISON NATURAL GAS PROJECT	

Photo Numbering Protocol

- Date (MMDDYYYY)
- Area (Gate, ML, HDD)
- Location (ex: Willliston, LaPlatte, station # i.e. 23+45)
- Initials (ex: JR)
- Brief description of photo

Examples:

06152014_Gate_Willliston_JR_inch welder bend test specimens

06212014_HDD_LaPlatte_KF_assembling pull back sections

06252014_ML_23+45_EC_lowering in drag sections

4 Weld Numbering Procedure
Radiographic Numbering Procedure
Tie-In Reports

Procedure for weld numbering on the Addison Natural Gas Project

First section:

1. First two digits:

- **RT** for radiography testing of welds
- **MT** for mag particle testing of welds
- **PT** for dye penetrant testing of welds

2. Third digit:

- Letter designation for unique identifier of NDE technician, for example **"A"** for A-rig, **"B"** for B-rig and so on. This will be assigned to the technician by the lead welding inspector when the technician arrives on the project and is to be used at all sites on the project.

Second section:

3. Forth, Filth and sometimes Sixth digit:

- **HDD** for horizontal directional drill strings
- **FB** for fabrication welds (i.e. offsite fabrication whether it be at the ware yard or contractors facility)
- **XR** for onsite gate station welds
- **ML** for mainline welds (including drag sections)
- **TI** for tie-in welds made in the bell hole (this includes tie-ins between mainline and HDD's)
- **FTI** for final tie-ins to be completed after pressure testing is completed
- **TW** for temporary welds to be removed from the line (test manifold's etc.)

Third Section:

- Numerical identifier starting at 001 running sequentially until completion of the project. Do not re-use the numerical portion of the weld identifier when moving from site to site only the first two sections. For instance 012 may not be used for RTA-FB-012 and RTA-XR-012. The numerical portion of the identifier will change for each weld you non-destructively examine regardless of your location.

- **R** for re-shot of a repaired weld
- **C** for re-shot of a weld that has been cut-out but in the same location between the same two sections of pipe or components

Note:

- All welds with rejects are to be cut out of the line and no repairs made without prior approval of the company.
- Only one weld cut-out is permissible. If weld must be cut out a second time, a suitable length pipe segment shall be added in place.

See example diagram below:

RTB-HDD-219C

	Date: 7-9-2014 Rev: B	Pages: 2
Vermont Gas CLEAN ENERGY. CLEAN AIR	CLIENT: VERMONT GAS	
	PROJECT: ADDISON NATURAL GASPROJECT	

Radiographic & Magnetic Numbering Protocol

- **RT** (for radiography testing of welds)

  MT (for magnetic particle testing of welds)

- Letter designation for unique identifier of NDE technician, for example **"A"** for A-rig, **"B"** for B-rig and so on. This will be assigned to the technician by the lead welding inspector when the technician arrives on the project and is to be used at all sites on the project.

- Weld type identifier

  · **HDD** for horizontal directional drill strings

  · **FB** for fabrication welds (i.e. offsite fabrication whether it be at the ware yard or contractors facility)

  · **XR** for onsite gate station welds

  · **ML** for mainline welds (including drag sections)

  · **TI** for tie-in welds made in the bell hole (this includes tie-ins between mainline and HDD's)

  · **FTI** for final tie-ins to be completed after pressure testing is completed

  · **TW** for temporary welds to be removed from the line (test manifold's etc.)

- Numerical identifier

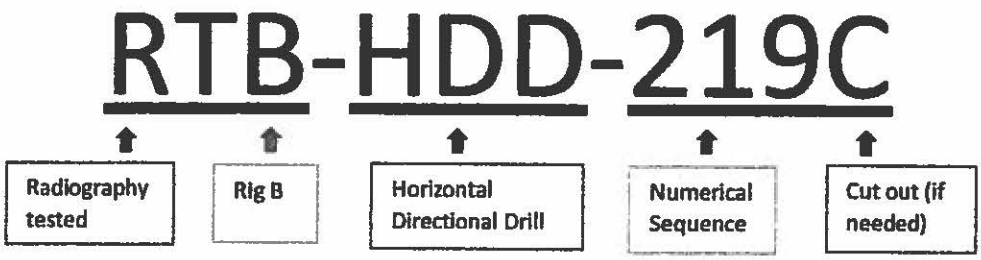
  Starting at 001 running sequentially until completion of the project. Do not re-use the numerical portion of the weld identifier when moving from site to site only the first two sections. For instance 012 may not be used for RTA-FB-012 and RTA-XR-012. The numerical portion of the identifier will change for each weld you non-destructively examine regardless of your location.

Continued on next page

Vermont Gas CLEAN ENERGY. CLEAN AIR.	Date: 7-9-2014 Rev: B	Pages: 2
	CLIENT: VERMONT GAS	
	PROJECT: ADDISON NATURAL GASPROJECT	

Radiographic & Magnetic Numbering Protocol – cont.

Example of Weld Numbering Protocol:



TIE-IN

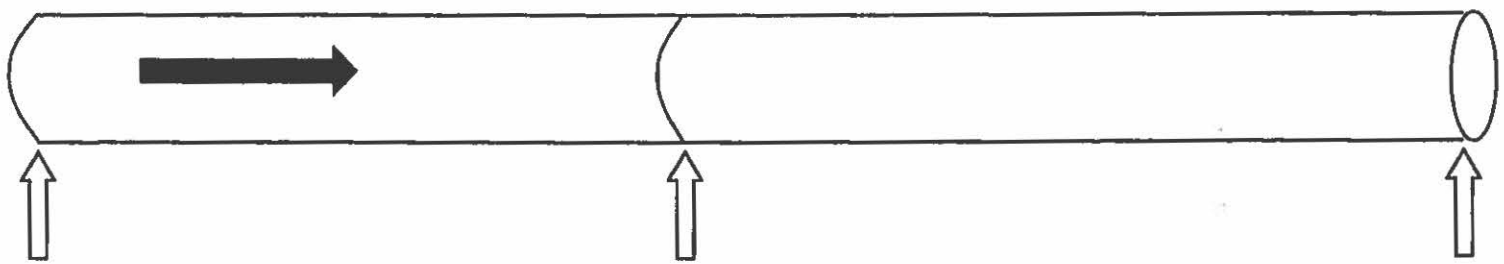
Report#	
Date:	
Inspector:	
WO #	
Contractor:	

Vermont Gas
CLEAN ENERGY. CLEAN AIR.

Location: _____

Joint #: _____
Heat #: _____
Length: _____
Dia. & WT _____
Grade: _____

Joint #: _____
Heat #: _____
Length: _____
Dia. & WT _____
Grade: _____



X-Ray #: _____
Sta. #: _____

X-Ray #: _____
Sta. #: _____

X-Ray #: _____
Sta. #: _____

TIE-IN

Report#	
Date:	
Inspector:	
WO #	
Contractor:	

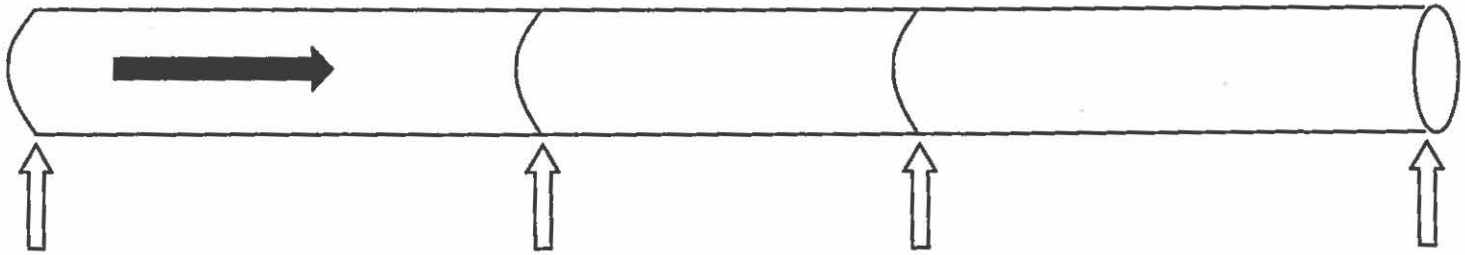
Vermont Gas
CLEAN ENERGY. CLEAN AIR.

Location _____

Joint #: _____
Heat #: _____
Length: _____
Dia. & WT _____
Grade: _____

Joint #: _____
Heat #: _____
Length: _____
Dia. & WT _____
Grade: _____

Joint #: _____
Heat #: _____
Length: _____
Dia. & WT _____
Grade: _____



X-Ray #: _____
Sta. #: _____

X-Ray #: _____
Sta. #: _____

X-Ray #: _____
Sta. #: _____

X-Ray #: _____
Sta. #: _____

Vermont Gas
CLEAN ENERGY. CLEAN AIR

TIE-IN

Report#	
Date:	
Inspector:	
WO #	
Contractor:	

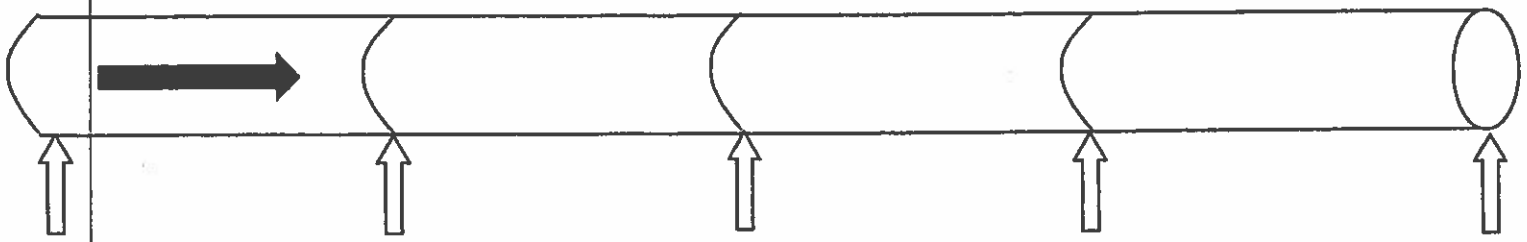
Location

Joint #: _____
Heat #: _____
Length: _____
Dia. & WT _____
Grade: _____

Joint #: _____
Heat #: _____
Length: _____
Dia. & WT _____
Grade: _____

Joint #: _____
Heat #: _____
Length: _____
Dia. & WT _____
Grade: _____

Joint #: _____
Heat #: _____
Length: _____
Dia. & WT _____
Grade: _____



X-Ray #: _____
Sta. #: _____

X-Ray #: _____
Sta. #: _____

X-Ray #: _____
Sta. #: _____

X-Ray #: _____
Sta. #: _____

X-Ray #: _____
Sta. #: _____

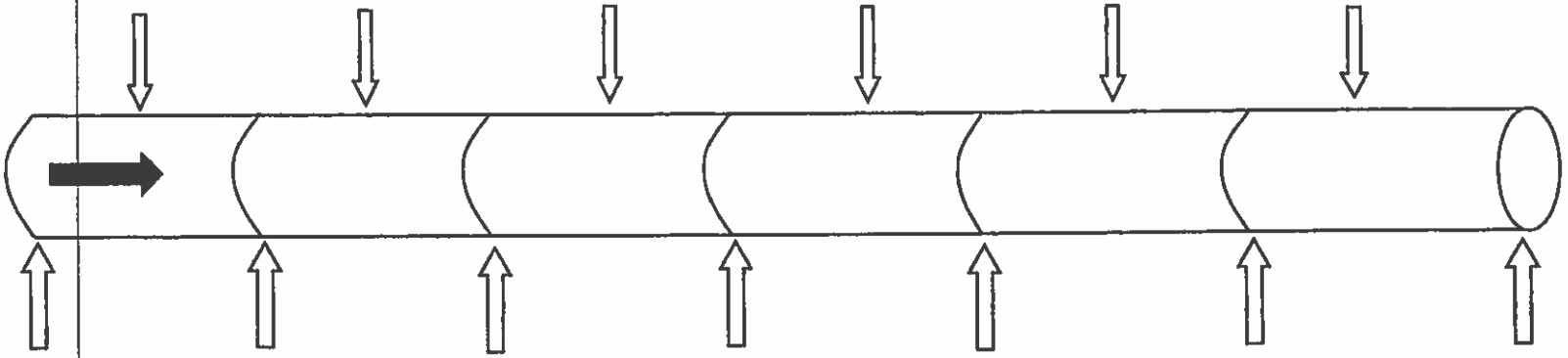
TIE-IN

Report#	
Date:	
Inspector:	
WO #	
Contractor:	

Vermont Gas
CLEAN ENERGY. CLEAN AIR.

Location: _____

Joint #:	Joint #:	Joint #:	Joint #:	Joint #:	Joint #:
Heat #:	Heat #:	Heat #:	Heat #:	Heat #:	Heat #:
Length:	Length:	Length:	Length:	Length:	Length:
Dia. & WT	Dia. & WT	Dia. & WT	Dia. & WT	Dia. & WT	Dia. & WT
Grade:	Grade:	Grade:	Grade:	Grade:	Grade:

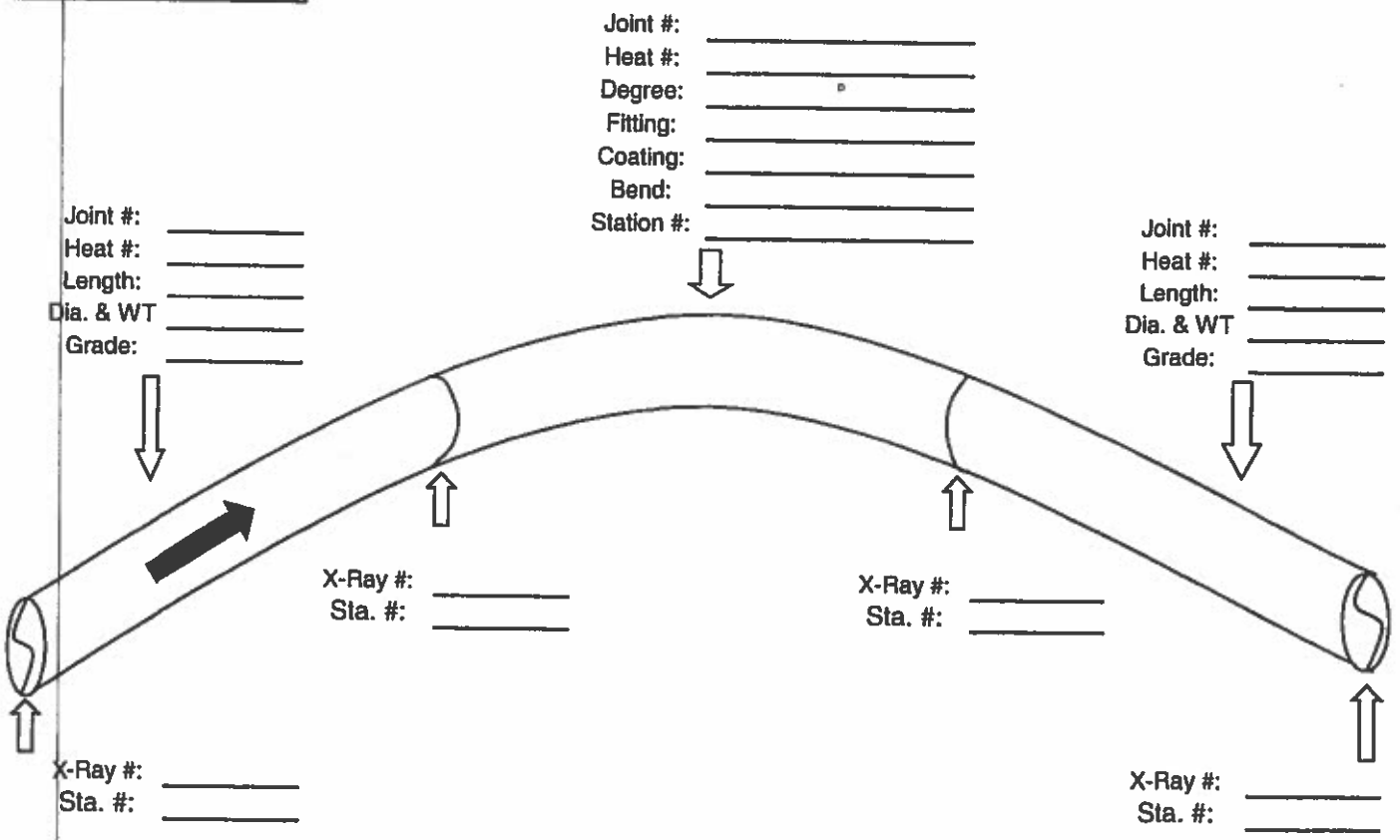


X-Ray #:	X-Ray #:	X-Ray #:	X-Ray #:	X-Ray #:	X-Ray #:	X-Ray #:
Station:	Station:	Station:	Station:	Station:	Station:	Station:

PI/TIE-IN

Vermont Gas
CLEAN ENERGY. CLEAN AIR.

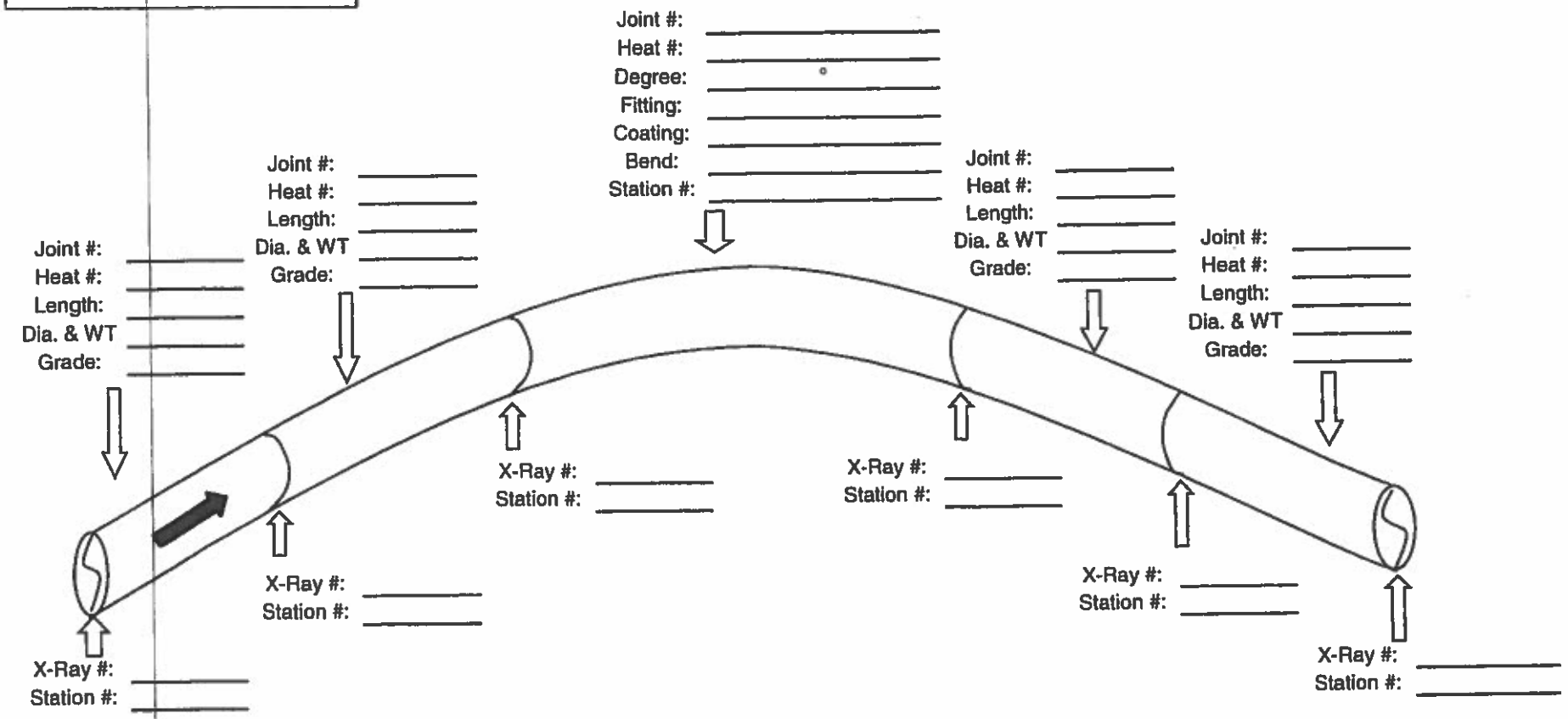
Report:	
Date:	
Inspector:	
WO:	
Contractor:	



PI/TIE-IN

Report#	
Date:	
Inspector:	
WO #	
Contractor:	

Vermont Gas
CLEAN ENERGY. CLEAN AIR



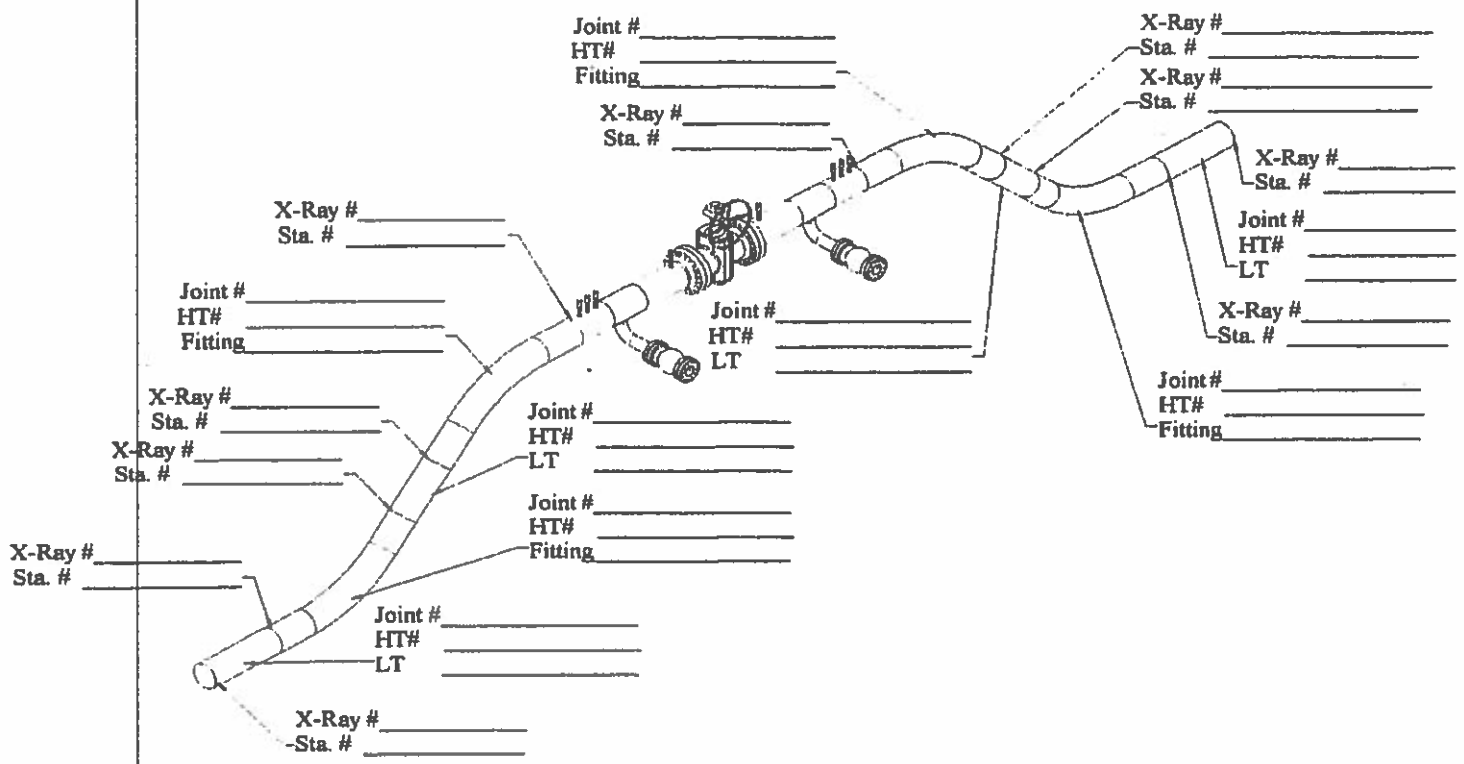
Vermont Gas
CLEAN ENERGY. CLEAN AIR.

Mainline Block Valve

Report#	
Date:	
Inspector:	
WO #	
Contractor:	

Location: _____
Block Valve # _____

Station: _____
Direction of Flow: _____



5 Coating Reports

Vermont Gas
Addison Natural Gas Project
Phase I

Vermont Gas
CLEAN ENERGY. CLEAN AIR.

COATING REPORT - Below Ground

Section: _____ Contractor: _____
Date: _____ Super/Foreman: _____
Report: _____ Weather/Temp: _____
W.O.: _____ County/Town: _____
Inspector: _____ JSA Topic: _____

COATING

From Station	To Station	Total Footage Today	Total Welds Coated Today
00+00	00+00	0	0
00+00	00+00	0	0
00+00	00+00	0	0
00+00	00+00	0	0
00+00	00+00	0	0

AMBIENT CONDITIONS

Time				
Air Temperature				
Wet Bulb Temperature				
Relative Humidity				
Dew Point				
Steel Temperature				
Location / Station#				

SURFACE PREPARATION

Abrasive Type	
Anchor Pattern	
Application Temp.	
Hours Uncoated	
Profile Tape	
Standard	
Comments	

Weld Number	Manufacturer's Name	Manufacturer's Description	Part A Batch Number	Part B Batch Number	Application Method	Average DFT	Min. DFT	Max. DFT

Anchor Profile is to be recorded at 12:00, 3:00, 6:00, & 9:00 O'clock positions for every 10th Mainline Weld and for each Tie In Weld

Comments & Activities:

Attach Testex Tape

Attach Testex Tape

Date: _____ Signature: _____

Vermont Gas

Addison Natural Gas Project
Phase I

COATING REPORT - Above Ground

Section: _____
Date: _____
Report: _____
W.O.: _____
Inspector: _____

Contractor: _____
Super/Foreman: _____
Weather/Temp: _____
County/Town: _____
JSA Topic: _____

LOC.	Primer Dry Film Thickness (mils)				
	12:00	3:00	6:00	9:00	Average
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

LOC.	Primer + Intermediate Dry Film Thickness (mils)				
	12:00	3:00	6:00	9:00	Average
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

LOC.	Primer + Intermediate + Top Coat Dry Film Thickness (mils)				
	12:00	3:00	6:00	9:00	Average
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

		Primer	Intermediate	Top Coat
PRODUCT TYPE & APPLICATION	Date Applied			
	Location / Station #			
	Manufacturer's Name			
	Manufacturer's Description			
	Part A Batch Number			
	Part B Batch Number			
	Thinner Type			
	Thinner Ratio			
	Application Method			
AMBIENT CONDITIONS	Time			
	Air Temperature			
	Wet Bulb Temperature			
	Relative Humidity			
	Dew Point			
	Steel Temperature			
SURFACE PREPARATION	Abrasive Type			
	Anchor Pattern			
	Application Temperature			
	Recoat Time			
	Profile Tape			
	Standard			
DFT (mils)	Minimum DFT			
	Maximum DFT			
	Average DFT			

Location of DFT Measurements & Readings	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Date: _____ Signature: _____

Vermont Gas

Addison Natural Gas Project
Phase I

AKA JEEP REPORT

Coating Repair Report

Section: _____
Date: _____
Report: _____
W.O.: _____
Inspector: _____

Contractor: _____
Super/Foreman: _____
Weather/Temp: _____
County/Town: _____
JSA Topic: _____

JEEPING

From Station	To Station	Total Footage Today	Total Welds Jeeped Today
0+00	0+00	0	0
0+00	0+00	0	0
0+00	0+00	0	0
0+00	0+00	0	0
0+00	0+00	0	0

AMBIENT CONDITIONS

Time				
Air Temperature				
Wet Bulb Temperature				
Relative Humidity				
Dew Point				
Steel Temperature				
Location / Station#				

SURFACE PREP & REPAIR METHOD

Abrasive Type	
Manufacturer	
Manufacturer Desc.	
Part A Batch Number	
Part B Batch Number	
Application Temp.	
Application Method	

Weld Number	Handling, Application, or Factory Holiday	Joint Number	Heat Number	Holiday Type (Scratch, Pin hole, Spatter burn, Other)

Comments & Activities:

Holiday Detector

Unit Serial Number	Voltage Setting	Voltage Calibration Performed (Yes or No)	Repair Method

Date: _____ Inspector Signature: _____

6 Pipe Tally

Vermont Gas
CLEAN ENERGY CLEAN AIR

PIPE TALLY

Vermont Gas
Addison Natural Gas Project
Phase I

	Length (Ft)	Heat Number	Pipe Number	Pipe Condition			Coating Condition			ID Number
				Good	Rebevel	Scrap	Good	Patch	Recoat	
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										
Total:	0.00									

Size		Material/Grade		Seam	
LB./FT.		O.D. Coating Type		End Type	
P.O. No.		Manufacturer		E.O.	
Item/Stock No.		Location From		Location To	

Remarks/Comments

Date:		Signature:	

Sheet of

7 Hydrotest

Vermont Gas
CLEAN ENERGY CLEAN AIR

Addison Natural Gas Project
Phase I
PIPELINE PRESSURE & TEST REPORT

DESCRIPTION

NAME OF SYSTEM OR FACILITY TESTED	Alignment Dwg.	State, County	TEST NO.

PIPE DATA

O.D. (in)	W.T. (in)	GRADE	TYPE	CLASS LOC.*	SEAM FAC	DESIGN FAC "F"	TEMP FAC "T"	INTERNAL PRESSURE (PSI)	FROM STA. NO. TO STA NO.

*For Gas Pipelines Only

DESIGN DATA (LIMITING SECTION)

CODE	TEST FACTOR	DOT		SCOPE
☐ ASME B31.4	☐ 1.25	☐ 192	☐ PIPELINE	☐ NEW CONSTRUCTION
☐ ASME B31.8	☐ 1.10	☐ 195	☐ STATION	☐ REQUALIFICATION
☐ OTHER_____	☐ OTHER_____	☐ OTHER_____		☐ INTERGRITY CHECK
				☐ REPLACEMENT
				☐ OTHER:

FITTINGS ANSI RATING_____ MAX OPERATING PRESSURE_____PSI LIMITING COMPONENT_____

PRESSURE REQUIREMENTS

MIN AT HIGHT POINT_____PSI _____%SMYS MAX AT LOW POINT_____PSI _____%SMYS

MIN AT TEST POINT _____PSI _____%SMYS MAX AT TEST POINT_____PSI _____%SMYS

ELEVATIONS

LOW POINT _____ Ft. @ STATION # _____ HIGH POINT_____ Ft. @ STATION# _____

TEST POINT_____Ft. @ STATION#_____

APPROVED BY PIPELINE ENGINEERING:_____

TEST DATA (Actual Observed Pressures during Test Period)

TEST MEDIUM ☐ WATER ☐ OTHER _____ ☐ ADDITIVE DESCIBE ADDITIVES_____

TEST DATE_____ DURATION OF TEST (hrs)_____ ☐ PIPE WAS EXPOSED & INSPECTED DURING

TEST ☐ PIPE WAS BURIED DURING TEST

MAX. AT LOW POINT_____PSI _____%SMYS MINIMUM TEST PRESSURE AT TEST SITE_____PSI

MINIMUM TEST PRESSURE IN TEST SECTION_____PSI

QUALIFIED TO OPERATE AT_____PSI AT _____

HYDRO-TEST LOG

TEST FAILURES

NO.	DATE	TIME	LOCATION	DESCRIPTION	HOW REPAIRED

PRESSURE AND TEMPERATURE LOG

Test Section No. _____ From Station No. _____ MP_____
To Station No._____ MP_____

Pressure/Temperature Sensor Station No._____

Start of Test Period: Time_____ Date_____

End of Test Period: Time_____ Date_____

No.	Time	Pressure (Dead Weights)	Pipe Temp.	Ambient Temp.	No.	Time	Pressure (Dead Weights)	Pipe Temp.	Ambient Temp.
1.					30.				
2.					31.				
3.					32.				
4.					33.				
5.					34.				
6.					35.				
7.					36.				
8.					37.				
9.					38.				
10.					39.				
11					40.				
12.					41.				
13.					42.				
14.					43.				
15.					44.				
16.					45.				
17.					46.				
18.					47.				
19.					48.				
20.					49.				
21.					50.				
22.					51.				
23.					52.				
24					53.				
25.					54.				
26.					55.				
27.					56.				
28.					57.				
29.					58.				

No.	Time	Pressure (Dead Weights)	Pipe Temp.	Ambient Temp.	No.	Time	Pressure (Dead Weights)	Pipe Temp.	Ambient Temp.
59.					89.				
60.					90.				
61.					91.				
62.					92.				
63.					93.				
64.					94.				
65.					95.				
66.					96.				
67.					97.				
68.					98.				
69.					99.				
70.					100.				
71.					101.				
72.					102.				
73.					103.				
74.					104.				
75.					105.				
76.					106.				
77.					107.				
78.					108.				
79.					109.				
80.					110.				
81.					111.				
82.					112.				
83.					113.				
84.					114.				
85.					115.				
86.					116.				
87.					117.				
88.					118.				

TIME & DATE TEST STARED: _____ STARTING PRESSURE: _____

TIME & DATE TEST ENDED: _____ ENDING PRESSURE: _____

DEADWEIGHT AND RECORDER INFORMATION

DEADWEIGHT CALIBRATION DATE: _____

PRESSURE RECORDER CALIBRATION DATE: _____

TEMPERATURE RECORDER CALIBRATION DATE (specify ambient or pipe temp: _____

TEMPERATURE RECORDER CALIBRATION DATE (specify ambient or pipe temp):_____

DEADWEIGHT Mfg./Range/Serial Number: _____

PRESSURE RECORDER Mfg./Range/Serial Number: _____

TEMPERTURE RECORDER Mfg./Range/Serial Number: _____

TEMPERTURE RECORDER Mfg./Range/Serial Number: _____

Operator Qualified Testing Contractor Print/Sign/Date:_____

Vermont Gas Services Representative: Print/Sign/Date:_____

List of attachments to accompany this report:

- Recorder and deadweight calibration sheets.
- OQ field verification report.
- Drawing of test section (i.e. highlighted detail drawings including sketch of test section configuration showing test boundaries with fill, drain and bleed points).
- MTR's of all temporary materials.

8 Gate Inspector Reports

Vermont Gas

Addison Natural Gas Project
Phase I

GATE-DAILY INSPECTOR REPORT

Section I - Colchester to Williston

Gate Station: _____ Contractor: _____
Date: _____ Super/Foreman: _____
Report: _____ Weather/Temp: _____
W.O.: _____ County/Town: _____
Inspector: _____ JSA Topic: _____
Final Report: ☐ No ☐ Yes

Item or Crew	Activity	Insp	On Schedule	Behind Schedule	Critical Path Issues
	Excavation/Earthwork	☐			
	Concrete	☐			
	Buildings/Structures	☐			
	Equipment	☐			
	Piping/Vessels	☐			
	Electrical	☐			
	Instrumentation	☐			
	Coating/Sandblasting	☐			
	Other	☐			
	Other	☐			

WORK DETAILS/COMMENTS

Construction:

Electrical:

Welding- Shop Fabrication:

Welding- Onsite:

Pressure Testing:

Other:

ECDs and PAY ITEMS (Pay items shown in yellow)				Today	To Date
Silt Fence	LF	00+00	00+00	0	0
Super Silt Fence	LF	00+00	00+00	0	0
Safety Fence	LF	00+00	00+00	0	0
Geotech	SY	00+00	00+00	0	0
Erosion Control/Water Bars	SY	00+00	00+00	0	0
Straw Bales	EA	00+00	00+00	0	0
Temp Culvert w/crush.stone	EA	00+00	00+00	0	0
Temp Culvert	EA	00+00	00+00	0	0
Timber Mats	LF	00+00	00+00	0	0
Winter Stabilization	AC	00+00	00+00	0	0
Trench Breakers	EA	00+00	00+00	0	0
Pipe Sacks/Saddlebags	EA	00+00	00+00	0	0
Select Fill/Sand	CY	00+00	00+00	0	0
Concrete Coated Pipe	LF	00+00	00+00	0	0
Rock Haul Away	CY	00+00	00+00	0	0
Stabilized Constr Entrance	CU FT	00+00	00+00	0	0
Mat Cleaning	EA	00+00	00+00	0	0
Wash Stations	EA	00+00	00+00	0	0

WELDING

	Today	To Date	Comments:	
Welds	0	0	Total Welds	0
NDT	0	0		
Rejected	0	0	Rejection Rate	#DIV/0!
Repairs	0	0		
Cut Out	0	0		
Other Welds	0	0		

Safety Issues:

Contractor Downtime **Hours & Reason:**

Agency Visitors

Agency	Name	Number	Comments

Landowner or Protester Interaction (if protester request for information, or landowner request or complaint, direct them to Dave Walker, RoW Manager, 802.951.0368 and provide his business card)

Hours Worked: **Signature:**

CHANGE ORDER WORK	Change Order Number:	

Time and Materials

Contractor Personnel

Name	Position	Hours	Comments

Equipment

Description	Equip #	Rent	Own	Comments
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	

Materials

Description	Quantity	Location/Station	Comments

Vermont Gas

Addison Natural Gas Project
Phase I

Vermont Gas
CLEAN ENERGY. CLEAN AIR.

GATE-CHIEF INSPECTOR REPORT

Section I - Colchester to Williston

Gate: _____
Date: _____
Report: _____
W.O.: _____
Inspector: _____

Contractor: _____
Super/Foreman: _____
Weather/Temp: _____
Country/Town: _____
JSA Topic: _____
Final Report: ☐ No ☐ Yes

Item/Crew		% Today	% To Date	Begin Date	End Date
	GENERAL PROJECT	0.00%	0.00%		
	Mobilization	0.00%	0.00%		
	Clearing and Grading				
	CIVIL WORK	0.00%	0.00%		
	Excavation	0.00%	0.00%		
	Backfill and Compaction to Subgrade	0.00%	0.00%		
	Traffic Bollards	0.00%	0.00%		
	Clean Stone and Gravel to Finish Grade	0.00%	0.00%		
	Paved Drive Way and Access Road	0.00%	0.00%		
	Permanent Security Fence				
	FOUNDATIONS	0.00%	0.00%		
	Meter & Regulator Building	0.00%	0.00%		
	DAC Building	0.00%	0.00%		
	Gas Heater Concrete Pad	0.00%	0.00%		
	Concrete Sleeper Supports	0.00%	0.00%		
	Filter Piping Sonotube Supports				
	PIPING	0.00%	0.00%		
	Filter Piping	0.00%	0.00%		
	Gas Heater Piping	0.00%	0.00%		
	Meter and Regulator Runs	0.00%	0.00%		
	Piping to Mainline Tie-In	0.00%	0.00%		
	Piping to Distribution Tie-In	0.00%	0.00%		
	Fuel Gas to Heater	0.00%	0.00%		
	Pressure Testing				
	INSTRUMENTATION	0.00%	0.00%		
	Meter & Regulator Building	0.00%	0.00%		
	Gas Heater	0.00%	0.00%		
	DAC Building	0.00%	0.00%		
	Gas Filter				
	ELECTRICAL	0.00%	0.00%		
	Grounding Grid	0.00%	0.00%		
	Underground Conduit	0.00%	0.00%		
	Meter & Regulator Building	0.00%	0.00%		
	DAC Building	0.00%	0.00%		
	Cables Pulled	0.00%	0.00%		
	Terminations at Panels and Devices	0.00%	0.00%		
	Electric Service to Facility	0.00%	0.00%		
	Communciations Service to Facility (telephone)	0.00%	0.00%		
	Security System				

Item/Crew	BUILDINGS AND EQUIPMENT	% Today	% To Date	Begin Date	End Date
	Meter & Regulator Building	0.00%	0.00%		
	DAC Building	0.00%	0.00%		
	Gas Heater	0.00%	0.00%		
	OTHER				
	Painting / Coating	0.00%	0.00%		
	Commissioning	0.00%	0.00%		
	Final Restoration	0.00%	0.00%		

WORK DETAILS/COMMENTS

Civil Work	**Inspector:**		**Subcontractor:**	
Foundations	**Inspector:**		**Subcontractor:**	
Piping	**Inspector:**		**Subcontractor:**	
Instrumentation	**Inspector:**		**Subcontractor:**	
Electrical	**Inspector:**		**Subcontractor:**	
Buildings & Equipment	**Inspector:**		**Subcontractor:**	
Other	**Inspector:**		**Subcontractor:**	

Item	ECDs and PAY ITEMS (Pay items shown in yellow)				Today	To Date
	Silt Fence	LF	00+00	00+00	0	0
	Super Silt Fence (reinforced)	LF	00+00	00+00	0	0
	Safety Fence	LF	00+00	00+00	0	0
	Geotech	SY	00+00	00+00	0	0
	Erosion Control Fabric	SY	00+00	00+00	0	0
	Straw Bales	BALE	00+00	00+00	0	0
	Temp Culvert w/crushed stone	EACH	00+00	00+00	0	0
	Temp Culvert w/o crushed stone	EACH	00+00	00+00	0	0
	Timber Mats	LF	00+00	00+00	0	0
	Winter Stabilization	ACRE	00+00	00+00	0	0
	Trench Breakers	EACH	00+00	00+00	0	0
	Pipe Sacks/Saddlebags	EACH	00+00	00+00	0	0
	Select Fill/Sand	LOAD	00+00	00+00	0	0
	Concrete Coated Pipe	LF	00+00	00+00	0	0
	Rock Haul Away	LOAD	00+00	00+00	0	0
	Stabilized Construction Entrance	CU FT	00+00	00+00	0	0
	Mat Cleaning	EACH	00+00	00+00	0	0
	Wash Stations	EACH	00+00	00+00	0	0

Welding

	Welds-Installed			Welds-Rejected					Welds-Temporary		
	Weld Count	Cut-Out for Engineering	Total Welds Installed	Reject Welds	Reject Repair	Reject Cut-Out	Reject Balance	Reject Rate	Welds X-Rayed	Welds Rejected	Welds Balance
Previous	0	0	0	0	0	0	0	0.0%	0	0	0
Today	0	0	0	0	0	0	0	0.0%	0	0	0
To Date	0	0	0	0	0	0	0	0.0%	0	0	0

Comments

SAFETY ISSUES

Contractor Downtime	Hours:		Reason:	

Agency Visitors

Agency	Name	Number	Comments

Land Owner or Protester Interaction (if protester request for information, or landowner request or complaint, direct them to Dave Walker, VGS RoW Manager, 802.951.0368 and provide his business card.)

Hours Worked:		**Signature:**	
CHANGE ORDER WORK		**Change Order Number:**	

Time and Materials

Contractor Personnel

Name	Position	Hours	Comments

Equipment

Description	Equip #	Rent	Own	Comments
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	

Materials			
Description	Quantity	Location/Station	Comments

Comments

9 HDD Inspector Reports

Vermont Gas

Addison Natural Gas Project
Phase I

Vermont Gas
CLEAN ENERGY. CLEAN AIR.

HDD-Daily Inspector Report

Section I - Colchester to Williston

Date: _____ Contractor: _____

Report: _____ Super/Foreman: _____

W.O.: _____ Weather/Temp: _____

Inspector: _____ County/Town: _____

Final Report: ☐ No ☐ Yes JSA Topic: _____

Item or Crew	HDD # and Name:						Estimated Length:	0
	PASS		Station From	Station To	Estimated Footage Today	Estimated Footage To Date	Estimated % of Completion	Comments
	Casing		00+00	00+00	0	0	#DIV/0!	
	Pilot Hole		00+00	00+00	0	0	#DIV/0!	
	First Ream		00+00	00+00	0	0	#DIV/0!	
	Second Ream		00+00	00+00	0	0	#DIV/0!	
	Third Ream		00+00	00+00	0	0	#DIV/0!	
	Fourth Ream		00+00	00+00	0	0	#DIV/0!	
	Swab		00+00	00+00	0	0	#DIV/0!	
	Pull Back		00+00	00+00	0	0	#DIV/0!	
	Other		00+00	00+00	0	0	#DIV/0!	
	Other		00+00	00+00	0	0	#DIV/0!	
Item	ECDs and PAY ITEMS (Pay items shown in yellow)				Today	To Date		
	Silt Fence	LF	00+00	00+00	0	0		
	Super Silt Fence	LF	00+00	00+00	0	0		
	Safety Fence	LF	00+00	00+00	0	0		
	Geotech	SY	00+00	00+00	0	0		
	Erosion Control/Water Bars	SY	00+00	00+00	0	0		
	Straw Bales	EA	00+00	00+00	0	0		
	Temp Culvert w/crush.stone	EA	00+00	00+00	0	0		
	Temp Culvert	EA	00+00	00+00	0	0		
	Timber Mats	LF	00+00	00+00	0	0		
	Winter Stabilization	AC	00+00	00+00	0	0		
	Trench Breakers	EA	00+00	00+00	0	0		
	Pipe Sacks/Saddlebags	EA	00+00	00+00	0	0		
	Select Fill/Sand	LOAD	00+00	00+00	0	0		
	Concrete Coated Pipe	LF	00+00	00+00	0	0		
	Rock Haul Away	LOAD	00+00	00+00	0	0		
	Stabilized Const Entrance	CU FT	00+00	00+00	0	0		
	Cleaning Mats	EA	00+00	00+00	0	0		
	Wash Stations	EA	00+00	00+00	0	0		

COMMENTS

Welding and X-rays

Rejected Welds

	Weld Count	Rejected	Reject Rate	Reject Repaired	Reject Balance	Reject Cut Out	Cut Out for Engineering
Today	0	0	0%	0	0	0	0
To Date	0	0	0%	0	0	0	0

Temporary Welds

	Temporary Welds X-Rayed	Temporary Welds Cut Out	Balance	Total Welds Installed	Comments
Today	0	0	0	0	
To Date	0	0	0	0	

WORK DETAILS/COMMENTS

Safety Issues

Contractor Downtime

Hours/Reason:	

PUBLIC INTERACTION

Agency Visitors

Agency	Contact Name	Number	Comments

Land Owner or Protestor Interaction: (if protester request for information or landowner request or complaint direct them to Dave Walker, VGS RoW Manager, 802.951.0368 and provide his business card)

Hours Worked:		Signature:	

CHANGE ORDER WORK	Change Order Number:	

Time and Materials

Item	Contractor Personnel			
	Name	Title	Hours	Comments

Equipment

	Description	Equipment #	Rent	Own	Comments
			☐	☐	
			☐	☐	
			☐	☐	
			☐	☐	
			☐	☐	
			☐	☐	
			☐	☐	
			☐	☐	
			☐	☐	
			☐	☐	

Materials

	Description	Quantity	Loc/Station #	Comments

Vermont Gas

Addison Natural Gas Project
Phase I

Vermont Gas
CLEAN ENERGY. CLEAN AIR.

HDD-CHIEF REPORT

Section I - Colchester to Williston

Section: _____
Date: _____
Report: _____
Final Report: ☐ No ☐ Yes

Contractor: _____
Weather/Temp: _____
County/Town: _____
Chief Inspector: _____

HDD

Item	HDD # 1 - Sand Plains			Actual Total Drill Footage =		
	Description	Estimated Drill Footage	Station From	Station To	Estimated Footage to Date	Estimated % of Comp.
	Pilot Hole		00+00	00+00	0	#DIV/0!
	Reeming		00+00	00+00	0	#DIV/0!
	Swab		00+00	00+00	0	#DIV/0!
	Pull-back	0	00+00	00+00	0	#DIV/0!
Foreman:		Inspector:			Hours Worked:	

Item	HDD # 2 - Winooski River			Actual Total Drill Footage =		
	Description	Estimated Drill Footage	Station From	Station To	Estimated Footage to Date	Estimated % of Comp.
	Pilot Hole		00+00	00+00	0	0%
	Reeming		00+00	00+00	0	0%
	Swab		00+00	00+00	0	0%
	Pull-back	940	00+00	00+00	0	0%
Foreman:		Inspector:			Hours Worked:	

Item	HDD # 3 - 2A			Actual Total Drill Footage =		
	Description	Estimated Drill Footage	Station From	Station To	Estimated Footage to Date	Estimated % of Comp.
	Pilot Hole		00+00	00+00	0	#DIV/0!
	Reeming		00+00	00+00	0	#DIV/0!
	Swab		00+00	00+00	0	#DIV/0!
	Pull-back	0	00+00	00+00	0	#DIV/0!
Foreman:		Inspector:			Hours Worked:	

Item	HDD # 4 - I-89/Hurricane Lane			Actual Total Drill Footage =		
	Description	Estimated Drill Footage	Station From	Station To	Estimated Footage to Date	Estimated % of Comp.
	Pilot Hole		00+00	00+00	0	0
	Reeming		00+00	00+00	0	0
	Swab		00+00	00+00	0	0
	Pull-back	880	00+00	00+00	0	0
oreman:		Inspector:			Hours Worked:	

Item	HDD # 5 - LaPlatte River (Section II - Williston to ??)			Actual Total Drill Footage =		
	Description	Estimated Drill Footage	Station From	Station To	Estimated Footage to Date	Estimated % of Comp.
	Pilot Hole		00+00	00+00	0	0
	Reeming		00+00	00+00	0	0
	Swab		00+00	00+00	0	0
	Pull-back	675	00+00	00+00	0	0
Foreman:		Inspector:			Hours Worked:	

Item	ECDs and PAY ITEMS (Pay items shown in yellow)				Today	To Date
	Silt Fence	LF	00+00	00+00	0	0
	Super Silt Fence	LF	00+00	00+00	0	0
	Safety Fence	LF	00+00	00+00	0	0
	Erosion Control Fabric	SY	00+00	00+00	0	0
	Straw Bales	BALE	00+00	00+00	0	0
	Temp Culvert w/crushed stone	EACH	00+00	00+00	0	0
	Temp Culvert w/o crushed stone	EACH	00+00	00+00	0	0
	Timber Mats	LF	00+00	00+00	0	0
	Winter Stabilization	ACRE	00+00	00+00	0	0
	Trench Breakers	EACH	00+00	00+00	0	0
	Pipe Sacks/Saddlebags	EACH	00+00	00+00	0	0
	Select Fill/Sand	LOAD	00+00	00+00	0	0
	Concrete Coated Pipe	EACH	00+00	00+00	0	0
	Rock Haul Away	LOAD	00+00	00+00	0	0
	Stabilized Construction Entrance	CU FT	00+00	00+00	0	0
	Cleaning Mats	EACH	00+00	00+00	0	0
	Wash Stations	EACH	00+00	00+00	0	0

Safety Issues

Contractor Downtime

Hours/Reason:

PUBLIC INTERACTION

Agency Visitors

Agency	Contact Name	Number	Comments

Land Owner or Protestor Interaction: (if protester request for information or landowner request or complaint direct them to Dave Walker, VGS RoW Manager, 802.951.0368 and provide his business card)

Welding and X-rays

Sand Plains	Rejected Welds						
	Weld Count	Rejected	Reject Rate	Reject Repaired	Reject Balance	Reject Cut Out	Cut Out for Engineering
Today	0	0	0%	0	0	0	0
To Date	0	0	0%	0	0	0	0

Sand Plains	Temporary Welds				
	Temporary Welds X-Rayed	Temporary Welds Cut Out	Balance	Total Welds Installed	Comments
Today	0	0	0	0	
To Date	0	0	0	0	

Winooski River	Rejected Welds						
	Weld Count	Rejected	Reject Rate	Reject Repaired	Reject Balance	Reject Cut Out	Cut Out for Engineering
Today	0	0	0%	0	0	0	0
To Date	0	0	0%	0	0	0	0

Winooski River	Temporary Welds				
	Temporary Welds X-Rayed	Temporary Welds Cut Out	Balance	Total Welds Installed	Comments
Today	0	0	0	0	
To Date	0	0	0	0	

2A	Rejected Welds						
	Weld Count	Rejected	Reject Rate	Reject Repaired	Reject Balance	Reject Cut Out	Cut Out for Engineering
Today	0	0	0%	0	0	0	0
To Date	0	0	0%	0	0	0	0

2A	Temporary Welds				
	Temporary Welds X-Rayed	Temporary Welds Cut Out	Balance	Total Welds Installed	Comments
Today	0	0	0	0	
To Date	0	0	0	0	

Equipment				
Item	Description & Equipment #	Rent	Own	Comments
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	

Materials				
Item	Description	Quantity	Location/Station	Comments

10 Main Line Inspector Reports

Vermont Gas

Addison Natural Gas Project
Phase I

Vermont Gas
CLEAN ENERGY CLEAN AIR

ML-DAILY INSPECTOR REPORT

Section I - Colchester to Williston

Section: _____
Date: _____
Report: _____
W.O.: _____
Inspector: _____

Contractor: _____
Super/Foreman: _____
Weather/Temp: _____
County/Town: _____
JSA Topic: _____
Final Report: ☐ No ☐ Yes

Item	Activity	Insp	Station From	Station To	Footage Today	Footage to Date
	Pre-Const Survey/Video	☐	00+00	00+00	0	0
	ECD Installation	☐	00+00	00+00	0	0
	Temp Fencing/Gates	☐	00+00	00+00	0	0
	Clearing and Grubbing	☐	00+00	00+00	0	0
	Grading	☐	00+00	00+00	0	0
	Machine Trenching	☐	00+00	00+00	0	0
	Excavator Trenching	☐	00+00	00+00	0	0
	Rock Removal-Mechanical	☐	00+00	00+00	0	0
	Rock Removal-Blasting	☐	00+00	00+00	0	0
	Loading and Hauling Soils	☐	00+00	00+00	0	0
	Hauling and Stringing	☐	00+00	00+00	0	0
	Bending and Setup	☐	00+00	00+00	0	0
	Lowering In	☐	00+00	00+00	0	0
	Welding	☐	00+00	00+00	0	0
	Welding-Tie-In	☐	00+00	00+00	0	0
	Welding-Tie-In-Final	☐	00+00	00+00	0	0
	NDT	☐	00+00	00+00	0	0
	Coating-Below Ground	☐	00+00	00+00	0	0
	Coating-Above Ground	☐	00+00	00+00	0	0
	CP-Zinc Ribbon	☐	00+00	00+00	0	0
	CP-Anodes	☐	00+00	00+00	0	0
	Padding and Compaction	☐	00+00	00+00	0	0
	Backfill	☐	00+00	00+00	0	0
	Permanent Fencing/Gates	☐	00+00	00+00	0	0
	Clean-up Rough	☐	00+00	00+00	0	0
	Clean-up Final	☐	00+00	00+00	0	0
	Road Crossing Cased	☐	00+00	00+00	0	0
	Road Crossing Uncased	☐	00+00	00+00	0	0
	Boring	☐	00+00	00+00	0	0
	HDD-Pilot Hole	☐	00+00	00+00	0	0
	HDD-Reaming	☐	00+00	00+00	0	0
	HDD-Pullback	☐	00+00	00+00	0	0
	HDD-Hydro-Aboveground	☐	00+00	00+00	0	0
	HDD-Hydro-Belowground	☐	00+00	00+00	0	0
	Hydrotest-Final	☐	00+00	00+00	0	0
	Drying	☐	00+00	00+00	0	0
	Pigging	☐	00+00	00+00	0	0
	Drain Tile Repair	☐	00+00	00+00	0	0
	Road Cleaning	☐	00+00	00+00	0	0
	Pipe Offload and Tally	☐			0	0

WORK DETAILS/COMMENTS

Item	ECDs and PAY ITEMS (Pay items shown in yellow)					
	Silt Fence	LF	00+00	00+00	0	0
	Super Silt Fence (reinforced)	LF	00+00	00+00	0	0
	Safety Fence	LF	00+00	00+00	0	0
	Geotech	SY	00+00	00+00	0	0
	Erosion Control Fabric	SY	00+00	00+00	0	0
	Straw Bales	BALE	00+00	00+00	0	0
	Temp Culvert w/crushed stone	EACH	00+00	00+00	0	0
	Temp Culvert w/o crushed stone	EACH	00+00	00+00	0	0
	Timber Mats	LF	00+00	00+00	0	0
	Winter Stabilization	ACRE	00+00	00+00	0	0
	Trench Breakers	EACH	00+00	00+00	0	0
	Pipe Sacks/Saddlebags	EACH	00+00	00+00	0	0
	Select Fill/Sand	LOAD	00+00	00+00	0	0
	Concrete Coated Pipe	LF	00+00	00+00	0	0
	Rock Haul Away	LOAD	00+00	00+00	0	0
	Stabilized Construction Entrance	CU FT	00+00	00+00	0	0
	Mat Cleaning	EACH	00+00	00+00	0	0
	Wash Stations	EACH	00+00	00+00	0	0

Welding and X-rays

	Rejected Welds					
	Weld Count	Rejected	Reject Rate	Reject Repaired	Reject Balance	Reject Cut Out
Today	0	0	0%	0	0	0
To Date	0	0	0%	0	0	0

	Rejected Welds	Temporary Welds			
	Cut Out for Engineering	Temporary Welds X-Rayed	Temporary Welds Cut Out	Balance	Total Welds Installed
Today	0	0	0	0	0
To Date	0	0	0	0	0

BORING

Location (station/road/railroad)	Length (pit face to pit face)	Pipe (length and type)

Safety Issues

Contractor Downtime	Hours & Reason:	

PUBLIC INTERACTION

ncy Visitors

Agency	Name	Number	Comments

Land Owner or Protestor Interaction (If protester request for information or landowner request or complaint direct them to Dave Walker, VGS RoW Manager, 802.951.0368 and provide his business card.)

Hrs Wkd:		Signature:	
CHANGE ORDER WORK		**Change Order Number:**	

Time and Materials

Contractor Personnel

Item	Name	Position	Hours	Comments

Equipment

Item	Equipment	Rent	Own	Comments
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	
		☐	☐	

Materials

Item	Description	Quantity	Loc/Station #	Comments

Vermont Gas Systems
Addison Natural Gas Project
Phase I

COMPILED DAILY CONSTRUCTION REPORT

Section I - Colchester to Williston

Report No.: 0000
Date:
Weather/Temp:
Const. Mgr.
Chief Insp.:
Prepared By:
Final Report: ☐ No ☐ Yes

Item or Crew	Description	Unit	Station From	Station To	Footage Today	Footage Previous	Footage to Date
	General Construction						
	Mobilization	%			0	0	0
	Pipe Offload and Tally						
Crew	**PRE-PIPE LAY**						
	Survey	LF	0+00	0+00	0	0	0
		LF	0+00	0+00	0	0	0
		LF	0+00	0+00	0	0	0
		LF	0+00	0+00	0	0	0
							0
	Resource Delineation	LF	0+00	0+00	0	0	0
		LF	0+00	0+00	0	0	0
		LF	0+00	0+00	0	0	0
		LF	0+00	0+00	0	0	0
							0
	Pre-construction Survey (Video)	LF	0+00	0+00	0	0	0
		LF	0+00	0+00	0	0	0
							0
	Matting	LF	0+00	0+00	0	0	0
		LF	0+00	0+00	0	0	0
		LF	0+00	0+00	0	0	0
		LF	0+00	0+00	0	0	0
							0
	Foreign Line Locating	LF	0+00	0+00	0	0	0
		LF	0+00	0+00	0	0	0
		LF	0+00	0+00	0	0	0
		LF	0+00	0+00	0	0	0
							0
	Clear and Grade	LF	0+00	0+00	0	0	0
		LF	0+00	0+00	0	0	0
		LF	0+00	0+00	0	0	0
							0
	Ditching						
	TRENCHER	LF	0+00	0+00	0	0	0
	Excavator	LF	0+00	0+00	0	0	0
		LF	0+00	0+00	0	0	0
							0
Crew	**PIPE LAY** (Bending and Handling Footage is same as Pipe Install)						
	Conventional Lay	LF	0+00	0+00	0	0	0
		LF	0+00	0+00	0	0	0
		LF	0+00	0+00	0	0	0
		LF	0+00	0+00	0	0	0
							0
	Bores	LF	0+00	0+00	0	0	0
		LF	0+00	0+00	0	0	0
		LF	0+00	0+00	0	0	0
		LF	0+00	0+00	0	0	0
							0
Crew	**BACKFILL/RESTORATION**						
	Backfill	LF	0+00	0+00	0	0	0
		LF	0+00	0+00	0	0	0
		LF	0+00	0+00	0	0	0
		LF	0+00	0+00	0	0	0
							0
	Final Clean-Up	LF	0+00	0+00	0	0	0
		LF	0+00	0+00	0	0	0
		LF	0+00	0+00	0	0	0
		LF	0+00	0+00	0	0	0
							0

BACKFILL/RESTORATION CON'T							
	Restoration	LF	0+00	0+00	0	0	0
		LF	0+00	0+00	0	0	0
		LF	0+00	0+00	0	0	0
		LF	0+00	0+00	0	0	0
							0

Crew	Colchester Launcher			
	Site		0%	0%	0%
	Welding		0%	0%	0%
	Clean-Up		0%	0%	0%
					0%

Main Line Valves					
MLV # 1	Welding		0%	0%	0%
	Electric		0%	0%	0%
	Site		0%	0%	0%
MLV # 2	Welding		0%	0%	0%
	Electric		0%	0%	0%
	Site		0%	0%	0%
MLV # 3	Welding		0%	0%	0%
	Electric		0%	0%	0%
	Site		0%	0%	0%

HDD							
Crew	HDD#1-Sand Plains	0,000'	0%	(Estimated)	HDD#1 Overall % Complete		0%
	Site Prep						0%
	String				Joints	0	0' 0%
	Welded				Welds	0	0' 0%
	Coated				Welds	0	0' 0%
	Pre-Tested						0' 0%
	Installed						0' 0%
	Post Test						0' 0%
	Caliper Pig Run		Footage from (ILI Contractor)Report recorded distance				0' 0%
	HDD#2-Winooski River	0,000'	0%	(Estimated)	HDD#2 Overall % Complete		0%
	Site Prep						0%
	String				Joints	0	0' 0%
	Welded				Welds	0	0' 0%
	Coated				Welds	0	0' 0%
	Pre-Tested						0' 0%
	Installed						0' 0%
	Post Test						0' 0%
	Caliper Pig Run		Footage from (ILI Contractor)Report recorded distance				0' 0%
	HDD#3-2A	0,000'	0%	(Estimated)	HDD#3 Overall % Complete		0%
	Site Prep						0%
	String				Joints	0	0' 0%
	Welded				Welds	0	0' 0%
	Coated				Welds	0	0' 0%
	Pre-Tested						0' 0%
	Installed						0' 0%
	Post Test						0' 0%
	Caliper Pig Run		Footage from (ILI Contractor)Report recorded distance				0' 0%
	HDD#4-I-89/Hurricane Ln	0,000'	0%	(Estimated)	HDD#4 Overall % Complete		0%
	Site Prep						0%
	String				Joints	0	0' 0%
	Welded				Welds	0	0' 0%
	Coated				Welds	0	0' 0%
	Pre-Tested						0' 0%
	Installed						0' 0%
	Post Test						0' 0%
	Caliper Pig Run		Footage from (ILI Contractor)Report recorded distance				0' 0%
	HDD#5-LaPlatte River	0,000'	0%	(Estimated)	HDD#4 Overall % Complete		0%
	Site Prep						0%
	String				Joints	0	0' 0%
	Welded				Welds	0	0' 0%
	Coated				Welds	0	0' 0%
	Pre-Tested						0' 0%
	Installed						0' 0%
	Post Test						0' 0%
	Caliper Pig Run		Footage from (ILI Contractor)Report recorded distance				0' 0%

Cathodic Protection					Today	Previous	To Date
	Deep Well Anode	EA	0+00	0+00	0	0	0
	Surface Anode Ground bed	EA	0+00	0+00	0	0	0
	Typical zinc ribbon	EA	0+00	0+00	0	0	0
	Rectifiers	EA	0+00	0+00	0	0	0
	Type T1 Standard Coupon Test Station	EA	0+00	0+00	0	0	0
	Type T2 Test Station Concentric Coupon Assembly	EA	0+00	0+00	0	0	0
	Type T3 Standard IR Drop Test Station	EA	0+00	0+00	0	0	0
	Type T4 Below Grade Isolation Flange Bond Test Station	EA	0+00	0+00	0	0	0
	Type T4P Below Grade Isolation Flange Bond Test Station with PCR	EA	0+00	0+00	0	0	0
	Type T5 IR Drop / Casing Test Stations	EA	0+00	0+00	0	0	0
	Type T6 Casing Test Station	EA	0+00	0+00	0	0	0
	Type T7 Bond Test Station at foreign Line Crossing	EA	0+00	0+00	0	0	0
	Above Ground Isolation Flange with PCR	EA	0+00	0+00	0	0	0
	Above Ground Isolation Flange with SSD	EA	0+00	0+00	0	0	0
	Casing	LF	0+00	0+00	0	0	0
	Bore Hole for linear anode installation	LF	0+00	0+00	0	0	0
						Cathodic Protection % Complete to date:	0.00%

Gate Stations

Williston Gate Station

	General	0%					0%
	Civil Work	0%					0%
	Foundation	0%					0%
	Piping	0%					0%
	Instrumentation	0%					0%
	Electrical	0%					0%
	Buildings	0%					0%
	Insulation	0%					0%
	Painting/Coating	0%					0%
	Commissioning	0%					0%
	Final Restoration	0%					0%
							0%

ECDs and PAY ITEMS (Pay items shown in yellow)				Today	Previous	To Date
Silt Fence	LF	00+00	00+00	0	0	0
Super Silt Fence	LF	00+00	00+00	0	0	0
Safety Fence	LF	00+00	00+00	0	0	0
Geotech	SY	00+00	00+00	0	0	0
Erosion Control Fabric	SY	00+00	00+00	0	0	0
Straw Bales	BALE	00+00	00+00	0	0	0
Temporary Culvert - with Crushed Stone	EACH	00+00	00+00	0	0	0
Temporary Culvert - without Crushed Stone	EACH	00+00	00+00	0	0	0
Timber Construction Mats	LF	00+00	00+00	0	0	0
Winter Stabilization	ACRE	00+00	00+00	0	0	0
Trench Breakers	EACH	00+00	00+00	0	0	0
Pipe Sacks/Saddlebags	EACH	00+00	00+00	0	0	0
Select Fill/Sand	LOAD	00+00	00+00	0	0	0
Concrete Coated Pipe	LF	00+00	00+00	0	0	0
Rock Haul Away	LOAD	00+00	00+00	0	0	0
Stabilized Construction Entrance	CU FT	00+00	00+00	0	0	0
Mat Cleaning	EACH	00+00	00+00	0	0	0
Wash Stations	EACH	00+00	00+00	0	0	0

Safety Issues

Today's Activities

Contractor:		Foreman:		Crew:		Location:		Inspector:	

Contractor:		Foreman:		Crew:		Location:		Inspector:	

Contractor:		Foreman:		Crew:		Location:		Inspector:	

Contractor:		Foreman:		Crew:		Location:		Inspector:	

Contractor:		Foreman:		Crew:		Location:		Inspector:	

Contractor:		Foreman:		Crew:		Location:		Inspector:	

Contractor:		Foreman:		Crew:		Location:		Inspector:	

Contractor:		Foreman:		Crew:		Location:		Inspector:	

Contractor Downtime

Contractor:		Hours and Reason:	
Contractor:		Hours and Reason:	
Contractor:		Hours and Reason:	
Contractor:		Hours and Reason:	

Public Interaction

Agency Visitors

Agency	Name	Number	Comments (reason for visit/report/write-up)

Land Owner or Protestor Interaction **(if protester request for information or landowner request or complaint direct them to Dave Walker, VGS RoW Manager, 802.951.0337 and provide his business card)**

Welding

ML	Welds Installed			Rejected Welds					Temporary Welds		
	Weld Count	Cut-Out for Eng.	Total Welds Installed	Rejected Welds	Reject Repair	Reject Cut-Out	Reject Balance	Reject Rate	Welds X-Rayed	Welds Removed	Welds Balance
Previous	0	0	0	0	0	0	0	0.0%	0	0	0
Today	0	0	0	0	0	0	0	0.0%	0	0	0
To Date	0	0	0	0	0	0	0	0.0%	0	0	0
Comments											

HDD	Welds Installed			Rejected Welds					Temporary Welds		
	Weld Count	Cut-Out for Eng.	Total Welds Installed	Rejected Welds	Reject Repair	Reject Cut-Out	Reject Balance	Reject Rate	Welds X-Rayed	Welds Removed	Welds Balance
Previous	0	0	0	0	0	0	0	0.0%	0	0	0
Today	0	0	0	0	0	0	0	0.0%	0	0	0
To Date	0	0	0	0	0	0	0	0.0%	0	0	0
Comments											

M&R	Welds Installed			Rejected Welds					Temporary Welds		
	Weld Count	Cut-Out for Eng.	Total Welds Installed	Rejected Welds	Reject Repair	Reject Cut-Out	Reject Balance	Reject Rate	Welds X-Rayed	Welds Removed	Welds Balance
Previous	0	0	0	0	0	0	0	0.0%	0	0	0
Today	0	0	0	0	0	0	0	0.0%	0	0	0
To Date	0	0	0	0	0	0	0	0.0%	0	0	0
Comments											

Hours:		Signature:	

MISC

VERMONT GAS ADDISON NATURAL GAS PROJECT

SCOPE OF WORK AND SPECIFICATIONS

1. **GENERAL**
   a. The work shall be carried out in accordance with these Construction Specifications, The U.S. Department of Transportation Title 49CFR Part 192 – Transportation of Natural Gas and Other Gas by Pipeline, ASME B31.8 and API 1104. In addition the WORK shall be performed in strict compliance with the CONFORMED **DOCUMENTS,** good engineering practice and industry accepted pipeline construction and installation techniques, and all applicable rules and regulations. The work shall strictly adhere to the most current version of the Vermont Gas Systems (VGS), Inc. Operation and Maintenance Manual and Operating Procedures. The requirements detailed in the VGS Operation and Maintenance Manual and Operating Procedures shall supersede any other specifications provided with the Project Manual.
   b. The Addison Natural Gas Project has been divided into four contracts; Transmission, Horizontal Directional Drilling, Meter & Regulation Stations, and Distribution. It is a requirement of the Transmission Contract to coordinate and cooperate with other Contractors working on other/adjacent areas of the project.
2. **SURVEYS**
   a. All pre-construction, construction, and as-built survey shall be the responsibility of the **COMPANY,** and jointly coordinated between the **CONTRACTOR** and the **COMPANY. CONTRACTOR** is responsible for coordinating the survey needs via the designated **COMPANY** representative, so it does not impact work.
   b. The **COMPANY** shall reserve the right to make any minor changes in the pipeline route and such changes shall in no manner alter the terms of compensation payable under this **CONTRACT** except as they are affected by linear measurements of the work completed.
   c. The COMPANY shall stake the edges of the RIGHT-OF-WAY at regular intervals. These stakes shall remain along the RIGHT-OF-WAY for the duration of the job and be removed as part of final clean up operations when authorized by COMPANY.
   d. The **CONTRACTOR** shall be held responsible for the preservation of all stakes and field markings. If any of the stakes or field markings are disturbed by the contractor, the cost of replacing them shall be borne by the **CONTRACTOR.** When it becomes necessary to move such stakes, the **CONTRACTOR** will relocate them to the spoil side of the RIGHT-OF-WAY in a line approximately perpendicular to the centerline of the pipeline location and opposite the original location of the stake.

Add "ANGP Scope of Work and Narrative Specification" for a prefix to the page #

e. The **CONTRACTOR** shall perform necessary field surveys for the proper grading of the trench and the bending of pipe, and for other such pipeline installations.

f. Refer to the following for additional information:

   A. Specification 017839 – Project Record Documents

   B. Supplemental Conditions

3. **RIGHTS-OF-WAY**

   a. The CONSTRUCTION RIGHT-OF-WAY shall be as shown on the DRAWINGS with such minor modifications as may be approved in the field by the **COMPANY.** The CONSTRUCTION RIGHT-OF-WAY may include a portion of the existing RIGHT-OF-WAY, new easements, and/or ADDITIONAL TEMPORARY WORK SPACE (ATWS) where such have been acquired by the **COMPANY.** In addition the standard CONSTRUCTION RIGHT-OF-WAY widths may be reduced substantially in certain areas, as indicated on the DRAWINGS.

   b. In negotiating any **CONTRACTOR** obtained third party agreement, the **COMPANY** will require a **COMPANY AGENT** accompany the **CONTRACTOR AGENT.** **All agreements shall be in writing and furnished to the COMPANY prior to any authorized activity.**

   c. The **COMPANY** will procure RIGHTS-OF-WAY for construction of said pipeline. For the **CONTRACTOR'S** construction operations, the COMPANY will provide construction RIGHT-OF-WAY that, unless specified otherwise in construction permits, RIGHT-OF-WAY Agreements, CONSTRUCTION LINE LISTS or on DRAWINGS will typically consist of 25ft of TEMPORARY WORK SPACE. **Working over existing** gas **pipelines shall be strictly prohibited.** The COMPANY will provide and furnish necessary federal, state, city, or other highway opening permits, and environmental permits for construction of the pipeline as proposed in the DRAWINGS and SPECIFICATIONS. CONTRACTOR shall be responsible for obtaining all travel or over the road permits relating to the hauling of their equipment, and company supplied pipe and/or materials.

   d. TEMPORARY WORK SPACE as has been shown on the DRAWINGS has been secured by the **COMPANY.** The TEMPORARY WORK SPACE limits will be strictly enforced throughout the project. Should any violations occur, the crew in violation, at the discretion of the **COMPANY,** will be shut down until further assessment by the **COMPANY.** All cost associated with a work stoppage due to RIGHT-OF-WAY limit violations shall be borne by the **CONTRACTOR.**

   e. When acquiring RIGHT-OF-WAY along the route of the pipeline, it may have been necessary at various locations for the **COMPANY** to agree to certain special requirements by landowners and tenants. Special requirements shall be noted on the CONSTRUCTION LINE LISTS and shall be made available to the **CONTRACTOR.** The **CONTRACTOR** shall comply with these special requirements at no additional cost to the **COMPANY**. If complete CONSTRUCTION LINE LISTS

are incomplete at the time of the bid, items requiring special attention will be negotiated with the **CONTRACTOR** at the time that such items are identified.

f. At certain locations the pipeline may be routed adjacent to or across other pipelines, highways, or telephone poles and wires, power poles and wires, embankments, cliffs, rivers, trees or other obstacles which may physically restrict or limit the use of the RIGHT-OF-WAY. In some cases such physical confinement may necessitate special methods of construction of the pipeline. Use of these special methods (for example rubber tired vehicles, etc.) shall be at the discretion of the **CONTRACTOR** at no additional compensation to the **CONTRACTOR.** Use of special construction methods must be approved by the **COMPANY.**

g. The **CONTRACTOR** shall determine in advance the location and required clearance of existing underground facilities which may be encountered and determine any necessary changes in grade or location. The location of underground structures as shown on the DRAWINGS shall be only for assistance of the **CONTRACTOR.** The ultimate responsibility for locating such underground facilities and structures remains with the **CONTRACTOR.** The **CONTRACTOR** shall avoid damage to all such structures. The **CONTRACTOR** shall be responsible for all underground utilities whether or not they are located or depicted on the drawings.

h. The **CONTRACTOR** shall be responsible for notifying pipeline, telephone, water, sewer, communications, power, and other companies or agencies who have structures above or below ground either across the construction route or near enough that there could be damaged during construction. The **CONTRACTOR** shall notify and comply with the appropriate local utility protection system or the state one-call system. The **CONTRACTOR** shall provide sufficient time in advance of construction. In addition, the **CONTRACTOR** shall provide the **COMPANY** with a record of all notifications. In the State of Vermont, the one call system is known as DIG-SAFE and can be reached at 811. Excavation tickets are valid for thirty (30) days.

i. Utility poles in the path of construction, that require removal or relocation, shall be coordinated by the **CONTRACTOR.**

j. **THE CONTRACTOR SHALL NOT MOVE EQUIPMENT ON OR ACROSS THE COMPANY'S EXISTINGS PIPELINE(S), EXCEPT UPON A SHOWING OF ABSOLUTE NECESSITY AND ONLY WITH THE COMPANY'S PRIOR CONSENT GIVEN IN EACH INDIVIDUAL INSTANCE AND ONLY IN ACCORDANCE WITH THE APPROVED COMPANY POLICY AND APPROVED EXISTING PIPELINE EQUIPMENT CROSSING TYPICAL DRAWING.**

k. The **CONTRACTOR** shall have a representative on site who is experienced in landowner relations. This representative shall not be a working foreman.

l. Prior to working on RIGHT-OF-WAY, landowners, tenants and occupants will be notified by COMPANY before start of work. CONTRACTOR shall further review entry requirements with COMPANY at least one working day preceding entry to work area.

4. CLEARING AND GRADING RIGHT-OF-WAY

a. The **CONTRACTOR** shall clear and grade the RIGHT-OF-WAY as shown on the DRAWINGS and as approved by the **COMPANY** to facilitate the use of rubber tired vehicles and track equipment. In clearing the RIGHT-OF-WAY and in the performance of the CONSTRUCTION WORK hereunder, the **CONTRACTOR** shall comply with the terms of the CONSTRUCTION LINE LIST, all environmental and regulatory permits, environmental avoidance plans, Erosion and Sediment Control Plans, and the ENVIRONMENTAL MITIGATION PLAN, and shall carry out and perform the WORK in a manner which shall cause a minimum of inconvenience, injury, or damage to persons or property. Clearing shall include removal of all obstructions, trees, shrubs, stumps, roots, grass and other vegetation necessary to permit the installation of the proposed pipeline and pipeline facilities. Where the **CONTRACTOR** fails to observe restrictions and limitations and causes damages to property beyond the servitudes, RIGHTS-OF-WAY, permits or grants secured by the **COMPANY**, such damages shall be the **CONTRACTOR'S** liability.

b. Prior to clearing and grading activity, the **CONTRACTOR** shall locate and mark all foreign line crossings, drain tile, underground facility and environmental/archaeological sensitive areas as directed by the **COMPANY**. The CONTRACTOR will expose the adjacent **COMPANY** pipeline at intervals of every 200ft and at all points of intersection, where applicable. The cost to expose the existing **COMPANY** pipeline as described will be borne by the CONTRACTOR.

c. Before clearing and grading the RIGHT-OF-WAY, the **CONTRACTOR** shall move survey stakes back to the spoil side edge of the RIGHT-OF-WAY and preserve them during all phases of the WORK for use in reporting progress and locations.

d. The **CONTRACTOR** shall take all reasonable precautions to protect, in place, public land survey monuments and private property corners or boundary markers. If any land markers or monuments, including existing company G.P.S. monuments are destroyed, the **CONTRACTOR** shall re-establish at his expense such markers or monuments in accordance with the specifications with a registered Vermont land surveyor.

e. Material removed from the banks of streams shall not be placed in stream beds, but shall be stockpiled on the RIGHT-OF-WAY or on adjacent ATWS from where it can be recovered and used by the **CONTRACTOR** to restore the stream banks to their original state or as by directed the **COMPANY** and/or the permit requirements. Spoil shall be stored 10 feet from top banks with silt fence barrier placed between the spoil pile and the water body.

f. Temporary bridges, roads, etc. used for construction shall be designed for proper drainage and built in such a manner to provide safe passage of construction

vehicles and to minimize soil erosion. The **CONTRACTOR** shall furnish any materials required for this purpose. Temporary bridges must span the entire water course and minimize disturbance to the bank slopes. Fording of streams is permitted with minimal clearing equipment, to allow for the installation of the stream bridges. The **COMPANY INSPECTOR** must be notified in advance of any equipment fording a stream or water body. The **COMPANY INSPECTOR** shall be on site before any equipment or vehicles are allowed to ford any stream.

g. The **CONTRACTOR** shall install conduits, as necessary to maintain natural drainage across the RIGHT-OF-WAY. The **CONTRACTOR** shall maintain the conduits such that drainage is maintained and does not damage adjacent properties.
h. Temporary gate shall be installed in the fences crossed by the route of the pipeline and shall be maintained through construction. The **CONTRACTOR** shall be responsible for loss of any livestock or other third party damages related to open or damaged fences.
i. Before cutting, gates and fences shall be braced to prevent damage to them. Temporary fences shall be constructed so that they can be securely closed. Following the completion of the pipeline construction, gates and fences shall be restored to their condition prior to the beginning of construction. The **CONTRACTOR** shall furnish all such gate and fence material that equals or exceeds any existing gate and fence material. Where the pipeline crosses fields of dry grasses or crops, the **CONTRACTOR** shall provide fire watches along both sides of the RIGHT-OF-WAY at no expense to the **COMPANY**. Adequate fire-fighting equipment shall be maintained on site by the **CONTRACTOR**, for control of any brush or grass fires, resulting from burning or welding operations.
j. The **CONTRACTOR** shall repair immediately any damage to bridges, private roads, fences, buildings, or other property when damage, in the judgment of the **COMPANY**, cannot await repair by the clean-up operation.
k. The **CONTRACTOR** shall restore all damaged property, including but not limited to buildings, fences, hedges, roads, bridges, culverts, drainage ditches, terraces, drainage tile, creeks, levees, and rivers occupied or crossed by construction. Any property damaged during the execution of the WORK shall be restored to its original condition at the **CONTRACTOR'S** expense.
l. All debris shall be completely disposed of in a timely manner preceding the grading operation. Cleared materials shall become Contractor's property and shall be disposed of by chipping in upland (non-wetland, non-stream, non-archaeological, non-RTE species) areas, unless otherwise directed by the COMPANY. Burning of debris on-site is not permitted. **In no event shall debris, stumps, tops, etc. be placed on top of the existing pipeline at any time during the project.**

m. Stumps and trees on said RIGHT-OF-WAY shall not come in contact with the pipe. All loose stumps, brush, boulders, and other debris shall be removed so that the spoil bank from ditching operations shall not fall on any such debris.

n. Immediately following clearing and grading operations, CONTRACTOR shall install applicable erosion prevention and sediment control measures to the right-of-way.

o. The RIGHT-OF-WAY shall be graded in such a manner as to best facilitate the laying of the pipeline and the performance of the WORK. Grading shall be performed in such a manner as to minimize interference with existing drainage (with emphasis of adjacent wetland areas). Where terraces or drainage canals are cut, they are to be restored to their original state as soon as possible. Temporary slope breakers shall be installed and spaced in accordance the Environmental Mitigation Plan. These breakers shall be maintained for the duration of the WORK. The **CONTRACTOR** shall provide a means of natural water drainage across the construction RIGHT-OF-WAY to occur continuously during construction. Brush and other debris shall not be mixed with earth from grading and shall not be place in piles off the RIGHT-OF-WAY limits, regardless of permission of the landowner or tenant, nor placed in the trench with backfill material.

5. <u>LOAD, HAUL, STRING</u>

a. The **CONTRACTOR** shall be responsible for final clean-up and restoration of the pipe yard sites located in WILLISTON AND NEW HAVEN, VERMONT and any other laydown or staging areas used for the Project.

b. The Contractor, prior to loading of the pipe shall, along with the **COMPANY**, perform a visual inspection to verify the physical conditions of the steel and coating. Any defects so found shall be clearly marked for repair and noted on the material transfer report.

c. The **CONTRACTOR** will be compensated for repairing steel and/or coating defects which may have occurred during transportation of the pipe from the pipe mill to the coating mill and from the coating mill to the pipe yard site in WILLISTON AND NEW HAVEN, VERMONT.

d. Any steel or coating defect or other damage detected after the **CONTRACTOR'S** inspection shall be repaired by the **CONTRACTOR** at no additional cost to the **COMPANY**.

e. The **COMPANY** will have a Material Clerk and the **CONTRACTOR** shall cooperate with said Clerk during the transfer of **COMPANY** materials. **COMPANY** materials shall be checked for quantity, quality, and condition by both the **COMPANY** and the **CONTRACTOR**, and transferred from the **COMPANY** to the **CONTRACTOR** by the use of a **COMPANY** supplied Material Transfer Report. Both the **CONTRACTOR** and the **COMPANY** shall sign and retain a copy of each Material Transfer Report.

f. All side boom A-frames, lifting belts, or other binders used to handle the pipe shall be padded to protect the pipe and coating. No forklift shall be permitted to handle pipe

g. The **CONTRACTOR** shall transport the pipe from the **COMPANY** designated Pipe Yard Facility located in WILLISTON AND NEW HAVEN, **VERMONT** to the respective work area.

h. All pipe hauled to the RIGHT-OF-WAY shall be loaded and strung from stringing trucks w/trailers along the RIGHT-OF-WAY by boom tractors, hydraulic excavators w/vacuum lift attachment, or swing cranes. In no event shall pipe be rolled from stringing trucks. Care shall be exercised so the pipe does not lay directly on the ground. Skids with felt strips shall be placed on the ground the pipe shall be laid to rest on felt strips in a manner as to protect the integrity of the pipe and pipe coating. Offloaded pipe shall be lapped, not butted end to end.

i. The **CONTRACTOR** or any **SUB-CONTRACTOR** that it employs to transport the pipe or other materials for the job shall secure all appropriate permits from the appropriate agency authorizing them to perform the types of transportation service required of the WORK.

j. The **CONTRACTOR** shall secure necessary permits and licenses at its own expense for pipe transportation services as well as for the operations, hauling, and transportation of its equipment. Any damages to public roads shall be borne by the **CONTRACTOR**. Transportation services shall be performed in strict accordance with applicable federal, state, and local statutes and regulations and at the rates and in accordance with the provisions of the applicable tariff or tariffs.

k. Felt padding strips supplied by the **CONTRACTOR** shall be placed between the skids and pipe.

l. All pipe shall be properly chocked to prevent damage to the pipe, persons, or other property.

m. Pipe shall not be strung ahead of excavation in rocky areas.

n. The stringing of the pipe shall be done in such a manner as to cause the least interference with the normal use of the land crossed. Gaps shall be left at intervals as required by the **COMPANY** to permit the use of the land and the passage of livestock, equipment, and/or vehicles across the RIGHT-OF-WAY.

6. TRANSPORTATION AND STORAGE OF MATERIAL

a. The **CONTRACTOR** shall take delivery and accept custody for all materials furnished by the **COMPANY** when and as delivered to it by the **COMPANY** at the delivery points specified. The **COMPANY** will obtain any necessary permits or approvals for the use of these delivery points.

b. Several staging areas have been obtained by the COMPANY and are indicated on the Plans. Additional required staging areas shall be acquired by the **CONTRACTOR** at the **CONTRACTOR'S** expense and are subject to COMPANY approval. In addition, the

CONTRACTOR shall provide adequate time and sufficient information to the **COMPANY** in order for the **COMPANY**, at the CONTRACTOR'S expense, to provide the necessary archaeological and environmental clearances. To request **COMPANY** approval for use of any additional staging areas, the **CONTRACTOR** shall provide a written request to the **COMPANY** that will include, at a minimum the following:

A. A map viewing the location of the space to be reviewed.
B. A legal description of the property.
C. A sketch showing dimensions and layout, and a brief description of the planned use, access road, including planned changes to the site.
D. Preliminary landowner approval.

c. Should the pipe or other material be damaged by the **CONTRACTOR** or should any pipe or other material for which the **CONTRACTOR** is responsible become damaged, lost, stolen, or otherwise unaccounted for, the **CONTRACTOR** shall, at the **COMPANY'S** option and at the **CONTRACTOR'S** expense, either satisfactorily repair or replace in kind such pipe or material or shall bear the **COMPANY'S** full costs for such pipe or material delivered to the job site. If the **CONTRACTOR** does not repair, replace or reorder such pipe or material, the **COMPANY** shall withhold amounts, as determined by the **COMPANY**, equal to the **COMPANY'S** full costs for such pipe or material delivered to the job site, from payments due to the **CONTRACTOR** pursuant to the GENERAL CONDITIONS.

d. If possible, defective pipe and pipe damaged in unloading, stockpiling, loading, hauling and stringing shall be restored to useable condition by the **CONTRACTOR** by cutting and beveling. Pipe damage for which the **CONTRACTOR** is responsible shall be repaired by the **CONTRACTOR** at no additional expense to the **COMPANY**. Pipe damage for which the **CONTRACTOR** is not responsible shall be repaired by the **CONTRACTOR** and the **CONTRACT** compensation shall be in accordance with the applicable unit price specified, in the BID SUMMARY FORM. Such repairs to damaged pipe shall be made at the direction of the **COMPANY**.

7. <u>TRENCHING</u>

a. The **CONTRACTOR** shall be solely responsible for determining the existence and location of, and shall take due precautions to avoid damages to all pipelines, water mains, sewers, overhead telephone lines, underground telephone lines and cables, fiber optic cables and power conduits, high power lines, wires, poles and guy wires, railroads, highways, bridges, or other underground or above ground structures crossing or adjacent to the pipeline being constructed.

b. The **CONTRACTOR** shall notify and comply with the appropriate local utility protection system or the state one-call system. In addition the **CONTRACTOR** shall provide the **COMPANY** with a record of all notifications.

c. The **CONTRACTOR** shall slope and/or shore the walls of the pipeline excavation in accordance with current OSHA regulations for human occupancy of trenches.

It shall be the **CONTRACTOR'S** responsibility to determine the proper ditch bank sloping or shoring technique applicable to the type of soil excavated and to have a competent person (as defined by OSHA) present at each excavation site when occupied by a person(s).

d. The **CONTRACTOR** will furnish a registered Vermont Professional Engineer at the **CONTRACTOR'S** expense to be available on-site for all shoring, trench box or if the depth of cut exceeds twenty feet.
e. Trenching and excavating for the laying of pipelines shall be performed such that the pipeline, when laid, will follow the survey as staked. Ditching and excavating WORK will conform to the terms of the **COMPANY'S** permits and RIGHT-OF-WAY easements.
f. All retrenching, re-digging and water pumping required on the pipeline trenching shall be at the expense of the **CONTRACTOR.**
g. The bottom of the trench shall be uniformly graded in proper depths to prevent unnecessary bending of the pipe and shall be free from loose rock, snow, ice, and other objects which might cause damage to the pipe or pipe coating or prevent discovery of such damages. Tree roots shall be cut flush with the sides and the bottom of the trench to prevent damage to pipe coating. The spoil from the trench shall not be allowed to fall on any debris or other undesirable foreign matter the might become mixed with the spoil bank and be backfilled in the trench.
h. Any corrections in the trench necessary to secure a proper fit at the bend shall be accomplished by grading the trench ahead of and behind the bend, or preparing another bend, all at the **CONTRACTOR'S** expense.
i. Material removed from creek and river ditches shall not be placed in the stream bed or where stream flow or drainage will be obstructed. Such material will be contained in accordance the **COMPANY'S** Environmental Mitigation Plan.
j. The depth of the pipeline cover will be a minimum of three (3) feet except where specified in the DRAWINGS. At all roads streams and ditches, the depth of cover shall be a minimum of five (5) feet unless the required pipeline cover is noted otherwise. The depth of pipeline cover in agricultural lands and VELCO right-of-ways shall be a minimum of four (4) feet unless the required cover is noted otherwise. If concrete coated pipe is used, depth of cover will be measured from the top of concrete to natural grade. The **CONTRACTOR'S** Bid Price for extra depth ditch is applicable to only those areas where extra depth is required in addition to that provided for herein. All excavation/cuts at streams, roads, and ditches are to comply with any **COMPANY**, local, state, or federal permit requirements, and will be done so at no additional expense to **COMPANY**.
k. The pipe shall be laid in the original soil and not in any new embankment established by the **CONTRACTOR'S** grading operations.

l. In the event of damage to foreign facilities, the **CONTRACTOR** will promptly notify the **COMPANY**. The **CONTRACTOR** will be responsible for all repairs and expenses associated with such damage.

m. To facilitate construction such as finding suitable subsoil conditions, the **CONTRACTOR** may excavate trenches to a greater depth than the minimum requirements given herein. No additional compensation will be paid to the **CONTRACTOR** for the additional excavation if intended for **CONTRACTOR'S** convenience. Spoil banks from any ditching operations shall not be placed where drainage will be affected and such spoil banks will be placed in a manner acceptable to the property owners and/or requirements as may be prescribed by federal, state, county or other agencies having jurisdiction.

n. The **CONTRACTOR** shall separate, store, and replace top soil for the RIGHT-OF-WAY as specified in the Bid Documents and Drawings. All top soil shall be backfilled as a separate operation and shall be replaced over the grade from which it was removed in a manner satisfactory to the **COMPANY**. Any top soil required to restore the pre-construction top soil conditions will be at the **CONTRACTOR'S** expense for those areas initially top soiled. The **CONTRACTOR** shall obtain **COMPANY** approval for sourcing top soil material.

o. During construction, CONTRACTOR shall not maintain more length of open trench than is necessary for the daily rate of lowering-in of pipe. When reasonably required by landowner or tenant to have passageway across the trench, the **CONTRACTOR** shall provide, at the **CONTRACTOR'S** expense trench soft plugs for crossing the trench at locations required by the landowner or tenant.

p. Certain RIGHT-OF-WAY Agreements or permits may require that extra depth trench be provided at certain locations. The **CONTRACTOR** shall provide such extra depth trench as required in the CONSTRUCTION LINE LIST. The **CONTRACTOR** will be paid no additional compensation for the extra depth trench required by the CONSTRUCTION LINE LIST, provided this information contained in the CONSTRUCTION LINE LIST was available at the time of bidding.

q. High water table conditions may require the use of pumps, well points, or other means of dewatering. The **CONTRACTOR** shall comply with all conditions of the pit/trench dewatering permits obtained by the **COMPANY**. In general water should be discharged through filter bags to upland areas with care taken to avoid discharging into surface waters or crop land. No additional compensation shall be due to the **CONTRACTOR** for any dewatering devices. The **CONTRACTOR** shall bear the costs for damages resulting disposal of such water from the trench upon any properties in proximity to the RIGHT-OF-WAY.

r. Unless noted otherwise the **CONTRACTOR** shall provide the required trench to allow installation of the pipe below an existing facility with a minimum vertical clearance of not less than twelve (12) inches. Drainage tile shall have the minimum

vertical clearance of twelve (12) inches between the tile bottom when restored to its normal position and the top of the pipe when placed in the trench.

s. Where existing underground drain tile are encountered, the trench shall provide for the installation of the pipeline under the tile. Any existing drain tile damaged, cut, or removed shall be immediately repaired as necessary to allow for its proper function until the tile can be permanently repaired. The **CONTRACTOR** shall place a lath, with red flagging attached, in the trench spoil bank directly opposite any damaged or removed tile. The marker shall not be disturbed until the tile has been repaired and the repairs have been approved and accepted by the **COMPANY.** Permanent repair and replacement of drain tile shall be done in accordance with the SPECIFICATIONS and the DRAWINGS.

t. ATWS has been acquired at certain road crossing, stream, and highway crossings to provide extra storage space for the excess spoil material resulting from the excavations. In agricultural land, the additional area used at each crossing shall be stripped of top soil prior to the placement of any spoil in the area, unless otherwise noted by the **COMPANY**INSPECTOR. Top soil shall not be used to ramp culverts, ditches, or drains.

u. Roadways shall not be blocked without approval of Town or County authorities concerned. Adequate protection of road users from CONTRACTOR's excavations shall be provided by means of barricades, lanterns and warning signs, and the provision of detours and flagmen.

v. Soft plugs shall be installed at start and end of wetland if trench has potential to drain wetland.

w. Trench shall have graded slopes for egress of wildlife.

x. The **COMPANY** shall expose, mark with a red flag, and subsequently backfill the **COMPANY'S** existing adjacent pipeline at intervals of not more than 200ft, at all points of intersection and at any other locations deemed necessary by the **COMPANY.** The **CONTRACTOR** shall be provided with a daily pot hole log from the COMPANY which shall identify the location (station number) and depth of the existing **COMPANY** pipeline.

y. The new pipeline may be laid adjacent to the existing **COMPANY** line. In all areas, it shall be the **CONTRACTOR'S** responsibility to stabilize the existing line adjacent to the pipeline trench by methods approved by the **COMPANY.** The approval shall be obtained prior to trenching. Failure to stabilize the existing line may cause damage to the existing line. If damage occurs to the existing line due to unstable conditions, all costs for repair and clean-up shall be borne by the **CONTRACTOR. THIS IS A SINGLE LINE FEEDING INTO THE GREATER BURLINGTON, VERMONT AREA. A LINE BREAK WILL PLACE 40,000 CUSTOMERS AT RISK OF LOSING GAS SERVICE.**

z. Refer to the following Specifications for additional requirements:
   A. 312319 Dewatering
   B. 312333 Trenching and Backfill
   C. 315000 Excavation Support and Protection

8. **BENDING AND LAYING PIPE**
   a. The **CONTRACTOR** shall make all necessary field pipe bends required in the construction of the line. The **COMPANY** may, at its option provide fabricated segmentable el's at locations where the use of such segmentable el's is deemed preferable. The **CONTRACTOR** shall be responsible for determining the degree of field bend necessary at points of angularity in the pipeline to allow the proper lay of the pipe in the ditch.
   b. All bending shall be done by the cold smooth method using a bending machine approved by the **COMPANY**. No fire or wrinkle bends will be allowed. Welded longitudinal pipe seams shall be right angles (neutral axis) to direction of bends, when applicable. The **CONTRACTOR** shall furnish and use, at no additional expense to the **COMPANY**, an internal bending mandrel to achieve smooth and undistorted bends, if necessary. Padded bending shoes are required for coated pipe. In no case shall heat be applied to the pipe for bending purposes.
   c. For field cold bends the longitudinal axis shall not be deflected more than 1-1/2 degrees in any length along the pipe access equal to the diameter of the pipe. An accurate method of measurement shall be used. The maximum diametrical reduction in a pipe bend shall not exceed 2-1/2% of the nominal pipe diameter. There shall be no deviation from the above constraints without prior written **COMPANY** approval. Separate approval must be obtained for each incidence.
   d. The distance between centerline of bending points shall be such that there will be no distortion of the pipe or of the bend previously made and in no event shall be closer than seven (7) feet to the end of the joint of the pipe. When pipe is double jointed before bending, the bend shall not be closer than three (3) feet to the butt (girth) weld.
   e. The pipe bends shall be measured, laid out, bent, and welded so that the complete pipeline will be in compression. All over-bends, sag bends and side bends shall be made and installed in such a manner that an adequate amount of slack is provided in the line. All over bends shall be made in such a manner that the mid-point of the bend when installed shall clear the high point of the trench bottom by a minimum of four (4) inches. Side bends shall have the neck against the outside curve of the ditch. All sag bends shall be fitted snug to the bottom of the ditch.
   f. If the **COMPANY** so directs, and prior to the bending of any pipe to be used on the WORK, test specimens of any or all sizes of pipe to be used on the WORK shall be bent to determine the optimum bending and the distortional limitations

that will be used on the WORK. For such test the **CONTRACTOR** shall furnish the labor and equipment necessary and the **COMPANY** shall furnish the pipe.

g. Under no circumstances shall any bend be straightened.

h. Any pipe that is buckled, wrinkled, flattened, egged or gouged by the bending operations shall be cut out and replaced at the sole expense of the **CONTRACTOR**. Hammering or the use of jacks at any time to attempt to repair buckled or deformed pipe is prohibited. A buckle shall be defined as any anomaly in the contour of a bend which, when measured with a six (6) inch metal straight edge oriented on the longitudinal axis, yields a depression or valley beneath the straight edge in excess of .06 inch.

i. For pipe line-up, the pipe shall be placed on skids with sufficient clearance between the bottom of the pipe and ground to accommodate the finishing weld. Pipe shall be handled in a manner to prevent damage to the pipe walls and shall be placed over or parallel to the ditch in such manner that when the pipe is lowered, the bends will rest in the ditch at the proper location. The **CONTRACTOR** shall align pipe so as to provide adequate slack when lowered. In the laying of the pipe other than seamless pipe, the longitudinal seams shall be offset by 20 degrees on adjoining pipes in the top 120 degrees of the pipe and welded sections shall be assembled and lowered into the trench so that the longitudinal seams will remain on the top 120 degrees of the pipe as laid. Exceptions shall be weld seams on side bends, which shall be located on top of the pipe, and weld seams on sag bends and over bends, which shall be located on either side of the pipe as laid.

j. At temperatures of 0ºF or below, COMPANY shall supply a pipe joint to CONTRACTOR for bend tests. Pipe shall be bent to the required curvature or to a less severe limit, should buckling, wrinkling or flattening occur. A restriction on bending shall be set by COMPANY which shall be subject to a re-test should the ambient temperature drop a further 10ºF.

9. WELDING

a. All welding shall meet the requirements of the latest approved edition of API 1104 Welding of Pipelines and Related Facilities, as approved by the Department of Transportation Title 49 CFR, Part 192, Transportation of Natural Gas and Other Gas by Pipeline.

b. The **COMPANY** shall provide approved qualified Welding Procedures to be used to complete the WORK.

c. All welders to be used on the WORK must pass a destructive butt qualifying test and branch qualifying test as prescribed by API 1104, under the **COMPANY'S** supervision and subject to the **COMPANY'S** approval. For making such test, the COMPANY will supply the pipe and the CONTRACTOR shall supply all equipment

and supplies, including testing machines and jigs, and labor of the welders being qualified. The tensile testing machine shall be calibrated by an independent laboratory prior to use, and the **CONTRACTOR** shall present the certificate of calibration to the **COMPANY** prior to its use. The **CONTRACTOR** shall notify the **COMPANY** of the time and location of the welder qualifications tests; whereupon, the **COMPANY** will witness the welding WORK and subsequent testing. In the event that either the **COMPANY** or the **CONTRACTOR** are not satisfied with a Welder's Test results, the welder shall not be employed. No extra test coupons shall be allowed. The **COMPANY** shall promptly notify the **CONTRACTOR** as to the qualification or disqualification of each welder tested.

d. After each welder has been accepted as qualified, he shall be permitted to weld on production lines subject to COMPANY's privilege to cut an additional test weld from the line. For all pipe diameters the test weld shall be radiographed and then followed by a Mechanical Test Procedure meeting the requirements of API 1104. Defective welds will follow criteria of API 1104 to determine acceptability. Where defective welding involves two or more welders, COMPANY and CONTRACTOR's welding foreman shall devise further tests and determine which welder is at fault.

e. The **CONTRACTOR** shall take every precaution to produce welds that meet the requirements of these SPECIFICATIONS by the initial welding process. Should the number of welds failing to meet these SPECIFICATIONS exceed SEVEN (7) percent based on total production for one full working day, the **COMPANY** reserves the right to suspend welding operations until the problem is identified and corrective measures are submitted for the **COMPANY'S** approval. Upon resuming welding operations, the **CONTRACTOR** shall produce a Controlled Welding Section of twenty welds, having opening at each end, which the **COMPANY** will promptly inspect. During the period the Controlled Welding Section is being inspected, the **CONTRACTOR** may only continue welding operations with the **COMPANY'S** approval. Should the results of the Inspection of the Controlled Welding Section be unacceptable, the **CONTRACTOR** shall suspend welding operations. Instructions will then be issued by the **COMPANY** regarding further welding operations.

f. All costs associated with unsatisfactory welding shall be at the CONTRACTOR'S expense.

g. All welds shall be radiographically inspected at the **COMPANY'S** expense according to API 1104. If the results of these inspections indicate the welds to be defective, **CONTRACTOR** shall replace or repair the defective welds at **CONTRACTOR'S** expense. If the cut-out method of examination of weld is employed by the **COMPANY**, the **COMPANY** may, in the judgment of its **COMPANY INSPECTOR**, cut-out and test any welds designated by him. Should such cut-out welds pass the requirements of API 1104, the cost of cutting out

and subsequent tie-in will be borne by the **COMPANY**. The cost of cutting out and replacing any welds that fail the tests shall be borne by the **CONTRACTOR**.

h. **CONTRACTOR** shall use the shielded metal-arc welding (SMAW) process on all mainline welds (sometimes called "stick electrode welding" or "shield arc process"). Welding will be performed in the vertical downhill direction, except for hot taps. Electrode stubs shall be collected at the time of use, accumulated for disposal, and may not be left on the RIGHT-OF-WAY, in the trench, or in the backfill.

i. The general requirements of mainline welding shall also apply to the welding of pipeline components such as valves, fittings, flanges, crossovers, tie-ins etc.

j. Each beveled end of a joint of pipe shall be cleaned in a manner satisfactory to the **COMPANY** to remove dirt, mill scale, and other foreign substances before being placed in alignment for welding.

k. The adjoining lengths of pipe shall be accurately aligned by the use of a suitable alignment clamp of a type and manufacture satisfactory to **COMPANY**. The adjoining lengths of pipe shall be aligned and spaced to provide a root face opening per the qualified Welding Procedure Specification (WPS). All bevels shall be 30 degrees, +5 degrees, -0 degrees. All root face (lands) shall be 1/16 inch, +1/64 inch, -0.Pipe possessing a longitudinal weld joint shall have all seams positioned in the top 120 degrees with the exception of over bends and sags. Weld seams of adjoining pipe shall be staggered a minimum of 30 degrees.

l. The root bead (stringer bead) shall be applied completely around the pipe followed immediately by a thorough cleaning of all scale, coating, slag, etc. The first bead or "stringer" shall be completed prior to the application of subsequent beads. The second bead (hot pass) shall be started immediately after completion of the stringer within the time limits indicated on the Welding Procedure Specification (WPS). The hot pass shall fully fuse the pipe bevel at each side of the stringer, making the deposit a minimum of one-third the pipe wall thickness. On pipe 16" OD and larger the stringer and hot pass shall each require two or more welders working on opposite sides to equalize stress.

m. No tack welds shall be permitted except when using external line up clamps on tie-ins, transitions, and fabrication piping and then only when preheating requirements are met.

n. The start of all weld passes shall overlap and no pass shall start closer than two (2) inches from the start of the preceding pass.

o. Internal alignment clamps shall not be relaxed until 100 percent of the root bead has been completed. External alignment clamps shall not be removed until at least 50 percent of the root bead has been completed provided that the completed portion of the root bead is in approximately equal segments evenly distributed about the circumference of the joint. Skids shall be placed in a manner to prevent stress on completed root beads.

p. When welding concrete coated pipe, internal alignment clamps shall not be relaxed until both the root bead and hot pass have been completed.

q. The "Stringer Bead" and "Hot Pass" welding operation shall not be advanced ahead of the finished welding operations to the extent that the section of line containing unfinished welds would be likely to fall from skids because of contraction and/or expansion of the line due to change in temperature. When the pipe is laid on skids after welding it shall be blocked and secured from rolling off skids in a manner acceptable to the **COMPANY**. The placing of skids shall be close enough to prevent undue stress on the free spanning pipe. Should a section of the line containing unfinished welds fall from the skids the **CONTRACTOR'S** representative shall immediately report the same to the **COMPANY** and all cost of any inspection and/or repairs shall be borne by the **CONTRACTOR**.

r. A preheat shall be used at all times. Preheat shall cover a band (4) inches wide on each side of the proposed weld. Heating shall not char the pipe coating. The temperature will be measured by temperature measuring crayons an infrared temperature detector, or other acceptable tools to be furnished by the **CONTRACTOR**. This process shall be performed immediately prior to welding. PREHEAT

s. The **CONTRACTOR** will take necessary precautions to insure that no arcing occurs between the ground bevels, leads of the welding machines and the pipe. Striking the arc on the pipe at any point other than the welding groove shall not be permitted. All arc burns occurring outside the welding groove shall be removed from the pipeline by cutting out a cylinder of pipe containing the arc burn or arc burns and replacing it with new pipe at the **CONTRACTOR'S** sole expense. Said cylinders are the property of the **COMPANY** and shall not be destroyed or tested on by the **CONTRACTOR**.

t. The open ends of all sections of line pipe shall be securely closed with suitable "Night Caps" supplied by the **CONTRACTOR** at the end of each day's WORK to prevent the entrance of small animals, water and obstructions. The pipe ends shall not be reopened until the WORK recommences. Covers shall be canvas type with an air release hole and tie cord (or secured with duct tape). Any obstructions in the line shall be removed by the **CONTRACTOR** at is expense and to the satisfaction and approval of the **COMPANY**. The line must be delivered free, from water, dirt, obstructions, and other foreign substances. NIGHT CAPS

u. The **CONTRACTOR** shall promptly collect, re-bevel, clean, haul ahead and place in the pipeline all usable "pup" joints having a minimum length of five (5) feet. "Pup" joints must be separated by a full-length joint. The **CONTRACTOR** shall be responsible for transferring all of the pipe stencil information to all pup joints. PUPS

v. The **CONTRACTOR** shall be required to re-bevel and weld all surplus pipe that is five (5) feet or more in length into nominal forty (40) foot lengths of pipe upon job completion at the **CONTRACTOR'S** expense.

w. A mechanical transition machine shall be used to taper bore pipe transitions for adjoining pipe wall thickness differences that exceed 0.94 inch. Flame cutting or hand grinding internal transition bevels shall not be permitted, with the exception of test head fabrication.

x. Each welder shall identify that portion of the weld performed by him on an area adjacent to the weld and in the top quarter of the pipe. A number will be assigned to each welder by the **COMPANY** while conducting his qualification test. Numbers shall be marked with a **COMPANY** approved material. Die stamping will not be used. In the event any welder leaves the job, his number shall not be used by another welder.

y. In the case of inclement weather, the **CONTRACTOR** shall provide protection for the welders at their WORK and care shall be taken to see that no welds are subjected to moisture or sudden variations in temperature. No welded sections of pipe shall be rolled off skids or dollies until the welds are thoroughly cool. The **CONTRACTOR** shall provide artificial lighting when necessary at no additional cost to the **COMPANY**.

z. Splatter shields shall be utilized during the welding operations to protect the adjacent pipe coating.

aa. During the final tie-in section the pipe shall be supported by side booms until all filler passes are complete.

TIE IN

10. <u>GIRTH WELD REPAIR PROCEDURE</u>

a. If NDT inspection indicates a weld to be defective, the **CONTRACTOR**, at no additional cost to the COMPANY, shall cut a cylinder of pipe containing such weld from the pipeline and replace it with new pipe or shall have the defective weld repaired in accordance with API 1104. Correction of an individual bead prior to the laying of a succeeding bead is not considered a repair of a defect under these SPECIFICATIONS.

b. Preheating shall be used for all repair welding. Such preheating shall be accomplished by a method acceptable to the **COMPANY** and shall cover at least four (4) inches wide on each side of the weld. Heating shall not char the pipe coating. Preheat temperature shall be checked by use of temperature indicating crayons or an infrared temperature detector.

c. All repair and replacement welds shall be NDT inspected and shall meet the acceptance standards of API 1104.

d. The **COMPANY** will allow repair of welds subject to the provisions of API 1104.

e. Only one repair shall be allowed per girth weld. The necessity of a second weld repair constitutes a mandatory cut-out.

f. The accumulated length of weld repairs shall not exceed 8% of the total length of the girth weld.

g. Under no circumstances should attempts be made to repair cracks in a weld. <u>All cracks shall be cut outs.</u>

CRACKS

The **COMPANY** shall provide the **CONTRACTOR** with the **VERMONT GAS SERVICES COATING SPECIFICATIONS**.

h. All coating shall be done in accordance with Manufacturers recommendations and the **COMPANY'S** approval.

i. Coating thickness shall be monitored by use of an appropriate dry film thickness gauge.

j. Holiday inspection shall be performed on all pipe and fittings with an electronic holiday detector, supplied by the **CONTRACTOR**, and operated in such a manner as to audibly and visually detect the presence of all holidays. Said inspection shall be performed as outlined in NACE Standards RP 0303-2003, RP0274, SP0490, latest revisions, with a certified holiday detector. This inspection shall occur on all piping to be buried..

k. If a jeep voltage is not specified by the manufacturer then the holiday detection voltage shall be determined by V = 125 X T, Where T = coating film thickness in mils. Proper voltage settings shall be confirmed be detecting three artificial holidays place in the initial joint.

l. For fabrication inspection, the electrode shall be a wet sponge detector supplied by the **CONTRACTOR**.

m. For pipe inspection, the electrode shall be the pipe OD and consist of a rolling spring composed of square stainless steel wire. The spring length shall fit securely to the surface of the pipe.

n. The holiday detector manufacturers approved by the **COMPANY** are:
   A. D.E. Stearns Company
   B. SPY Holiday Detectors
   C. Tinker & Rasor

o. **CONTRACTOR** may submit alternate equipment for approval by the **COMPANY**.

p. The **CONTRACTOR** shall be responsible for all damages to pipe or pipe coating outlined in these SPECIFICATIONS. The **CONTRACTOR** shall repair coating damage and piping damage at no additional cost to the **COMPANY**.

q. Any joints of pipe with a limited number of holidays shall be repaired using **COMPANY** approved material for areas in excess of two square inches; hot melt epoxy patch stick for areas two square inches and less shall be applied as recommended by material vendor. Epoxy patch sticks shall not be used on any pipe to be installed by boring.

r. Upon completion of the pipeline construction final clean up, the **COMPANY** may elect to conduct a DCVG Coating Survey. The **CONTRACTOR** shall uncover all of the holidays detected. The coating shall be cleaned, dried, jeeped, and the uncovered coating defects shall be repaired. Any Coating Integrity indications uncovered that require coating repair will be at the **CONTRACTOR'S** expense, including the excavation, coating repair, backfill and final clean up. Should the

COMPANY elect to perform a DCVG Survey the cost to perform the DCVG Survey will be borne by the **COMPANY**.

12. LOWERING IN

a. Debris, skids, rocks, large clods, welding rods, projecting rocks and other foreign objects shall be removed from the bottom of the trench prior to lowering in the pipe so that the protective coating is not damaged. Top soil shall not be used for padding materials. All bedding and padding materials shall be one and one-half (1 1/2) inch and smaller in size.

b. TUFF N NUFF Rock Shield, furnished by the **CONTACTOR**, will be used in locations to protect the pipe and pipe coating from loose rocks in the backfill. Rock shield will be "TUFF N NUFF" three eighths 3/8 inches thick and shall be installed around the circumference of the pipe. Both bedding/padding materials and rock shield shall be utilized to protect pipe and pipe coating from loose rocks in the backfill.

c. The **CONTRACTOR** shall remove water and snow from the bottom of the trench before lowering pipe into the trench. The **CONTRACTOR** shall meet all conditions as listed on the **COMPANY** acquired pit/trench dewatering permit.

d. Immediately prior to and during lowering in, the **CONTRACTOR** shall check the coating with an electrical holiday inspection instrument supplied by the **CONTRACTOR** and approved by the **COMPANY**. All pipe shall be inspected for holidays and all holidays shall be repaired in accordance with these SPECIFICATIONS.

e. Jeeping shall be done before any rock shield, pipe saks, concrete coating or any other type of additional materials are applied to the pipe.

f. Final jeeping shall be done when pipe is lifted into the ditch. At no time shall the pipe be jeeped or lowered in without a COMPANY INSPECTOR present.

g. The **CONTRACTOR** shall be responsible for all equipment to be in good working condition. The **CONTRACTOR** shall have on the job at all times a holiday detector calibrator to make sure the proper setting is obtained. The **COMPANY** will have the right to inspect or test equipment to determine if it is in proper working condition.

h. Holiday detectors shall have adequate grounding at all times.

i. During lowering operations, coated pipe shall be handled by use of adequately spaced lowering in belts or cradles. Belts shall be at a minimum equal to the diameter of the pipe width and made of proper material, which shall be free of protrusions that may cause damage to the protective coating. Roller cradles shall have nylon/neoprene roller wheels.

j. The coated pipe shall be lowered into the trench in a manner that will allow proportionate distribution of the total weight of pipe to prevent undue stress or strain on the pipe and to prevent damage to the pipe coating. The pipe shall not be dropped or subjected to jarring or impact.

k. Sections of coated pipe being tied into the line shall not be dragged or pulled into position. The length of sections shall be regulated to allow handling without damaging the protective coating. At water crossings or at any other locations where it may be necessary to pull or drag sections of pipe into place, the coated pipe shall be properly protected using wood lagging provided by the **CONTRACTOR** and handled in a manner to prevent damage to the coating or to the pipe.

l. On hillsides and sloping ground, unfrozen rock-free earth filled bags shall be placed in the bottom of the trench before the pipeline is lowered in position. Before backfilling the ditch, additional bags shall be placed on and around the pipe to form a trench breaker. The trench breaker shall be built slightly lower than the surface of the ground to prevent water flow in the bottom of the backfill ditch. The location of the trench breakers shall be as shown on the Drawings and as required by the **COMPANY**.

m. When lowering the pipe the unsupported length of straight pipe or pipe containing sag or over bends shall not exceed 150ft. All side bends shall be supported to minimize torsional stress in the pipe.

13. **BACKFILLING**

a. At no time shall the trench be backfilled without the **COMPANY INSPECTOR** present. Prior to backfilling trench it is the responsibility of the **CONTRACTOR** to obtain approval from the **COMPANY**. If any section is backfilled without the **COMPANY'S** approval and the **COMPANY** so requests, the **CONTRACTOR** shall uncover the pipe for inspection at no additional expense to the **COMPANY**.

b. Backfilling operations shall commence as soon as possible after the pipe has been lowered into the trench. The amount of lowered pipe not backfilled shall remain minimal at all times. Backfilling of all side bends, over-bends and sag bends shall be performed within the same workday as lowering in unless approved otherwise by the **COMPANY**. The **CONTRACTOR** shall take all necessary precautions to ensure that backfill material is kept free of all stones, rocks, skids, stumps, brush, welding rods, cans, bottles, trash and other debris. During frost conditions, the **CONTRACTOR** shall backfill with the utmost care. After bedding and padding of the pipe in frost conditions the **CONTRACTOR** will sift for smaller backfill material prior to backfilling with larger frozen clumps.

c. If backfilling or any other operation damages replaced or existing drain tile, the **CONTRACTOR** shall excavate and repair the damaged tile immediately at no additional cost to the **COMPANY**.

d. If subsurface water is encountered, **CONTRACTOR** shall implement draining techniques to channel the water from the ditch at the **CONTRACTOR'S** expense and in accordance with applicable permits.

e. All disturbed areas shall be restored to its original condition, or better, per the Army Corps of Engineers Permit, Vermont Wetland Permit, Individual (NPDES) Construction

Stormwater Permit, Vermont 401 Water Quality Permit, Construction Line List, and landowner clean up and final restoration sign off agreement, applicable procedures and the requirements of the Land Owners Line List. This shall include backfilling the pipe trench and restoring creek banks, hillsides, or other locations that are disturbed. Backfilling of the trench shall be executed with extreme care so as not to damage pipe or coating. Hand labor shall be used during initial backfilling as deemed necessary by the **COMPANY.**

f. At all locations where the pipeline crosses roadways, walkways, and proposed roadways where the open trench method of crossing is utilized, backfill shall be placed in lifts and mechanically compacted within the limits of the existing or proposed pavements and to the satisfaction of the governing agency. The **CONTRACTOR** shall hold the **COMPANY** harmless from any and all damages resulting from open trench Construction. Unless specified otherwise, backfill compaction shall achieve at least ninety five percent (95%) Modified Proctor density by wetting and tamping at all levels in the backfill material. Approval shall be received from the COMPANY to operate compaction equipment within thirty-six (36) inches of the pipeline.

g. Attention shall be given in backfilling the pipeline near roads to ensure that proper pad dirt is place in such a manner as to completely fill the voids around and under the pipe and to prevent damage to electrolysis test site leads.

h. The **CONTRACTOR** shall compact subject to **COMPANY** approval, ditches crossing residential and industrial yards and bell holes around all above ground pipeline appurtenances at the **CONTRACTOR'S** expense.

i. The pipe shall rest on undisturbed trench bottom provided the material does not include rocks, sharp objects and/or debris that may cause damage to the pipe. Structured pipe pillows shall be installed in the bottom of the trench at maximum intervals of every 16ft to protect the pipe from lying on rocks, sharp objects and/or debris which may cause damage to the pipe or pipeline coating. The COMPANY may require the CONTRACTOR to use select fill trench bottom padding material. Select fill base material for rock trench areas and areas with cobbles/boulders, shall provide a minimum of nine (9) inches of padding below and twelve (12) inches of padding on the sides and top of the pipe. Select fill material and/or padding material shall be sand in accordance with VTrans Standard Specification 703.03 or shall be screened native material containing silts, sands and gravels with the largest material being no larger than 1-inch on the longest dimension. Topsoil from the RIGHT-OF-WAY shall not be used for padding material.

j. The **CONTRACTOR** shall build temporary slope breakers to divert the flow of water from grades on the RIGHT-OF-WAY onto areas protected by established vegetation. See Environmental Mitigation Plan.

k. Through agricultural and pasture lands, rock three (3) inches and larger measure in any dimension shall be removed as stated in the Environmental Mitigation Plan and the Agricultural Mitigation Plan or Agreement. Rock 12 inches and

larger shall not be allowed in any portion of the backfill, unless otherwise stated in the CONSTRUCTION LINE LIST.

l. Surplus rock shall be disposed of at the **CONTRACTOR'S** expense as follows:

m. If the landowner and/or tenant requests that the surplus rock be removed from his property and the **COMPANY** agrees, the **CONTRACTOR**, at his expense, shall haul the surplus rock by the shortest route to a dumping ground approved by the **COMPANY**. The **CONTRACTOR** shall submit to the **COMPANY** a list of possible dumping grounds together with such documentary evidence of approval by the Public or Private Authority having jurisdiction or control over the dumping grounds, for **COMPANY** approval for the use of such grounds.

n. If approved by the **COMPANY** and landowner, the rock shall be buried at a sufficient depth on the RIGHT-OF-WAY at the **CONTRACTOR'S** expense.

o. Depending on soil conditions a crown shall be place over the backfilled ditch line, unless no crown is requested by the **COMPANY** or landowner. See the Agricultural Mitigation Plan or Agreement for further detail. Under no circumstances shall a crown be left in wetlands, ditches, drains or streams.

p. Particular care shall be exercised in order that all drainage ditches be maintained and left unobstructed to prevent the back up of water against the spoil bank of backfill.

q. At tie-ins to existing pipe, special attention shall be given to ensure that padding dirt is placed in such a manner as to completely fill all voids around and under the pipe.

r. If the subsoil is not suitable for backfill and compaction, the **CONTRACTOR** shall provide select fill material, backfill and compact as specified in the BID DOCUMENTS. No additional compensation will be paid to the **CONTRACTOR** for any compaction required. <u>All excess or non-usable material shall be hauled off the RIGHT-OF-WAY at the **CONTRACTOR'S** expense.</u>

s. The **CONTRACTOR** is responsible for all ditch line settlement until the warranty period expires. Should the ditch backfill material settle within the warranty period, the **CONTRACTOR** shall return and make repairs at no additional cost to the **COMPANY**. In Agricultural areas, imported topsoil may be required from COMPANY approved sources to repair ditch line settlement.

t. Refer to the following Specifications for additional requirements:

   A. 312333 Trenching and Backfilling
   B. 310519.13 Geotextiles for Earthwork

14. <u>APPURTENANCES</u>

a. Appurtenances included under this SPECIFICATION are: fabricated assemblies (mainline valves, station facilities, crossovers and crossunders, pipeline markers, aerial markers and electrolysis stations.)

b. Material handling, trenching, bending, hydrostatic testing and all other WORK required to fabricate and install Appurtenances shall be in accordance with the applicable sections of the SPECIFICATIONS.

c. Other contractors (station, grading, electrical, building erection, etc.) may be constructing and installing facilities within the same sites and RIGHTS OF WAY as this WORK. All personnel shall be compatible to working on the same site with another contractor's personnel and subcontractors. Construction shall be carried out in such a manner as to provide a minimum of inconvenience to all concerned.

15. **FABRICATED ASSEMBLIES**

a. The **CONTRACTOR** shall fabricate and install complete mainline crossunder/crossover assemblies as shown on the DRAWINGS.

b. At flanged connections, bolts shall be tightened evenly by means of an impact wrench to impose equal pressure on the gasket at all times per **COMPANY** procedure and industry bolt torque standards. In bolting up flanges, an approved thread lubricant shall be used on all bolt threads and flange faces. Ordinary greases shall not be used for this purpose.

16. **ELECTROYLYSIS TEST LEADS**

a. The **CONTRATOR** shall install electrolysis test leads at the location identified on the DRAWINGS. The type of test lead and the method of installation (thermite weld process) shall be in accordance with the DRAWINGS.

b. The **COMPANY** will check all test leads for electrical continuity after backfilling and those found broken or otherwise defective shall be excavated and re-installed or repaired at the **CONTRACTOR'S** expense. All cables shall be continuous with no splices.

c. No test leads shall be installed on foreign lines by the **CONTRACTOR**. The **COMPANY** will install all test leads on foreign lines to comply with all specifications of foreign pipeline companies and DRAWINGS.

17. **PIPELINE MARKERS**

a. The **CONTRACTOR** shall install markers on both sides of roads, railroads, or stream crossings, fence lines, where existing markers are installed or any other locations as directed by the **COMPANY**.

b. All pipeline markers shall be furnished by the **COMPANY** and installed by the **CONTRACTOR.**

18. **TILE REPAIR**

a. A tile crossing shall be defined as any portion of tile traversing or adjacent to the RIGHT-OF-WAY that is disturbed by Construction activities.

b. All tile disturbed by the **CONTRACTOR'S** equipment shall be excavated for inspection and temporarily repaired in accordance with the DRAWINGS and the Landowner Agreement. Tile damaged during trench excavation shall be

immediately reported to the **COMPANY**. The **CONTRACTOR** will mark such locations by survey station on a lath adjacent to the damaged tile.

c. Broken tile shall be removed in such a manner as to ensure the functional integrity of the remaining tile and provide for satisfactory joint replacement and adequate support of the replacement section.
d. Reused tile shall be thoroughly cleaned.
e. Tile shall be replaced so that its former gradient and alignment are restored.
f. The soil beneath and around all replaced tile lines shall be firmly hand tamped at the ditch sides.
g. All permanent drain tile replacements are to be in strict accordance with the Landowner Agreement, the following requirements and as shown in DRAWINGS.
h. A single continuous supporting member shall be placed across the trench as a trough in which to lay replacement tile.
i. The supporting member shall span the trench and have a minimum of two (2) feet of solid bearing under each end.
j. The **CONTRACTOR** shall fabricate and weld the material into shapes and lengths as shown on the DRAWINGS to properly support the tile line.
k. In cases where the original tile line very nearly parallels the pipe, the tile line shall be relaid for some distance on both sides of the trench such that it crosses the pipeline at a suitable angle.
l. Before completing permanent tile replacements, the **CONTRACTOR** shall examine, by suitable means, the adjacent tile lying beneath the working side of the RIGHT-OF-WAY to assure that such tile has not been crushed, plugged, misaligned or otherwise disturbed as a result of the **CONTRACTOR'S** activities.
m. The excavated pipeline trench shall provide a minimum of twelve (12) inches clearance between the top of the pipe and the bottom of the tile. At locations along the RIGHT-OF-WAY where future underground tile is proposed, the pipeline trench shall be excavated to the required depth to provide the specified clearance. Such excavations will be at **CONTRACTOR'S** expense.

19. CLEAN-UP

a. All clean-up and restoration shall be performed in accordance with the Environmental Mitigation Plan, the Agricultural Mitigation Plan or Agreement, and the CONSTRUCTION LINE LIST, and the applicable SPECIFICATIONS.
b. The **CONTRACTOR** shall keep the RIGHT-OF-WAY cleared daily of paint barrels, skids, defective materials, coating waste, electrode stubs and all other construction debris immediately behind the operations of all crews, to the satisfaction of the property owners and the **COMPANY**, and dispose of such wastes at a location acceptable to the **COMPANY**.

c. Upon completion of the backfill, the **CONTRACTOR** shall clear and dispose of all rock three (3) inches in diameter or larger, stumps or other remaining debris, fill holes, ruts and depressions, and the RIGHT-OF-WAY shall be left in a neat and acceptable condition. The **CONTRACTOR** shall exercise care to insure that no cast-off cable, wire, machinery parts, skids, timbers or logs are left buried or imbedded in the RIGHT-OF-WAY or adjacent lands.

d. As general clean-up is completed all topsoil will be returned to its original location and depth and then lime and fertilizer shall be applied as necessary – Refer to Erosion Prevention and Sediment Control Plan. Paratilling, chisal plowing, wind rowing, and rock picking shall then be performed on the CONSTRUCTION RIGHT-OF-WAY and TEMPORARY WORK SPACE areas. All rock three (3) inches and larger measure in any dimension shall be removed in accordance with the Agricultural Mitigation Plan or Agreement in all agricultural and pasture lands across the entire CONSTRUCTION RIGHT-OF-WAY width and disposed of at the CONTRACTOR'S expense. The **CONTRACTOR** shall be required by the **COMPANY** and certain governmental agencies to seed and/or mulch, certain CONSTRUCTION RIGHTS-OF-WAY and temporary WORK space areas used during Construction according to the governing authority. The **COMPANY** will specify the seed mixes to be used. The **CONTRACTOR** shall furnish such seed, lime, fertilizer and mulch.

e. CONTRACTOR shall at his own expense be responsible for the repair and maintenance of roadways, lands, terraces, and levees subjected to his activities in the construction of the pipeline.

f. All lawns or yards of private roads crossed will be restored to the satisfaction of the landowners and the **COMPANY.**

g. All temporary access to the RIGHT-OF-WAY will be removed and such areas will be restored to the condition found as directed by the **COMPANY INSPECTOR.**

h. All fences and gaps will be restored to the condition found prior to the WORK. All materials used shall be equal to or better than existing.

i. Clean-up shall follow backfill operations as close as practical.

j. All **COMPANY** designated material, staging, and pipe yards used by the **CONTRACTOR** will be returned to the condition found prior to beginning the WORK, as directed by the **COMPANY INSPECTOR.**

k. All backfill and clean-up operations shall be completed, when practical, prior to the commencement of hydrostatic testing.

l. All clean-up work attempted during inclement weather will be redone, if required, at the **CONTRACTOR'S** expense.

m. Permanent water bar spacing shall be in accordance with the Erosion Prevention and Sediment Control Plans or relevant permits. If the Environmental Mitigation Plan and permits differ, the more stringent shall apply.

n. Following the completion of the clean-up and permanent repair of fences for any respective property and after the **COMPANY'S** general approval of such clean-up, but prior to "Payment of Retainage", the **CONTRACTOR**, with the **COMPANY** RIGHT-OF-WAY AGENT PRESENT, will obtain a signed "CONSTRUCTION PERFORMANCE CLEAN-UP MEMORANDUM' (or other form identified by the **COMPANY**) from all landowners, occupants, tenants and other authorities having jurisdiction, acknowledging that the clean-up WORK has been completed to their satisfaction. The **CONTRACTOR** shall provide the **COMPANY** with copies of the memorandum as soon as practical to facilitate payment of damage to the landowner.

o. If the landowner or tenant refused to sign "Construction Performance Clean-up Memorandum", the **CONTRACTOR** shall attempt to obtain a signed statement from landowner and/or tenant setting forth the reason(s) for such refusal. One copy of this statement shall be furnished to the **COMPANY**.

20. CONTINUOUS CONCRETE WEIGHT COATING

a. Continuous concrete weight coating of pipe shall be installed in locations as required in the DRAWINGS. The **CONTRACTOR** will own any surplus concrete coated pipe. The **CONTRACTOR** shall comply with the following specifications:

b. One layer of tar felt paper shall be placed along the top of the pipe. The tar felt paper shall be approximately one foot wide and will serve to protect the fusion bonded epoxy coating from the aggregate as it falls from the chute. Coating protection, approved by the **COMPANY**, in the form of either tar felt paper or pipeline type tape, shall also be placed under the form support blocks to prevent damage to the epoxy coating.

c. Weight coating for pipelines shall be reinforced concrete. The concrete shall develop a minimum allowable compressive strength of 3,000 psi at 28 days, in accordance with the CONCRETE SPECIFICATIONS in the DRAWINGS. Should the results of the concrete cylinder tests fail to meet these requirements, the Structural Concrete Specification requirements shall apply. The strength and density will be tested by the Company's representative. Minimum concrete density used shall be approximately 140 lbs./ft. and maximum concrete density is 190 lbs./ft. Samples shall be taken by the **COMPANY** for testing at the rate of four (4) samples per thousand feet of pipe.

d. Internal support shall be placed inside the pipe to prevent out of round (egging) from occurring from the concrete coating. Wooden skids, contoured to fit the

pipe curvature, shall be placed in the ends of each pipe joint prior to pouring the concrete coating. Internal skids may be removed in five days after pouring.

e. The cutback on the concrete coating for the poured sections shall be fourteen (14) inches. Joint ends must be kept covered and clean during the application of concrete.

f. Reinforcing shall be applied prior to concreting and shall consist of 2"x2" sixteen gauge galvanized wire mesh. The reinforcement shall be overlapped not less than eight (8) inches.

g. Form spacers shall be used to keep the pipe forms concentric with the shape. Such spacers shall be of masonry material approved by the **COMPANY'S** representative. Spacers shall be of adequate height to insure the required concrete thickness as set forth on the Drawing. The welded wire mesh shall be securely tied to the spacers to prevent any movement while pouring.

h. The forms shall be securely held in place around the spacers to insure proper application and uniform coating of the pipe. The concrete poured shall be vibrated to produce a dense, homogeneous, smooth surface with a uniform thickness with no variations in weight per linear foot. The method of vibration shall be approved by the **COMPANY**. No one section of coated pipe shall contain honeycombs or high porosity. Honeycombs or porosity may be repaired with grouting at the **CONTRACTOR'S** expense.

i. When ready mixed concrete is used, a copy of each batching ticket of the ready mix supplier shall be furnished by the **CONTRACTOR** to the **COMPANY**.

j. Concrete coated pipe shall possess a minimum negative buoyancy of 10% (1.10 S.G.). The **CONTRACTOR** will demonstrate that the thickness and density of the concrete applied shall result in the specified specific gravity.

k. The first joint of pipe for each coating thickness shall be weighted after application and curing. The mix shall be adjusted as required to meet the specified weight.

l. The **CONTRACTOR** shall exercise due caution in handling, storing and transporting the coated pipe.

m. Repairs to damaged weight coating shall be made as follows:

   A. If the coating damage is less than 25% of the coating thickness and less than one (1) square foot in area, repairs shall not be required.

   B. If the coating damage is less than 25% of the coating thickness and more than one (1) square foot, but less than ten (10) square feet in area, the damage will be repaired by exposing the reinforcing mesh and repairing with a suitable concrete mixture of grout.

C. Damage to the coating not covered above will be repaired by exposing the entire periphery of the pipe throughout the damaged area, installing a metal form and replacing all materials.

D. Cracks in excess of one sixteenth (1/16) inch in width and twelve (12) inches in longitudinal length or in excess of one sixteenth (1/16) inch in width and extending over 180 degrees circumferentially, shall be repaired to the satisfaction of the **COMPANY**.

E. All repairs to weight coating shall be properly cured. Failure to comply with the SPECIFICATIONS shall constitute cause for rejection of the coated pipe.

n. Concrete forms shall be left on a minimum of twenty four (24) hours. Once forms have been removed, the concrete coated pipe shall not be moved for a minimum of 72 hours.

o. With or without non-chloride admixtures – Temperature of the concrete must be maintained and monitored as follows.

A. 0-24 hours – Concrete temperature no less than 55° F.

B. 24-48 hours – Concrete temperature no less than 50° F. °

C. 48-120 hours-Only protective covering is required if ambient temperature falls below 40° F. No concrete temperature monitoring is required after 48 hours.

D. The concrete temperature should be measured with contact thermometers during the first 48 hours after it has been poured. Temperatures shall be checked on 10% of each day's production.

E. When the mean daily ambient temperatures fall below 40°F, the use of non-chloride, non-corrosive accelerator must meet the requirements of ASTM C494, Type C. Calcium chloride is not acceptable for continuous concrete coating.

p. COMPANY designated pipe shall be concrete coated.

21. ROAD CROSSINGS

a. The **COMPANY** will obtain the necessary permits from state, county, and other jurisdictional authorities for pipeline crossings of roads identified on the DRAWINGS and CONSTRUCTION LINE LISTS. The **CONTRACTOR** shall construct each crossing in accordance with the permit and the **COMPANY'S** DRAWINGS, as applicable. In situations where the permit stipulations are less than the **COMPANY'S** requirements, then the **COMPANY'S** requirements shall govern. Copies of permits or information concerning crossings will be given to the **CONTRACTOR**. It shall be the **CONTRACTOR'S** responsibility to furnish and install at all crossings adequate and proper traffic aids, warning signs, barricades, flares and other safeguards necessary for public safety and to maintain them throughout the duration of the work. Any specialized insurance that is required

by any permitting authority having jurisdiction over any road will be at the **CONTRACTOR'S** expense.

b. **OPEN CUT CROSSING**

A. The locations of open cut roads will be as designated by the **COMPANY**. Installation will be in accordance to Drawing specifications.

B. The **CONTRACTOR** shall immediately backfill that portion of the ditch which crosses the road after the pipe is installed. Backfill in pipe trenches crossing roadways shall be compacted to a minimum of 95 percent of modified Proctor maximum dry density. Backfill materials shall be placed with water content within plus or minus 3 percent of optimum moisture content per the modified Proctor method (ASTM D1557). Any water used for compaction shall be provided by the Contractor at his own expense. The Contractor is responsible for the repair of any trench settlement at no expense to the COMPANY.

C. Backfilling, compaction and surface restoration will meet the requirements of the jurisdiction issuing the permit and also any COMPANY requirement. The compensation for such WORK shall be included in the pricing for such WORK in the BID DOCUMENTS.

D. Proper traffic control meeting Federal and State D.O.T. requirements will be provided by the **CONTRACTOR** at CONTRACTOR'S expense.

E. Any shoring or well pointing, if required, will be at CONTRACTOR'S expense.

F. All excavations shall comply with current OSHA Standards.

G. Refer to Specification 31233 Trenching and Backfilling for additional requirements.

c. **BORED CROSSING**

A. The locations of the bore crossings will be as designated by COMPANY.

B. The bore hole shall not exceed the pipe diameter by more than one and one-half (1- 1/2) inches.

C. Any shoring or well pointing, if required, will be at CONTRACTOR'S expense.

D. All excavations shall comply with current OSHA Standards.

E. Should the bore prove unsuccessful, the void created shall be filled with concrete at the CONTRACTOR'S expense. All COMPANY material so wasted will be replaced at the CONTRACTOR'S expense. Any additional expense incurred in acquiring new permits or RIGHT-OF-WAY will be at the CONTRACTOR'S expense.

F. The CONTRACTOR will provide the "Deadman" and "Dummy Pipe", as necessary.

G. Road boring methods shall comply with State and Local Regulations.

H. Welded pipe joint final locations should be minimized under road surfaces. If pipe joints under a travelled way is unavoidable, prior to pipe installation, CONTRACTOR shall review with OWNER location of welds and an alternative mechanical protection, approved by the OWNER, shall be installed around weld.

22. RAILROAD CROSSINGS

a. The COMPANY will obtain the necessary permits from federal, state and other jurisdictional authorities for pipeline crossings of railroads identified on the DRAWINGS and CONSTRUCTION LINE LISTS. The CONTRACTOR shall construct each crossing in accordance with the permit and the COMPANY'S DRAWINGS, as applicable. In situations where the permit stipulations are less than the COMPANY'S requirements, then the COMPANY'S requirements shall govern. Copies of permits or information concerning crossings will be given to the CONTRACTOR. It shall be the CONTRACTOR'S responsibility, at all crossings, to furnish and install adequate and proper traffic aids, warning signs, barricades, flares and other safeguards necessary for public safety and to maintain them throughout duration of the work. Any specialized insurance that is required by any permitting authority having jurisdiction over any railroad will be at the CONTRACTOR'S expense.

b. BORED CROSSINGS

   A. The locations of the bore crossings will be as designated by the COMPANY.
   B. The bore hole shall not exceed the casing pipe diameter by more than one and one half inches.
   C. Any shoring or well pointing, if required, will be at the CONTRACTOR'S expense.
   D. All excavations shall comply with current OSHA Standards
   E. Should the bore prove unsuccessful, the void created shall be filled with concrete at the CONTRACTOR'S expense. All COMPANY material so wasted will be replaced at the CONTRACTOR's expense. Any additional expense incurred in acquiring new permits or RIGHT-OF-WAY will be at the CONTRACTORS expense.
   F. The CONTRACTOR will provide the "Deadman" and "Dummy Pipe", as necessary.
   G. Railroad boring methods shall comply with Federal and State Regulations.

23. RIVER, STREAM AND WETLAND CROSSINGS

a. Construction of pipelines at rivers, including major rivers, and at streams and other water crossings shall be performed in such a manner as to minimize damage to shorelines, waters crossed, adjacent drainage areas, fish and wildlife habitats and recreational areas, in accordance with the SPECIFICATIONS, the Project Permits, and requirements of any governmental or other authority having jurisdiction there over and as prescribed in these SPECIFICATIONS. Minimum depth of cover will be specified in the BID DOCUMENTS.

ll. All the above records shall show the size and name of the pipeline, the location of the Test Section, the location of the test gauge, and the quantities of each wall thickness of pipe included in the Test Section, and the starting and ending times/dates of tests. These records shall be signed by the authorized representatives of the **CONTRACTOR** and the **COMPANY**. Original signed copies of all records for each Test Section shall be turned over the COMPANY immediately after the successful completion of the test in that section. All records shall be in accordance with DOT Part 192.

mm. All testing operations involving work on the RIGHT-OF-WAY or on the pipeline, including but not limited to move-in/move-out, cutting fences, handling the **COMPANY** furnished materials, bending, welding, coating, tie-ins and backfilling shall be in accordance with the applicable sections of the SPECIFICATIONS.

nn. All areas disturbed by any of the testing operations, including but not limited to filling, pressurizing, failure repairs, buckle repairs, manifold or temporary scraper trap removal and water damage to previously cleaned-up RIGHT-OF-WAY shall be cleaned up immediately after testing operations have been completed in accordance with these Specifications.

27. <u>GEOMETRY PIG</u>

a. The **CONTRACTOR** is responsible to demonstrate conformity with API 5L, ASME B31.8, other related standards, and VERMONT GAS SYSTEMS policies and procedures by the use of a "geometry pig" (charted dent tool). The tool used shall be an ENDURO DDL Pig or approved equivalent. Prior to commencing any Geometry Pig activity, **CONTRACTOR** shall present for **COMPANY** approval, tool specification and vendor, if other than what is above.

b. Upon completion of the drying of the pipeline to a minus 40 degree dew point, which follow the hydrostatic testing, and after installation of mainline valves, the **CONTRACTOR** shall furnish all labor, supervision, services, supplies, materials, equipment and instrumentation including any temporary launching and receiving traps required to perform one successful run of the "geometry pig" through the completed sections of the pipeline. The **CONTRACTOR** shall submit a plan for benchmarking the "geometry pig" run to the **COMPANY** for approval. The benchmarking data shall have above ground reference points spaced no further than 3 miles, but with a 2 mile average. Should an inconclusive chart be produced due to any reason whatsoever, the "geometry pig" shall be rerun entirely at the **CONTRACTORS** expense until a satisfactory chart is produced.

c. In order to best attain a constant pig speed, the pipeline shall first be pressurized with air, furnished by the **CONTRACTOR**, to approximately 50 psi on the downstream side of the pig prior to launching. The pressure shall be maintained during the entire pig run by regulating the discharge rate of the blowdown valve at the downstream end of the section to approximately 50 psi. Ideally, the operator should maintain a 3 or 4 m.p.h. speed or per the manufacturer's

recommendation. The contractor shall insure inlet air pressure, volume, hoses, in-let header, and etc. to ensure adequate head, differential and pressure is maintained during the entire "geometry pig" tool run. The maximum length of section to be pigged at one time shall be the length of the hydrostatic test section, unless approved in writing.

d. A summary of the 'geometry pig" run shall be provided to the **COMPANY** for review and acceptance. At a minimum, the report shall include:
    A. Summary of tool logistics including maximum speed, minimum speed, average speed, data quality, Vendor assurance of 100% coverage and etc.
    B. An Excel spreadsheet containing a summary of the following:
        1. Reference to pipeline stationing
        2. All dents greater than 2% of pipe diameter
        3. All combination dents and ovality greater than or equal to 5% of pipe diameter.
        4. Ovality greater than 5% of pipe diameter.
        5. All bore restrictions greater than or equal to 6% of pipe diameter.
        6. All welds.
        7. All pipe and wall thickness changes.
        8. Location and radius of all bends.
        9. Location and description of all fittings, tees, valves, and etc.
        10. Benchmarking data
    C. Software to review and analysis data.
    D. The report shall adhere to the following Reporting Standards.
        1. **In-Line Inspection, Geometry, and Tracking Vendor Reporting Standards Hard Copy Information And Electronic Documentation**
            a. **<u>Hard Copy Report – Title Page (3 Ring Binder)</u>**
                i. Vendor's Logo
                ii. Line Number
                iii. Diameter of Pipe (Imperial and Metric)
                iv. In-Line Inspection run from trap – trap section (e.g. Regina – Cromer)
                v. Trap = Trap (Milepost and Kilometer)
                vi. Run Date: Month, Day, and Year
                vii. **Type of tool used for run: (e.g. Elastic Wave, Metal Loss, Scout Scan, etc)**
                viii. Book Numbering (e.g. Book 1 of 1) Bottom right hand of the page.
                ix. GPS (If Applicable)

b. Spine – Hard Copy Report (3 Ring Binder)
   i. Vendor's Logo
   ii. Line Number
   iii. Diameter of Pipe (Imperial and Metric)
   iv. In-Line Inspection run from trap – trap section (e.g. Regina – Cromer)
   v. Run Date: Month, Day, and Year
   vi. Book Numbering (e.g. Book 1 or 1)
   vii. GPS (if Applicable)

c. Electronic Documentation – Compact Disks and/or DVD
   i. Jewel Case - Spine
      1. Vendor's Name, Initials or Logo
      2. Month and Year of Run
      3. Diameter of Pipe (Imperial)
      4. Tool Type (Metal Loss, Elastic Wave etc)
      5. In-Line Inspection Section (Call Signs)
      6. Disk Numbering System (e.g. Disk 1 of 2)
   ii. Compact Disk and/or DVD
      1. Vendor's Name of Logo
      2. Line Number
      3. Diameter of Pipe (Imperial)
      4. In-Line Inspection Section (e.g. Regina-Cromer)
      5. Run Date: Month, Day, and Year
      6. Application and Data Type (e.g. Excel, Pipe image etc.)
      7. Disk Numbering System (e.g. Disk 1 of 1)
      8. Vendor's Information
      9. Revision Number (IF applicable)
      10. GPS (if Applicable)

2. Information Requirements
   a. 1 Set of Hardcopy Information (1 working copy)
   b. Three ring binders will only be accepted.
   c. 1 Set of Electronic Information (1 working copy)
   d. **The In-Line inspection run data criteria and schedule is mandatory.**

b. Unless a separate price is stated for specific river, stream or wetland crossing in the BID DOCUMENTS, no additional compensation will be due the **CONTRACTOR** for such work.

c. All rivers, stream and other wetland crossings shall be constructed using the "free stress" or field bend (sag/overbend) method of construction unless specified otherwise. The **CONTRACTOR** will be responsible for installing and removing all bridges required for river, stream, and wetland crossings at the **CONTRACTORS** expense.

d. All river and stream bank restoration will be according to the conditions as set forth in the SPECIFICATIONS, Environmental Mitigation and applicable permits.

e. The **CONTRACTOR** will be required to conduct the WORK in such a manner as to minimize obstruction in navigable waters.

24. NON-DESTRUCTIVE TESTING

a. The **COMPANY** shall supply all labor, materials and facilities to meet the requirements of the latest addition of API 1104. See Drawings.

b. The **COMPANY** shall furnish all labor, material and equipment to provide all NDT of all pipeline welds and to provide and interpretation of such examination. 100% of girth welds shall be examined radiographically as well as visually. Personnel performing such examination shall be qualified as ASNT Level II as a minimum.

c. Marking of all weld information on the pipe is the responsibility of the **CONTRACTOR**.

d. All examination results will be furnished to **COMPANY** and will be reviewed by **COMPANY**. The **COMPANY** interpretation will be the final decision as to the acceptance or rejection of any weld.

e. The **COMPANY** is fully responsible for supporting and coordinating NDT crews so as to cause no delays to the project. Any costs associated with such delays shall be at the expense of the **COMPANY**.

25. HORIZONTAL DIRECTIONAL DRILLING

a. The **CONTRACTOR** has the option to directional drill crossings, subject to the **COMPANY'S** approval and SPECIFICATIONS and PERMITS; however, the **CONTRACTOR** shall not receive any additional compensation for the option to directional drill.

26. HYDROSTATIC TESTING

a. Prior to commencing the Hydrotest activities, **CONTRACTOR** shall provide, for **COMPANY** approval, a hydrotest plan and procedure, which shall include a temporary evacuation and security plan.

b. All hydrostatic testing shall be performed by **CONTRACTOR** and approved by the **COMPANY.** The Pipeline and appurtenances shall be pressure tested to a pressure, time and procedure as specified in this Specification, the Department

of Transportation CFR 49, Part 192, latest edition, and ANSI B31.8, latest accepted edition. Such WORK shall include, but not be limited to, cleaning and preparing pipeline for test, filling and dewatering the pipeline, making repairs in the event of failure, drying the pipeline, and reconnecting or capping the pipeline following successful completion of the test. Filters, subject to approval by **COMPANY**, shall be used for filling operations of hydrostatic testing, unless clean well or domestic water is used. Dewatering shall be performed in accordance with the **COMPANY'S** Environmental Permits, discharge permits, and all applicable Federal, State and local Regulations.

c. All record keeping will be the responsibility of the **CONTRACTOR**. The original and two (2) copies of all hydrostatic test records are to be submitted to the **COMPANY** upon completion of each hydrostatic test. Each hydrostatic test must be approved by the **COMPANY** prior to the depressurization of the test station.
d. The **COMPANY** will furnish DRAWINGS detailing the number and length of each test section, the test pressures required, and the pipeline profile.
e. The **COMPANY** will supply a Test Engineer to witness the hydrostatic tests. The **CONTRACTOR** shall supply personnel experienced with the operation of all required testing instruments and equipment in accordance with the provisions of this **CONTRACT**.
f. The **COMPANY** will secure Hydrostatic Test Water Discharge Permits. Copies of the Hydrostatic Test Water Discharge Permits will be furnished to the **CONTRACTOR**.
g. Water used for testing purposes shall comply with water discharge permits and be kept free of additives including acids or other material detrimental to the pipe metal. Unless otherwise specified, the **COMPANY** shall be responsible for supplying water acquisition sites and permits and the **CONTRACTOR** will abide by any restriction therein. CONTRACTOR shall utilize commercial or public water sources, unless otherwise approved by the COMPANY. All efforts will be made to locate the water source on the Working side of the RIGHT-OF-WAY
h. The **CONTRACTOR** shall furnish equipment which complies with the following specifications:
    A. Fill lines and pumps shall be in good operating condition, capable of pumping a minimum of one thousand five hundred (1500) gallons per minute to a pressure of two hundred (200) psi.
    B. Filters shall be installed between all unprocessed water sources and the pipeline. Filters shall be equipped with one hundred (100) mesh screen or equivalent and capable of removing particles one hundred sixty (160) microns and larger. Filters shall be installed in such a manner to

permit back flushing or change out without interruption of the pumping operation and without bypassing the filtration system.

i. High-pressure pumps shall be in good operating condition, capable of pumping a minimum of fifty (50) gallons per minute, and rated at least fifty-percent (50%) above maximum required test pressures. Pumps shall be equipped with a stroke counter or other means of volume measurement and a variable speed control to reduce capacity to three (3) gallons per minute. High pressure pumps shall be mobile enough to allow movement from one location to another without causing delay.

j. Air compressors required for dewatering shall have a total capacity of not less than 1200 CFM.

k. Deadweights shall be installed at one end of each test section, whereas a pressure recorder and ambient and pipe temperature recorders shall be installed at both ends of each test section, as designated by the **COMPANY**. The following minimum requirements shall be met:

   A. Deadweight pressure gauges 0-3000 psig with readings to the nearest 1 psig, complete with a current test certificate in accordance with the requirements of the governing authorities.

   B. Pressure recording gauges 0-3000 psig with twelve (12) inch minimum diameter or width chart with pressure increments of 20 psig maximum complete with a current test certificate in accordance with the requirements of the governing authorities.

   C. Pressure dial gauges 0-3000 psig, six (6) inch minimum diameter with pressure increments of 30 psig maximum.

   D. Temperature recording gauges for pipe temperature, soil temperature and air temperature, 32 deg. F. – 120 deg. F. twelve (12) inch minimum diameter with temperature increments 1deg F maximum, complete with a current test certificate in accordance with the requirements of the governing authorities.

l. A suitable building or trailer, approved by the **COMPANY**, with proper chairs (5), tables (2), lighting and heat and installation of a **COMPANY** supplied radio for communications shall be provided and/or installed by the **CONTRACTOR** at each test site, to house test instrumentation and personnel.

m. The **CONTRACTOR** shall provide test manifolds with the exception of the line pipe provided by the **COMPANY**. The **CONTRACTOR** shall install manifolds at locations designated by the Company. CONTRACTOR shall provide the following for the test header:

   A. Material test reports on the header pipe, cap and fittings, with a complete bill of materials.

   B. X-rays of each weld on the test manifold/header

   C. Serial numbers on each valve.

D. Valves and fittings clearly stamped with ASTM, API, ASME specifications.
E. Traceable materials including heat numbers, where applicable.
F. Visual examination of the testing materials for dents, gouges or other damage

n. The **CONTRACTOR** shall perform and provide a pressure-volume (P-V) plot for hydrostatic tests.

o. The **CONTRACTOR** shall, within thirty (30) days after award of Contract, submit the following data to the **COMPANY** for approval:
   A. A list of all instrumentation to be used showing manufacturer rating, range, accuracy, limits, etc., complete with certified copies of all calibration reports. Certification to be current within 6 months.
   B. A detailed section line fill, test procedure and schedule.

p. The **CONTRACTOR** shall ensure that the pipeline and appurtenances are free of dirt and debris prior to filling the test section and that all valves are fully open. The **CONTRACTOR** shall furnish compressed air to run a minimum of one (1) **CONTRACTOR** furnished wire brush pig with cups. The **COMPANY** may request additional runs at no additional cost to the **COMPANY.**

q. Filling shall be continuous and accomplished with one (1) of more bi-directional squeegee pigs (four (4) disk minimum) furnished by the **CONTRACTOR.** The **CONTRACTOR** shall regulate the speed of travel of the fill pig(s) to the satisfaction of the **COMPANY** in order to prevent water from bypassing the pigs during the filling and dewatering operations. The **CONTRACTOR**, at no additional cost to the **COMPANY**, shall cut from the line any pig which stops during filling, dewatering or drying, and cannot be dislodged, and repair the line in accordance with the **COMPANY'S** Specifications.

r. The temporary piping at the fill point shall include a water meter and a recording pressure gauge for the purpose of estimating the location of the fill pig. A check valve shall be installed at the point where the fill pump discharge piping is tied into the pipeline.

s. All buried pipeline and appurtenances shall be tested to the pressure designated by the **COMPANY** for a period of eight and one-half (8.5) continuous hours; whereas, pre installation (above ground) testing shall be for a period of four and one-quarter (4.25) continuous hours. The **COMPANY** Test Engineer shall be present during the pressurizing operation. Pipe installed at specified crossings shall be hydrostatically tested at a pressure specified by the COMPANY (for four and one quarter (4.25) hours) prior to installation. This includes some HDD crossings.

t. The **CONTRACTOR** shall connect two pressure recorders (one at each end), deadweight test pressure gauge and four temperature recorders (one in the backfill at pipeline depth and one on the pipe, at each end of the pipeline) to the pipeline before the start of the test pressurizing. Starting at sixty (60) percent of the test pressure specified for the test point location, the pressure shall be

continually checked with the deadweight test gauge until the specified test pressure is reached. Also, during this portion of the test, the volume of test medium added shall be measured by one of the following methods:

A. **A calibrated turbine meter and totalizer installed in a manner approved by the COMPANY.**
B. A counting device installed on the positive displacement pump which will record the number of pump strokes.

u. At Sixty (60) percent of the specified test pressure a stabilization period shall start. The temperature stabilization period of the test medium shall be continued for a minimum of one (1) hour and until a temperature-time plot is asymptotic to the ground temperature. During the stabilization period, all appurtenances (mainline valves, test connections, etc.) shall be checked for leakage and be in the open position for the remainder of the test.

v. After termination of stabilization period, the yield plot will commence. A constant pumping rate will be maintained to obtain a suitable pressurizing rate of not more than 15 psi increase per minute. As each 15 psi increment is indicated on the deadweight gauge, the cumulative volume of test medium added shall be recorded. This pressure and volume information shall be recorded in tabular form and immediately transferred to produce a graph of pressure versus cumulative volume or "yield plot". The yield plot will form a straight line until the elastic limit of a portion of the pipe is reached, at which time it will gradually curve to the right of the projected straight line. Pressurizing shall cease when either the required test pressure has been reached or a pressure has been reached which corresponds to a deviation from a straight line proportionality of 0.2 percent (offset method on the pressure volume plot for the section being tested.

w. Pipe installed at specified crossings shall be hydrostatically tested for four hours at a pressure specified by the COMPANY, both prior to, and after installation.

x. The **CONTRACTOR** shall not be permitted to tighten or otherwise disturb any flange or pipeline appurtenance that is under pressure.

y. After successful completion of the test and after approval by the **COMPANY** Test Engineer, the pressure shall be bled down only to the hydrostatic head at the bleed off point. The bleed off point shall be the highest point of the two ends in the Test Station, the intent being to bleed excess pressure from the pipeline while preventing air from entering the pipeline.

z. The **CONTRACTOR** shall be required to comply with all applicable water acquisition and dewatering permit requirements furnished by the **COMPANY** and in accordance with the **COMPANY'S** Environmental Mitigation Plan. The **CONTRACTOR** shall obtain approval from the **COMPANY** Test Engineer before discharging any test water.

aa. Dewatering shall be accomplished with one (1) or more bi-directional **COMPANY** approved four (4) disk squeegee pigs that are not excessively worn or damaged and one (1) or more bi-directional poly pigs furnished by the **CONTRACTOR**. The bi-directional poly pig may be loaded in the receiving manifold prior to the filling operation such that if may be run in combination with the squeegee fill pig during the initial dewater run.

bb. Drying shall be accomplished utilizing compressed air furnished by the **CONTRACTOR** with **COMPANY** approved directional squeegee or poly pigs furnished by the **CONTRACTOR**. A minimum of two (2) separate air propelled runs will be run. Additional foam pig drying runs may be requested by the **COMPANY** at the **CONTRACTOR'S** expense. The **CONTRACTOR** shall provide pipeline dryers to achieve a minus 40 degree dew point of the finished pipeline. Pipeline dryers and labor to be furnished by the **CONTRACTOR** at no additional expense to **COMPANY.** CONTRACTOR shall demonstrate recent calibration (within the previous three (3) months) of dew point tester.

cc. Whenever possible, all fabricated assemblies shall be hydrostatically tested as an integral part of the mainline pipeline, in accordance with these Specifications. However, situations may arise which result in the fabricated assemblies not being in place at the time of mainline testing. With prior written approval of the **COMPANY,** fabricated assemblies may be proof tested above ground for eight (8) hours duration, prior to installation in the pipeline. Such tests shall be performed in general accordance with these Specifications, Department of Transportation Regulations and ANSI B31.8.

dd. If any leaks or breaks occur during any of the testing operations, the **CONTRACTOR** shall locate, repair and retest the Test Section in which the failure took place. The CONTRACTOR shall immediately notify the **COMPANY** of all pipe failures and all suspected leaks complete with all particulars.

ee. Leaks or breaks occurring in the pipe metal or pipe seam shall be repaired by cutting out and replacing the entire joint. If the leak or break has been caused by construction damage only and is in a straight joint of pipe, it will not be necessary to replace the full joint and repairs shall be as directed by the **COMPANY**. Leaks occurring in the circumferential welds shall be replaced with a 10ft minimum length pup. Failures occurring in field bends shall be replaced with field bends of the same degree. No cuts shall be made closer than twelve (12) inches to a defect.

ff. For all leaks and breaks, accurate records shall be kept from the time the leak or break is first indicated until it has been located, repaired, refilled and re-pressurized to the same pressure at which the failure was first indicated. Records shall detail the quantities of materials and supplies used. All supervision, labor, and equipment shall be classified by operational and standby time.

gg. All pipeline sections containing leaks or breaks which are cut out of the pipeline shall be handled in accordance with the pipe manufacturer's representatives or the **COMPANY'S** instruction's so as not to damage the defective areas. All such cut out pipe shall be clearly marked with paint immediately after removal from the ditch to show the **COMPANY** stationing and date of failure. The edges of the defect shall be protected with grease. Defective pipe shall be transported as directed by the **COMPANY**.

hh. Leaks or breaks occurring in the pipeline during any of the testing operations which are a result of defective permanent materials furnished by the **COMPANY** shall be located, repaired and the repaired Test Station refilled and re-pressurized to the same pressure which the failure was first indicated, all by the **CONTRACTOR** at the **COMPANY'S** expense.

ii. During all testing operations, the **CONTRACTOR** shall take all necessary safety precautions to protect all persons and property including the temporary evacuation and lodging of property owners/residents/tenants as required by the **COMPANY'S** SPECIFICATIONS. This shall include, but not be limited to, keeping all persons not directly engaged in the testing operations off the CONSTRUCTION RIGHT-OF-WAY of the test section during the pressure stabilization and holding periods. Warning signs shall be placed along the RIGHT-OF-WAY at points of public crossings and must remain in place throughout the pressurizing and holding periods.

jj. The deadweight pressure gauge, pressure recorder, and dial pressure gauge shall be tied into a common manifold which is connected to the Test Section by a high pressure hose. This manifold and the instrumentation shall be located a minimum of fifty (50) feet from the Test Section being tested. The same criteria shall hold true for the pressure recorder and dial pressure gauge located at the other end of the test section. CONTRACTOR shall demonstrate recent calibration (within the previous three (3) months) of the deadweights and chart recorders.

kk. The **COMPANY** will furnish the forms for and the **CONTRACTOR** shall prepare the following records for each Test Section:

A. Log of deadweight pressure readings taken every 15 minutes during stabilization period, yield plot and eight (8) hour hold test.

B. Pressure recording charts for:
   1. Pressurizing and stabilization period
   2. Eight (8) hour hold test.

C. Temperature recording charts for:
   1. Pressurizing and stabilization period
   2. Eight (8) hour hold test.

D. Report on any leak or break including location, pressure, dimensions of defect, pipe manufacturer heat number and joint number, how repaired, etc.

e. **If the criterion has changed from the previous run, an electronic file with the analysis**
    i. **With the previous criteria and the current run data is required. Documentation regarding this information being available is required within the hard copy report.**
f. Include Internal Inspection Questionnaire used for the specified run.

3. **Revision Requirements**
    a. A revision to either the hard copy of electronic documentation requires an explanation for the revision, inserted in the hard copy issue of the report.
    b. Revisions require re-issue to both sets of documentation.
    c. Provide revision number, month of revision and year.
    d. The maximum allowable pipe defect shall be as specified in ANSI ASME B31.8, API 1160, and API 5L and the following Company Specifications;
    e. All dents greater than 2% (regardless of orientation), any dents with metal loss, and all dents or ovality greater than or equal to 5 percent shall be replaced at the **CONTRACTOR'S** expense. If the analysis of the calibrated pig ("geometry pig" run, as determined by the caliper approved vendor technician, shows indications of pipe defects exceeding these allowable limits, the **CONTRACTOR** shall locate and correct the defects and the "geometry Caliper Pig" shall be rerun to the satisfaction of the **COMPANY**, all at no additional cost to the **COMPANY**.
    f. One running of the calibration instrument pig shall be included in Lay Price Bid of the Bid Documents. This one run of the "Caliper Geometry Pig" is for the entire length of the pipeline laid. Additional runs of the "Caliper Geometry Pig" where requested by the **COMPANY** and which were not the liability of the **CONTRACTOR**, shall be compensated for in accordance with the Bid Document.

28. **COATING AND PAINTING**

a. Whenever painting, the **CONTRACTOR** shall take special precautions to prevent primer or finish paint from being blown onto the existing or newly painted surfaces. All Splattering of primer and finish paint falling on these and nearby surfaces shall be removed by the **CONTRACTOR** at his expense. Paint damage to automobiles or any other structures caused by wind drift shall be the **CONTRACTOR'S** responsibility.

b. No paint shall be applied at ambient temperatures below 50 deg. F. or on surface temperatures less than 5 deg. F above the dew point.
c. Unless otherwise specified, surfaces which are abrasive blasted will be done so as to conform to Steel Structures Councils Specification SSPC-SP6 Commercial Blast Cleaning with cleanliness according with NACE #3 to obtain a one to three mil profile. All spent abrasives and dust shall be removed from the surface before the application of any paint.
d. The **CONTRACTOR** shall supply a paint mil thickness gauge to enable the **COMPANY** to verify dry film thickness of applied paint.
e. Any paint coating other than Specified shall require specific **COMPANY** approval prior to application.
f. Crystalline silica sand will not be permitted for use in abrasive blasting operations. The **CONTRACTOR** shall be permitted to use "Black Beauty" or equivalent.
g. Above ground fabrication piping furnished with thin film fusion bond epoxy coating shall be "brush" blasted to obtain an acceptable anchor pattern prior to painting, subject to approval of the **COMPANY**.
h. The transition of below grade coating to above grade paint shall have all below grade coatings extend six inches above grade.

29. ENVIRONMENTAL CONSIDERATIONS

a. GOVERNMENTAL RULES AND REGULATIONS

A. The **CONTRACTOR** shall be responsible to abide by all governmental laws, rules and regulations applicable to the **COMPANY** concerning environmental protection and obtain all necessary permits and licenses required under such laws, rules and regulations unless specifically stated otherwise, elsewhere in this **CONTRACT**.

B. Workers to be informed and instructed

1. **CONTRACTOR** shall have all personnel participate in environmental training.
2. The **CONTRACTOR** shall ensure all employees, servants and agents (and by employees, servants and agents of ALL SUBCONTRACTORS) are:
3. Informed of the environmental concerns and special conditions of the construction area.
4. Instructed on the requirements of environmental laws, rules and regulations applicable to the construction area.

C. General Housekeeping

1. The **CONTRACTOR** shall ensure that general rubbish such as food wrapping, garbage and sanitary wastes are confined to RIGHT-OF-WAY and other WORK sites and are collected on a daily basis by each WORK crew. Disposal of said wastes is the responsibility of

the **CONTRACTOR** and shall be in an approved manner at a site approved by authorities having jurisdiction.

2. The **CONTRACTOR** shall ensure that the RIGHT-OF-WAY and/or WORK sites are left in a tidy and workmanlike condition following the cessation of daily activities.
3. No disposal of materials will be permitted off the RIGHT-OF-WAY unless prior approval is obtained from the appropriate authorities.
4. Open burning of waste materials is not allowed.

D. Environmental Disturbance

1. The **CONTACTOR** shall carry out all WORK under this **CONTRACT** in such a manner as to cause the least possible disturbance or damage to the environment. Continuous efforts shall be made to prevent and control fires; soil erosion; and air, noise and water pollution. In cases where some temporary disturbance or damage is unavoidably caused due to the nature of the construction WORK, the **CONTACTOR** shall, as soon as possible, remove the cause of such temporary disturbance, repair damage, and in general restore the affected areas to their original or specified condition to the extent possible.

E. Pollution Controls

1. The **CONTACTOR** shall not permit liquid wastes, fuels or other potential pollutants to be deposited on the ground or into bodies of surface water. Refueling and lubrication changes shall be carried out at a minimum distance of 100 feet from a surface water body to prevent any material spilled from entering the water body. Fuel trucks shall carry at least 25 lbs. of absorbent material at all times. The CONTRACTOR shall comply with the COMPANY SPILL PREVENTION, CONTAINMENT AND CONTROL PLAN.

F. Dust Control

1. The **CONTRACTOR** shall exercise care to minimize uncontrolled emissions of dust (particulate matter) from its activities on the RIGHT-OF-WAY and other WORK areas. Particular care shall be taken in residential areas. These measures include watering down the RIGHT-OF-WAY and suspending topsoil stripping and replacement during strong winds. All such control measures taken shall be in accordance with any regulations applicable to the **COMPANY**. The **CONTRACTOR** will furnish, at his expense sufficient water trucks and water to 'wet' the RIGHT-OF-WAY to

control fugitive dust near residential areas and other areas as directed by the **COMPANY**.

G. Construction Noise

1. The **CONTACTOR** shall exercise care to minimize noise from its activities, including blasting, in accordance with local regulations.

2. **The CONTRACTOR shall not perform any work on Sunday, and shall limit work hours on the construction Right of Way in** accordance with applicable Contract Documents. Unless otherwise noted within the Contract Documents, the work hours shall be as **follows;**
   a. Monday through Friday 7 to 7,
   b. Saturday 8 to 5, and
   c. Sunday no work will be permitted

H. Wildlife

1. The **CONTACTOR** shall make every effort to ensure that wildlife encountered along the RIGHT-OF-WAY or other WORK areas are not unduly harassed by equipment or personnel. In certain instances, the **COMPANY** may require additional protective measures to be implemented to prevent disturbance to wildlife and comply with environmental conditions. No wildlife shall be fed. Graded trench exits shall be spaced appropriately to allow egress for wildlife which may become entrapped in the trench. Construction personnel shall not be permitted firearms or pets on the RIGHT-OF-WAY.

I. Archaeological and Heritage Sites

1. In the event that any archaeological or heritage sites are discovered during construction, the **CONTACTOR** shall take immediate measures to protect the site. No artifacts shall be removed from the site. The location of the site shall be immediately brought to the attention of the **COMPANY** who will advise the landowner and the appropriate State authority. Until such time as the site has been assessed by a qualified archaeologist, the **CONTRACTOR** shall cease his activities at the site.

J. Farming Areas

1. The **CONTRACTOR** shall ensure that all equipment brought to the RIGHT-OF-WAY from outside of the local area arrives in clean condition in order to minimize the risk of weed introduction.
2. The **CONTRACTOR** shall make every effort to ensure that livestock are not unduly harassed by equipment or personnel. No livestock

shall be fed. All gates shall be closed unless a watchperson is maintaining the gate.

K. Noxious Weeds

1. The RIGHT-OF-WAY includes limited areas that are infested with noxious weeds. The **COMPANY** may fence the infested area to minimize the opportunity for spreading the infestation. In areas where the **CONTRACTOR** must travel through the infested areas, the following approaches shall be utilized.
2. Use the minimum amount of equipment to complete construction in the infested area.
3. Minimize the number of passes a single piece of construction equipment has to make through the infested area.
4. Use matting in infested areas where possible to minimize the amount of vegetation soil which comes in contact with construction equipment that passes through the infested area.
5. The Environmental Inspector shall identify the boundaries of the infested area prior to construction. The **CONTRACTOR** shall remove plant material and as much soil as possible from each piece of equipment leaving the infested area. Permits which are currently outstanding may require the establishment of washing stations to prevent noxious weeds from leaving the infested area.

30. GOOD PIPELINE CONSTRUCTION PRACTICES

a. In accordance with the best pipeline construction practices, the **CONTRACTOR** shall suspend construction during adverse weather or under wet ground conditions where certain construction activities may damage the RIGHT-OF-WAY or the environment. Where the **CONTRACTOR** has not suspended its construction activities voluntarily and the weather or right-of-way conditions warrant a shutdown in the opinion of the **COMPANY**, the **COMPANY** may require the **CONTRACTOR** to cease all or certain construction activities until such time as conditions improve. **In the event of a suspension of work due to weather or wet conditions, the CONTRACTOR shall not be entitled to extra compensation or standby charges.**

31. SPILL PREVENTION AND CONTAINMENT

a. The **COMPANY** has prepared a Spill Prevention, Containment and Control (SPCC) Plan for the project that outlines emergency response procedures that are to be performed in the case of hazardous material release. Requirement and procedures of the plan shall be followed and the designated response measures shall be strictly adhered to as outlined in the Plan. All fines incurred a result of the **CONTRACTOR'S** failure to adhere to the procedures and measures outlined in the Plan shall be at the **CONTRACTOR'S** expense.

b. The **CONTRACTOR** shall inspect the construction equipment at frequent intervals for leaking for leaking fuel, hydraulic fluids, and/or lubricants. All leaks so discovered shall be repaired immediately.
c. The **CONTRACTOR** shall maintain a supply of oil absorbent booms on the right-of-way; the booms shall be on site at all water crossings. If an accidental spill should occur, the **CONTRACTOR** shall make every effort to contain the spilled material and immediately notify the **COMPANY**.
d. All fixed refueling sites used during construction shall be encircled with an earthen dike and temporary fencing.

32. <u>MATERIAL AND EQUIPMENT SUPPLIED BY THE COMPANY</u>

a. All COMPANY furnished line pipe will be manufactured in accordance with API 5L requirements with ends beveled for welding. The pipe will be X65 grade. The average joint length for the pipe, by size, is listed as follows:
    A. 12" TRLS 56' min. average.
b. Additional specifications and descriptions for the pipe are listed as follows:
c. Ends: 30 degree bevel
d. Coating:
    A. Pritec 10/40
    B. Nominal 40 mil ARO (drills and select bores)
e. Type: ERW
f. Size & Grade 12" OD API 5L-X65
g. Wall:
    A. 0.312" line pipe
    B. 0.375" induction bends
    C. 0.500" valve sites
h. Project materials shall be available for loading at the designated COMPANY material yards
i. <u>Other COMPANY Supplied Material</u>
    A. Valves, actuators, fittings, flanges and pipe 2" and above
    B. Induction Bends
    C. Casing Pipe, Casing/Carrier spacers, casing end seals
    D. Mechanical/Electrical components listed on plans as "By Owner"
    E. AC Mitigation Materials including zinc ribbon, SSD stations, coupon stations and cattle guards
    F. Cathodic Protection Materials including anodes, retifiers, cable and connectors
    G. Fencing and gates around Main Line Valve areas
    H. Pipeline warning signs and detectable warning tape
    I. Pipeline aerial markers
    J. Main line pipe for test leads

K. Electrolysis test stations

L. 2,300 timber mats (4'x16')

j. The COMPANY will provide only those materials specified. The CONTRACTOR shall furnish all other materials required to complete the WORK.

k. COMPANY provided material will be available for unloading and/or loading at the COMPANY designated material yard. The exception to this is the ARO pipe for HDD operations – CONTRACTOR shall handle/transport/deliver ARO pipe from Swanton, Vermont to the pipe yard and/or right-of-way.

l. The CONTRACTOR will coordinate with the COMPANY Material Representative when scheduling material loading and/or unloading in order to avoid conflicts and delays. The **CONTRACTOR** shall provide all necessary labor and equipment required to load and/or unload any **COMPANY** provided material at any **COMPANY** designated material yard(s) in a timely manner. The **COMPANY** will prepare the material transfer report and the **CONTRACTOR** will acknowledge, along with any exceptions, at the time transfer occurs. The **CONTRACTOR** shall plan its WORK to minimize pipe wastage, i.e. cutting pipe in pups less than 3 pipe diameters in length.

m. The CONTRACTOR shall return surplus materials to the **COMPANY** designated yard. Surplus materials shall be cleaned and all materials re-racked or stacked on pallets as directed by the **COMPANY** material Representative.

n. The **CONTRACTOR** shall be responsible for maintaining the designated material yard utilized for this project. The **CONTRACTOR** will provide any rock to the sites to stabilize the area. In addition, the **CONTRACTOR** shall be responsible for keeping the yards clean and shall not dispose any wastes on site without **COMPANY** approval. All such WORK will be at the **CONTRACTOR'S** expense.

o. The **CONTRACTOR** shall designate an individual responsible for receipt of **COMPANY** materials and issuance to the **CONTRACTOR'S** force. The **CONTRACTOR** is reminded that weather sensitive equipment must be adequately sheltered from the elements (i.e., storage shed, trailer, etc.) to the satisfaction of the **COMPANY**. The **CONTRACTOR** shall supply equipment for off-loading all material at the storage yard.

p. Tagging areas shall be acquired by the **CONTRACTOR** at the **CONTACTOR'S** expense. Site areas shall be subject to **COMPANY** approval. In addition, the **CONTRACTOR** shall provide adequate time and sufficient information to the **COMPANY** in order for the **COMPANY** at the **COMPANY'S** expense, to provide the necessary archaeological and environmental clearances.

q. Estimated Schedule of Delivery Dates

A. A schedule of delivery dates will be submitted to the successful bidder.

33. <u>MATERIAL AND EQUIPMENT SUPPLIED BY THE CONTRACTOR</u>

a. The **CONTRACTOR** shall supply all material, equipment and supplies necessary for completion of the WORK in accordance with the DRAWINGS and

SPECIFICATIONS with the exception of material listed "Material and Equipment Supplied by the **COMPANY**"

34. <u>FIELD OFFICE FACILITIES</u>

a. The **CONTRACTOR** shall provide, in addition to its own needs and at no additional cost to the **COMPANY**, temporary facilities detailed in Specification 015000 – Temporary Facilities for the use of the **COMPANY** and INSPECTION staff. The accommodation is to be provided complete with normal utilities (heating, air conditioning, light, power, and phone/ internet. It is to be secure and located in close proximity to the **CONTRACTOR'S** own filed office complexes. Office layouts and telephone locations shall be approved by the **COMPANY** prior to installation.

b. All equipment, furnishings and accommodations shall be provided in good working order and shall be repaired and/or maintained by the **CONTRACTOR** as necessary. Upon completion, the **CONTRACTOR** shall be responsible for demobilization and clean-up of all field office facilities.

c. Refer to Specification 015000 – Temporary Facilities and Controls for additional requirements.

SECTION 011000- SUMMARY

PART 1 - GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: Project consists of Vermont Gas Systems - Addison Natural Gas Project.

1. Project Location: Chittenden County and Addison County Vermont.

2. Owner: Vermont Gas Systems, Inc., 85 Swift Street, South Burlington 05403

B. Engineer Identification: The Contract Documents, dated October, 2013 were prepared for the Project by CHA, III Winners Circle, Albany, NY 12205.

C. Construction Manager: To Be Determined

1.2 CONTRACTS

A. The Project will be constructed under multiple contracts. Multiple contracts are separate contracts, representing significant construction activities, between Owner and separate contractors. Each contract is performed concurrently and coordinated closely with the construction activities performed on the Transmission Mainline Project. Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work, under this or the separate Contracts.

B. Contracts for the Vermont Gas Systems Addison Natural Gas Project include the following:

1. Vermont Gas Systems Addison Natural Gas Project – Horizontal Directional Drill Design/Build (Awarded to Engineers Construction Inc. 98 Engineers Drive, Williston, VT 05495 Contact Tom Loyer 802-863-6389)

2. Vermont Gas Systems Addison Natural Gas Project – Transmission Mainline

3. Vermont Gas Systems Addison Natural Gas Project – Meter and Regulation Stations

4. Vermont Gas Systems Addison Natural Gas Project – Distribution Mains

C. The project consists of the following principal components:

1. Approximately 42 miles + of new 12-inch transmission pipeline, extending from an existing gas mainline along Severance Road in Colchester, Vermont, to Route 7 in Middlebury, Vermont (the "Transmission Mainline").The transmission mainline will be contained as shown on the drawings, but generally, within a 50' wide permanent easement, with 25' temporary work space and additional temporary workspace easements.

2. Launcher Site: The transmission mainline will interconnect with an existing pipeline in Colchester, VT, ("Colchester Launcher"). The Colchester Launcher is located on line list number (LLN) 1.03 (681 Severance Road, Colchester, VT), approximately 700 feet north of Severance Road, parallel to an existing gas mainline. The launcher will be contained on an easement having dimensions of 110 feet by 135 feet.

3. Three new distribution meter and regulating stations (Under Separate Contract):

   a. Williston Station: Located on the south side of Route 2 (Williston Road) approximately 850' east of the Williston Road and Talcott Road intersection, in Williston.

   b. Plank Road Station: Located on the south side of Plank Road approximately 1,050 feet west of the Plank Road and North Street intersection, in New Haven.

   c. Middlebury Station: Located on the west side of Route 7 approximately 2,600 feet north of the Route 7 and Exchange Street intersection. It is also the terminus of the transmission mainline.

4. Meter and regulating stations will be located on parcels that are owned by Vermont Gas Systems. The Colchester tie-in and launch site will be located on property where Vermont Gas Systems will acquire an easement.

5. Construction of mainline valve sites, including driveways and access roads, fencing, electrical and communications services. This includes mainline valves located within the fence limits of the meter and regulation stations.

6. Transmission main-line valves: To be fabricated, hydrostatically tested and installed after mainline hydrotest.

7. Three distribution main pipelines (Under Separate Contract):

   a. Vergennes Distribution Mainline: Approximately 3.7 miles of new 6-inch distribution mainline from the proposed Plank Road Station, westward along Plank Road to within two hundred feet of the Route 7 Plank Road intersection;

   b. Middlebury Distribution Mainline: Approximately 1.3 miles of new 6-inch distribution main from the proposed Middlebury Station, south along Route 7, and thence south-westerly along Exchange Street to the approximate southern extents of the Agrimark, Inc. property line (869 Exchange St, Middlebury, VT). This is also the terminus of the project.

   c. Middlebury Distribution Network: Approximately 5.1 miles of new 6-inch, 4-inch and 2-inch distribution network piping in Middlebury.

1.3 WORK UNDER THE TRANSMISSION MAINLINE CONTRACT

A. The WORK under the Vermont Gas Systems Addison Natural Gas Project – Transmission Mainline consists of the following:

1. The Alignment as indicated on the project drawings and as generally described below:

   a. NORTHERN SEGMENT (Route-289 Corridor)

      1) The project commences at the Colchester Launcher site, runs north 0.1 miles to northerly side of the un-built Circumferential Highway (CCCH, CIRC, Route 289) right-of-way. The pipeline follows the CCCH right-of-way in an easterly direction for approximately 2.1 miles crossing Mill Pond Road (STA 24+50), VELCO's K-22 transmission line (STA 70+00), Indian Brook (STA 80+00), and Colchester Road (Route 2A,

STA 110+00), ((See Crossings Table I attached for Stream, HDD, Utility and Road Crossing details) (Stations therein are approximate but relative, subject to localized equalization station adjustments)).

2) The alignment continues easterly along the CCCH right-of-way, for approximately 2.0 miles, to Upper Main Street (Route 15) (STA 215+00), crossing VELCO's transmission lines (STA 159+00) and Indian Brook (STA 192+00).

3) The alignment continues in a easterly direction along the northern extents of the built portion CCCH right-of-way, for approximately 0.5 miles, to and crossing Essex Way (STA 240+00).

4) The alignment continues to follow the CCCH right-of-way in a southeasterly direction for approximately 2.1 miles where it exits the CCCH right-of-way and jogs east then south lining up for the HDD under Route 117 (STA 357+00) and the Winooski River (STA 361+50); crossing Alder Brook three times along the way, (STA 266+25), (STA 324+00), and (STA 349+00), a Champlain Water District easement (STA 328+25), and a GMP electric easement (STA 328+75).

5) After the HDD crossing of the Winooski River, the alignment continues westerly along the New England Central Railroad right-of-way for 0.3 miles, crossing the RR at STA 373+00 and an un-built portion of the CCCH (STA 383+00), before it turns southwest and travels up between the Burlington Transfer Station and Chittenden Solid Waste District transfer station and intersects Redmond Road.

6) The alignment follows Redmond Road south southwest along its eastern side of the road ROW for approximately 1.4 miles to Mountain View Road (STA 474+00), crossing another portion of the CCCH right-of-way (Redmond Road Collector). and continues east along Mountain View Road, for approximately 0.1 miles, where it crosses Mountain View Road (STA 481+50), and reenters the CCCH right-of-way, proceeding south for approximately 1.2 miles; crossing Allen Brook (STA 546+75), and US Route 2 (Williston Road, STA 549+00), and connects to the Williston M&R Station on the south side of US Route 2.

7) The alignment continues in a south southwest direction to I-89, parallels the I-89 corridor for approximately 0.7 miles, and then crosses I-89 (STA 598+00) via a HDD, surfacing on the south side of Hurricane Lane, where it turns west and runs along the shoulder of Hurricane Lane 0.2 miles to the western side of the VELCO transmission line corridor.

b. MID SEGMENT (VELCO Corridor)

1) The alignment generally follows the VELCO corridor (VELCO) in a southerly direction for the next 2.3 miles to Lincoln Road. Paralleling VELCO, 0.5 miles from Hurricane Lane the pipeline cuts west to Route 2A (St George Road), parallels the same for 0.2 miles before crossing Route 2A (STA 656+00) and VELCO (STA 661+00) back to the western edge of VELCO (STA 662+50), where the pipeline resumes paralleling VELCO for the next mile before crossing back over VELCO (STA 711+50) and going around the VELCO Substation off Route 2A.

2) The alignment runs the eastern edge of VELCO after rounding the substation and continues south for approximately 0.6 miles, crossing Sucker Brook (STA 728+00) and Lincoln Road (STA 756+00).

3) The alignment turns off VELCO after crossing Lincoln Rd (STA 763+00) and runs off the western edge of Route 2A for 0.7 miles, crossing Breezy Valley Drive (STA 788+00) and then turning back to the VELCO ROW. The pipeline crosses VELCO (STA 804+00) and proceeds to follow the western extent of VELCO south 0.9 miles, where it crosses back across VELCO (STA 855+00) to Route 2A again (STA 867+50).

4) The alignment follows the western side of Route 2A for approximately 0.4 miles, where it then crosses Route 2A at the intersection of Rocky Ridge Circle (STA 887+50) and follows the eastern side of Route 2A crossing Route 116 (STA 893+00) and VELCO (STA 895+50).

5) The pipeline then follows the western side of VELCO for another 1.3 miles crossing Hickory Place, a private road, (STA 948+00) before diverging from VELCO at STA 962+00 for a 1.0 mile stretch, crossing a tributary to the LaPlatte River, and Shelburne Falls Road (STA 1000+00), and reconnects back to the western side of VELCO (STA 1014+00).

6) The alignment then proceeds south, generally following VELCO's ROW for approximately 4.8 miles; crossing the LaPlatte River (STA1028+75), HDD; Charlotte Road (STA1046+50); Baldwin Road (STA 1114+50); Drinkwater Road (STA 1179+00), HDD; and Lewis Creek (STA 1207+00), HDD; continuing along VELCO until STA 1266+50, where it then diverts around a conservation area and intersects with Rotax Road (STA 1295+50).

7) After crossing Rotax Road, the pipeline meanders cross country for 1.4 miles in a southerly direction until it reconnects to the westerly side of VELCO, and runs therewith for approximately 1.8 miles, crossing Stillson Road, a private road, (STA 1378+50), Hollow Road (STA 1397+00), and Post Road, a private road, (STA 1424+50). After crossing Post Road, the pipeline diverges away from VELCO in a southwesterly direction crossing under "Monkton Swamp" (STA 1439+50—1468+75), HDD.

8) The alignment reconnects with VELCO on the west side of Monkton Swamp at Station 1484+50 and follows the western side of VELCO for approximately 1.0 miles to Old Stage Road, crossing Monkton Road (STA 1491+00), HDD; and an Archaeological Site, (STA 1508+25 – 1512+50), HDD; where it then proceeds along Old Stage Road until Station 1564+50, where the pipeline crosses Old Stage Road and VELCO (STA 1568+00).

9) The alignment then follows the western side of VELCO for approximately 2.8 miles, crossing Parks Hurlburt Road (STA 1588+25), Little Otter Creek (STA 1705+50) and Plank Road (STA 1711+00), HDD; and travelling to the Plank Road M&R Station (STA 1718+50).

10) The pipeline exits the Plank Road M&R Station and continues south following the western side of VELCO for approximately 2.3 miles, crossing Quarry Road (STA 1768+50) Route 17 (STA 1842+50), circumventing the New Haven Substation (STA 1852+00) and then paralleling GMP ROW until reaching Town Hill Road (STA 1882+00) in New Haven. The pipeline crosses VELCO at Town Hill Road and follows along the eastern side of VELCO for 0.6 miles before crossing back to the western side of VELCO (STA 1921+00).

11) The pipeline continues along the western side of VELCO 3.1 miles to River Road (STA 2088+00), crossing Hunt Road (STA 2012+00) and the New Haven River (STA 2077+00), HDD

c. SOUTHERN SEGMENT

1) The southern segment of the alignment follows the northern side of River Road, for approximately 0.8 miles, to the intersection of Route 7 and River Road, where it crosses Route 7 (STA 2137+50) to the northern side of Belden Road, and immediately crosses Belden Road (STA 2129+50) and parallels Route 7 on its western side, heading south for approximately1.0 miles to the Middlebury M&R Station.

2. ADDITIONAL WORK ITEMS

a. The Transmission Mainline Contractor is responsible for constructing and maintaining the Construction Laydown Yards identified on plans ANGP-T-G-022 & 023, in accordance with Section 015000 Temporary Facilities and Controls, and as described below. The Owner/Engineer will require a Construction Trailer adjacent to any location the Mainline Contractor sets up facilities for their own use.

1) Williston Pipe Yard: The entire scope of the Plank Road Pipe Yard is included in the Transmission Contract and is the responsibility of the selected contractor.

2) Plank Road Pipe Yard: The entire scope of the Plank Road Pipe Yard is included in the Transmission Contract and is the responsibility of the selected contractor.

b. The Transmission Mainline Contractor is responsible for constructing the Mainline Valve Sites. Materials furnished by owner are noted in this section. Required materials not provided by Owner, for a complete installation of the Mainline Valve Site will be the responsibility of the Contractor. Mainline valves within the fence limits of Meter and Regulation Stations are a responsibility of the Transmission Contractor. Coordination and scheduling between the Transmission Contractor and M&R Contractor for mainline valve installations is a requirement of this contract.

c. The Transmission Mainline Contractor will be required to construct and utilize, as identified in the permits, wash stations for the removal of mud and vegetation on mats and equipment, before using mats or engaging equipment in activities within wetland areas.

d. The Transmission Mainline Contractor shall install the 8-inch distribution casing, and all necessary appurtenances, at the New England Central Railroad crossing in Colchester (Approximately Sta. 112+71 to 113+88)

e. The Transmission Mainline Contractor will be required to comply with all of the requirements and conditions of Permits secured, permit applications submitted, applicable additional information provided with this contract and Memorandum of Understandings agreed to by Vermont Gas Systems for the Addison Natural Gas Project.

f. Colchester Launcher and Tie-In Site: As described in Section 1.2.C.

g. Meter and Regulation (M&R) Station Access Roads: The civil/site construction of the M&R Station access roads is a responsibility of the Transmission Contractor. Coordination and scheduling between the Transmission Contractor and M&R Contractor for complete M&R station installations is a requirement of this contract. The Transmission Contractor access road limits of work shall be from the existing roads to the fence line of the M&R stations. The scope shall include all required stormwater and erosion prevention/sediment control measures. The scope shall include, but not be limited to, all earthwork, temporary access, drainage, subbase prepration, finished surfaces, and site restoration (within the defined limits of work).

h. Any additional work items noted, shown or indicated on the Project Drawings for a complete installation of the 12-inch transmission pipeline.

1.4 USE OF PREMISES

A. General: Each Contractor shall have full use of premises for construction operations, including use of Project site, during construction period. Each Contractor's use of premises is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

B. The Owner has obtained necessary easements for the Project. The list of Property Owner's is included herein at the end of this Section. The Contractor shall be responsible for complying with all terms, requirements, and conditions of these easements.

1.5 OWNER-FURNISHED PRODUCTS

A. Owner will furnish the following listed products. Contractor shall be responsible for transportation, protection, installation, testing and commissioning, as well as labor and equipment necessary for a complete installation.

1. 12-inch transmission piping, fittings, valves, and appurtenances

2. Mainline Valves, piping, fittings, actuators and appurtenances - 2-inches and greater in nominal size.

3. 2,300 timber mats (4'x16'), any additional mats required for the complete installation of all contract components shall be furnished, installed, removed and disposed of (if necessary) by the Contractor.

4. Items indicated as by owner on project plans.

B. The Contractor shall include providing support systems to receive Owner's equipment and furnished products.

1. Contractor shall arrange and pay for delivery of Owner-furnished items according to Contractor's Construction Schedule. The haul route for delivery is included in Section "Maintenance and Protection of Traffic".

2. Contractor is responsible for receiving at the Owner's stockyard, loading, transporting, unloading, and handling Owner-furnished items at Project site.

3. After delivery, Owner will inspect delivered items for damage. Contractor shall be present for and assist in Owner's inspection.

4. If Owner-furnished items are damaged, defective, or missing, Owner will arrange for replacement.

5. Contractor is responsible for protecting Owner-furnished items from damage during storage and handling, including damage from exposure to the elements.

6. If Owner-furnished items are damaged as a result of Contractor's operations, Contractor shall repair or replace them.

1.6 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are generally organized into Divisions and Sections using the 48-division format and CSI/CSC's "MasterFormat" numbering system.

1. Section Identification: The Specifications use section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of sections in the Contract Documents.

B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.

2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.

a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

END OF SECTION

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for alternates.

1.2 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.3 PROCEDURES

A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.

C. Execute accepted alternates under the same conditions as other work of the Contract.

D. Schedule: A Schedule of Alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No. 1 – Project Rock/Ledge Removal (INCLUDED)

1. Alternate #1 shall be a Lump Sum added cost to the overall project Lump Sum amount. If accepted by Owner, Contractor shall assume all responsibility for any and all required rock removal and disposal (if necessary) over the entire length of the project. *Supply and installation of pipeline pillows and rock shield shall be included in this price.* The Owner reserves the right to accept or reject this Alternate Price. If the Owner rejects the Alternate Price, but accepts the overall Project Lump Sum amount, rock removal shall be

paid for on a unit cost basis with the limits defined by the Rock Removal technical specification.

B. Alternate No. 2 – HDD Support (INCLUDED)

1. Work included under this Alternate involves providing support of the HDD Contractors operations. If accepted by the Owner, the Contractor shall provide services to the Owner's HDD Contractor that are necessary for the completion of the *sixteen (16)* HDD's included in the Vermont Gas Systems Addison Natural Gas Project – Horizontal Directional Drill Design/Build scope of work. HDD sections are defined on the alignment sheets with start and stop stations. The Contractor will provide support to the HDD Contractor to the extent identified below:
   a. Receive and offload pipe deliveries for the HDD sections *in Swanton, VT (44*54'13.62" / 73*6'28.17"). Load and transport pipe from Swanton to HDD locations in accordance with HDD Contractor's scheduling needs and project permitting requirements. Unload, handle and string pipe at the HDD site.*
   b. Clear and Grade Site;
   c. Install timber mats as needed;
   d. Install temporary access roads;
   e. Align, weld, and coat HDD pull back pipe field joints;
   f. Place HDD pipe pull back section on rollers;
   g. Install Hydrostatic Test Manifolds on HDD pipe pull back section;
   h. Fill HDD pipe pull back section with water;
   i. Complete successful 4hr Hydrostatic Test of HDD pipe pull back section (pre and *post-installation*);
   j. Dewater HDD pipe pull back section;
   k. Provide Holiday Detector to inspect HDD pipe pull back section for coating Holidays during pipe pull back operations;
   l. Repair coating Holidays during HDD pipe pull back operations;
   m. Provide all necessary equipment, operators, and labors, to assist HDD Contractor with The installation of HDD pipe pull back section;
   n. Provide all necessary equipment, operators, labor, and materials to run a 95% ID aluminum sizing plate through HDD pipe pull back section;
   o. Coordinate final tie-ins of HDD pipe pull back section with Mainline Pipeline Contractor;
   p. Remove timber mats from site;
   q. Restore site to finish grade;
   r. Complete clean up and final restoration

2. Provide Schedule of values that adequately breaks down the cost adder in a manner that allows Owner to evaluate pricing. A cost breakdown for each HDD is requested.

3. Additional HDD operations are being contemplated, the cost breakdown will be used as a basis for including additional scope.

NOTE: The HDD Contractor is responsible for the containment, removal, and disposal of all inadvertent returns of any drilling fluids.

C. Alternate No. 3 – NGA OQ Alternative (EXCLUDED)

1. Alternate #3 shall be a Lump Sum deducted cost to the overall project Lump Sum amount. If accepted by the Owner, the Contractor will provide an acceptable alternative to the specification requirement as described in the Instructions to Bidders, Item 21.1 Operator Qualification Requirements, whereby the Contractor will meet the requirements for any covered task performed by the Northeast Gas Association (NGA). Include with the deduct price, the name of the proposed OQ service provider.

D. Alternate No. 4 – Jack and Bore Alternative (Sta. 109+29 to 113+96) (INCLUDED)

1. Alternate #4 shall include all required work, as shown on the plans, for a complete installation of all piping, cases, appurtenances and all other associated components from Sta. 109+29 to 113+96. The Transmission Contractor has submitted an acceptable proposal of directional drilling (HDD) the proposed work. The HDD work shall be completed by the existing HDD Contractor (Engineers Construction, Inc – Williston, Vermont) and be supported, as described in Alternate 2 above, by the Transmission Contractor. The price included in this contract shall be for HDD Support only. The HDD Contract will be amended as necessary to include all components required for a complete installation of work between Sta. 109+29 and 113+96. The HDD design/construction shall meet specifications for Genesee and Wyoming Railway Crossings (New England Central Railroad locations) – refer to documents attached to Addendum 2.

E. Alternate No. 5 – Jack and Bore Alternative (Sta. 372+36 to 373+85) (INCLUDED)

1. Alternate #4 shall include all required work, as shown on the plans, for a complete installation of all piping, cases, appurtenances and all other associated components from Sta. 372+36 to 373+85. The crossing is currently shown as a horizontal crossing with 11.1' of cover below the tracks – this may be modified and the casing/carrier installed with a vertical angle, as long as a minimum separation from the tracks to the top of casing is 6.5'. Contractors may submit an alternate installation solution without a casing – indicate the installation method as well as the cost deduct (if applicable) of this Alternate with the bid submission. The alternate installation solution shall meet specifications for Genesee and Wyoming Railway Crossings (New England Central Railroad locations) – refer to attached documents.

END OF SECTION

SECTION 012600- CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.

1.2 MINOR CHANGES IN THE WORK

A. Owner's Consultant will issue through Construction Manager supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time.

1.3 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Construction Manager will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Proposal Requests issued by Construction Manager are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.

2. Within time specified in Proposal Request after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.

b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.

c. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to Construction Manager.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.

2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.

3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.

4. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

5. Comply with requirements in Division 1 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.

C. Proposal Request Form: For Change Order proposals use CSI Change Order Request (proposal format).

1.4 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Proposal Request, Construction Manager will issue a Change Order for signatures of Owner and Contractor on form.

1.5 WORK CHANGE DIRECTIVE

A. Work Change Directive: Construction Manager may issue a Work Change Directive. Work Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Work Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Work Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 012900- PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.2 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.3 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.

1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:

a. Contractor's progress schedule.
b. Application for Payment form.
c. List of subcontractors.
d. List of products.
e. List of principal suppliers and fabricators.
f. Schedule of submittals.

2. Submit the Schedule of Values to Owner's Consultant through Construction Manager at earliest possible date but no later than 21 days before the date scheduled for submittal of initial Applications for Payment.

3. Subschedules: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values correlated with each phase of payment.

B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the Schedule of Values:

a. Project name and location.
b. Name of Engineer.
c. Project number.
d. Contractor's name and address.
e. Date of submittal.

2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:

a. Generic Name
b. Related Specification Section or Division.

c. Description of the Work.
d. Name of subcontractor.
e. Name of manufacturer or fabricator.
f. Name of supplier.
g. Change Orders (numbers) that affect value.
h. Dollar value.

1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.

4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.

5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

a. Differentiate between items stored on-site and items stored off-site. Include evidence of insurance or bonded warehousing if required.

6. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.

7. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.

8. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.4 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by Owner's Consultant and Construction Manager and paid for by Owner.

1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.

C. Payment Application Forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets for Applications for Payment or use forms provided by Owner for Applications for Payment. Sample copies will be provided, if requested.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Construction Manager will return incomplete applications without action.

1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.

2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

E. Transmittal: Submit 3 signed and notarized original copies of each Application for Payment to Construction Manager by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

F. Waivers of Mechanic's Lien: With every other Application for Payment (once monthly), submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application. This requirement only applies for contractual values of greater than $50,000.

1. Submit partial waivers on each item for amount requested, before deduction for retainage, on each item.

2. When an application shows completion of an item, submit final or full waivers.

3. Owner reserves the right to designate which entities involved in the Work must submit waivers.

4. Waiver Delays: Submit each Application for Payment with Contractor's waiver of mechanic's lien for construction period covered by the application.

a. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.

5. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.

G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of Values.
3. Contractor's Construction Schedule (preliminary if not final).
4. Products list.
5. Submittals Schedule (preliminary if not final).
6. List of Contractor's staff assignments.
7. List of Contractor's principal consultants.
8. Copies of permits, if required to be obtained by Contractor.
9. Initial progress report.
10. Report of preconstruction conference.
11. Certificates of insurance and insurance policies.

H. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.

2. This application shall reflect Certificates of Partial Substantial Completion issued previously for designated portions of the Work.

I. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.

2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.

3. Updated final statement, accounting for final changes to the Contract Sum.

4. AIA Document G706 "Contractor's Affidavit of Payment of Debts and Claims."

5. AIA Document G706A "Contractor's Affidavit of Release of Liens."

6. AIA Document G707 "Consent of Surety to Final Payment."

7. Evidence that claims have been settled.

8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.

9. Final, liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 013000- PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. Coordination.
2. Submittals.
3. Administrative and supervisory personnel.
4. Project meetings.
5. General installation provisions.
6. Cleaning and protection.

B. Where applicable, each prime Contractor shall participate in these coordination requirements, even though certain areas of responsibility are assigned to a specific prime Contractor.

1.2 COORDINATION

A. Coordination: Coordinate construction activities included under various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections of these Specifications that are dependent upon each other for proper installation, connection, and operation.

B. Coordination: Each prime contractor shall cooperate with Owner's, coordinate construction activities to assure efficient and orderly installation of each part of the Work.

1. Where installation of one part of the Work is dependent on installation of other components, either before or after its own installation, cooperate with scheduled construction activities in the sequence required to obtain the best results.

2. Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair.

3. Make adequate provisions to accommodate items scheduled for later installation.

4. Coordinate construction activities with public and private utilities.

a. Notify Dig Safe® a minimum of 48 hours prior to excavation or blasting.

b. Notify the Owner, Construction Manager, and the Owner's Representative of any utility locations encountered which conflict with the work. Coordinate with the Owner and Utility Company in the protection, removal, relocation or replacement of conflicting utility locations.

C. Where necessary, prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.

1. Prepare similar memoranda for the Owner and separate Contractors where coordination of their Work is required.

D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's Construction Schedule.
2. Preparation of the Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Pre-installation conferences.
7. Project closeout activities.

E. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

1.3 SUBMITTALS

A. Coordination Drawings: Prepare and submit coordination Drawings where close and careful coordination is required for installation of products and materials fabricated off-site by separate entities, and where limited space availability necessitates maximum utilization of space for efficient installation of different components.

1. Show the interrelationship of components shown on separate Shop Drawings.
2. Indicate required installation sequences.
3. Comply with requirements contained in Section "Submittals Procedures."

B. Staff Names: Within 15 days of starting construction operations, submit a list of principal staff assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone.

1.4 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Construction Manager of scheduled meeting dates and times.

2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.

3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Owner's Representative, within 3 days of the meeting.

B. Preconstruction Conference: Schedule a preconstruction conference and organizational meeting at the Project site or other convenient site prior to commencement of construction activities. Conduct the meeting to review responsibilities and personnel assignments.

1. Attendees: Authorized representatives of Owner, the Owner's Consultants, and their consultants; the Contractor and its superintendent; major subcontractors; manufacturers; suppliers and other concerned parties shall each be represented at the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Discuss items of significance that could affect progress, including the following:

   a. Tentative construction schedule.
   b. Phasing.
   c. Critical work sequencing.
   d. Designation of responsible personnel.
   e. Procedures for processing field decisions and Change Orders.
   f. Procedures for processing Applications for Payment.
   g. Distribution of the Contract Documents.
   h. Submittal procedures.
   i. Preparation of Record Documents.
   j. Use of the premises.
   k. Responsibility for temporary facilities and controls.
   l. Parking availability.
   m. Office, work, and storage areas.
   n. Equipment deliveries and priorities.
   o. Safety procedures.
   p. First aid.
   q. Security.
   r. Progress cleaning.
   s. Working hours.
   t. Housekeeping.
   u. Subcontractors.
   v. Preliminary Schedule of Shop Drawings and Samples.
   w. Co-ordination with other contractors.
   x. Insurance in Force.
   y. Contractor's Schedule of Values.

C. Progress Meetings: Conduct progress meetings at the Project Site at regularly scheduled intervals. Coordinate dates of meetings with preparation of payment requests.

1. Attendees: In addition to representatives of the Owner and Owner's Consultants, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the current status of Project.

   a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how

construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

b. Review present and future needs of each entity present, including the following:

1) Interface requirements.
2) Time.
3) Sequence of operations.
4) Status of submittals.
5) Deliveries.
6) Off-site fabrication.
7) Access.
8) Site utilization.
9) Temporary facilities and controls.
10) Work hours.
11) Hazards and risks.
12) Progress cleaning.
13) Quality and work standards.
14) Change Orders.
15) Documentation of information for payment requests.

3. Reporting: No later than 3 days after each progress meeting date, distribute copies of minutes of the meeting to each party present and to parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.

a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION PROVISIONS

A. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

B. Manufacturer's Instructions: Comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.

C. Inspect materials or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items.

D. Provide attachment and connection devices and methods necessary for securing Work. Secure Work true to line and level. Allow for expansion and building movement.

E. Recheck measurements and dimensions, before starting each installation.

F. Install each component during weather conditions and Project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.

G. Coordinate temporary enclosures with required inspections and tests, to minimize the necessity of uncovering completed construction for that purpose.

3.2 CLEANING AND PROTECTION

A. During handling and installation, clean and protect construction in progress and adjoining materials in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

B. Clean and maintain completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

C. Limiting Exposures: Supervise construction activities to ensure that no part of the construction completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Where applicable, such exposures include, but are not limited to, the following:

1. Excessive static or dynamic loading.
2. Excessive internal or external pressures.
3. Excessively high or low temperatures.
4. Thermal shock.
5. Excessively high or low humidity.
6. Air contamination or pollution.
7. Water or ice.
8. Solvents.
9. Chemicals.
10. Light.
11. Radiation.
12. Puncture.
13. Abrasion.
14. Heavy traffic.
15. Soiling, staining and corrosion.
16. Combustion.
17. Electrical current.
18. Unusual wear or other misuse.
19. Contact between incompatible materials.
20. Destructive testing.
21. Misalignment.
22. Excessive weathering.
23. Unprotected storage.
24. Improper shipping or handling.
25. Theft.
26. Vandalism.

END OF SECTION

SECTION 013200- CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Preliminary Construction Schedule.
2. Contractor's Construction Schedule.
3. Submittals Schedule.
4. Daily construction reports.
5. Material location reports.
6. Field condition reports.
7. Special reports.
8. Construction photographs.

1.2 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.

2. Predecessor activity is an activity that must be completed before a given activity can be started.

B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

C. Critical Path: The longest continuous chain of activities through the network schedule that establishes the minimum overall Project duration and contains no float.

D. Event: The starting or ending point of an activity.

E. Float: The measure of leeway in starting and completing an activity.

1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.

2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the following activity.

3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

F. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.

G. Major Area: A story of construction, a separate building, or a similar significant construction element.

H. Milestone: A key or critical point in time for reference or measurement.

I. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.

1.3 SUBMITTALS

A. Qualification Data: For firms and persons specified in "Quality Assurance" Articleto demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

B. Submittals Schedule: Submit 3 copies of schedule. Arrange the following information in a tabular format:

1. Scheduled date for first submittal.
2. Specification Section number and title.
3. Submittal category (action or informational).
4. Name of subcontractor.
5. Description of the Work covered.
6. Scheduled date for Engineer's and Construction Manager final release or approval.

C. Preliminary Construction Schedule: Submit 2 printed copies; and one electronic copy. Preliminary Network Diagram: Submit 2 printed copies; one a single sheet of reproducible media, and one electronic copy; large enough to show entire network for entire construction period.

D. Contractor's Construction Schedule: Submit 2 printed copies of initial schedule, one a reproducible print and one a blue- or black-line print, large enough to show entire schedule for entire construction period.

1. Submit an electronic copy of schedule on CD or DVD. Include type of schedule (Initial or Updated) and date on label.

E. CPM Reports: Concurrent with CPM schedule, submit 3] printed copies of each of the following computer-generated reports. Format for each activity in reports shall contain activity number, activity description, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float.

1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.

2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.

3. Total Float Report: List of all activities sorted in ascending order of total float.

4. Earnings Report: Compilation of Contractor's total earnings from commencement of the Work until most recent Application for Payment.

F. Construction Photographs: Submit a digital photo of each view within 7 days of taking photographs.

1. Format: Digital JPG image with minimum resolution of 2584x1936 and image quality set to fine/high or better.

2. Identification: A photo-log shall be provided containing a record for each submitted photo with the following information:

   a. File Name of Photo.

   b. Name of Project.

   c. Name and address of photographer.

   d. Name of Engineer [and Construction Manager].

   e. Name of Contractor.

   f. Date photograph was taken.

   g. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

   Photo-logs may be scanned hard-copy forms, though digital formats such as MS Word, MS Excel or MS Access are preferred. If the delivery method for the photos is via an online file management system, photo-log records should be entered into that system provided it supports entering the above information.

3. Delivery: All photos and accompanying identification will be uploaded to the Project's Collaboration Website.

G. Daily Construction Reports: Submit 2 copies at monthly intervals.

H. Material Location Reports: Submit 2 copies at monthly intervals.

I. Field Condition Reports: Submit 2 copies at time of discovery of differing conditions.

J. Special Reports: Submit 2 copies at time of unusual event.

1.4 QUALITY ASSURANCE

A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting.

1.5 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from parties involved.

2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

C. Auxiliary Services: Cooperate with photographer and provide auxiliary services requested, including access to Project site and use of temporary facilities including temporary lighting.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE

A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.

1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.

2. Initial Submittal: Submit concurrently with preliminary network diagram. Include submittals required during the first 60 days of construction. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.

a. At Contractor's option, show submittals on the Preliminary Construction Schedule, instead of tabulating them separately.

3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."

B. Time Frame: Extend schedule from date established for the Notice of Award.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

C. Activities: Treat each separate area as a separate numbered activity for each principal element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Construction Manager.

2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.

3. Submittal Review Time: Include review and resubmittal times indicated in Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.

4. Startup and Testing Time: Include not less than 30 days for startup and testing.

5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for the Owner's Consultant and Construction Manager's administrative procedures necessary for certification of Substantial Completion.

D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.

2. Work under More Than One Contract: Include a separate activity for each contract.

3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.

4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.

5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.

6. Work Restrictions: Show the effect of the following items on the schedule:

   a. Coordination with existing construction.
   b. Limitations of continued occupancies.
   c. Uninterruptible services.
   d. Use of premises restrictions.
   e. Provisions for future construction.
   f. Seasonal variations.
   g. Environmental control.

7. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

   a. Subcontract awards.
   b. Submittals.
   c. Purchases.
   d. Fabrication.
   e. Sample testing.
   f. Deliveries.
   g. Installation.
   h. Tests and inspections.
   i. Adjusting.
   j. Curing.
   k. Startup and placement into final use and operation.

E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to the Notice to Proceed, Substantial Completion, and Final Completion.

F. Cost Correlation: At the head of schedule, provide a cost correlation line, indicating planned and actual costs. On the line, show dollar volume of the Work performed as of dates used for preparation of payment requests.

1. Refer to Section "Payment Procedures" for cost reporting and payment procedures.

G. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall project schedule.

H. Computer Software: Prepare schedules using a program that has been developed specifically to manage construction schedules.

1. Microsoft Project, Version 2010, for Windows XP Professional operating system.

2.3 PRELIMINARY CONSTRUCTION SCHEDULE

A. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.4 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

A. General: Prepare network diagrams using AON (activity-on-node) format.

B. Preliminary Network Diagram: Submit diagram within 14 days of date established for the Notice of Award. Outline significant construction activities for the first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

C. CPM Schedule: Prepare Contractor's Construction Schedule using a CPM network analysis diagram.

1. Develop network diagram in sufficient time to submit CPM schedule so it can be the Notice of Award.

2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
4. Use "one workday" as the unit of time.

D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the preliminary network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:

a. Preparation and processing of submittals.
b. Purchase of materials.
c. Delivery.
d. Fabrication.
e. Installation.

2. Processing: Process data to produce output data or a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.

3. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.

a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.

E. Initial Issue of Schedule: Prepare initial network diagram from a list of straight "early start-total float" sort. Identify critical activities. Prepare tabulated reports showing the following:

1. Contractor or subcontractor and the Work or activity.
2. Description of activity.
3. Principal events of activity.
4. Immediate preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.
7. Activity duration in workdays.
8. Total float or slack time.
9. Average size of workforce.
10. Dollar value of activity (coordinated with the Schedule of Values).

F. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity durations in workdays.
5. Changes in the critical path.
6. Changes in total float or slack time.
7. Changes in the Contract Time.

G. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.

1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.

2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.

3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.

4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.

   a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.

   b. Submit value summary printouts one week] before each regularly scheduled progress meeting.

2.5 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel, by spread and crew, at Project site.
4. List of both active and in-active equipment
5. High and low temperatures and general weather conditions.
6. Accidents.

7. Meetings and significant decisions.
8. Unusual events (refer to special reports).
9. Stoppages, delays, shortages, and losses.
10. Meter readings and similar recording.
11. Emergency procedures.
12. Orders and requests of authorities having jurisdiction.
13. Change Orders received and implemented.
14. Work Change Directives received.
15. Service connected and disconnected.
16. Equipment or system tests and startups.
17. Partial Completions and occupancies.
18. Substantial Completions authorized.

B. Material Location Reports: At monthly intervals, prepare a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with lit a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.

C. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare a detailed report. Submit with a request for information on CSI Form 13.2A. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.6 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, and response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule 1 week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.

2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.

3. As the Work progresses, indicate Actual Completion percentage for each activity.

B. Distribution: Distribute copies of approved schedule to the Owner's Representative, Construction Manager, Owner, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.

2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

3.2 CONSTRUCTION PHOTOGRAPHS

A. Date Stamp: Unless otherwise indicated, date and time stamp each photograph as it is being taken so stamp is integral to photograph.

B. Preconstruction Photographs: Before starting construction, take ample digital photographs of Project site and surrounding properties from different vantage points, as directed by Construction Manager. Show existing conditions adjacent to property.

C. Periodic Construction Photographs: Take ample digital color photographs monthly, coinciding with cutoff date associated with each Application for Payment. Photographer shall select vantage points to best show status of construction and progress since last photographs were taken.

1. Field Office Prints: Retain an electronic set of photographs in field office at Project site, available at all times for reference. Identify photographs the same as for those submitted to the Owner's Representative and Construction Manager.

D. Final Completion Construction Photographs: Take ample digital photographs after date of Substantial Completion for submission as Project Record Documents. Construction Manager will direct photographer for desired vantage points.

END OF SECTION

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other miscellaneous submittals.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Owner Consultant's and Construction Manager's responsive action.

B. Informational Submittals: Written information that does not require Owner Consultant's and Construction Manager's approval. Submittals may be rejected for not complying with requirements.

C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.

D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1. Submittal Administrative Requirements:

a. Engineer's Digital Data Files: Electronic digital data files of the Contract Drawings will be provided by Owner's Representative for Contractor's use in preparing submittals.

1) Owner's Consultant will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings.

a) Owner's Consultant makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.

b) Digital Drawing were prepared using AutoCAD Software.

c) Digital data drawing files will made available after signing a CAD release form.

b. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1) Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

2) Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.

3) Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.

4) Retain subparagraph below if one submittal has an impact on another submittal. Submittals that require concurrent review should be so indicated in those Sections.

5) Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

a) Owner's Consultant's and Construction Manager reserve the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

c. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Construction Manager's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1) Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Construction Manager will advise Contractor when a submittal being processed must be delayed for coordination.

2) Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.

3) Resubmittal Review: Allow 15 days for review of each resubmittal.

4) Sequential Review: Where sequential review of submittals by Owner's Consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.

5) Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Owner's Consultants and Construction Manager, allow 15 days for review of each submittal. Submittal will be returned to Construction Manager, before being returned to Contractor.

E. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.

2. Name file with submittal number or other unique identifier, including revision identifier.

   a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).

3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Owner's Consultant and Construction Manager.

4. Transmittal Form for Electronic Submittals: Use software-generated form from electronic project management software acceptable to Owner, containing the following information:

   a. Project name.

   b. Date.

   c. Name and address of Owner's Consultant

   d. Name of Contractor.

   e. Name of firm or entity that prepared submittal.

   f. Names of subcontractor, manufacturer, and supplier.

   g. Category and type of submittal.

   h. Submittal purpose and description.

   i. Specification Section number and title.

   j. Specification paragraph number or drawing designation and generic name for each of multiple items.

   k. Drawing number and detail references, as appropriate.

   l. Location(s) where product is to be installed, as appropriate.

   m. Related physical samples submitted directly.

   n. Indication of full or partial submittal.

   o. Transmittal number, numbered consecutively.

   p. Submittal and transmittal distribution record.

   q. Other necessary identification.

   r. Remarks.

5. Metadata: Include the following information as keywords in the electronic submittal file metadata:

a. Project name.
b. Number and title of appropriate Specification Section.
c. Manufacturer name.
d. Product name.

F. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Owner's Representative and Construction Manager on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.

2. Note date and content of revision in label or title block and clearly indicate extent of revision.

3. Resubmit submittals until they are marked with approval notation from Owner's Consultant and Construction Manager's action stamp.

H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

I. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Owner's Consultant's and Construction Manager's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Post electronic submittals as PDF electronic files directly to Project Web site specifically established for Project.

a. Owner's Consultant, through Construction Manager, will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

2. Submit electronic submittals via email as PDF electronic files.

a. Owner's Consultant, through Construction Manager, will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

3. Action Submittals: Submit three paper copies of each submittal unless otherwise indicated. Owner's Representative, through Construction Manager, will return two copies.

4. Informational Submittals: Submit two paper copies of each submittal unless otherwise indicated. Owner's Consultant and Construction Manager will not return copies.

5. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

   a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.

   b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.

2. Mark each copy of each submittal to show which products and options are applicable.

3. Include the following information, as applicable:

   a. Manufacturer's catalog cuts.
   b. Manufacturer's product specifications.
   c. Standard color charts.
   d. Statement of compliance with specified referenced standards.
   e. Testing by recognized testing agency.
   f. Application of testing agency labels and seals.
   g. Notation of coordination requirements.
   h. Availability and delivery time information.

4. Submit Product Data before or concurrent with Samples.

5. Submit Product Data in the following format:

   a. PDF electronic file.

   b. Three paper copies of Product Data unless otherwise indicated. Consultant, through Construction Manager, will return two copies.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based on Owner's Consultant's digital data drawing files is otherwise permitted.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

   a. Identification of products.
   b. Schedules.
   c. Compliance with specified standards.
   d. Notation of coordination requirements.
   e. Notation of dimensions established by field measurement.

f. Relationship and attachment to adjoining construction clearly indicated.
g. Seal and signature of professional engineer if specified.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least [8-1/2 by 11 inches (215 by 280 mm), but no larger than 30 by 42 inches (750 by 1067 mm)]

3. Submit Shop Drawings in the following format:

a. PDF electronic file.

D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.

2. Manufacturer and product name, and model number if applicable.

3. Number and name of room or space.

4. Location within room or space.

5. Submit product schedule in the following format:

a. PDF electronic file.

E. Coordination Drawing Submittals: Comply with requirements specified in Division 01 Section "Project Management and Coordination."

F. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."

G. Application for Payment and Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."

H. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Division 01 Section "Quality Requirements."

I. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section "Closeout Procedures."

J. Maintenance Data: Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."

K. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of Engineers and owners, and other information specified.

L. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

M. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

N. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

O. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

P. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

Q. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

R. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

S. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

T. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

U. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

V. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

W. Construction Photographs and Videotapes: Comply with requirements in Division 1 Section "Construction Progress Documentation."

2.2 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Owner's Representative.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file and three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

2.3 CONTRACTOR'S PROJECT HEALTH & SAFETY PLAN

A. No later than the Pre-construction meeting, the Contractor shall submit to the Construction Manager a written Health & Safety Plan which states the Contractor's company policy relative to safety. The plan must also address specific health and safety concerns which are expected to be encountered on the project. As a minimum this plan shall include:

1. Listing of project and company safety officers
2. Specific company safety policies
3. Employee Safety Training Program
4. Administrative procedures to handle employee health & safety concerns
5. Procedures for insuring worker compliance with health and safety requirements.

B. The Contractor shall be responsible to insure that each Subcontractor employed on the project complies with the requirements of this section either by submitting a copy of the subcontractor's Project Health & Safety Plan or by submitting a letter from the Subcontractor stating that they will comply with the provisions of the Contractor's Project Health & Safety Plan.

C. Submission of the required Project Health & Safety Plan by the Contractor is primarily for information or record purposes and shall not be construed to imply approval by the Owner or to relieve the Contractor from the responsibility to adequately protect the health & safety of all workers involved in the project.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Review each submittal and check for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Construction Manager.

B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 OWNER'S CONSULTANT'S AND CONSTRUCTION MANAGER'S ACTION

A. General: Owner's Consultant and Construction Manager will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: Owner's Consultant and Construction Manager will review each submittal, make marks to indicate corrections or modifications required, and return it. Owner's Representative and Construction Manager will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:

1. Final Unrestricted Release: Where submittals are marked "No Exceptions Taken," that part of the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents; final acceptance will depend upon that compliance.

2. Final-But-Restricted Release: When submittals are marked "Make Corrections Noted," that part of the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents; final acceptance will depend on that compliance.

3. Returned for Resubmittal: When submittal is marked "Revise and Resubmit," "Rejected," or "Submit Specified Item," do not proceed with that part of the Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal in accordance with the notations; resubmit without delay. Repeat if necessary to obtain a different action mark.

   a. Do not permit submittals marked "Revise and Resubmit," "Rejected," or "Submit Specified Item" to be used at the Project site, or elsewhere where Work is in progress.

4. Other Action: Where a submittal is primarily for information or record purposes, special processing or other activity, the submittal will be returned, marked "Action Not Required."

C. Informational Submittals: Owner's Consultant and Construction Manager will review each submittal and will not return it, or will reject and return it if it does not comply with requirements. Owner's Representative and Construction Manager will forward each submittal to appropriate party.

D. Submittals not required by the Contract Documents will not be reviewed and may be discarded.

END OF SECTION

B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

C. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Description of test and inspection.
3. Identification of applicable standards.
4. Identification of test and inspection methods.
5. Number of tests and inspections required.
6. Time schedule or time span for tests and inspections.
7. Entity responsible for performing tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

D. Reports: Prepare and submit certified written reports, that include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Ambient conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

E. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, notices, receipts for fee payments, , correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

SECTION 014000- QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in these Sections may also cover production of standard products.

2. Specified tests, inspections, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with the Contract Document requirements.

3. Requirements for Contractor to provide quality-control services required by Owner's Representative, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.2 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction complies with requirements. Services do not include contract enforcement activities performed by Engineer.

C. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

1.3 DELEGATED DESIGN

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Owner's Representative.

1.4 SUBMITTALS

A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

C. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

D. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance.

E. Engineering services are defined as those performed for installations of the system, assembly, or products that are similar to those indicated for this Project in material, design, and extent.

F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirement for specialists shall not supersede regulations governing the Work, nor interfere with local trade-union jurisdictional settlements and similar conventions.

G. Testing Agency Qualifications: An agency with the experience and capability to conduct testing and inspecting indicated, as documented by ASTM E 548, that specializes in types of tests and inspections to be performed. Each testing agency shall be authorized by the authorities having jurisdiction in the state in which the project is located.

H. Preconstruction Testing: Testing agency shall perform preconstruction testing for compliance with specified requirements for performance and test methods.

1. Contractor responsibilities include the following:

a. Provide test specimens and assemblies representative of proposed materials and construction. Provide sizes and configurations of assemblies to adequately demonstrate capability of product to comply with performance requirements.

b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.

c. Fabricate and install test assemblies using installers who will perform the same tasks for Project.

d. When testing is complete, remove assemblies; do not reuse materials on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Owner's Representative through Construction Manager, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

1.6 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of the types of testing and inspecting they are engaged to perform.

2. Costs for retesting and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

B. Contractor Responsibilities: Unless otherwise indicated, provide quality-control services specified and required by authorities having jurisdiction.

1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services. Contractor will furnish Owner with names, addresses, and telephone numbers of testing agencies engaged and a description of the types of testing and inspecting they are engaged to perform.

a. Contractor shall not employ the same entity engaged by Owner, unless agreed to in writing by Owner.

2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.

3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.

4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.

5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Tests and Inspections: Owner will engage a testing agency to conduct special tests and inspections required by authorities having jurisdiction and identified as the responsibility of Owner.

1. Testing Agency will notify Construction Manager and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.

2. Testing Agency will submit a certified written report of each test, inspection, and similar quality-control service to Construction Manager with copy to Contractor and to authorities having jurisdiction.

3. Testing Agency will submit a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.

4. Testing Agency will interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

5. Testing Agency will retest and reinspect corrected work.

D. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing.

E. Retesting/Re-inspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and re-inspecting, for construction that revised or replaced Work that failed to comply with requirements established by the Contract Documents.

F. Testing Agency Responsibilities: Cooperate with Owner's Representative and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Owner's Representative and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.

2. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.

3. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service.

4. Do not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.

5. Do not perform any duties of Contractor.

G. Associated Services: The Contractor shall cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify Testing Agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.

2. Incidental labor and facilities necessary to facilitate tests and inspections.

3. Adequate quantities of representative samples of materials that require testing and inspecting.

4. Assist agency in obtaining samples.

5. Provide facilities for storage and field-curing of test samples.

6. Delivery of samples to testing agencies.

7. Preliminary design mix proposed for use for material mixes that require control by testing agency.

8. Security and protection for samples and for testing and inspecting equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within 10 days of date established for commencement of the Work (i.e., Notice to Proceed).

1. Distribution: Distribute schedule to Owner, Construction Manager, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Sections of these Specifications. Restore patched areas and extend restoration into adjoining areas in a manner that eliminates evidence of patching.

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

SECTION 014200 - REFERENCES

PART 1 - GENERAL

1.1 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": The term "approved," when used in conjunction with Owner's Representative's action on Contractor's submittals, applications, and requests, is limited to Owner's Representative's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean directed by Engineer, requested by Engineer, and similar phrases.

D. "Indicated": The term "indicated" refers to graphic representations, notes, or schedules on Drawings; or to other paragraphs or schedules in Specifications and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the user locate the reference.

E. "Regulations": The term "regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": The term "furnish" is used to mean supply and deliver to Project site, ready for unloading, unpacking, assembly installation, and similar operations..

G. "Install": The term "install" is used to describe operations at Project site including unloading, temporary storage, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": The term "provide" means to furnish and install, complete and ready for the intended use.

I. "Installer": An installer is the Contractor or another entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier, to perform a particular construction operation, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.

J. The term "experienced," when used with the term "installer," means having successfully completed previous projects similar in size and scope to this Project; being familiar with the special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1. Trades: Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individual of a corresponding generic name, such as "carpenter". It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.

2. Assignment of Specialists: Certain Sections of the Specifications require that specific construction activities shall be performed by specialists who are recognized experts in the operations to be performed. The specialists must be engaged for those activities, and assignments are requirements over which the Contractor has no choice or option.

Nevertheless, the ultimate responsibility for fulfilling Contract requirements remains with the Contractor.

a. This requirement shall not be interpreted to conflict with enforcement of regulations governing the Work. It is also not intended to interfere with local trade union jurisdictional settlements and similar conventions.

K. "Project Site" is the space available by Permit and easements to the Contractor for performing construction activities, either exclusively or in conjunction with others performing other work as part of Project. The extent of Project site is shown on the Drawings.

L. Testing Laboratories: A "testing laboratory" is an independent entity engaged to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1.2 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of the date of the Contract Documents, unless otherwise indicated.

C. Conflicting Requirements: Where compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Construction Manager for a decision before proceeding.

1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. In complying with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements. Refer uncertainties to Construction Manager for a decision before proceeding.

D. Copies of Standards: Each entity engaged in construction on the Project must be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, the Contractor shall obtain copies directly from the publication source and make them available on request.

E. Abbreviations and Names: Abbreviations and acronyms are frequently used in the Specifications and other Contract Documents to represent the name of a trade association, standards-developing organization, and authorities having jurisdiction, or other entity in the context of referencing a standard or publication. Where abbreviations and acronyms are used in the Specifications or other Contract Documents, they mean the recognized name of these entities. Refer to Gale Research's "Encyclopedia of Associations" or Columbia Books' "National Trade & Professional Associations of the U.S.," which are available in most libraries.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements

1. The Owner's Consultants have contacted authorities having jurisdiction over the Work in obtaining information necessary for preparation of Contract Documents and Permits. Contact authorities having jurisdiction directly for information and decisions having a bearing on the Work. The Contractor shall execute the Work in accordance with Permit requirements.

2. Copies of Regulations and Permits: The Contractor shall obtain copies of regulations governing and project permits issued to the Project. Contractor shall retain copies at the Project Site, and make them available to the Construction Manager for reference by parties who have a reasonable need for such reference.

1.4 SUBMITTALS

A. Permits, Licenses, and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, and similar documents, correspondence, and records established for compliance with standards and regulations bearing upon performance of the Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 015000- TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes requirements for temporary services, facilities and controls, including temporary utilities, support facilities, and security and protection facilities.

B. Temporary utilities include, but are not limited to, the following:

1. Sewers and drainage.
2. Water service and distribution.
3. Sanitary facilities, including toilets, wash facilities, and drinking-water facilities.
4. Heating and cooling facilities.
5. Ventilation.
6. Electric power service.
7. Lighting.
8. Telephone and internet service.

C. Temporary construction and support facilities/equipment include, but are not limited to, the following:

1. Adjust list below to suit Project.
2. Temporary roads and paving.
3. Dewatering facilities and drains.
4. Project identification and temporary signs.
5. Waste disposal facilities.
6. Field offices.
7. Storage and fabrication sheds.
8. Lifts and hoists.
9. Temporary stairs.
10. Construction aids and miscellaneous services and facilities.
11. Temporary enclosures.
12. Temporary heat.
13. Construction Manager All-Terrain Vehicles, including trailers, cell phone boosters, insurance and registration

14. Additional communication means for appropriate personnel including radios, repeaters, stations

D. Security and protection facilities include, but are not limited to, the following:

1. Adjust list below to suit Project.
2. Environmental protection.
3. Stormwater control.
4. Tree and plant protection.
5. Pest control.
6. Site enclosure fence.
7. Security enclosure and lockup.
8. Barricades, warning signs, and lights.
9. Temporary enclosures.
10. Temporary partitions.
11. Fire protection.

1.2 USE CHARGES

A. General: The cost of all use charges for temporary facilities are not chargeable to Owner, Construction Manager, or Engineer and shall be included in the Contract Sum. The contractor shall be responsible for paying all use charges until the project is substantially complete. Allow other entities to use temporary services and facilities without cost, including, but not limited to, the following:

1. Owner's construction and operations forces.
2. Engineer.
3. Construction Manager.
4. Testing agencies.
5. Personnel of authorities having jurisdiction.

B. Sewer Service: If necessary, pay sewer service for all parties engaged in construction, at Project sites.

C. Water Service: Pay water service use charges, whether metered or otherwise, for water used by all entities engaged in construction activities at Project site.

D. Electric Power Service: Pay electric power service use charges, whether metered or otherwise, for electricity used by all entities engaged in construction activities at Project site.

E. Communication Service: Pay internet service use charges for internet equipment/service specified for the duration of construction. If applicable, pay applicable radio/repeater fees for all equipment/service specified for the duration of construction.

F. Transportation Service: Pay insurance, registration and fuel charges for provided all-terrain vehicles.

1.3 SUBMITTALS

A. Temporary Utility Reports: Submit reports of tests, inspections, utility billings, and similar procedures performed on temporary utilities.

B. Implementation and Termination Schedule: Within 15 days of date established for submittal of Contractor's Construction Schedule, submit a schedule indicating implementation and termination of each temporary utility.

1.4 QUALITY ASSURANCE

A. Standards: Comply with ANSI A10.6, NECA's "Temporary Electrical Facilities," and NFPA 241.

1. Trade Jurisdictions: Assigned responsibilities for installation and operation of temporary utilities are not intended to interfere with trade regulations and union jurisdictions.

2. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

3. Refer to Guidelines for Bid Conditions for Temporary Job Utilities and Services, prepared jointly by AGC and ASC, for industry recommendations.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

C. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction, including but not limited to:

1. Building Code requirements.
2. Health and safety regulations.
3. Utility company regulations.
4. Police, Fire Department and Rescue Squad rules.

1.5 PROJECT CONDITIONS

A. Conditions of Use: The following conditions apply to use of temporary services and facilities by all parties engaged in the Work:

1. Keep temporary services and facilities clean and neat.

2. Relocate temporary services and facilities as required by progress of the Work.

3. Operate in a safe and efficient manner.

4. Take necessary fire prevention measures.

5. Dot not overload facilities or permit them to interfere with progress.

6. Do not allow hazardous, dangerous or unsanitary conditions or public nuisances to develop or persist on the site.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide new materials. Undamaged, previously used materials in serviceable condition may be used if approved by Engineer. Provide materials suitable for use intended.

B. Portable Chain-Link Fencing: Minimum 2-inch (50-mm) 9-gage, galvanized steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD top and bottom rails. Provide concrete or galvanized steel bases for supporting posts.

C. Lumber and Plywood:

1. For job-built temporary offices, shops and sheds within the construction area, provide UL labeled, fire treated lumber and plywood for framing, sheathing and siding.

2. For signs and directory boards, provide exterior type, Grade B-B High Density Concrete Form Overlay Plywood conforming to PS-1, of sizes and thickness indicated.

3. For fences and vision barriers, provide exterior type, minimum 3/8" thick plywood.

4. For safety barriers and similar uses, provide minimum 5/8" thick exterior plywood.

D. Roofing: Provide UL Class, A standard weight asphalt shingles complying with ASTM D 3018, or UL Class "C mineral surfaced roll roofing complying with ASTM D 249 on roofs of job-built temporary offices, shops and sheds.

E. Gypsum Board: Minimum 1/2 inch (12.7 mm) thick by 48 inches (1219 mm) wide by maximum available lengths; regular-type panels with tapered edges. Comply with ASTM C 36.

F. Insulation: Unfaced mineral-fiber blanket manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indices of 25 and 50, respectively.

G. Paint:

1. For job-built temporary offices, shops, sheds, fences and other exposed lumber and plywood, provide exterior grade acrylic-latex emulsion over exterior primer.

2. For sign panels and applying graphics, provide exterior grade alkyd gloss enamel over exterior primer.

3. For interior walls of temporary offices, provide two coats interior latex flat wall paint.

H. Tarpaulins: Provide waterproof, fire-resistant, UL labeled tarpaulins with flame-spread rating of 15 or less. For temporary enclosures provide translucent nylon reinforced laminated polyethylene or polyvinyl chloride fire retardant tarpaulins.

I. Water: Provide potable water approved by local health authorities

2.2 EQUIPMENT

A. General: Provide new equipment; if acceptable to the Construction Manager, undamaged, previously used equipment in serviceable condition may be used. Provide equipment suitable for use intended.

B. Field Offices: Mobile units with lockable entrances, operable windows, and serviceable finishes; heated and air conditioned; on foundations adequate for normal loading.

C. General Requirements for all Construction Managers Offices:

1. Lighting: Electric light, non-glare type luminaries to provide a minimum illumination level of 100 ft. candles at desk height level.

2. Heating and Cooling: Adequate equipment to maintain an ambient air temperature of 70°F ±5°F.

3. Telephone: A separate phone for the exclusive use of Construction Manager.

4. Potable Water.

5. First Aid Kit: The Contractor shall keep the kit properly stocked with appropriate first aid supplies at all times.

6. Toilet: A separately enclosed room, properly ventilated and complying with applicable sanitary codes. Wherever possible, the Contractor shall provide a lavatory with running water and flush type toilet.

7. Locker: A wooden locker of sufficient size for storage of surveying instruments and testing equipment.

8. Maintenance: The Contractor shall maintain all facilities and furnished equipment in good working condition.

9. Fire Extinguisher: Non-toxic, dry chemical, fire extinguisher meeting Underwriters Laboratories, Inc., approval for Class A, Class B, and Class C fires with a minimum rating of 2A: 10B: 10C.

10. Fire Resistant Cabinet: Fire resistant, legal size file cabinet with lock and 2 keys, meeting the requirements for "Insulating Filing Devices, Class 350-1 Hour (D) of ANSI/UL 72 or the Class D rating of the original Underwriters Laboratories specification for insulated filing devices. The number of drawers will be specified for each type of office.

11. Thermometer: A minimum - maximum thermometer.

12. Multifunction printer/copier/scanner: floor mount, heavy duty, electric, dry process letter and legal size photocopying machine and an adequate supply of copy paper. The supply of copy paper shall be replenished by the Contractor as required by the Construction Manager.

13. Signs: The Contractor shall furnish and install necessary signs to locate and identify the Construction Manager's Office.

D. Construction Manager's Office:

1. Construction Manager's Office: In addition to the general requirements, provide an approximately 64' x 24' section modular that is partitioned to provide four office rooms and one lavatory facility. The Construction Manager's office shall be located in the same location as the Contractor's primary field office. The furnishings shall be as follows:

   8 Suitable office desks with drawers and locks.

   16 Office Chairs.

4 Fire resistant cabinet, 4-drawer, each and as specified in GENERAL REQUIREMENTS.

2 Drafting-type tables, each three feet by six feet, supported by wall brackets and legs.

2 Draftsmans stools.

1 Office table, four feet by twelve feet.

4 Vertical filing plan racks for four sets of 22" x 36" plans each rack.

2 Roll file unit with twelve 6" x 6" compartments capable of housing twelve cross-section rolls each 22 inch length.

2 Legal size 4-drawer file cabinet.

1 Metal storage cabinet with four adjustable shelves, tumbler lock and two keys (approximate size 72" high by 36" side by 18" deep).

1 High speed internet connection service and wireless router(s) capable of adequately handling up to 12 computers.

3 Additional fire extinguisher as specified in GENERAL REQUIREMENTS.

2. Equip with a water cooler and private toilet complete with water closet, lavatory and mirror-medicine cabinet unit.

E. Fire Extinguishers: Provide hand-carried, portable, UL-rated, class "A fire extinguishers for temporary offices and similar spaces. In other locations provide hand-carried, portable, UL-rated, class "ABC dry chemical extinguishers, or a combination of extinguishers of NFPA recommended classes for the exposures.

1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

F. Self-Contained Toilet Units: Single-occupant units of chemical, aerated recirculation, or combustion type; vented; fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.

G. Drinking-Water Fixtures: Containerized, tap-dispenser, bottled-water drinking-water units, including paper cup supply.

1. Where power is accessible, provide electric water coolers to maintain dispensed water temperature at 45 to 55 deg F (7.2 to 12.7 deg C).

H. Heating Equipment: Unless Owner authorizes use of permanent heating system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.

2. Heating Units: Listed and labeled, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use for type of fuel being consumed.

I. Electrical Outlets: Properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-V plugs into higher-voltage outlets; equipped with ground-fault circuit interrupters, reset button, and pilot light.

J. Power Distribution System Circuits: Where permitted and overhead and exposed for surveillance, wiring circuits, not exceeding 125-V ac, 20-A rating, and lighting circuits may be nonmetallic sheathed cable.

K. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered glass enclosures, where exposed to breakage. Provide exterior fixtures where exposed to moisture.

L. First Aid Supplies: Comply with governing regulations.

M. Radios: Contractor shall provide twenty (20) fully programmable repeater capable two-way radios (UHF). Radios shall have high capacity lithium batteries with a minimum single charge duration of 15 hours. Contractor shall provide repeater(s) and/or base station(s) as necessary to maintain clear radio communication throughout the entire project area. Repeater(s) and base station(s) shall be compatible with the provided radios.

N. Transportation Equipment: Contractor shall provide four (4) utility-terrain vehicles (UTV's) for use by the Construction Manager. Requirements of the Transportation Equipment is as follows:

1. Four (4) mid-sized 400 Ranger Series UTV's as manufactured by Polaris, or equal. Registration and insurance as may be required shall be included for the duration of the project.

2. Two (2) tow-behind trailers capable of transporting one UTV as described above. Registration and insurance shall be included for the duration of the project.

3. Cell Phone boosters, one for each UTV, capable of providing clear cell coverage throughout the entire project area.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.

B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Engage appropriate local utility company to install temporary service or connect to existing service. Where utility company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with utility company recommendations.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

2. Provide adequate capacity at each stage of construction. Before temporary utility is available, provide trucked-in services.

3. Obtain easements to bring temporary utilities to Project site where Owner's easements cannot be used for that purpose.

B. Sewers and Drainage: If sewers are available, provide temporary connections to remove effluent that can be discharged lawfully. If sewers can't be lawfully used for discharge of effluent, provide containers to remove and dispose of effluent off-site in a lawful manner.

1. Connect temporary sewers to municipal system or private system as directed by sewer department officials.

2. Maintain temporary sewers and drainage facilities in a clean, sanitary condition. After heavy use, restore normal conditions promptly.

3. Provide temporary filter beds, settlement tanks, separators, and similar devices to purify effluent to levels acceptable to authorities having jurisdiction.

C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction until permanent water service is in use. Sterilize temporary water piping before use.

D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking-water fixtures. Comply with regulations and health codes for type, number, location, operation, and maintenance of fixtures and facilities.

1. Disposable Supplies: Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Maintain adequate supply. Provide covered waste containers for disposal of used material.

2. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy.

3. Drinking-Water Facilities: Provide bottled-water, drinking-water units.

a. Where power is accessible, provide electric water coolers to maintain dispensed water temperature at 45 to 55 deg F (7.2 to 12.7 deg C).

E. Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload-protected disconnecting means, automatic ground-fault interrupters, and main distribution switchgear, as applicable.

1. Install electric power service underground, unless overhead service must be used.

2. Install power distribution wiring overhead and rise vertically where least exposed to damage.

F. Electric Distribution: Provide receptacle outlets adequate for connection of power tools and equipment.

1. Provide waterproof connectors to connect separate lengths of electrical power cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.

2. Provide warning signs at power outlets other than 110 to 120 V.

3. Provide metal conduit, tubing, or metallic cable for wiring exposed to possible damage. Provide rigid steel conduits for wiring exposed on grades, floors, decks, or other traffic areas.

4. Provide metal conduit enclosures or boxes for wiring devices.

5. Provide 4-gang outlets, spaced so 100-foot (30-m) extension cord can reach each area for power hand tools and task lighting. Provide a separate 125-V ac, 20-A circuit for each outlet.

G. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations and traffic conditions.

1. Install and operate temporary lighting that fulfills security, protection and meets personnel Health and Safety Requirements for the execution of the work.

2. Install exterior-yard site lighting that will provide adequate illumination for construction operations, traffic conditions, and signage visibility when the Work is being performed.

3. Provide a portable cellular telephone for superintendents' use in making and receiving telephone calls when away from field office.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Locate field offices, storage sheds, sanitary facilities, and other temporary construction and support facilities for easy access.

2. Provide incombustible construction for offices, shops, and sheds located within construction area or within 30 feet of building lines. Comply with NFPA 241.

3. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate to support loads and to withstand exposure to traffic during construction period. Locate temporary roads and paved areas as indicated on Drawings.

1. Provide a reasonably level, graded, well-drained subgrade of satisfactory soil material, compacted to not less than 95 percent of maximum dry density in the top 6 inches

2. Provide gravel paving course of subbase material not less than dimension indicated on drawings; roller compacted to a level, smooth, dense surface.

3. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

C. Traffic Controls: Provide temporary traffic controls at junction of temporary roads with public roads in accordance with applicable permits. Include warning signs for public traffic and "STOP" signs for entrance onto public roads. Comply with requirements of authorities having jurisdiction.

D. Dewatering Facilities and Drains: Comply with requirements in applicable project permits for temporary drainage and dewatering facilities and operations not directly associated with construction activities included in individual Sections. Where feasible, use same facilities. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining property nor endanger permanent Work or temporary facilities.

2. Before connection and operation of permanent drainage piping system, provide temporary drainage where roofing or similar waterproof deck construction is completed.

3. Remove snow and ice as required to minimize accumulations.

E. Waste Disposal Facilities: Collect waste from construction areas and elsewhere daily. Provide waste-collection containers in sizes adequate to handle waste from construction operations. Containerize and clearly label hazardous, dangerous, or unsanitary waste materials separately from other waste. Comply with Division 1 Section "Execution Requirements" for progress cleaning requirements.

1. If required by authorities having jurisdiction, provide separate containers, clearly labeled, for each type of waste material to be deposited.

2. Develop a waste management plan for Work performed on Project. Indicate types of waste materials Project will produce and estimate quantities of each type. Provide detailed information for onsite waste storage and separation of recyclable materials. Provide information on destination of each type of waste material and means to be used to dispose of all waste materials.

F. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment involved, including temporary utility services. Sheds may be open shelters or fully enclosed spaces within building or elsewhere on-site.

1. Construct framing, sheathing, and siding using fire-retardant-treated lumber and plywood.

2. Paint exposed lumber and plywood with exterior-grade acrylic-latex emulsion over exterior primer.

G. Lifts and Hoists: Provide facilities for hoisting materials and personnel. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects. Avoid using tools and equipment that produce harmful noise. Restrict use of noisemaking tools and equipment to hours that will minimize complaints from persons or firms near Project site.

B. Stormwater Control: Provide earthen embankments and similar barriers in and around excavations and subgrade construction, sufficient to prevent flooding by runoff of stormwater from heavy rains.

C. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from construction damage. Protect tree root systems from damage, flooding, and erosion.

D. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erecting structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and public of possible hazard. Where appropriate and needed, provide lighting, including flashing red or amber lights.

E. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities.

F. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.

1. Provide fire extinguishers, installed on walls on mounting brackets, visible and accessible from space being served, with sign mounted above.

a. Field Offices: Class A stored-pressure water-type extinguishers.

b. Other Locations: Class ABC dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for exposures.

c. Locate fire extinguishers where convenient and effective for their intended purpose.

2. Store combustible materials in containers in fire-safe locations.

3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for fire fighting. Prohibit smoking in hazardous fire-exposure areas.

4. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition.

5. Develop and supervise an overall fire-prevention and first-aid fire-protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

3.5 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage caused by freezing temperatures and similar elements.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

2. Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.

C. Termination and Removal: Unless the Construction Manager requests that it be maintained longer, remove each temporary facility when need for its service has ended, or no later than Substantial Completion. . Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are the property of Contractor. Owner reserves right to take possession of Project identification signs.

2. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.

3. Comply with final cleaning requirements in Division 1 Section "Closeout Procedures."

END OF SECTION

SECTION 015700 MAINTENANCE AND PROTECTION OF TRAFFIC

PART 1 - GENERAL

1.1 SUMMARY

A. This section specifies the requirements for maintenance and protection of Traffic during construction of the Project.

B. General:

1. All streets and travel ways shall remain open to the passage of vehicular and pedestrian traffic during the construction period, unless prior written consent is obtained from the Construction Manager and the governing body having jurisdiction over the street or travel way.

2. Maintenance and protection of traffic shall be provided in accordance with the Manual of Uniform Traffic Control Devices (MUTCD) and any provisions contained in the plans or the contract documents.

3. Safe and adequate ingress and egress to and from intersecting highways, town roads, access roads, homes, adjoining properties and commercial establishments shall be provided and maintained at all times to the satisfaction of the Construction Manager.

4. The traffic maintenance schemes shown in the MUTCD describe the minimum methods and control devices necessary. The Construction Manager may order additional devices and/or methods to meet field conditions. No additional payment will be made for additional devices ordered.

5. The Contractor shall give the required advance notice, as indicated in the contract document or by agreement with the Construction Manager, of his proposed operations to affected police, fire, and other emergency response departments. The Contractor shall give reasonable notice of his proposed operations to owners and tenants of private properties which will be affected by the construction operations.

6. Traffic Control Plans for work within VAOT right-of-ways has been prepared as part of the VGS ANGP – 19 V.S.A. 1111 Permit Application, and upon approval will become a part of this Contract.

C. Submittals:

1. Prior to the start of work, the Contractor must submit any proposed changes to the traffic control plan to the Construction Manager for approval. Any changes which alters the basic concept of the plan must be approved by the Construction Manager.

PART 2 - PRODUCTS

2.1 DEVICES AND EQUIPMENT

A. All signing, operations, safety, and directive devices shall conform to the Manual of Uniform Traffic Control Devices and the Authority having jurisdiction.

1. Delineators: Delineators shall be of the reflectorized plastic drum type.

2. Warning Signs: Advance warning signs shall be diamond shaped and have black lettering on an orange background.

PART 3 - EXECUTION

3.1 MAINTENANCE OF TRAFFIC

A. The Contractor shall provide signs, signals, barricades, flares, lights, and all other equipment, service, and personnel necessary to regulate and protect traffic and warn of hazards. The Contractor shall remove temporary equipment and facilities when no longer required, and restore area to original or specified conditions upon removal.

B. When crossings, obstructions, or the temporary closures of street or travelway are required, the Contractor shall provide and maintain suitable bridges, detours or other temporary measures, all of which must be to the satisfaction of the Construction Manager, for the accommodation of traffic. The duration of the operation shall be for the minimum time practical. Traffic shall be restored as soon as the street or travelway is safely passable.

3.2 WORK ZONES

A. Work zones on opposite sides of the road shall not overlap. A work zone is defined as that area in which traffic is restricted because of construction activities, or that area which involves a drop-off within 10 feet of the edge of pavement.

B. The Contractor shall delineate areas where there is a drop-off near the edge of the traveled way and areas on which it is unsafe to travel. The provisions for delineation shall be as approved by the Construction Manager, and the governing body having jurisdiction over the street, travelway, or site.

C. Excavations that produce drop-offs on both sides of the traveled way at the same time shall not be permitted.

D. Reflectorized plastic drum delineators shall be used along embankments and at other hazardous locations determined by the Construction Manager. Delineators shall remain in place until satisfactory protection is provided. Delineators shall be spaced at a distance not to exceed 50 feet, or as directed by the Construction Manager.

E. The Contractor shall provide 1-inch steel plates to provide for traffic movement over narrow, open excavations. Excavations made for the installation of the pipes will be backfilled at the close of each day.

F. No material is to be stored on the shoulder or within the 20-foot roadside clear area, except that which is to be placed that day.

G. Construction equipment shall be removed from the roadside clear area of all highway pavement during the hours that the Contractor is not working. This requirement shall not be limited to the contract limits.

H. Traffic Signals and Signs:

1. The Contractor shall provide and operate traffic control and directional signals required to direct and maintain an orderly flow of traffic in areas affected by the Contractor's operations.

2. The Contractor shall provide traffic control and direction signs, mounted on barricades or standard posts at each change of direction of a roadway, at each crossroad, at detours, at hazardous areas, and at parking areas.

3. The correct sequence and spacing of signs, either permanent or temporary must be maintained at all times in accordance with MUTCD unless shown otherwise on the plans. All signs, including guide signs, shall indicate actual conditions at all times and shall be covered, moved, removed, or changed immediately as ordered by the Construction Manager.

4. In order to maintain effective traffic control, the contractor shall be responsible for the maintenance of all signs, cones, flashers, barrels, and other devices the Contractor shall ensure that they are in place and in good condition.

I. Flag Personnel:

1. The Contractor shall provide suitably qualified and equipped flag personnel when construction operations encroach on traffic lanes. The regulation of traffic by flag personnel shall be in accordance with the requirements of the MUTCD or the Authority having jurisdiction.

J. Flares and Lights:

1. During periods of low visibility the Contractor shall provide flares and lights to guide traffic, to clearly delineate traffic lanes, and to warn of hazardous areas. Flag personnel shall use lights in directing traffic during periods of low visibility. Illumination of critical traffic and parking areas shall be provided by the Contractor during periods of low visibility.

K. Parking Control:

1. The Contractor shall control all Contractor related vehicular parking such that it does not interfere with public traffic and parking, access to emergency vehicles, Owner's operations, or construction operations. The Contractor shall provide temporary parking facilities for the public as construction operations dictate.

2. The Contractor shall provide parking areas for workman's private vehicles that comply with applicable laws, regulations, codes, and ordinances. The Contractor shall ensure free vehicular access to and through the parking areas. The Contractor shall not permit parking on or adjacent to access roads or in non-designated areas.

L. Haul Routes:

1. The Contractor shall consult with governing authorities and establish thorough fares which shall be used as haul routes and site access. The Contractor shall confine construction traffic to designated haul routes. The Contractor will be required to provide traffic control at critical points of haul routes to expedite traffic flow and minimize interference with normal public traffic. Where required by governing authorities, the Contractor shall prepare and submit traffic control plans for approval by both the Construction Manager and the governing Authority prior to commencement of work.

M. Contractor Operations:

1. If the Construction Manager notifies the Contractor or his superintendent of any hazardous construction practices, all operations in that area shall be discontinued and immediate remedial action shall be taken to the satisfaction of the Construction Manager before work is resumed.

END OF SECTION

SECTION 017300- EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. General installation of products.
4. Coordination of Owner-installed products.
5. Progress cleaning.
6. Starting and adjusting.
7. Protection of installed construction.
8. Correction of the Work.

1.2 SUBMITTALS

A. All information identified in Contract Documents.

B. Requests for Information made by Construction Manager.

C. Qualification Data: Sufficient information to demonstrate capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of engineers and owners, and other information specified.

1.3 QUALITY ASSURANCE

A. Quality Assurance and Quality Control as identified in Section – Quality Requirements.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.

2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Acceptance of Conditions: Examine substrates, TWS and ATWS areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations. Report to the Construction Manager any unresolvable issues.

1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

a. Description of the Work.
b. List of detrimental conditions, including substrates.
c. List of unacceptable installation tolerances.
d. Recommended corrections.

2. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Existing Utility Interruptions: Do not interrupt utilities unless permitted, then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Construction Manager and Owner not less than 48 hours in advance of proposed utility interruptions.

2. Do not proceed with utility interruptions without Construction Manager's and Utility's written permission.

C. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication/installation schedule with construction progress and work of others to avoid unnecessary delay of the Work.

D. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

E. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Construction Manager. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding with the Work, verify layout information shown on Drawings, in relation to the survey control and field layout. If discrepancies are discovered, notify Construction Manager promptly.

B. General: Owner will provide project lay out using accepted surveying practices, as follows:

1. Establish benchmarks and control points to set lines and levels and elsewhere as needed to locate each element of Project.

2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.

3. Inform installers of lines and levels to which they must comply.

4. Check the location, level and plumb, of every major element as the Work progresses.

5. Notify Construction Manager when deviations from required lines and levels exceed allowable tolerances.

6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Engineer and Construction Manager.

F. Contractor is responsible for protecting and maintaining all construction layout information at no additional cost to the Owner.

3.4 FIELD ENGINEERING

A. Alignment of the pipeline is depicted on the ANGP Transmission Pipeline alignment sheets and associated drawings. VGS will have the pipeline alignment staked along the centerline of the proposed pipeline. Survey stakes will be set at minimum 200-feet spacing. The Contractor is responsible for preserving and replacing all layout controls, existing survey stakes, and monuments.

B. Identification: Owner will identify existing benchmarks and control points.

C. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Construction Manager. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to and Construction Manager before proceeding.

2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

3. Contractor shall install temporary markers with survey station numbers at minimum 200-feet spacing to facilitate location and progress reporting. These shall be located on the boundary of the working side of the right-of-way, with station numbers visible. Contractor shall also flag the right of way boundaries at 200 feet intervals to eliminate off right of way damage. Contractor shall maintain all temporary markers and boundary flagging throughout construction.

4. Contractor shall replace any pipeline trench centerline markers disturbed by construction operations ahead of the trenching operation in their original location. Owner may check and adjust the location of these markers as necessary.

D. Benchmarks: Establish and maintain permanent benchmarks on Project site, as necessary, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

2. Where the actual location or elevation of survey points cannot be marked, provide temporary reference points sufficient to locate the Work.

3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

E. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, Owner shall prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.

F. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous. Provide MSDS on all products or provide controls in accordance with proper use.

3.6 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning of joint-use areas where more than one Contractor is working with the others. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.

2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F (27 deg C).

3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.

2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration.

G. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.

H. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

I. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration.

J. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period.

K. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.7 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 1 Section "Quality Requirements."

3.8 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.9 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Inspection procedures.
2. Project Record Documents.
3. Warranties.
4. Instruction of Owner's personnel.
5. Final Cleaning and restoration.

1.2 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.

2. Advise Owner of pending insurance changeover requirements.

3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.

4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.

5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.

6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.

7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.

8. Complete startup testing of systems.

9. Submit test records.

10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.

11. Submit changeover information related to Owner's use, operation, and maintenance.

12. Complete final cleaning requirements, including touchup painting.

Fix footer spacing

13. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Construction Manager will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Construction Manager, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

2. Results of completed inspection will form the basis of requirements for Final Completion.

1.3 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment according to Division 1 Section "Payment Procedures."

2. Submit certified copy of Construction Manager's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Construction Manager. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.

3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

4. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.4 PROJECT RECORD DOCUMENTS

A. General: Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for Construction Manager's reference during normal working hours.

B. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications. Mark copy to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.

3. Note related Change Orders, Record Drawings, and Product Data, where applicable.

C. Record Product Data: Submit one copy of each Product Data submittal. Mark one set to indicate the actual product installation where installation varies substantially from that indicated in Product Data.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.

3. Note related Change Orders, Record Drawings, and Record Specifications, where applicable.

D. Miscellaneous Record Submittals: Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

E. Provide Construction Manager and Owner with an electronic (PDF) copy of all record documents on collaboration website.

1.5 OPERATION AND MAINTENANCE MANUALS

A. Assemble a complete set of operation and maintenance data indicating the operation and maintenance of each system, subsystem, and piece of equipment not part of a system. Include operation and maintenance data required in individual Specification Sections and as follows:

1. Operation Data:

a. Emergency instructions and procedures.

b. System, subsystem, and equipment descriptions, including operating standards.

c. Operating procedures, including startup, shutdown, seasonal, and weekend operations.

d. Description of controls and sequence of operations.

e. Piping diagrams.

2. Maintenance Data:

a. Manufacturer's information, including list of spare parts.
b. Name, address, and telephone number of Installer or supplier.
c. Maintenance procedures.
d. Maintenance and service schedules for preventive and routine maintenance.
e. Maintenance record forms.
f. Sources of spare parts and maintenance materials.
g. Copies of maintenance service agreements.
h. Copies of warranties and bonds.

B. Organize operation and maintenance manuals into suitable sets of manageable size. Bind and index data in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, with pocket inside the covers to receive folded oversized sheets. Identify each binder on front and spine with the printed title "OPERATION AND MAINTENANCE MANUAL," Project name, and subject matter of contents. Also include a PDF file with the applicable information.

1.6 WARRANTIES

A. Submittal Time: Submit written warranties on request of Engineer for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, 3-ring, "D" ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.

2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.

3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

C. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 DEMONSTRATION AND TRAINING

A. Instruction: Instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Provide instructors experienced in operation and maintenance procedures.

2. Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.

3. Schedule training with Owner through Construction Manager, with at least 7 days advance notice.

4. Coordinate instructors, including providing notification of dates, times, length of instruction, and course content.

B. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections. For each training module, develop a learning objective and teaching outline. Include instruction for the following:

1. System design and operational philosophy.
2. Review of documentation.
3. Operations.
4. Adjustments.
5. Troubleshooting.
6. Maintenance.
7. Repair.

3.2 FINAL CLEANING

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers for final cleaning. Clean each surface or unit to condition expected in an average industrial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.

b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.

c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.

d. Remove tools, construction equipment, machinery, and surplus material from Project site.

e. Remove snow and ice, where applicable, to provide safe access.

f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.

g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.

h. Sweep concrete floors broom clean in unoccupied spaces.

i. Remove labels that are not permanent.

j. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

k. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

l. Replace parts subject to unusual operating conditions.

m. Clean exposed surfaces of diffusers, registers, and grills.

n. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

o. Leave Project clean and ready for operation.

C. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.
4. Record Documentation specified elsewhere with this Specification
5. Record Samples.

1.2 SUBMITTALS

A. Record Drawings: Owner's representative shall bear the responsibility of the Record Drawings. Contractor shall assist and coordinate with the Owner, as necessary, to complete this task.

B. Record Specifications: Submit 1 copy of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit 1 copy of each approved Product Data submittal.

1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in the manual instead of submittal as Record Product Data.

D. Record Documentation: See subsequent specification Sections for task specific documentation requirements.

PART 2 - PRODUCTS

2.1 AS-BUILT INFORMATION TO BE COLLECTED

A. Contractor will provide labor and equipment, when necessary, to assist the Owner with the collection of as-built information to accurately document the installation of the pipeline. All as-built locations will be with reference to the actual distance in feet along the top of pipe.

B. Contractor shall not cover up any piping before Owner has recorded as-built data.

C. Contractor shall provide VGS with marked-up drawings of any changes to dimensions or configuration of fabricated components. Contractor shall also provide VGS with all original hydrostatic test records, including yield plots, charts, limits of each mainline test section, and the minimum and maximum test pressures realized for each test or test section

2.2 RECORD DRAWINGS

A. Record Prints: Owner shall bear the responsibility of Record Prints.

B. Record CAD Drawings: Owner shall bear the responsibility of Record CAD Drawings.

2.3 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.

3. Record the name of the manufacturer, supplier, installer, and other information requested by task Specification to provide a record of selections made.

4. Note related Change Orders, Record Drawings, and Product Data where applicable.

2.4 RECORD PROJECT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.

3. Note related Change Orders, Record Drawings, and Product Data where applicable.

2.5 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.

B. Maintenance of Record Documents: Store Record Documents in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Owner, Owner Consultants, and Construction Manager's reference during normal working hours.

C. Post Record Documents on project collaboration website.

END OF SECTION

SECTION 023219 EXPLORATORY EXCAVATION

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes exploratory excavations for the purpose of verifying the exact locations of underground utilities, structures, and other subsurface conditions.

1.2 SUBMITTALS

A. Sketches: Submit a sketch showing the location of the subsurface features which were uncovered in the test pit, including the following information:

1. horizontal location of the subsurface feature relative to three individual surface features.
2. depth of feature below ground surface.
3. diameter, type, material, and condition of pipe or conduit.
4. orientation of pipe, conduit or structure relative to other site features.
5. other pertinent dimensions.
6. exploratory excavation identification number.
7. discrepancies from design plan

1.3 JOB CONDITIONS

A. Perform exploratory excavations only within the limits of the work, easements and rights of way.

B. Excavate exploratory excavations with care to avoid damage to structures and utilities. Excavate by hand if necessary. Promptly repair any damaged utilities and structures at no cost to the Owner.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 GENERAL

A. Exploratory excavations shall be performed in advance of construction, where necessary, at the locations shown on the Drawings, or where directed by the Engineer to. determine the exact location of all pipes, conduits, duct, or other interfering structures in both horizontal and vertical locations. Excavate to the depth and width necessary to accurately determine the locations of the utilities of interest.

B. Upon satisfactory execution of the required exploratory excavations the Engineer shall adjust pipe elevations, alignment or design he feels necessary to minimize interferences.

C. Backfill exploratory excavations in accordance with Section "Trenching and Backfilling"

D. Exploratory excavations performed in areas to be further disturbed shall be graded for temporarily traffic or use.

E. Exploratory Excavations performed in areas not to be further disturbed shall be restored to pre construction conditions.

END OF SECTION

SECTION 099000 MAINLINE VALVE ASSEMBLY PAINTING & CORROSION COATING

PART 1 - GENERAL

1.1 WORK TO BE DONE

A. Furnish all labor, materials, scaffolding, tools, and equipment necessary to complete the painting and finishing requirements of the MLV assemblies.

B. Included in the painting work are all MLV assemblies required for the project, including the following parts of each assembly:

1. Above Grade Coatings
   a. Above grade piping, valves, fittings, support steel and miscellaneous steel structures.

2. Below Grade Coatings
   a. Below grade piping, valves and fittings, support steel and miscellaneous steel structures
   b. All below ground field joints

3. Transition Coatings
   a. All transitions from below to above ground piping.

C. The work shall include cleaning and surface preparation, supply and application of primer, if required, supply and application of top coating and the supply of all consumable materials required for performing and completing the work.

1.2 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Structural and Miscellaneous Steel primed and finish painted.

1.3 SURFACE CONDITION OF RECEIVED MATERIALS

A. For equipment supplied and installed under this contract it is the Contractor's responsibility to ensure that the equipment is suitably primed, if required, and final painted after installation.

B. All above ground piping will be received unpainted with a thin layer of mill applied lacquer.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Below Ground Coatings:

1. Coatings shall be fusion bonded epoxy (FBE), manufactured by 3M or equal. Product shall be:

   a. Scotchkote 6233, 206N or equal – 14 mils cured film thickness minimum

   b. Field Joints on Below Ground Piping:

c. Coating shall be Canusa HBE-95 or equal. – 20 mils dry film thickness (DFT) minimum

d. Pipe and Fittings in Air / Soil Transitions (12" Above and Below Grade):

e. Coating shall be Carboline Bitumastic 300M or equal - 14 to 16 mils DFT.

f. Carboline Bitumastic should be applied in two coats to minimize both dry time and excessive film application.

B. Above Ground Coatings:

1. Coatings shall be manufactured by PPG Amercoat or equal. Coatings shall be:

a. Primer coat: Amerlock 2 or Amerlock 400 – 3 to 4 mils thick DFT
b. Second coat: Amerlock 2 or Amerlock 200 – 3 to 4 mils thick DFT
c. Top Coat: Amercoat 450 Series – 3 to 4 mils thick DFT

2. Coating shall be 9 to 12 mils DFT overall.

a. Amerlock 2/400 should be applied in two coats to minimize both dry time and excessive film thickness application.

2.2 GENERAL

A. All materials shall be delivered in unopened containers as packed by the Manufacturer. Each container shall bear the Manufacturer's standard label for the catalog item as approved showing trade name and number, formula, and directions for use. Containers shall not be opened until contents are to be used.

B. No coating shall be thinned more than specifically recommended in the Manufacturer's printed directions and thinner used shall be the highest type of those recommended. No coating ready prepared for use shall be thinned without the approval of the Company. No driers shall be added at the job unless approved by the Company.

C. All auxiliary materials shall be pure, of highest quality, and approved by the Company. Such materials shall bear identifying labels on the containers.

PART 3 - EXECUTION

3.1 GENERAL

A. All coatings shall be applied as per the Manufacturer's printed instructions by brush or roller unless spray application is specifically named as acceptable in the description of required treatment, when air or airless spray shall be acceptable.

B. Coatings shall be thoroughly stirred and kept at a uniform consistency during application.

C. No work shall be done on damp surfaces unless printed instructions on label so recommend for the particular coating being used.

D. Exterior painting shall not be done during or immediately following rainy or frosty weather or when the temperature is below 508F or likely to drop to freezing. The application of treatments while

surfaces are exposed to hot sun or when temperature is above 908F or likely to be during the drying period shall be avoided.

E. All work shall be done by skilled mechanics in a workmanlike manner; all coats flowed on or brushed out to a uniform film. Completed work shall be free of runs, sags, blocked angles, raised grain, and all other evidence of poor or careless workmanship.

F. Allow sufficient time before recoating to ensure proper drying of the preceding coat.

G. For enamel finishes on metal of shop-primed surfaces sand original surface between coats with fine sandpaper and remove all resulting grit and dust before application of each coat.

H. Raised face surfaces of flanges shall be protected from blasting medium and paint.

3.2 SURFACE PREPARATION

A. Prior to all surface preparation, Contractor shall protect all gasket surfaces, flange faces, valve stems, nameplates, pressure gauges, instrument cases, gauge glasses, electrical conduit and fixtures, instrument tubing, aids to navigation and all previously installed and coated equipment, including galvanized equipment and all specialty items.

B. Where practical, electrical cable and instrument tubing will be installed after blasting and coating has been completed. During all blasting operations, Contractor shall exercise caution and employ masks, shields, etc. to assure that coated surfaces adjacent to the blast area are protected from overblast damage by stray or rebounding blast particles.

C. Prior to all surface preparation, all surfaces shall be cleaned as necessary to remove oil, grease, dirt, salts, and other foreign matter, in accordance with SSPC-SP1, "Solvent Cleaning". A biodegradable water-soluble cleaner such as PPG Amercoat Prep 88, or approved equal, shall be used, followed by a fresh water wash with a minimum of 3000 psi. Surfaces to be coated shall be tested for chloride contamination prior to abrasive blasting or surface preparation using the CHLOR*TEST™ test kit or equivalent.

D. All surfaces shall be blasted to a "near-white metal" blast cleaned surface finish as per NACE 2/SSPC-SP10/ ISO SA2.5 and will demonstrate an angular anchor pattern of at least 1.5 to 4.0 mils peak to peak. Coater shall strive to have an anchor pattern of 3.0 to 3.5 mils peak to peak.

E. Mechanical cleaning in accordance with SSPC-SP2, SSPC-SP3 or SSPC-SP11 and solvent cleaning in accordance with SSPC-SP1 may be required separately or in conjunction with each other when blasting cannot achieve a near-white metal surface or when blasting will damage fragile components

F. The abrasive may be coal slag, refractory slag, garnet, aluminum oxide or flint, sized to produce the required anchor profile and graded to be free from clay, silt or other matter likely to become embedded in the steel surface.

G. Blast cleaning operations will not be conducted on surfaces that will be wet after blasting and before coating, when the surfaces are less than 5°F (30C) above dew point as measured by a sling psychrometer or digital hygrometer, or when the relative humidity of the air is greater than 85% without permission of Company. Paint manufacturer's alternate recommendations for conditions for blasting may be acceptable, with Company approval.

H. It is desired that outdoor abrasive blasting be done during daylight hours, unless the blasting is done inside humidity and temperature controlled blasting booths/buildings. If outdoor blasting is allowed

during the night, the surface will be swept clean and bright the next morning with fresh, light blasting to provide a "white" blasted surface.

I. Blasting will be done in an area removed from coating operations and freshly coated surfaces to prevent contamination. Contaminated coatings will be reblasted by Contractor to bare metal and re-applied as originally specified.

J. After blasting, Contractor will thoroughly clean all blast grit and dust from both internal and external surfaces, including from crevices, recesses, etc.

3.3 COATING APPLICATION

A. Blast-cleaned surfaces will be coated during the same day as blasting and at least one coat prior to sundown of that day and also before any rusting occurs. A minimum of 3 inches around edges of blasted areas will be left unprimed. Blasting will continue a minimum of 1-inch into adjoining coated surface. Any blast-cleaned surfaces that are not primed and are wet by rain or moisture will be re-blasted prior to application of primer.

B. The coating film thickness is specified in Section 2.0 and is subject to inspection by the Company Inspector.

C. No coating will be placed on or within 3 inches of edges prepared for field welds. Succeeding coats of paint will be stopped a minimum of 3 inches from the edge of the previous coat at the field weld location (i.e. primer coat stops 3 inches from field weld, intermediate coat stops 6 inches from field weld, etc.).

D. The finished job will not contain sags, runs, wrinkles, spots, blisters or other application flaws. Holidays in the final coat at edges, corners, welds and inaccessible areas may be repaired by spraying or hand brushing an additional layer of top coat provided excessive buildup does not occur.

E. The coatings described in this specification may contain flammable solvents. The vapor from these solvents may be harmful and cause skin and eye irritation. The resinous components of the primers and laminating resin may cause serious delay dermatitis. Employees involved in coating work will be provided with breathing apparatus, eye and skin protection by the Contractor as necessary.

F. Succeeding coats of paint will be of colors that contrast to the color of the previous coat. Contractor will verify the finish coat color with Company prior to the initiation of material procurement.

3.4 STEELWORK

A. Note that all steelwork is to be sandblasted before applying paint.

3.5 PROTECTION AND SURFACES NOT TO BE PAINTED

A. The Contractor shall use tarpaulins, drops, and coverings as much as possible to protect floors, equipment, etc., from over-spray, spatter, droppings, etc.

B. The following are not to be painted:

1. Nameplates, tags, or labels.
2. Machined surfaces.
3. Valve stems (remove handles and paint separately).
4. Swagelok or other compression fittings.
5. Lubrication points.
6. Pivot points involving mechanical movement.

3.6 CLEANING UP AND REPAINTING

A. The Contractor shall remove all paint where it has been spilled, splashed, or spattered on surfaces.

B. The Contractor shall touch up or repaint, as required by the Company all painted surfaces that are marred, marked, chipped, spalled, defaced, or deficient in any way before it is turned over to the Company.

3.7 REPAIRS TO COATINGS

A. Below Ground Coatings:

1. Grinding or filing shall prepare defective and/or damaged coating including pinholes with a flat file. The surface shall be abraded or "feathered" with a fine sand paper or emery cloth.

2. Catalyzed Epoxy Patching Compound shall be applied to prepared surface of holidays and/or defective or damaged coating, excluding pinholes in accordance with the manufacturer's recommendations to attain a uniform minimum thickness of 25 mils. Pipe with unacceptable coating, excessively low mils (thickness), separation of bond and/or holidays shall be completely reblasted to NACE Near-White finish and recoated as bare pipe. Hot melt patch stick shall be used for pinholes up to 1/4" diameter.

3. After repairs, pipe shall be re-inspected with an electrical holiday detector set at the appropriate voltage.

B. Above Ground Coatings:

1. Coating damage shall be repaired as follows:

a. Top coat damaged, but base coat undamaged: Repair by removing damaged coating with 3M Clean-N-Strip, abrasive cloth, or other means acceptable to Company (wire brushing will not be acceptable), feather edges of adjacent coated surfaces and applying top coat as specified.

b. Coating damaged to base metal: Repair by blasting and/or mechanical cleaning of the damaged area to NACE 2/SSPC-SP10/ISO Sa2.5 Near White Metal, feather adjoining paint surfaces with grit paper to provide a smooth surface transition and apply the coating system as specified in Section 2.0.

c. Care will be taken to avoid damaging the coatings surrounding repaired areas and to assure complete tie-in of the coating with surrounding area.

3.8 INSPECTION

A. Coating application in accordance with this procedure shall be subject to inspection by Company Inspector at all times.

B. Company inspector or his representative shall have access to all work while being performed.

C. Contractor will provide and utilize wet and dry film thickness, temperature and humidity gauges as required by the performance of the work. Paint foreman shall inspect and monitor the work of painters and blasters under his direction. Daily painting logs and inspection reports shall be kept by the Contractor. Replica tape of surface profile shall be attached to inspection report.

D. Contractor will maintain all necessary measuring and test equipment in good working order with up to date calibration records that are available for Company inspector's review. Magnetic Dry film thickness (DFT) gauges will be calibrated using either test blocks bearing nonmagnetic coatings that are traceable to a known standard or plastic shims provided by maker of electronic DFT gauges.

E. Work shall be rejected because of poor workmanship. Poor workmanship is defined as, but not limited to improper surface preparation, inadequate drying or curing, excessive paint build-up, dirt or dust inclusions, overspray, pinholes, runs and sags or inadequate film build. Rejected work will be repaired as originally specified in this specification, at no additional cost to Company.

3.9 FUSION BONDED EPOXY COATING SPECIFIC REQUIREMENTS

A. Pipe shall be uniformly preheated to a temperature range of 450°F to 475°F. Temperatures shall be monitored by means of suitable temperature indicating devices. The duration of preheated temperature shall be kept to the absolute minimum required for proper application. Temperatures shall comply with the manufactures recommendations but not to exceed 500°F. Pipe that is "blued" in the heating operation shall be rejected and replaced at the Coater's expense.

B. External pipe coating shall be electrostatically sprayed.

C. Sufficient "Gel" time shall be allowed for liquefying powder, wetting of pipe and flow out followed by sufficient "Cure" time prior to quenching or forced cooling. "Gel" and "Cure" times shall vary with each powder and manufacturer's recommendation. Therefore, the manufacturer's recommendation shall be followed.

END OF SECTION

SECTION 130000 MINIMUM REQUIREMENTS FOR PIPELINE CONSTRUCTION PARALLELING OVERHEAD ELECTRIC LINES

PART 1 - GENERAL

1.1 MINIMUM REQUIREMENTS FOR PIPELINE CONSTRUCTION PARALLELING OVERHEAD ELECTRIC LINES

A. This construction specification applies to pipeline construction that parallels overhead high voltage electric transmission lines and represents minimum requirements only.

B. The purpose of this specification is to cover the procedures and construction techniques which must be used during the construction period to reduce potentials on the pipe and construction equipment to a level less than 15 volts Root Mean Square (RMS) measured between the structure and ground. This is measured using a digital voltmeter.

C. This specification is not all inclusive and is intended to remind the installer of the potential hazards which may be associated with pipeline construction in the vicinity of induced voltage, fault current, and contact to high voltage electric transmission lines.

D. The Designer should review the project and initiate additional requirements deemed necessary to ensure the safety of persons and property affected thereby. The company shall furnish any special materials required to comply with this section. Consult with the company Electrical Transmission & Distribution Engineering for specific applications and requirements.

1.2 REFERENCES

A. National Electric Safety Code (NESC)

B. Occupational Safety and Health Administration (OSHA)

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 STEEL PIPE INSTALLATIONS PARALLELING HIGH VOLTAGE ELECTRIC LINES

A. When exposed metallic piping is run parallel to overhead A.C. electric lines, the pipe is subject to induced voltages and currents that are the result of electromagnetic, electrostatic and resistive coupling.

B. Induced voltages and currents may cause coating damage as well as damage to cathodic protection and electronic monitoring equipment.

C. Induced voltages and current can be hazardous to personnel working on the pipeline during the construction period when long sections of pipe are exposed above ground. Lightning and faults on the transmission line can be especially dangerous.

3.2 ELECTRICAL SAFETY

A. The contractor will furnish a responsible person that can understand and follow the Technical Specifications and Electrical Safety required for the specific project. The responsible person for electrical safety must be approved by the Owner.

1. The person in charge of electrical safety shall:

a. Assure that all electrical safety requirements and devices are fully understood by all members of the construction forces.

b. Be fully aware of proper grounding procedures and with the dangers associated with electromagnetic and electrostatic couplings, resistive coupling, ground fault current discharge, lightning, etc.

c. Know the proper OSHA and NESC safeguards for the construction equipment being used related to the company's "limit of approach" regulations to the specific overhead transmission circuits that will be paralleled.

d. Have the necessary instrumentation, equipment and authority to implement and maintain safe working conditions.

e. Assure all safety devices and practices are properly employed during all periods of construction activity in the proximity of electric overhead transmission systems. This includes the choice of the appropriate rubber gloves for the situation.

f. Communicate at least daily with the dispatcher controlling the involved electric lines to ascertain any scheduled changes in loading, outages and switching operations and to notify of work on their Right-of-Way.

3.3 EQUIPMENT SAFETY

A. Each piece of equipment utilized to handle pipe in any way such as unloading, picking up, transporting, bending or setting-in shall be grounded and shall be equipped with a cable assembly capable of grounding the sections of pipe to the piece of equipment handling that pipe.

B. Before any section of pipe is picked up or moved in any way, the ground shall be completed between the section of pipe and the equipment moving that pipe. "Setting-In" booms shall be equipped with ground cable and the ground must be maintained at least until the stringer bead is completed. The ground connection on cranes shall be also made to the upper rotating structure supporting the boom.

C. Pipe shall be unloaded from stringing trucks by a side boom equipped with grounding cable as described above. A ground shall be completed between all sections of pipe to be unloaded and the side boom before unloading cables or slings are attached to the pipe.

3.4 GROUNDING

A. Each continuous segment of pipeline being worked on should be grounded to at least two separate points. This grounding should consist of one of the following alternatives:

B. Grounding should be established by driving one or more ground rods to at least a four-foot depth and connecting these ground rods to each other and the pipeline with a #2 A.W.G. stranded copper cable. Suitable connectors should be utilized to connect the #2 A.W.G. cable to the individual ground rods and to the pipeline. No ground connections should be removed without the knowledge and concurrence of the person responsible for electric safety.

C. Should sub-surface conditions prohibit the driving of ground rods, temporary grounding can be established with one or more ground rods, conduits of aluminum foil installed horizontally and covered with a minimum 4 inches of dirt. The segment of the pipeline being worked on should be bonded to the temporary grounding. This bond should consist of an insulated #2 A.W.G. jumper cable. The grounding cable should first be securely attached to the temporary grounding and then attached to the pipeline. Removal should be in reverse order.

D. It is of the utmost importance that the person making or breaking the connection at the ground rod connection not "bridge the gap" between the ground rod and bond clamp.

E. When installing or removing a grounding or bonding facility, personnel shall wear the class of rubber insulating gloves selected by the person responsible for electrical safety. The following procedures for making and breaking grounding connections shall be strictly adhered to:

1. Using Jumper Cable with End Clamps

   a. Making grounding connections

      1) Establish temporary grounds (ground rods, bare casings, other appropriate ground).

      2) Using jumper cable with end clamps, connect one end clamp to the temporary ground.

      3) Using rubber gloves, connect the other end clamp to the structure to be grounded.

   b. Disconnecting grounding connections

      1) Using rubber gloves, disconnect the clamp attached to the structure end.

      2) Disconnect the clamp connected to the temporary ground.

2. Using Clamp Around the Pipe and Jumper Cable with End Clamps

   a. Making ground connections

      1) Establish temporary ground (ground rods, bare casing, other appropriate ground).

      2) Using rubber gloves, connect grounding clamp around the pipe.

      3) Connect one end of the grounding cable to the temporary ground.

      4) Using rubber gloves, connect the other end of the grounding cable to the grounding clamp around the pipe.

b. Disconnecting grounding connections

1) Using rubber gloves, disconnect the grounding cable from the grounding clamp around the pipe.

2) Using rubber gloves, disconnect the grounding clamp around the pipe.

3) Disconnect the grounding cable from the temporary ground.

4) Proper work procedures related to electrical safety shall be established for all construction activities associated with this project.

F. The person in charge of electrical safety shall check the integrity of each connection by measuring the resistance from a near point on the copper cable to the ground rod or pipeline steel using a suitable Ohm Meter. A good electrical connection will have a resistance of 0.1 Ohm or less.

G. Pipe shall be hauled to the right-of-way and stored in stacks of ten sections or less. Each section of pipe in the stack shall be grounded with a 5/8" min. diameter ground rod driven into the ground at least four (4) feet. All sections in one stack shall be grounded together. This ground shall be maintained until each individual section of pipe has been removed from the stack.

H. When grounding sections of pipe, the ground rod shall be driven and the grounding cable connected to the ground rod first. The grounding cable shall then be connected to the pipe. Cables used for temporary grounding attachments shall have good mechanical strength as well as high conductivity. The cable shall be single conductor #2 A.W.G. stranded copper, cable or equivalent. Cable attachments to temporary grounding systems shall be made by a method that assures good electrical contact while applying firm pressure to the pipe metal. This method of attachment should have a current carrying capacity of at least 200 amperes. When removing grounding cable, the cable shall be removed from the pipe or equipment first and then from the ground rod.

I. All grounding attachments and removals shall be made by or under the direct supervision of the person responsible for electrical safety.

J. Temporary ground connections should be made by electrically connecting the pipeline to each casing. Prior to the installation of the cathodic protection test leads, a bond should be installed using an insulated #2 A.W.G. jumper cable with suitable clamps. Connection shall be made first to the casing and then to the pipe. Removal of bond shall be made on reverse order.

K. If electrolytic grounding cells are to be installed between the pipe and casing as part of the final installation, the bonds shall not be removed until the grounding cells are installed.

L. Before any casing-pipeline temporary bond is removed, the person in charge of electrical safety shall determine that all permanent test wire connections to the pipeline and casing are intact. This shall be done by measuring the potential of the wire to a close copper-sulfate reference electrode using a suitable high resistance volt-meter. A wire connection with good metallic contact will show a potential of from 0.3 to 0.7 volt. A broken or disconnected wire connection will show a potential of 0.2 volt or less.

M. Insulating joints shall be installed with a bond cable shorting out the insulating material. This bond cable shall remain in place until the insulating joint has been welded into the pipeline and a

grounding cell has been connected across the insulating flange. The grounding cell with test station must be in service and the bond cable removed before the insulating joint is buried.

1. Each person coming in contact with the pipeline during construction should do so only when:

   a. Using rubber-insulating gloves. The person in charge of electrical safety should be in charge of insuring that all rubber-insulating gloves are kept in good insulating condition by following accepted test procedures. All gloves that are damaged (punctured, ripped, torn, etc.) shall be immediately replaced.

   b. Standing on a grounding mat that is electrically connected to the pipeline at two separate locations. The grounding mat could consist of a copper weld wire mesh of #8 A.W.G. wire with a 4" x 4" mesh spacing. The mat should be electrically connected to the pipeline through a minimum #2 A.W.G. insulated jumper cables thermo welded to the mat and connected to the pipe using suitable clamps.

N. Temporary gradient control mats shall extend a minimum of 1 meter in all directions outside the work area. There shall be no contact between persons over the gradient mat and those not over the mat, including the handing over of tools, instruments or other materials.

1. Regardless of the approach selected, it is always advisable to handle the pipe (whenever possible) by the coated area of the pipe.

O. All piping at tie-ins shall be bonded across the gap. All piping at cut-outs shall be bonded across before the cut-out is started. Prior to installing the cable bond at tie-ins and prior to removing the cable bond across cut-outs, each side shall be properly grounded as indicated in Item 6.1.

P. Whenever a section of pipe must be lifted free of the earth on a web sling or equivalent for transport, the pipe steel so lifted should be electrically connected to a metallic portion of the tractor doing the lifting and transporting. This requirement may be waived if the lifting and/or transporting of the pipe can be accomplished with connections called for in Item 6 of these recommendations.

Q. A grounding strap or chain shall be attached to each rubber tired vehicle with a secure electrical connection to provide a ground contact for the vehicle during both mobile and stationary operations. The grounding strap or chain shall be of sufficient length to provide three (3) feet of earth contact immediately after the vehicle comes to a stop within 200 feet from the centerline of high voltage overhead conductors.

R. If steel chain is used for the grounding connection, it shall be of a minimum 1/4" size. If a strap is used for the grounding connection, it must be approved by the Owner before utilization.

S. All bonding connections shall be made to driven ground rods as described above. Bonding connections shall not be made between the pipeline and the electric transmission line ground. Such a connection can result in high pipeline potentials during power line faults with current flow through the pipeline that could damage the steel as well as the coating.

T. The pipeline shall not be bonded or grounded to foreign structures without permission of the Owner of the foreign structure. If permission is not granted, the foreign structure shall be electrically isolated from the pipeline under construction.

U. Workers shall avoid at all times making simultaneous contact to a grounded and ungrounded structure.

V. Other grounding materials and suppliers can be used subject to approval by Owner. Examples of other cable jumpers that could be used are:

1. Cable jumpers using 50 lb. minimum pull magnet for connection to pipe, heavy equipment, fuel trucks and general use.

2. Standard welding or battery jumper clamps with well-insulated handles, and teeth to bite into the metal.

W. All grounding attachments and removals should be made by or under the direct supervision of the person in charge of electrical safety.

3.5 VOLTAGE MEASUREMENT

A. The voltage to ground of any string of pipe exposed to contact by personnel shall be measured periodically by reading the voltage between the pipe and a clean steel pin driven in the ground.

B. If the A-C voltage exceeds 15 volts above ground, supplementary grounds must be used to reduce this voltage to less than 15 volts. In the event that measured A-C voltage above ground exceeds 15 volts, the person in charge of electrical safety shall issue appropriate warnings and all work on the pipe string shall be suspended until potential is reduced to less than 15 volts.

C. These grounds shall be maintained at all times. A record of a periodic measurement of induced voltage shall be obtained and the record of these readings maintained. The bonding entities shall be as widely separated as is possible. As the "still-above ground" portion of the construction advances, bonds should be kept close to the construction end. This may only be done by installation of a third or higher number bond near the "construction end" before removing a bond near the completed end.

3.6 VEHICLES

A. Rubber tired equipment parked for any appreciable time on a power line right-of-way can obtain a significant static charge. Vehicles should be parked no closer than 200 feet from the centerline of high voltage overhead conductors.

B. Refueling of any motor vehicles or construction equipment shall not be permitted within 100 yards of any electric overhead transmission facility unless right-of-way conditions are such that this distance is unobtainable. If the 100 yards minimum cannot be complied with, the maximum distance possible shall be obtained, then each fuel truck shall be grounded and shall be equipped with a cable assembly capable of completing an electrical bond between the truck and any piece of equipment to be fueled. This bond must be made each and every time the refueling takes place within 100 yards of any electric overhead transmission facility prior to any part of refueling operation. This bond shall not be removed until all refueling operations are completed. Care should be taken where the cable attachments are made so that good electrical continuity is established. No fueling operations shall be carried out within 50 feet of the power transmission line.

C. At all times during construction, care must be exercised to assure that booms, cables and other equipment are no closer than 25 feet from overhead power lines. Height of conductors above

ground shall never be taken for granted but should be investigated in each case. Where operator of equipment is unable to personally assess that minimum distance is maintained, a second person shall be designated to guide the operator. Consideration must also be given to the possibilities of broken cables whip lashing close to power lines. It is recommended that each piece of equipment be positioned so that, should this occur, the cable would not come closer than 25 feet to a power line.

3.7 WEATHER LIMITATIONS

A. All construction work shall be suspended in the area of overhead high voltage power lines during any potential lightning activity.

3.8 WARNING SIGNS

A. The Contractor should post adequate signs warning of possible electrical hazards at each access to the right-of-way and any other measures required to prevent public access to temporary grounding installations.

B. Warning signs shall be posted on all cranes and other hoisting equipment at locations that will always be in plain view of the operator. Said signs shall state: "Danger, do not operate any part of this equipment within 25 feet of the High-Voltage Lines." Similar warning signs shall be posted on various parts of the equipment.

END OF SECTION

SECTION 136000 MAINLINE VALVE PIPING FABRICATION

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. The Contractor shall furnish all labor, materials as shown on project drawings, scaffolding, tools, and equipment necessary to complete the piping fabrication requirements of the project. Company supplied materials are shown on project drawings. Included in the piping fabrication work is the following:

1. All above and below ground piping inside Mainline Valve Station boundary limits as shown on project drawings.

B. This specification defines the minimum requirements for shop and field fabrication, erection, inspection and testing of process and utility piping by the CONTRACTOR.

C. The construction drawings and COMPANY specifications indicate the required piping class, materials and valve type. CONTRACTOR shall strictly adhere to the requirements of the COMPANY specifications for the materials, fabrication erection, inspection and testing procedures.

D. This specification covers the fabrication of metallic pipe only.

1.2 REFERENCES

A. Materials and installation shall be in accordance with the latest revisions of the following codes, standards and specifications, except where more stringent requirements have been specified herein:

1. Part 192, Title 49, Code of Federal Regulation, including section 192.112 covering additional design requirements for steel pipe.

2. API 1104 – Welding of Pipelines and Related Facilities

3. ASME B31.8 – Gas Transmission and Distribution Piping Systems

4. ASME Boiler & Pressure Vessel Code (BPVC) Section IX "Welding and Brazing Qualifications"

5. ASTM material standards as shown in Mainline Valve station drawings.

1.3 CONTRACT DRAWINGS

A. The Company shall provide the contractor with one set of general construction drawings for the mainline valve stations.

1.4 SHOP AND AS-BUILT DRAWINGS

A. If not provided by COMPANY, the CONTRACTOR shall prepare piping isometrics and spool drawings for all piping. The isometric drawings shall show all spool numbers, welded attachments, location and type of welds (shop or field), type of pressure test and test pressure, other notes on construction, post weld heat treatment requirements, NDE requirements and a complete bill of materials. Where the COMPANY has supplied isometrics the CONTRACTOR shall review, annotate and prepare all additional isometrics in accordance with the above to fully define the piping spool

fabrication and piping installation scope of work. The COMPANY will carry out spot checks on the isometrics to ensure that the correct materials are called out.

B. The CONTRACTOR shall ensure that all positions and locations of piping components, piping runs and terminal points are maintained.

C. The CONTRACTOR shall verify that all spools, whether built from isometrics or shop drawings, are of a length which will enable the spool to be trucked if necessary and enable spools to be easily installed. Spools requiring field weld connections shall have ample length at weld connection ends to allow for trim for proper fit and weld bevel preparation.

D. CONTRACTOR shall maintain an up to date, complete and accurate record of all minor changes made to design drawings during the fabrication and erection of the piping. Upon completion of the project, the CONTRACTOR shall mark all changes on one set of shop drawings and "As Built" construction drawings. COMPANY will not consider that Work is completed until the as-built drawings are received. If CONTRACTOR was responsible for piping design, the as-built marks shall be incorporated into CONTRACTOR's drawings for issue with final documentation.

PART 2 - MATERIALS

2.1 GENERAL

A. Upon delivery of any COMPANY supplied material, the CONTRACTOR shall assume responsibility of the materials and the certification covering the materials. The CONTRACTOR shall be responsible for the supply of all other materials including temporary material and consumables to enable the work to be completed.

B. The CONTRACTOR shall be responsible for ensuring that all materials fully comply with applicable COMPANY specifications. Materials shall not be considered for use unless the CONTRACTOR is in possession of the necessary documentation, e.g., Material Test Reports and other specialized test data as required by the references shown in section 1.2 of this specification.

C. No substitution of materials shall be permitted unless prior written approval is obtained from the COMPANY.

D. Should the COMPANY discover that "out of specification" material has been utilized, or material has been substituted without the written approval of the COMPANY, the CONTRACTOR shall replace all non-specification materials and take remedial actions as required to ensure compliance with specifications. The cost of this work shall be borne by the CONTRACTOR.

E. Material Test Reports (MTR's) shall be provided by CONTRACTOR for all pipe and fittings. Complete traceability of piping material, is required for all piping. Traceability shall be recorded by noting heat number of piping components on piping isometric on spool drawing markups. Heat numbers shall also be marked on the piping components, and be maintained until shop fabrication is completed and numbers are recorded on isometrics.

F. All piping materials must comply with Part 192, Title 49, Code of Federal Regulation, including section 192.112 covering additional design requirements for steel pipe.

2.2 GENERAL FABRICATION

A. All materials which require documentation in use during fabrication or installation that cannot be identified with documentation shall be immediately removed from the area and replaced at the CONTRACTOR's expense.

B. The CONTRACTOR shall maintain "clean" fabrication areas for the fabrication of stainless steel and nickel alloy piping to minimize the possibility of contamination.

C. The CONTRACTOR shall pay specific attention to the segregation of tools and the protection of materials.

D. The CONTRACTOR shall utilize shop tools and equipment compatible with materials in fabrication, including but not limited to grinding discs and power brushes designed for use with stainless steel and/or other high alloy materials.

E. All spools shall have their piece number clearly designated on each spool piece, corresponding to the appropriate drawing.

2.3 PIPING FABRICATION & ASSEMBLY

A. All pipe, fittings, flanges, in-line, on-line and piping specialty items shall be provided and installed in accordance with the COMPANY construction drawings.

B. Flange bolt holes shall straddle horizontal and vertical center lines unless noted otherwise on the construction drawings.

C. All flanged connections shall be made up by tightening the flange bolts in an accepted pattern to an even torque. CONTRACTOR shall torque all flange connections with a calibrated torque wrench per a COMPANY approved procedure. CONTRACTOR shall hang a torque tag on the flange connection after torquing.

D. Dimensional tolerances for fabrication and installation of piping shall be plus or minus 1/8" at equipment tie-in points unless otherwise noted on the drawings.

E. Flange faces shall be aligned within ± ½° from square with pipe, regardless of orientation.

F. The CONTRACTOR shall be responsible for locating required assembly/field welds. Inclusion of field welds on COMPANY provided piping drawings shall not relieve the CONTRACTOR of the responsibility of providing additional assembly/field welds which may be required.

G. CONTRACTOR shall also be responsible for allowing additional cut length at field/assembly welds adequate to accommodate normal fabrication variations in both CONTRACTOR's fabrication and fabrication of COMPANY supplied equipment. Unless otherwise noted, minimum 6" of extra cut length shall be provided at field welds indicated on COMPANY provided piping isometrics.

H. Piping shall be installed plumb, level and square unless designated otherwise on the construction drawings.

I. Screwed threads shall be clean cut with no burrs or stripping. Dies shall be new, sharp, and properly designed for the piping material. Immediately before erecting the piping, all pipe threads and fittings shall be thoroughly cleaned of cuttings, dirt, oil or other foreign matter. Teflon tape shall be used for all screwed connections. Care shall be taken to ensure that the tape is wound in the correct direction and that the tape does not enter the inside of the pipe.

J. Piping shall be erected and supported in a manner that will not put undue strain on equipment. All equipment, prefabricated piping, and appurtenances shall be fitted and assembled strain-free. The CONTRACTOR shall be prepared to demonstrate, by disassembly of the spool, the strain-free state of all fabricated piping.

K. For screwed or socketweld pipe installations, CONTRACTOR shall install sufficient unions to allow for convenient removal of any spool or component without disassembly or removal of any piece of equipment or major inline instrumentation.

L. Valve handles and wrenches shall be modified by CONTRACTOR where necessary for proper valve operation, and when the valve cannot be otherwise rotated to clear the obstruction.

M. Thread-O-Lets shall not be installed on elbows. Elbow-Lets shall be used for branch connections at elbows.

2.4 PIPE SUPPORT FABRICATION

A. CONTRACTOR shall procure, fabricate, and install all pipe supports as noted on project drawings. CONTRACTOR shall also design pipe supports, if this design is not provided by COMPANY, or for supports required which are not included in COMPANY designed items.

B. Welding of attachments for the purposes of supports shall be carried out as part of the piping fabrication in accordance with the applicable codes and standards. All other parts shall be fabricated in accordance with ANSI/AWS D1.1 and the guidelines in AISC, "Manual of Steel Construction".

C. If not provided by COMPANY, the CONTRACTOR shall purchase and install all support specialty items in accordance with construction drawings, COMPANY specifications, and good engineering practice.

D. All relief, blowdown and safety head discharge piping shall be securely braced for relieving conditions.

2.5 WELDING

A. General

1. All piping welding shall be carried out to an approved weld procedure specification by a welder qualified in accordance with the ASME Code for the procedure and in the position the welding shall be carried out in accordance with this specification.

B. Cutting and Preparation

1. The ends of all pipe to be butt welded shall be prepared in accordance with ASME B31.8 and the governing welding procedure specification.

2. Bevels shall be made by machine tool or machine thermal cutting. Manual thermal cutting shall not be permitted unless specifically approved by COMPANY on a one by one basis. The bevelled ends shall be smooth and uniform, and dimensions shall be in accordance with the qualified welding procedure/drawing requirements. Burrs, small scuff marks, indentations or small defects within the joint preparation area shall be blended out by grinding, otherwise the joint should be re-prepared.

3. The pipe ends and faces forming part of a welded joint shall be cleaned down to sound metal immediately prior to making the joint. All paint, grease, scale, rust, and other extraneous

matter shall be removed. The cleaning shall extend for at least 1" from the edge of the bevel on both the internal and external faces of the components to be welded.

C. Weld Procedure Specifications

1. All welding shall be carried out to approved welding procedure specifications. Eachwelding procedure specification and supporting procedure qualification records shall be submitted to COMPANY for approval prior to starting any fabrication.

2. Welding procedures shall be in accordance with ASME Boiler & Pressure Vessel Code (BPVC) Section IX "Welding and Brazing Qualifications" or API 1104.

3. The CONTRACTOR shall bear all costs for preparation and qualification of all weld procedures required for the work.

4. CONTRACTOR shall employ a welding procedure that provides a smooth, regular fully penetrated inner surface for meter tubes.

D. Welder Qualifications

1. Welders to be used on the project shall be qualified for each welding process they will use in the position they will use it in accordance with ASME B31.8 and CFR Title 49, Part 192 Code requirements.

2. The CONTRACTOR shall bear all costs for qualifying all welders. For each welder qualification test, laboratory tests shall be carried out as required by the applicable code.

E. Identification of Welders and Welds

1. Each welder shall be assigned a unique identifying number or symbol that identifies each individual welder's work.

2. All welds shall be stenciled (stamped) with the welder's number or symbol within 1½" of the weld using low stress concentration dies. Pipe with wall thickness too thin to apply stencils without deforming or alloy pipe is to be marked with approved markers or engraved. Stencils are to be recorded on the weld map or spool drawings and included in manufacturing data Welds not stenciled shall be removed and replaced at the CONTRACTOR's expense.

F. Pipe Welding Requirements

1. Preheat shall be in accordance with ASME B31.8 requirements.

2. When the ambient temperature is less than 40 °F, carbon steel shall be pre-heated to a minimum of 150 °F prior to welding. Preheat temperatures for low and high alloy steels shall be stated in the welding procedure specifications. Preheat and interpass heating requirements and methods shall be addressed in the appropriate Welding Procedure Specifications. The temperature shall be monitored with the use of temperature indicating crayons placed a minimum of 3" from the edge of the heat affected zone.

3. Any pinholes, cold lap, slag, flux, or other impurities that appear on any surface during or after welding shall be removed by grinding or chipping before depositing the next successive bead.

4. All passes of all welds shall have all oxides and slag removed to permit clear visual inspection and to prevent unacceptable slag indications in radiography film.

G. Weld Repairs

1. All weld repairs shall be carried out to an approved weld repair procedure. The approved procedure shall include for the mechanical removal of defective material, and blending of excavation.

2. Weld repairs shall be inspected and tested in accordance with Section 5. NDE of repairs to be completed using the same method that detected the defect.

3. Additional examination of welds completed by the welding operator is to be completed as required by the governing ASME / API welding code.

PART 3 - EXECUTION

3.1 INSPECTION

A. General

1. COMPANY reserves the right to inspect all materials, fabrication, workmanship, welding of materials and fabricated components. COMPANY or its representative shall have free entry at all times to any part of the CONTRACTOR's or subcontractor's facility where manufacture of COMPANY components occurs.

2. The approval of any work by COMPANY and their release of piping for shipment shall in no way relieve CONTRACTOR of any responsibility for carrying out the provisions of this specification, or for compliance with applicable codes.

3. The COMPANY shall be responsible for Non-Destructive Testing (NDT) as stated in this specification.

4. The inspection and NDT requirements of this section are those required by the COMPANY and are not intended to restrict in any way whatsoever the good working practice and internal QA / QC of the CONTRACTOR.

5. The COMPANY reserves the right to carry out NDT in addition to that required by the scope of work. Where the additional NDT shows unacceptable defects then all remedial works for rectification shall be considered wholly within the CONTRACTOR's scope of work.

6. COMPANY NDT operators will be trained and qualified in accordance with guidelines SNT-TC-1A of the American Society of Non-Destructive Testing.

B. Non Destructive Testing (NDT)

1. The COMPANY shall be responsible for Non-Destructive Testing (NDT) as stated in Table 1 of this specification, and for all other NDT requirements specified herein. The definition of 10% inspection shall be 100% of 10% of the welds designated by the COMPANY for the designated pipe size and specification.

2. NDT as shown in table 1 shall apply to both CONTRACTOR shop and field welding activities.

3. If NDT shows unacceptable defects, then all remedial works for rectification shall be considered wholly within the CONTRACTOR's scope of work. Further NDT due to unacceptable defects, shall be charged to the CONTRACTOR.

Pipe Class	Minimum Inspection Required	
	Threaded / Socketweld	Buttwelded
150# Class Piping	10% Magnetic Particle	10% Radiography
600# Class Piping	10% Magnetic Particle	100% Radiography

C. Radiographic Inspection

1. Radiographic inspection methods and acceptance criteria will be in accordance with API 1104. All radiographic inspection shall be at COMPANY's expense and performed by a third party.

2. Each radiographic film will be properly identified with a corresponding weld map marked drawing, or NDT map.

D. Ultrasonic Inspection

1. Where a weld is subject to 100% radiography but will not yield an interpretable radiograph then the weld shall be subject to ultrasonic inspection in lieu of radiography.

2. Ultrasonic inspection methods and acceptance criteria shall be in accordance with API 1104.

E. Magnetic Particle Inspection

1. Magnetic particle inspection shall be used only on carbon steel.

2. Where magnetic particle inspection is specified, only the "wet" method will be used. MT procedures shall detail types of particle suspension fluids, contrast paints, and types of devices used for the inspection.

3. Welds to be examined by magnetic particle inspection shall be sufficiently smooth to avoid false defect indications.

4. Magnetic Particle inspection methods and acceptance criteria shall be in accordance with API 1104.

3.2 TESTING

A. General

1. A pressure test shall be performed on facilities piping with piping spools assembled and joined in the final location. A minimum number of tie-in welds will be permitted with company approval

2. The CONTRACTOR shall develop procedures covering system preparation, flushing, pressure testing, drying and preservation and submit for approval. The procedures shall define the methodology, materials, safety equipment, and instrumentation for documentation, testing media, duration and disposal. The procedures shall provide sufficient detail for the COMPANY to evaluate the work to be performed. The CONTRACTOR shall be responsible for ensuring the safety of all personnel engaged in and witnessing of the tests. The safety provisions shall be clearly stated in the hydrostatic and pneumatic testing procedures.

Pneumatic testing will only be performed with prior written approval from COMPANY. A separate procedure shall be submitted outlining all steps of the testing including a safety plan to protect personnel.

3. The CONTRACTOR shall provide all equipment, materials and consumables required for the system preparation, flushing pressure testing, drying, preservation and reinstatement. All test equipment and temporary materials shall be compatible with the pressure rating and material of the system under test. Gaskets intended for final assembly shall not be used for test purposes. The welding of temporary fittings for test purposes shall be carried out to the same standards as the piping under test. No NDT (except for welding attachments to permanent job piping) will be required by the COMPANY on these welds unless otherwise stated by COMPANY or required by COMPANY Inspector.

4. Recorders utilized for testing shall be capable of recording pressure & temperature. Recorders and pressure gauges shall be rated at not more than double the test pressure (300 psi gauge for a 150 psi test, etc.)

5. All pressure tests shall be witnessed and accepted by the COMPANY, its representatives or a third party inspector authorized by the COMPANY.

6. Hydrotest water shall be clean, fresh, non-corrosive water, free of undissolved solids and available at a minimum of 45 °F.

B. System Preparation

1. Prior to system preparation all piping shall have been cleaned to remove mill scale, weld spatter, dirt and other foreign matter. All welding, NDT and stress relieving shall be complete and accepted by COMPANY as complete. All welds and flanges shall be clean and exposed for external inspection.

   a. All in-line equipment or devices which may be damaged or hamper the test shall be

   b. Removed from the system. All sensitive in-line and on-line instrumentation items shall be removed or isolated and this shall include, but not limited to the following:

      1) Pressure vessels or any mechanical equipment
      2) Check valves or check valve flappers
      3) Restriction orifices / orifice plates
      4) Positive displacement meters
      5) Turbine type meters
      6) Self regulated controllers
      7) Relief valves
      8) Rupture Discs
      9) Level controls and switches
      10) Filter elements
      11) Diffusers
      12) Transmitters

2. Equipment removed for pressure test shall have documentation of manufacturer's pressure ratings and/or factory test records.

C. Pressure Testing

1. All piping shall be subject to a hydrostatic test or pneumatic test in accordance with CFR Title 49, Part 192, Subpart J. Piping shall be tested to 1.5 times MAOP. Test media shall be approved by COMPANY and shall not be harmful to the piping materials or the environment.

D. Hydrostatic Test

1. Valves shall generally be in the open, or half open, position for test. A closed valve may be used as isolation of a test only with specific approval of COMPANY, and after confirmation that the valve seats are rated for the test pressure. Provisions to vent air from the test arrangement shall be made prior to filling with test media.

2. The area where testing is to be performed is to be barricaded to prevent access by unauthorized personnel during the testing.

3. The piping shall be slowly filled with water until all air is evacuated. Temperature of the pipe shall be allowed to equalize with that of the test media prior to applying pressure. The vents shall be closed and the piping shall be slowly pressurized to 50% of the test pressure and visually inspected for leaks. When it is confirmed no leaks exist, pressure shall be increased in increments of 25% of test pressure until the test pressure is reached. When leaks are identified, the pressure shall be reduced to the level not greater than the previous increment 0 psi before flange bolts shall be torqued to stop the leak. Flange bolts shall not be torqued over allowable stresses. Where the leak cannot be stopped, pressure shall be relieved from the arrangement and inspection to determine the cause of the leak shall be carried out; this may require disassembling connections.

4. The piping shall be carefully inspected for leaks or distortions during the test. Inspection may require remote observation depending on test pressure and/or test media in order to safeguard personnel. For acceptance, no leaks or distortions in the piping are permitted.

E. Pneumatic Testing

1. All applicable guidelines for hydrostatic testing shall be followed. In addition, the space between the faces of all flanges connections shall be wrapped with duct tape shrink wrap, or other media that will seal the area and a small hole shall be punched through the tape, plastic, or other media at the top of the flange.

2. The piping shall be pressurized to 25 PSI and gross air leaks shall be remedied. The piping shall be slowly pressurized to 50% of the test pressure, then increased in increments of 10% until the test pressure is reached. Leak detector solution shall be applied to all threaded connections, welds, and at the holes in the sealing material applied at flange connections. When leaks are identified, the pressure shall be reduced to 0 PSI before flange bolts are retorqued or threaded connections tightened to stop the leak. Where the leak cannot be stopped. Pressure shall be relieved from the arrangement and inspection carried out; this may require disassembling connections.

F. Reading, Measurements & Test Duration

1. Pressure test duration shall be 8 hours, maintained at a pressure equal to or above the test pressure. Both chart recorders and hydraulic deadweight gauges shall be used for test measurement. Deadweight gauge readings shall be taken every hour. Chart recorders and pressure gauges shall have a valid calibration certificate within 6 months.

G. Records

1. The CONTRACTOR shall provide documentation to record each pressure test. CONTRACTOR shall provide test records in accordance with CFR Title 49, Part 192, Subpart J.

2. If the piping fails the pressure test then no test chart will be signed off. The CONTRACTOR shall be responsible for all remedial work, repairs and retesting of piping that fails during testing. All rework shall be carried out in accordance with the relevant specifications and procedures.

H. Reinstatement

1. After a successful test, the piping shall be emptied of the test medium. Where applicable, pressure tested piping shall be reinstated in accordance with project drawings. Where a hydrotest has been completed, pipe shall be dried post-hydrotest using a suitable method. The piping shall be subject to preservation to ensure no deterioration prior to system commissioning.

END OF SECTION

SECTION 260501 ELECTRICAL – GENERAL INSTALLATION REQUIREMENTS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. This specification covers the requirements for the supply of equipment, material, labor, tools, services and supervision as required for the installation, testing and placing into satisfactory operation of the electrical systems detailed in this specification and the attached drawings.

B. Any equipment and materials, other than those identified as being pre-purchased by the Company, necessary for the installation and wiring of the equipment within the scope of this contract shall be supplied by the Contractor.

C. The drawings presented outline the scope of the work required of the Contractor and are to be the basis of the Contractor's bid. The Contractor may offer for consideration alternates that are cost effective so long as these are clearly defined and approved by the Company.

D. The Contractor shall be responsible for sizing of all junction boxes and splitter boxes, verification of conduit sizes, conduit fill and loadings, cable ampacities and short circuit ratings for all Contractor-supplied equipment and materials.

1.2 REFERENCES

A. Materials and installation shall be in accordance with the latest revisions of the following codes, standards and specifications, except where more stringent requirements have been specified herein:

1. Local Building Codes
2. Building Code of Vermont
3. Fire Code of Vermont
4. National Fire Protection Association (NFPA)
5. National Electrical Code(NEC)
6. Underwriters Laboratories, Inc. (UL)
7. National Electrical Manufacturers Association (NEMA)
8. Institute of Electrical and Electronic Engineers (IEEE)
9. American Society of Testing Materials (ASTM)
10. Insulated Cable Engineers Association (ICEA)
11. Association of Edison Illuminating Companies (AEIC)
12. American National Standard Institute (ANSI)

B. In general, all electrical equipment furnished shall be listed and labeled by Underwriters Laboratories, Inc. (UL) or another acceptable organization to the "Authority having Jurisdiction" and the Company. This requirement will be waived only when the specified equipment is not available from any manufacturer with such a label or listing.

1.3 WORK TO BE DONE

A. The work to be done by the Contractor under this specification consists of the installation, supply of materials, off-loading of equipment, and inspection and testing, as specified.

B. Electrical equipment installed by the Contractor shall include equipment in Vermont Gas Systems – Addison Natural Gas Project Mainline Valve Stations.

C. In general, the equipment to be supplied and installed by the Contractor shall consist of, but not be limited to the following:

1. Supply and installation of all low voltage, control, signal and communication conduits and cabling.

2. Installation of any Company pre-purchased equipment.

3. Installation and termination of all RTU / DAC Panels in electronics buildings as shown on Drawings.

4. Supply, installation and termination of all junction boxes as shown on Drawings.

5. All conduit and raceway systems.

6. Lighting transformers and distribution panels

7. Building lighting system

8. Building receptacles, switches and heater

9. Building and equipment grounding system

10. Electrical check-out of all equipment installed and provide assistance to Company with commissioning and operational testing of all equipment and facility systems.

1.4 QUALITY ASSURANCE

A. Uniformity: Unless otherwise specified, equipment or material of same type of classification, used for the same purpose shall be products of same manufacturer. All material shall be new and of the current design of manufacturer providing equipment or material. All materials shall be as stated on project drawings. Any substitutions by contractor shall be approved by Company.

B. Design: Equipment and accessories not specifically described or identified by manufacturer's catalog numbers shall be designed in conformity with NEMA, IEEE, or other applicable technical standards and shall have neat and finished appearance.

C. Installation: Erect equipment in neat and workmanlike manner; align, level and adjust for satisfactory operation; install so that parts are easily accessible for inspection, operation, maintenance and repair. Minor deviations from indicated arrangements may be made, but only after obtaining approval from Company.

1.5 CONTRACT DRAWINGS

A. Location Approximate

1. The locations of equipment, fixtures, outlets and similar devices shown on the Contract Drawings are approximate only.

2. The Contractor shall determine the exact locations of the equipment, outlets, box-outs, sleeves and of similar items required for the coordination of electrical work with the structural, architectural, mechanical and other work as necessary.

B. Drawings Diagrammatic

1. Circuit diagrams shown are diagrammatic and functional only and are not intended to show exact circuit layouts, number of fittings, or other installation details.

2. The Contractor shall furnish all labor and materials necessary to install and place in satisfactory operation all power, lighting and other electrical systems.

1.6 CONTINUITY OF SERVICES

A. When buildings are in use during construction operations, keep all electrical systems in operation within all rooms of building at all times.

B. Schedules for various phases of Work shall be coordinated with all other trades and with Company.

C. Provide necessary and temporary connections and relocations as required to maintain systems in operation.

D. When connecting new facilities, do not shut off any Mechanical/Electrical facilities or services without prior written approval of the Company.

1.7 PROTECTED WORK

A. Hazardous Locations

1. In the areas designated as Hazardous and where explosion-proof work is shown or specified, all work and electrical equipment shall meet the requirements of the NEC for Class I Division 1 and 2 Group D locations unless otherwise noted.

B. Wet Locations

1. Where installed outdoors or in areas designated as Wet Locations, all work and electrical equipment shall meet the requirements of the NEC for Wet Locations.

1.8 INSPECTIONS AND APPROVAL

A. The Contractor shall have all electrical work inspected by the following agencies and this work shall pass such inspection:

1. Vermont Division of Fire Safety

B. The Contractor shall furnish to the Company a certificate of compliance stating that the completed installation complies with the requirements of the National Electrical Code. This certificate shall be completed by the agency listed above.

C. Any changes required by the authorities resulting from deficiencies in the Contactor's workmanship shall be implemented by the Contractor without cost to the Company.

1.9 SUBMITTALS

A. Contractor shall supply a submittal for all Contractor-supplied materials and equipment as indicated in the Electrical Technical Specifications.

PART 2 - PRODUCTS

2.1 EQUIPMENT AND MATERIALS SUPPLIED BY CONTRACTOR

A. The Contractor shall supply all equipment and materials needed for the electrical installation as shown on drawings.

2.2 MATERIAL CONTROL

A. The Contractor shall establish a very strict and comprehensive material control scheme, to warn of any potential material shortages.

2.3 DELIVERY, HANDLING AND STORAGE OF MATERIAL

A. Materials and equipment shall be delivered to the site of the work in their original containers, and containers shall not be opened until inspected by the Company.

B. Electrical equipment shall at all times during construction be adequately protected against mechanical injury or damage by weather.

C. If any materials or apparatus have been damaged, the apparatus or materials shall be restored to a new condition, subject to the inspection and approval of the Company, or replaced with new materials or apparatus.

D. Equipment shall be stored in accordance with manufacturer's recommendations. Temporary heaters shall be provided as required to prevent buildup of condensation in the equipment.

PART 3 - EXECUTION

3.1 GENERAL EQUIPMENT INSTALLATION

A. The installation of equipment shall be defined as the receiving, off-loading, storing where necessary, moving into its designated location, uncrating, assembly, setting up, connection to other equipment and preparing for operation, all in accordance with the Specification and with the Vendor's instructions and Installation Manuals.

B. The installation of cables shall be defined as the receiving, off-loading, storing where necessary, pulling out of cables, placing in conduit as required, entering the cables into panels and terminating.

C. The Contractor shall ensure that the cables and equipment are kept clean and are protected against damage, dust and moisture.

D. Cable ends shall be kept sealed to prevent the ingress of moisture.

E. Unless otherwise specified, the Contractor shall supply, fabricate, construct and erect all support brackets on mountings for all equipment supplied by the Contractor.

3.2 MAIN EQUIPMENT INSTALLATION

A. Wall mounted equipment shall be fastened to steel brackets to provide an installation that is true, plumb, secure and safe.

B. Vendor drawings and instructions for the installation of Company pre-purchased equipment will be made available to the Contractor. It shall be the responsibility of the Contractor to follow these documents during the installation, wiring, testing and energization of the equipment.

C. Installation of safety signs as required by code regulations or stipulated by the Engineer shall be the responsibility of the Contractor.

3.3 IDENTIFICATION

A. Equipment and Devices

1. All electrical equipment shall be clearly identified with its equipment number, function and voltage.

2. Each power and distribution panelboard, circuit breaker, junction box, etc. shall be identified with white lamacoid nameplate with black engraving, mechanically secured to the front with the screws or rivets to indicate function, voltage and equipment number as specified on the drawings. Enclosure ratings shall not be compromised in the attachment of labels. Labeling in accordance with NFPA70E must be applied where required.

3. Each power and distribution panelboard shall be equipped with a directory card, neatly typed with the final circuit designation and placed in the card holder under a transparent cover on the inside of the door of each panelboard.

4. The Contractor shall install "High Voltage" warning signs and "Danger" signs as called for by the safety regulations as required by code.

B. Cables and Conductors

1. All cables in panels, pullboxes, junction boxes and switchboards shall be tagged at both ends with the cable number assigned in the cable schedule/drawings. Tags shall be non-aging, labels which encircle the cable.

2. Both ends of all wires of each cable shall be clearly and permanently identified with wire markers, at the terminal to which they connect, with the proper wire number as shown on the drawings or wire termination sheets. Non-aging approved markers which encircle the wire shall be used.

3. All terminals for external connection shall be plainly and permanently marked, on approved marking strips as shown on the drawings or wire termination sheets.

3.4 AREA CLASSIFICATION

A. If the scope of work includes installations in hazardous area, the Contractor will be issued an area classification drawing indicating the Class, Division and Group designations in accordance with the NFPA classification for the different work areas.

B. The Contractor shall ensure that all equipment, materials and installation methods are suitable for the area classifications and shall report any discrepancies to the Company for correction.

3.5 SEALS AND FIRE STOPS

A. In hazardous locations, sealing fittings (seal offs) shall be installed in all conduit runs on the outside of buildings where the conduits enter the building. In addition, approved drain fittings

shall be installed at the bottom of these conduit runs and in all outdoor junction boxes to drain off any accumulated moisture.

B. Sealing fittings shall be installed for explosion proof work in accordance with in accordance with the provisions of Article 501 of the National Electric Code for Class 1, Group D, Division 1 and 2 locations. Compound filled seal off fittings as specified shall be installed as required.

C. Seal offs shall be located in conduits not more than 16 inches from points of penetrations through floors or walls and where emerging from earth. Seal offs shall be sized in accordance with the latest requirements of the NEC.

D. Fire stops shall be provided for all cable penetration in floors and walls to prevent spread of fire, dust, water and gases from one area to another. The material used for sealing of all cable penetrations shall be non-combustible and shall have low heat transfer. The sealed opening shall have a fire rating equal to that of the surrounding wall or floor.

E. Use 3M fire Barrier Caulk CP-25 or Putty 303 or equal.

3.6 ELECTRICAL EQUIPMENT PAINTING AND CLEANUP

A. All distribution panels, steel work and similar indoor and outdoor equipment furnished with enameled epoxy or lacquered finish or which are galvanized and which are scratched or defaced during construction shall be refinished and restored to the original finish by the Contractor.

B. All exposed steel surfaces on electrical equipment panels, unless already supplied galvanized or epoxy painted, shall be cleaned, prime coated and finish coated with an epoxy enamel.

C. The Contractor shall make a thorough inspection of all electrical equipment, remove any left over packing braces, shipping supports and thoroughly clean all equipment by hand operated vacuum machine.

D. The Contractor shall clean up all lighting fixtures. Damaged parts shall be removed and replaced. All burned out lamps shall be replaced.

END OF SECTION 260501

SECTION 260521 WIRE & CABLE (600V OR LESS)

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide a cable system complete with all materials, including cables, wire, connectors, lugs and fittings as indicated in the specification or as indicated on the drawings. All cables and wiring shall be complete with identification tags per this Specification Section.

1.2 STANDARDS

A. Furnish cable, wire and wiring accessories listed by Underwritters' Laboratories (UL) as meeting National Electrical Code requirements and bearing the UL label where available for the equipment specified. In addition, the cable type shall have been submitted to standard tests established or approved by ASTM, ANSI, ICEA and NEMA.

1.3 SUBMITTALS

A. Submit Vendor data for all types and sizes of cables and wires being supplied by the Contractor. Identify material, construction data, color coding, insulation and jacket thickness and typical test data.

B. Submit Vendor data for the cable and wire identification tags to be supplied.

PART 2 - PRODUCTS

2.1 LOW VOLTAGE POWER CABLES (600 VOLTS OR LESS)

A. Multi-conductor low voltage power cables when installed in cable tray shall be type "MC", Class B stranded copper conductor, 600 Volt rated, XHHW or THHN conductor insulation, 90°C conductor temperature, with bare copper ground wire, binder tape and overall black, flame retardant PVC jacket.

B. Low voltage power cables installed in conduit shall as listed below. A suitable insulated ground conductor shall be installed adjacent to the phase conductors and must not be less than 45% of the phase conductor cross sectional area.

1. THHN (90°C damp or dry) insulation shall be used in damp or dry locations for all sizes.
2. XHHW (75°C wet or 90°C dry) insulation shall be used in wet locations for all sizes.

C. Conductors shall be annealed copper, 98% conductivity.

D. Minimum size conductor for general wiring shall be #12 AWG.

2.2 CONTROL CABLING

A. Multi-conductor control cable shall be 600 Volt rated, type "MC" when installed in cable tray, Class B stranded copper conductor, PVC/nylon insulated, UL type THHN 90°C, with an overall flame retardant PVC jacket rated at 90°C and overall aluminum mylar shield when indicated on the drawings. Conductors shall be color coded per ICEA S-66-524 Method 1, Table K-2 and shall be number printed.

B. Single conductor control wiring for insulation in conduit shall be of insulation type THHN for damp and dry locations and XHHW when installed in wet locations.

C. Minimum size conductor for control wiring shall be #14 AWG.

2.3 INSTRUMENTATION AND SIGNAL CABLE

A. Instrumentation and signal cables, shall be 300 Volt rated type "MC" when installed in cable tray, Class B stranded copper conductor, flame retardant, 105°C PVC conductor insulation, color coded, twisted pairs, triplets or quads, with aluminum mylar shield, stranded tinned copper drain wire and overall PVC jacket rated at 90°C. Belden Type or approved equal.

B. Minimum size of instrumentation and signal wiring shall be #18 AWG.

2.4 THERMOCOUPLE CABLE

A. Thermocouple cable shall be 300 Volt rated type "MC" when installed in cable tray, Class B stranded copper conductor, flame retardant, 105°C PVC conductor insulation, color coded, twisted pairs, triplets or quads, with aluminum mylar shield, stranded tinned copper drain wire and overall PVC jacket rated at 90°C. Belden Type or approved equal.

B. Minimum size of instrumentation and signal wiring shall be #18 AWG.

2.5 DIRECT BURIAL CABLES

A. Not used.

2.6 WIRE CONNECTION DEVICES FOR SPLICING

A. No splicing shall be permitted.

2.7 TERMINATING LUGS

A. Lugs for terminating power conductors up to and including #8 AWG shall be color coded, solderless compression or bolted type, unless otherwise indicated.

B. Lugs for terminating power conductors #6 AWG and larger shall be color coded, solderless compression type one-hole for #6 AWG through #4 AWG inclusive, and two-hole for larger sizes.

C. Lugs for terminating control and switchboard wiring shall be color coded, solderless compression type with tinned copper ring tongue. Spade type lugs are not permitted in any control, protection or alarm circuits.

2.8 WIRE AND CABLE LABELS

A. Labels shall be non-aging, labels which encircle the cable or wire as applicable.

B. Refer to section 26 05 01 for cable and wire identification requirements.

PART 3 - EXECUTION

3.1 INSTALLATION

A. No cables or wires shall be installed in conduits or ducts until the entire installation is completed and cleaned inside and out. When installing cables, the Contractor shall exercise due care to prevent damage to cables and raceways; avoid undue tension, bending and kinks.

B. Only approved cable lubricants, expressly manufactured for this purpose shall be used.

C. The Contractor shall install conductors in such a manner that the bending radius of any wire or cable is not less than the minimum recommended by ICEA and/or the manufacturer. Do not exceed the manufacturer's recommended values for maximum pulling tension applied to any cable or wire.

D. All power conductors and cables shall be run full length without splices and shall be continuous from origin to termination. Where splices are necessary and approved, they shall be made in approved splice boxes with suitable connectors. All splices shall be insulated with heat-shrinkable heavy-wall flame-retardant cable sleeves.

E. Thoroughly clean wire ends before connectors or lugs are applied.

F. Jumpers shall be installed inside the various panels as indicated in the cable termination sheets/drawings.

G. All power conductors in multi-color cables shall be color coded consistently, distinctly and continuously throughout the work. Color coding tape shall be utilized and applied at all terminations, junctions, pull boxes and conduit fittings.

H. Single conductor cables having black insulation for power feeders and sub-feeders shall be identified by colored tape as to phase connections.

I. Conductor terminators for all power cables sizes shall result in a connection both mechanically and electrically secure and approved for the application regarding dissimilar metals.

J. Control and instrument cables shall be terminated at panels, junction boxes and individual device enclosures using approved fittings.

K. The Contractor shall install phase and neutral conductors of each branch or feeder circuit in a single conduit except where paralleling circuits are indicated on the circuit schedule. Install paralleling circuits of identical makeup and length as the paralleled circuit, and terminate conductors at the same location, mechanically and electrically, at both ends, to ensure equal division of the total current between conductors.

L. The Contractor shall connect all AC power wiring to equipment.

END OF SECTION

SECTION 260527 GROUNDING & BONDING SYSTEMS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide grounding and bonding system as specified or indicated on the drawings.

1.2 STANDARDS

A. Ground the electrical system neutrals and bond the non-current carrying parts of electrical equipment as indicated in the specification or drawings and as a minimum the grounding and bonding must meet the requirements of the National Electrical Code.

1.3 SUBMITTALS

A. Submit product data for conductors, connectors and devices supplied for use with the grounding system.

PART 2 - PRODUCTS

2.1 GROUNDING AND BONDING CONDUCTORS, CONNECTORS AND DEVICES

A. Provide the grounding and bonding conductors, connectors and devices of the type specified on the drawings.

PART 3 - EXECUTION

3.1 EQUIPMENT AND BUILDING BONDING

A. Static grounding (bonding) of equipment shall be by means of bonding the equipment to the embedded ground grid as indicated on the drawings.

B. Bolted connections shall be used on all equipment and building bonding. A washer shall be used between the bolt head and terminal lug. Surfaces shall be free from paint, rust, dirt, grease and corrosion.

C. Holding down bolts or flange bolts shall not be used for bonding connections. Holes, if not provided, shall be drilled and tapped to suit the grounding bolt.

D. Building structural steel, steel structures, vessels, tanks and other similar process equipment, which is not in direct contact with the building steel structures, shall be bonded as noted on the drawing.

3.2 ELECTRICAL SYSTEM SERVICE GROUNDING

A. Service grounding of equipment (grounding) shall be by means of grounding the equipment to a continuous ground conductor, including all connections from source of power to the equipment. All grounding shall meet the requirements of the National Electrical Code.

B. Where UL type "MC" cable is specified, the bare internal copper ground wire shall be used for service grounding.

C. Service grounding shall be provided for all motors, housing of electrical equipment, transformers, transformer neutrals, grounding resistors, distribution equipment, lighting panel board and other similar equipment as required by the National Electrical Code and as indicated on the drawings.

D. The neutral conductor of any electrical distribution system shall not be used as an equipment grounding conductor. System neutrals shall be grounded in accordance with the National Electrical Code.

3.3 INSTALLATION

A. Immediately after installation, the equipment shall be grounded and bonded as indicated on the grounding layout and detail drawings.

B. Exposed grounding or bonding conductors shall not be routed across sections where they may be subject to damage or interfere with the movement of equipment or personnel. In such cases and as required, the conductor may be embedded in the floor, protected by conduit or copper strap of equivalent size shall be used.

C. Ground and bonding conductors shall be installed in a neat manner and rigidly supported by clips or straps at intervals not greater than 5 feet.

D. Install conductors of size required by the National Electrical Code unless otherwise indicated or specified on the drawings.

E. Power, control and instrumentation cable shields and/or sheaths shall be grounded in accordance with instructions contained in the cable schedules or wire termination sheets.

F. When it is indicated on the drawings that the conduit system serves as the equipment service grounding, the means and continuity of ground shall be permanent, effective and maintained throughout. Threaded couplings or double locknuts and bushings shall be used at all boxes and equipment enclosures, including lighting fixtures. All flexible conduits shall be properly grounded through a grounding jumper and the necessary fittings. A separate ground conductor shall be installed in epoxy coated or PVC coated conduit, or other non-metallic duct runs and so connected to maintain the ground continuity of the conduit or duct system.

G. Conduit expansion joints, not thoroughly bonded otherwise, shall be provided with approved bonding jumpers of not less than No. 6 AWG green insulated stranded copper.

H. A minimum No. 6 AWG green insulated stranded copper ground conductor shall be run in all cable tray and bonded to each tray section at intervals not exceeding 50 ft.

END OF SECTION

SECTION 260534 CONDUITS

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes the conduit systems required, specified, and/or shown on Contract Drawings including conduits, fittings, boxes, hangers, and accessories being installed for Vermont Gas Systems, Inc. (Company).

1.2 REFERENCES

A. Material and installation shall be in accordance with the latest revisions of the following codes, standards and specifications, except where more stringent requirements have been specified herein:

1. American National Standard Institute (ANSI)
2. National Electric Code (NEC)
3. National Electrical Manufacturers Association (NEMA)
4. Underwriters Laboratories, Inc. (UL)

1.3 QUALITY ASSURANCE

A. Qualifications of Manufacturer

1. All equipment furnished under this Section shall be furnished by manufacturers who meet the quality, workmanship, and experience requirements as specified and approved by Company.

1.4 SUBMITTALS

A. General

1. Submittals and samples shall be submitted upon Company's request.

2. Prior to obtaining any material in connection with this Section, detailed shop drawings on all material shall be submitted upon Company's request.

3. Submittals shall contain a material list with manufacturer's name and data describing the material and showing its compliance with specifications and associated standards.

PART 2 PRODUCT

2.1 CONDUIT

A. Rigid Galvanized Steel Conduit (RGS)

1. Rigid metal conduit shall be galvanized steel, hot-dipped with zinc over the entire length, both exterior and interior including threads.

2. Each conduit shall have a coupling on one end and a thread protector on the other.

3. Conduit shall meet ANSI Standards C80.1 and C80.4 latest revisions. The conduit shall be manufactured by Allied Tube & Conduit Corporation, Pittsburgh Standard Conduit Company, Triangle PWC Co. or equal.

B. Rigid PVC Coated Galvanized Steel (RPGS) Conduit

1. The conduit, prior to PVC coating, shall meet the requirements for RGS conduit above.

2. A PVC coating shall be bonded to the outer surface of the galvanized conduit. The bond between the coating and the conduit surface shall be greater than the tensile strength of the coating. The inside surface of the conduit shall have a urethane coating.

3. PVC coating thickness shall be not less than 40 mils.

4. PVC coated RGS shall be manufactured in accordance with ANSI C80.1, UL-6, Federal Specification WW-C-581E and NEMA RN1 – PVC Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit standards.

5. Manufacturers or Equal

   a. Robroy
   b. Thomas & Betts

C. Electrical Metallic Tubing (EMT)

1. EMT shall be galvanized steel, hot-dipped with zinc over the entire length, both exterior and interior.

2. EMT shall be in accordance with ANSI Standards C80-3 latest revisions.

3. EMT shall be manufactured by Pittsburgh Standard Conduit Co., Allied Tube & Conduit Corporation, Triangle PWC Co., or equal.

D. Flexible Conduit

1. Flexible metallic conduit (Greenfield) - Shall be hot dipped zinc galvanized flexible steel or aluminum and shall comply with UL Standard No. 1, latest revisions. Conduit shall be manufactured by Anaconda Metal Hose Company, Triangle PWC Co. or equal.

2. Liquid-tight flexible metal conduit (Seal-tite) - Shall be constructed of flexible corrosion resistant zinc galvanized steel conduit with an extruded plastic jacket and built-in continuous copper ground strap under the jacket. Conduit shall be Type UA manufactured by Anaconda Metal Hose Company, Type LA manufactured by Electri-Flex Co. or equal.

3. Liquid-tight Flexible Non-Metallic Conduit - Shall be constructed of corrugated flexible PVC. Fittings shall be identified for use with flexible non-metallic conduit. Flexible non-metallic conduit shall be Carflex as manufactured by Carlon or equal.

4. Hazardous Area Flexible Metal Conduits - Flexible metal conduits installed in areas classified as Hazardous shall be Crouse-Hinds Series EC, Killark Series EK or equal.

2.2 JUNCTION, DEVICE AND PULL BOXES

A. Junction Boxes

1. Junction boxes and pull boxes shall be sized as required for the quantity and size of conductors to be installed within the box. Sizes shall comply with the requirements of the National Electric Code for wire bending space and radius.

2. Junction boxes installed in all non-hazardous open, wet areas or outdoors shall be NEMA type 4X with mounting lugs. Junction boxes shall have drilled and tapped holes for conduit terminations, gasketed covers secured by galvanized steel screws and drain holes.

3. Stamped Steel Junction Boxes -Junction boxes installed in areas approved for use with EMT conduit may be constructed of code-gaged galvanized steel.

4. Cast Junction Boxes -Junction boxes for use with RSC shall be constructed of hot dipped galvanized cast iron or copper free aluminum and shall be sized per NEC requirements. Boxes shall be manufactured by Crouse-Hinds Co., Killark Co., or equal.

5. Hazardous Area Junction Boxes - Junction boxes in areas classified as Hazardous shall be Series EJB or GU manufactured by Crouse-Hinds Co., Series XB or GR as manufactured by Killark Co., or equal.

B. Device Boxes for Outlets and Switches

1. Stamped Steel Device Boxes -In areas approved for use with EMT Conduit may be constructed of code-gage galvanized steel with required knockouts. Boxes shall be manufactured by Steel City Co., Raco Co. or equal.

2. Cast Device Boxes -In areas using exposed RSC boxes shall be constructed of hot dipped galvanized cast iron or copper free aluminum and sized per NEC requirements. Boxes shall be Series FD manufactured by Crouse-Hinds Co., Series FD, manufactured by Killark Co., or equal. (Use copper free aluminum boxes with RAC)

3. Hazardous Area Device Boxes -In areas classified as Hazardous, shall be Series ED manufactured by Crouse-Hinds; series SWB manufactured by Killark Co., or equal.

C. Pull Boxes

1. Pull boxes shall be used in dry locations only for pulling. No splicing of conductors shall be allowed. The boxes shall be constructed of galvanized steel, 12 gauge sheet metal, angle and frame members with welded joints. The box cover shall be gasketed and attached with stainless steel screws. A ground lug shall be provided, sized in accordance with the NEC.

2.3 CONDUIT OUTLET BODIES, FITTINGS, COUPLINGS AND EXPANSION COUPLINGS

A. Conduit Outlet Bodies

1. Conduit outlet bodies shall be used where required to permit ready fishing and withdrawing of wires. Conduit bodies not located in areas classified as Hazardous shall be gasketed. Bodies shall be of the cast iron or copper-free aluminum type. Bodies shall be Condulet series manufactured by Crouse-Hinds Co., Electrolet series manufactured by Killark Co., or equal.

B. Fittings and Couplings

1. EMT - All couplings and connectors for EMT shall be of the raintight cadmium plated, malleable iron gland compression type manufactured by O.Z. Gedney Co., Steel City Company, or equal.

2. Hazardous Areas - Seal off fittings in areas classified as Hazardous or Corrosive shall be Series EYS manufactured by Crouse-Hinds Co., Series E manufactured by Killark Co., or equal. Sealing compound shall be Chico manufactured by Crouse-Hinds or series SC manufactured by Killark or equal. Damming material shall be of the ceramic fiber type.

3. Flexible metallic conduit (Greenfield), Liquid-tight flexible metal conduit (Sealtite), and Liquid-tight Flexible Non-Metallic Conduit -Fittings shall be compatible with raceway material and in conformance with NEMA FB-1 and UL 514B. C. Expansion Couplings

1. Expansion couplings shall be a water-tight, corrosion resistant coupling with flexible neoprene outer jacket, stainless steel jacket clamp, flexible copper ground strap, and internal hub bushing.

2. Coupling shall compensate for the following movements:

a. Axial expansion or contraction
b. Angular misalignment
c. Parallel misalignment

3. Coupling shall be Type XD as manufactured by Crouse-Hinds Company, Type DX as manufactured by O-Z Gedney Co. or equal.

2.4 CONDUIT SLEEVES

A. Where conduits pass through the walls of structures, they shall be installed in suitable sleeves. Sleeves, installed in the outside walls of structures or elsewhere where watertightness is required, shall be cast iron and shall be equal to thruwall and floor seals manufactured by O.Z. Gedney Electrical Manufacturing Company, Inc. Types No. FSK, WSK, FSC or WSC as required, or Link-Seal as manufactured by Thunderline Corp. When Link-Seal is used, a wall sleeve, with waterstop, shall be installed. All other sleeves shall be galvanized steel pipe.

2.5 CONDUIT HANGERS AND SUPPORTS

A. General

1. Hangers and supports for conduits shall be adequate to support conduit systems with a minimum safety factor of 10.

2. All steel parts of the conduit support systems shall be galvanized, cadmium plated or PVC coated.

3. Perforated strap hangers will not be accepted.

4. Conduit supports shall be as manufactured by T&B (Steel City-Kindorf or Superstrut), Unistrut, Allied, Globe, or B-Line.

5. One hole malleable iron pipe clamps shall be hot dipped galvanized. Pipe spacers shall be of malleable iron and have a hot dip galvanized finish.

6. Hanger rods shall be continuous thread and galvanized not less than 3/8" inch in diameter.

B. Slotted Channel Framing: Cold-Formed Metal Channels with Continuous Slot.

1. Size of Channels: Nominal 1-5/8 by 1-5/8 inches, 12 gauge unless otherwise indicated or required for the application.

2. Finish:

a. Indoor Dry Applications: Electro-plated zinc coating (Super-strut Gold- Galv, Kindorf Gold Galv-Krom, etc.).

b. Outdoor, wet applications: Hot dipped galvanized (Superstrut HDG, Kindorf HD, etc.).

c. Corrosive applications: PVC coated (Superstrut PVC, Kindorf "P", etc.).

3. Fittings

a. Channel attachment nuts shall be prelocated in channel and be self supporting (spring type).

b. Conduit straps shall be of the notched type to fit channel with captured nut and bolt for tightening.

c. Beam clamps shall be provided with jaw openings to accommodate selected beam and provided with tapped holes and/or captured nuts for support of threaded rods.

4. Manufacturer (refer to Finish above for correct product)

a. Kindorf B-900, 905 series
b. Superstrut A-1200, A-1200P series
c. Globe G-5812, G-5812PO series
d. B-Line B-22, B-22-1-7/8 H series
e. Unistrut P-1000, P-1000-HS series
f. Power Strut PS-200, PS-200-H-1-7/8 series
g. Equal

C. Fasteners

1. All fasteners shall be stainless steel or silicon bronze.
2. All expansion anchors shall be self-drilling type.

2.6 MISCELLANEOUS ACCESSORIES

A. Warning Tape

1. Tape shall be of the detectable type and shall consist of a polyethylene tape with aluminum foil coil. Tape shall be 6" wide and shall have the legend "CAUTION ELECTRIC LINE BURIED BELOW". Lettering shall be black, on a red background. Tape shall be Panduit HTDU6R-E, Seton 37236, or equal.

B. Duct Bank Conduit Spacers

1. Underground ductbank conduit spacers shall provide stability and consistent separation of conduits within duct banks. Spacers shall be sized for the conduits with which they are used. They shall provide both vertical and horizontal spacing with interlocking intermediate and base spacers.

2. The separation between adjacent conduits shall be in accordance with NEC Article 310.

3. Manufacturer:

   a. Carlon
   b. Equal

PART 3 EXECUTION

3.1 INSTALLATION

A. General

1. All interior conduit work shall be installed exposed except areas in which there is a finished ceiling, or as indicated on the Contract Drawings, "Room Finish Schedule," a finished ceiling will be installed. These areas shall have all conduit work concealed.

2. No exterior conduits shall be run exposed on outside walls of buildings or structures.

3. Minimum size shall be 3/4 inch unless specifically shown otherwise.

4. Terminations of metallic conduits shall be furnished with grounding bushings.

5. Where exposed conduit requires clamping to the building structure, clamps shall consist of galvanized iron one-hole pipe straps and expansion shields.

6. Support outlets; pull boxes and junction boxes separately from building construction, not from conduit.

7. Where exposed conduit is permitted, install conduit parallel to or at right angles with lines of building in neat and organized configurations.

8. Coordinate all conduit installations with other trades in advance of installation.

9. Plug conduit openings until wires are installed.

10. Conduit reducers shall not be allowed.

11. Expansion couplings shall be installed in conduits crossing buildings expansion joints.

12. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

13. Complete raceway installation before starting conductor installation.

14. Install temporary closures to prevent foreign matter from entering raceways.

15. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above the finished slab.

16. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and keep straight legs of offsets parallel, unless otherwise indicated.

17. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.

18. Run parallel or banked raceways together on common supports.

19. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.

20. Join raceways with fittings designed and approved for that purpose and make joints tight.

21. Provide insulating bushings to meet NEC requirements.

B. Conduit Supports and Hangers

1. Conduit supports shall be spaced at intervals of 8 feet or less as required to obtain rigid construction.

2. Single conduits shall be supported by pipe clamps with clamp backs to raise conduits at least ¼ inch from the surface.

3. Multiple runs of conduits shall be supported on trapeze type hangers with steel horizontal members and threaded hanger rods.

4. Trapeze hangers shall be cross-braced to prevent spreading.

5. Conduit hangers shall be attached to structural steel by means of beam or channel clamps.

6. Supports located in corrosive areas and or where shown shall be PVC coated.

3.2 UNDERGROUND CONDUITS

A. Conduits shall be buried to a minimum depth of 24 inches unless otherwise shown or specified.

B. All buried conduits or groups of conduits shall have a warning tape buried 12 inches under finished grade and located directly over the centerline of the conduits. A second tape shall be buried 12 inches above the top of the highest conduit in the group. Where shown on the drawings, additional tapes shall be provided for ductbanks wider than 30 inches.

C. Underground conduits exiting and entering structures shall have expansion couplings as specified.

D. Where conduit is buried below grade, Contractor shall excavate, install, backfill and compact buried conduit prior to final compaction by General Contractor.

E. Any Earthwork shall be in accordance with Division 31 – Earthworks.

F. All conduits shall be cleaned and tested with a mandrel, prior to pulling cables.

G. The transition from the underground conduit system to the building interior conduit system shall occur at the first junction box, device, or equipment enclosure within the building. Conduit seals shall be provided at this location. Such seals shall minimize the circulation of air between the underground conduit system and the indoor enclosures. Seals shall be composed of Duct Seal sealing compound or similar non-hardening removable sealant.

H. Conduit bends in underground conduits shall have a minimum centerline radius as follows:

Conduit Size	Radius (inches)
3 inch	36
4 inch	42
5 inch	48

I. Conduit spacers shall be used when installing two or more underground conduits. Conduit spacers shall be located at intervals of 8 feet or less.

3.3 CONDUITS IN CORROSIVE AREAS

A. Where conduits pass through Corrosive Area walls and/or floors, seal off fittings as specified shall be installed to prevent gas leakage through conduit system.

3.4 CONDUITS IN HAZARDOUS AREAS

A. All conduit and equipment, in or through areas classified as Hazardous and all conduit and equipment for explosion proof work, shall be in accordance with the provisions of Article 501 of the National Electric Code for Class I, Group D, Division 1 and 2 locations. Compound filled sealoff fittings as specified shall be installed as required.

3.5 CONDUIT TYPES

A. Rigid steel conduit shall be provided unless specifically noted otherwise on the Contract Drawings.

END OF SECTION

SECTION 260800 ELECTRICAL ACCEPTANCE TESTING

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. All electrical equipment, devices, electrical systems installed or provided by the Contractor under this Section shall be inspected and tested by the Contractor to ensure that they operate correctly for the specific installation and are operating as designed, based on the associated layout drawings.

B. Refer to Section 3.0 for the Contractors' responsibilities related to inspection, testing, and commissioning of Company Furnished equipment.

C. Any defects in the Contractor's workmanship disclosed by such tests shall be corrected by the Contractor at the expense of the Contractor and the work shall be tested again. All changes made in the installation shall be marked by the Contractor on a master set of "As-Built" drawings.

D. When required by the Company, the Contractor shall provide at the Contractor's expense, equipment field Representatives for Contractor supplied equipment to perform equipment tests and train Company's operating staff.

E. The Company will provide specialized commissioning personnel when required to complete the commissioning of Company pre-purchased equipment with terminations or for other specialized testing when and as needed. The Contactor will provide support personnel as needed during system checkout, start up, commissioning and acceptance testing.

F. The Contractor shall provide instruments, meters, equipment and qualified personnel required to conduct tests and studies during and at the conclusion of the project.

G. The Contractor shall implement a safety, test and commissioning tagging procedure. The tags shall be dated and signed and shall indicate equipment checked, equipment tested, equipment energized and equipment commissioned.

H. The Contractor shall perform all the equipment field tests as required to support Company commissioning plan.

I. In general, the work shall be performed as outlined in Section 3.0 of this Specification.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 INSPECTION

A. The first stage shall be inspection of all equipment associated with the Contractor installation responsibility, including Company Pre-Purchased equipment and prefabricated buildings and Contractor supplied equipment.

B. The Contractor shall confirm that all equipment and required quantities are complete and that equipment make and model specifications comply with the specified Project drawings and documentation.

C. The Contractor shall record that all equipment is without defects or damage. Any deviations shall be recorded and the Company immediately informed of any discrepancy.

3.2 TESTING (PRE-COMMISSIONING)

A. The second stage shall be Testing (Pre-Commissioning), prior to system power up, consisting of the following items.

1. Check that the installation is complete and that all interconnections are correct.

2. Check all power, control and signal wiring for continuity to ensure a clear path has been maintained. A formal sign off list of all wiring checks shall be provided to the Company prior to equipment energization.

3. Perform all equipment testing and correct deficiencies.

4. Provide assistance for third party commissioning and testing of the equipment.

5. Perform function tests to confirm correct operation of all devices, subsystems and systems, and correct all deficiencies.

3.3 COMMISSIONING (START-UP)

A. Commissioning (Start-up) Mainline Valve Station equipment and systems will be carried out by the Company or equipment manufacturer. The Contractor shall provide personnel throughout the commissioning period to assist and carry out any equipment adjustments, corrections or repairs, as required.

3.4 TEST PROCEDURES AND RECORD FORMS

A. The Contractor shall work with Company, develop and submit for approval to the Company's Representative an outline of proposed inspection and test procedures, checklists and test record forms for each system or piece of equipment, prior to the start of testing.

B. Test record forms shall include equipment number and system, method of testing, test equipment used, final readings obtained, adjustments made, test results and associated data.

C. The Contractor shall submit inspection and test results including complete data on actual readings taken and corrected values to the Company's Representative for approval after each test period.

3.5 TESTING AND PRE-COMMISSIONING OF COMPANY FURNISHED EQUIPMENT

A. The Contractor shall provide testing and pre-commissioning of Company-furnished equipment. The Contractor shall submit for approval to the Company's Representative an outline of proposed tests for approval 30 days prior to the scheduled testing. The Contractor shall be responsible to thoroughly checkout, test and pre-commission all Company-furnished and Contractor supplied equipment and materials.

B. Field Representatives shall be provided by the Company for specialized testing and commissioning of the Company furnished equipment.

C. The Contractor will assist the Manufacturers' field representatives and Company's Field Personnel or commissioning representatives, as required, to complete final commissioning, startup and acceptance testing up to and including placing all equipment into Service.

D. The Contractor shall assist in correcting any manufacturer defects in the Company-furnished equipment, as required by the Company. The Contractor will be reimbursed under the terms of the Contract.

3.6 GENERAL GUIDELINES

A. All inspections and testing shall be performed in accordance with, OEM instructions, applicable codes and standards including but not limited to NEC, ANSI, IEEE, NFPA, NEMA, and OSHA.

B. All testing and commissioning shall also be performed in accordance with the following guidelines, as a minimum:

1. NETA Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

2. Equipment Manufacturer Guidelines

C. In general the Contractor's tests shall include the items listed in this specification and as further detailed in the following sections.

C. Verify that the installed equipment and systems are installed correctly with respect to the site layout and interconnection drawings, schematics, and drawings and specifications and bill of materials

D. Check that all grounding terminals are connected to the correct grounding terminal and verify there are no ground loops.

3.7 DETAILED GUIDELINES

A. The Contractor shall test all equipment or devices in accordance with the equipment manuals and manufacturer's instructions. The test shall include as a minimum the items covered in the following sections.

3.8 GROUNDING

A. The grounding system shall be tested to ensure that all parts of the steel structures, motor frames, switchgear, trays, conduit and other electrical equipment will be at a potential in accordance with specifications.

3.9 LOW VOLTAGE (POWER & CONTROL) CABLES

A. Testing of all low voltage cable shall be performed by Company personnel. Contractor shall retain the responsibility for correction of any faulty installation or replacement of defective equipment as identified by the Company.

3.10 FINAL TEST REPORTS AND ACCEPTANCE

A. The Contractor shall submit the final approved test reports to the Company at the completion of the work under this Section.

B. Inspection and approval of Contractor tests will not constitute a waiver of his responsibility for the successful operation of the installed systems.

C. When all tests and commissioning have been completed to the satisfaction of the Company, the work shall be released by the Contractor to the Company.

END OF SECTION

SECTION 270000 DATA & COMMUNICATIONS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide data and communication system raceways, equipment mounting backboards, wall jacks and cabling as specified or indicated on the drawings.

B. Data and communication systems shall include telephone systems and data/computer communications systems, as specified or indicated on the drawings.

1.2 STANDARDS

A. Furnish communication systems cabling, and wall jacks listed by Underwriters' Laboratories as meeting National Electrical Code requirements and bearing the UL label where available for equipment specified.

1.3 SUBMITTALS

A. Submit product data for the communication systems cabling and wall jacks. Include manufacturer model number and detailed product data to evaluate the products.

PART 2 - PRODUCTS

2.1 GENERAL

A. System cabling, wall jacks and raceway systems shall be of the type indicated or specified on the drawings.

PART 3 - EXECUTION

3.1 GENERAL

A. Provide and install the data and communication raceway system, including conduits complete with pull boxes, as specified or indicated on the drawings.

B. All openings for cables or conduit that penetrate exit corridors or as indicated on the drawings shall be sealed to maintain the fire ratings and integrity of these areas.

C. Provide pull lines in all spare conduits or ducts.

END OF SECTION

SECTION 310519.13 GEOTEXTILES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the installation of separation/stabilization fabric as shown on the Contract Drawings and as specified herein.

1.2 QUALITY ASSURANCE

A. The latest edition of the following standards, as referenced herein, shall be applicable:

1. American Society for Testing and Materials (ASTM).

1.3 SUBMITTALS

A. Product Data:

1. Submit Manufacturer's material specifications, product literature and installation instructions.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Delivery:

1. Deliver sufficient materials to the site to prevent interruption of the work.

2. All materials shall be inspected by Contractor upon delivery. Products received at the site torn, with holes, deteriorated, or otherwise damaged will not be approved and shall be returned and replaced at no expense to the Owner.

B. Storage:

1. All material shall be stored in strict accordance with the manufacturer's recommendations and as approved by the Engineer.

2. Do not store products directly on ground. Ship and store geotextile with suitable wrapping for protection against moisture and ultraviolet exposure. Store geotextile in way that protects it from elements, if stored outdoors, elevate and protect geotextile with waterproof cover.

C. Handling:

1. All material shall be handled in strict accordance with the manufacturer's recommendations and as approved by the Engineer.

PART 2 - PRODUCTS

2.1 WOVEN GEOTEXTILE

A. Stabilization Fabric: To be used beneath and adjacent to the 12-inch transmission main in areas directed by the Construction Manager.

B. Composed of polymeric yarn interlaced to foam planar structure with uniform weave pattern.

C. Calendared or finished so yarns will retain their relative position with respect to each other.

D. Polymeric Yarn: Long-chain synthetic polymers (polyester or polypropylene) with stabilizer or inhibitors added to make filament resistant to deterioration due to heat and ultraviolet light exposure.

E. Physical Properties: Conform to requirements noted below:

Property	Design Value	Test Method
Tensile Strength	315 lbs	ASTM D4632
Elongation	12%	ASTM D4632
Trapezoidal Tear	113 lbs	ASTM D4533
CBR Puncture Strength	900 lbs	ASTM D6241
A.O.S.	40 (US Sieve)	ASTM D4751
Permittivity	.05 sec^{-1}	ASTM D4491

PART 3 - EXECUTION

3.1 GENERAL

A. The Contractor shall be responsible for the installation and seaming of geotextile fabric in accordance with the specifications and the manufacturer's recommendations, as approved by the Engineer.

3.2 SUBGRADE PREPARATION

A. Surfaces to be covered with geotextile fabric shall be as directed by the Construction Manager. The surface to be covered shall be firm and unyielding, with no sudden changes or breaks in grade. There shall be no standing water or excessive moisture on the surface when the fabric is placed.

B. The compacted subgrade shall be maintained in a smooth, uniform and compacted condition during installation of the fabric.

3.3 GEOTEXTILE INSTALLATION

A. The fabric shall be cleaned of all debris or other materials that may negatively affect the fabric's performance.

B. Mechanical equipment shall not be permitted to operate directly on the fabric unless authorized to do so by the manufacturer and approved by the Engineer.

C. Geotextile Placement

Fabric shall be placed as recommended by the manufacturer and approved by the Engineer on surfaces which have been prepared to conform with these Specifications and found acceptable for fabric installation.

2. The fabric shall be placed as smooth and wrinkle-free as possible.

3. All areas of fabric damaged during installation as determined by the Engineer shall be repaired or replaced by the Contractor as specified at no additional cost to the Owner. Should the fabric be damaged during any step of the installation, the damaged section shall be repaired by covering it with a piece of fabric which extends at least 24 inches in all directions beyond the damaged area. The fabric shall be secured by sewing or bonding as approved by the Engineer.

4. At time of installation, fabric will be rejected if it has defects, ribs, holes, flaws, deterioration, or damage incurred during manufacture, transportation, handling, or storage. Damaged materials shall be removed and replaced at no additional cost to the Owner.

5. Fabric shall be protected at all times during construction from contamination by surface run-off and any fabric so contaminated shall be removed and replaced with uncontaminated fabric.

D. Seams and Overlaps of Geotextile:

1. All overlaps shall be a minimum of eighteen (18) inches.

3.4 COVER MATERIALS OVER GEOTEXTILES

A. Granular materials shall be placed on geotextiles as shown on the Contract Drawings. During back-dumping and spreading, a minimum depth of 6 inches of granular material shall be maintained at all times between the fabric and wheels of trucks or spreading equipment. All equipment used in spreading or traveling on the cover layer for any reason shall exert low ground pressures and shall be approved by the manufacturer and Engineer. Dozer blades, etc. shall not make direct contact with the fabric; however, if tears occur in the fabric during the spreading operation, the granular material shall be cleared from the fabric and the damaged area repaired as previously described.

B. The granular material shall be spread in the direction of fabric overlap. Large fabric wrinkles which may develop during the spreading operations shall be folded and flattened in the direction of the spreading. Occasionally, large folds may reduce the fabric overlap width. Special care shall be given to maintain proper overlap and fabric continuity.

C. All equipment spreading cover material or traveling on the cover layer shall avoid making sharp turns, quick stops or quick starts.

D. Fabric shall be covered as soon as possible after placement to minimize exposure to sunlight. Fabric shall not be exposed for more than 5 days.

3.5 DISPOSAL OF SCRAP MATERIALS

A. On completion of installation, the Contractor shall legally dispose of all trash and scrap material off-site or in a location approved by the Owner and Engineer, remove equipment used in connection with the work herein, and shall leave the premises in a neat acceptable manner.

END OF SECTION

SECTION 312000 EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the preparation of the site, protection, excavation, embankment, drainage, dewatering, for site grading, excavating, and backfilling as shown on the Drawings, and as herein specified.

B. The Contractor shall accept the site in the condition in which it exists at the time of the award of the Contract.

C. The Construction Manager shall determine the suitability of materials that are to be used in the work and should any materials encountered be unsatisfactory for the purpose intended, they shall be removed from the site at the Contractor's expense.

1.2 QUALITY ASSURANCE

A. Reference Standards:

1. The latest edition of the following standards, as referenced herein, shall be applicable.

a. Vermont Agency of Transportation (VTAOT), 2011 Standard Specifications for Construction Book.

b. "Standard Specifications for Highway Materials and Methods of Sampling and Testing, American Association of State Highway and Transportation Officials (AASHTO)."

B. The Contractor shall comply with the requirements for soil erosion and sedimentation control, and other requirements of governmental authorities having jurisdiction, including the Vermont Agency of Natural Resources, Department of Environmental Conservation (DEC) and United States Army Corp of Engineers – New England Branch.

C. The Contractor shall provide and pay for all costs in connection with an approved independent testing facility to determine conformance of soils and aggregate with the specifications in accordance with Section "Quality Requirements."

1.3 SUBMITTALS

A. Samples:

1. The Contractor shall furnish earth materials to the testing laboratory for analysis and report, as directed by the Engineer, or as outlined in the specifications.

B. Test Results:

1. The testing laboratory shall submit written reports of all tests, investigations, and recommendations to the Contractor and the Engineer.

1.4 PROJECT REQUIREMENTS

A. Notify the Engineer of any unexpected subsurface condition.

B. Protection of Existing Utilities:

1. Locate existing underground utilities in areas of work. If utilities are to remain in place, provide adequate support and protection during earthwork operations, comply with OSHA requirements.

2. Coordinate interruption and/or termination of utilities with the utility companies and the Owner.

3. Provide a minimum of forty-eight (48) hours notice to the Owner and Utility and receive written notice to proceed before interrupting any utility.

4. Repair any damaged utilities as acceptable to the Construction Manager, at no additional cost to the Owner.

C. Protection of Persons and Property:

1. Barricade open excavations occurring as part of this work and post with warning signs and lights.

2. Operate warning lights as recommended by authorities having jurisdiction.

3. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Select Granular Material: Sound, durable, sand, gravel, stone or blends with these materials, free from organic, frozen, or other deleterious materials, conforming to the requirements of VTAOT Div. 301 - Subbase and meeting the following gradation requirements Subsection Div. 704.05 – Crushed Gravel for Subbase:

Grading	Sieve	Percent Passing
Course	4"	95 to 100
	No. 4	25 to 50
	No. 100	0 - 12
	No. 200	0 - 6
Fine	2"	100
	1-1/2"	90 to 100
	No. 4	30 - 60
	No. 100	0 to 12
	No. 200	0 - 6

B. Selected Fill: Sound, durable, sand, gravel, stone, or blends of these materials, free from organic, frozen or other deleterious materials, conforming to the requirements of VTAOT Div. 301 - Subbase and meeting the following gradation requirements for Subsection 704.06 – Dense Graded Crushed Stone for Subbase:

Sieve	Percent Passing
3/4"	100
1/2"	70 to 100
No. 4	50 to 90
No. 100	0 to 12
No. 200	0 – 6

1. Fines passing No. 200 shall be non-plastic.
2. Particle size analysis shall show no gap grading.

C. Bank Run Gravel: Shall conform with Section 704.04 of the VTrans Standard Specification for Construction.

D. Bank Run Sand: Shall conform with Section 703.03 of the VTrans Standard Specification for Construction.

E. ¾-inch Crushed Stone: Shall conform with Section 704.02B of the VTrans Standard Specification for Construction

F. 1-inch Crushed Stone: Shall conform with Section 704.02C of the VTrans Standard Specification for Construction

PART 3 - EXECUTION

3.1 PRECONSTRUCTION MATERIAL QUALIFICATION TESTING

A. A 30-pound minimum representative sample shall be obtained from each potential borrow source. If different material gradations are known to exist in the pit, samples shall be obtained for each material. Each sample shall be mixed thoroughly and reduced to test specimen size, in accordance with AASHTO T87. The test shall be performed in the order shown. Failure to pass any test is grounds for disqualification and shall lead to cessation of the test program for that material.

1. Particle Size Analysis:

   a. Method: ASTM D422.
   b. Number of Tests: One (1) per potential source.
   c. Acceptance Criteria: Gradation within specified limits.

2. Maximum Density Determination:

   a. Method: ASTM D1557, Modified Proctor.
   b. Number of Tests: One (1) per potential source.

3. Re-establish gradation and maximum density of fill material if source is changed during construction.

3.2 PREPARATION

A. Establish required lines, levels, contours and datum.

B. Maintain benchmarks and other elevation control points. Re-establish, if disturbed or destroyed, at no additional cost to the Owner.

C. Establish location and extent of utilities before commencement of grading operations.

3.3 EXCAVATION

A. Excavation shall consist, in general, of the excavation of whatever substance is encountered to the lines, grades and sections shown on the Drawings, including excavation as necessary for grading and other similar features.

B. All suitable materials removed in excavation shall be used in the construction of embankments, subgrade, shoulders, slopes and at such other places as directed. The Engineer shall be the sole judge of what constitutes suitable material.

3.4 During construction, the grading operations shall be executed in such a manner that the excavation will be well drained at all times. All grading shall be finished on neat, regular lines conforming to the sections and contours shown on the Drawings.

A. Removal of materials beyond the indicated subgrade elevations, without authorization by the Engineer, shall be classified as unauthorized excavation and shall be performed at no additional cost to the Owner.

B. Excavation shall be performed in proper sequence with all other associated operations.

C. Maintain the slopes of excavation in a safe condition until completion of the grading operation.

D. All excavation work shall be inspected and approved by the Engineer before proceeding with construction.

E. Any excess excavation shall be removed from the site to disposal areas at the Contractor's expense.

3.5 FILL

A. When native soil conditions are not acceptable for pipe bedding and pipe envelope backfill, "bank run sand" shall be utilized.

B. When native soil conditions are not acceptable for trench backfill, "bank run gravel", "selected granular fill", "selected fill", or approved equal backfill shall be utilized.

C. All site fill not included within the trench limits shall be "selected fill" unless otherwise shown on the Drawings, or directed by the Engineer. "Select granular fill" shall be placed in lieu of selected fill where directed by the Engineer.

D. Before depositing fills, the surface of the ground shall be cleared of all refuse, brush and large stones. Conform to Section "Site Clearing."

E. Prior to placing fill over undistributed material, scarify to a minimum depth of six (6) inches.

F. Where fills are made on hillsides or slopes, the slope of the original ground upon which the fill is to be placed shall be plowed or scarified deeply or where the slope ratio of the original ground is steeper than 2 horizontal to 1 vertical, the bank shall be stepped or benched.

G. A thoroughly and satisfactorily subgrade is defined as having a minimum dry density of 95 percent of the maximum density of the material used. The subgrade material shall be compacted at a moisture content suitable for obtaining the required density.

H. Place backfill and fill materials in layers not more than 12" in loose depth unless shown otherwise on the Drawings. Lift height shall be governed by the ability of the compaction equipment to obtain the required compaction with 12" as a maximum lift height. Before compaction, moisten or aerate each layer as necessary to facilitate compaction to the required density. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost, ice, ponded water or extraneous debris.

I. When work is suspended during periods of freezing weather, measures shall be taken to prevent fill already in place from freezing. Upon resumption of work after any inclement weather, prepare the exposed surface by proof rolling to identify any zones of soft/loose soils. Soft/loose materials or frozen soils shall be removed and replaced by compacted granular fill.

J. Moisture Control:

1. Where fill or backfill must be moisture conditioned before compaction, uniformly apply water to the surface and to each layer of fill or backfill. Prevent ponding or other free water on surface subsequent to, or during, compaction operations.

2. Remove and replace, or scarify and air dry, soil that is too wet to permit compaction to specified density. Soil that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing or pulverizing, until moisture content is reduced to a value which will permit compaction to the percentage of maximum density specified.

K. All fill shall be thoroughly and satisfactorily compacted to 95 percent of the maximum dry density of material used when under pavements or roadways. All other fill shall be thoroughly and satisfactory compacted to 90 percent of the maximum dry density.

3.6 GRADING

A. The present and finished grade lines are shown on the contract drawings. Grade over the entire area, as shown on the drawings, shall be to the finished subgrade levels. Upon completion of this work, all debris shall be cleaned out and removed from the premises.

B. All cutting, filling, backfilling and grading necessary shall be done to bring the area to the following grade or subgrade levels:

1. For roadway surface areas; to the finished subgrade levels specified on the contract drawings.
2. For areas to be topsoiled and seeded; to within 6-inches of the finished grade.
3. For other surface treatments; as detailed on the Drawings.

C. Sufficient grading must be done during the progress of the work so that the entire site shall be well drained and free from water pockets.

D. Finish grading, including dressing swales, cleaning up excess footing excavation, dressing terraces, disposing of excess material and all other work necessary to prepare the site for topsoil and seeding shall be done after construction of structures and roadway surface areas is substantially complete.

3.7 COMPACTION EQUIPMENT

A. Compaction equipment used for the Work is subject to approval by the Engineer. Any equipment not originally manufactured for compaction purposes and equipment which is not in proper working order

will not be approved. Furnish manufacturer's specifications covering data not obvious from a visual inspection of the equipment and necessary to determine its classification and performance characteristics.

B. Vibratory Drum Compactors: A self-propelled compactor classified for use according to the developed compactive force rating per linear inch of drum width (PLI). The actual operating frequency of the compactor will determine the PLI rating.

1. Approval of vibratory compactors usage is contingent upon proper operation of equipment at all times during compaction operations.

2. Compaction equipment other than vibratory drum compactors may be used subject to the approval of the Owner's Representative. Submit specifications at least 2 weeks prior to use of this equipment.

3. Do not use vibratory drum compactors after concrete is poured.

3.8 DRAINAGE AND DEWATERING

A. Prevent surface, subsurface or ground water from flowing into excavation and from flooding project area, as well as surrounding areas.

B. Do not allow water to accumulate in excavations. Remove water to prevent soil changes detrimental to the stability of subgrades.

C. Provide and maintain the pumps, well points, sumps, suction and discharge lines, and other dewatering components necessary to convey water away from excavations.

D. Provide and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water and water removed from excavations by dewatering, to collection or run-off areas.

E. Dewatering operations shall be as directed by the Engineer and performed in accordance with Section "Dewatering."

3.9 FIELD QUALITY CONTROL

A. Notify the Engineer at least one (1) working day in advance of all phases of filling and backfilling operations.

B. Compaction testing shall be performed to ascertain the compacted density of the fill and backfill materials in accordance with the following methods:

1. In-place relative density:

a. Method: AASHTO T238, Nuclear Method
b. Number of Tests: One (1) per 12" vertical lift.

C. The Construction Manager may direct additional tests to establish gradation, maximum density, and in-place density as required by working conditions, at the Contractor's expense.

D. Acceptance Criteria: The sole criterion for acceptability of in-place fill shall be in situ dry density. Minimum dry density for all fill or backfill under pavement or roadways shall be 95 percent of the maximum dry density (90 percent for all other areas). If a test fails to qualify, the fill shall be further compacted and re-tested. Subsequent test failures shall be followed by removal and replacement of the material. (See VTAOT Specs. 203.11 (d) regarding moisture content to be determined by Engineer)

3.10 CLEAN UP

A. Provide and maintain protections or newly filled areas against damage. Upon completion or when directed, correct all damaged and deficient work by building up low spots and remove temporary protections, fencing, shoring and bracing.

B. Remove all surplus excavated material not required for filling and backfilling and legally dispose of same away from premises.

C. Leave the premises and work in clean, satisfactory condition, ready to receive subsequent operations.

END OF SECTION

SECTION 312316.26 ROCK REMOVAL

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes drilling, blasting, excavation, removal and disposal of rock as necessary for the installation of the Work, and as indicated and specified herein.

1.2 REFERENCES

A. The latest edition of the following standards, as referenced herein, shall be applicable:

1. "Structure Response and Damage Produced by Ground Vibration From Surface Mine Blasting," U.S. Bureau of Mines Publication RI 8507.

1.3 DEFINITIONS

A. Rock: Limestone, sandstone, shale, granite, quartz, and formations of other varying mineral or aggregate composition in solid beds or masses in its original or stratified position that exceed 1 cubic yard and that cannot be excavated with one of the following

1. A crawler tractor having a minimum draw bar pull rated at not less than 71,000 lbs. (Caterpillar D9N or equivalent), and occupying an original volume of at least 1 cubic yards or more.

2. A backhoe having a break out force rated at not less than 44,000 lbs. (Caterpillar 235D or equivalent), and occupying an original volume of at least 1 cubic yards.

B. Rock Excavation: Removal of rock by means of drilling, blasting, or use of pneumatic tools or expansive chemical agents. Removal of materials which, in the opinion of the Construction Manager, can be loosened and excavated by mechanical means (ripping, etc.) including frozen materials, soft laminated shale or hardpan, pavements, curbs and similar materials shall be classified as earth excavation with the exception of rock face scaling. Do not proceed with the excavation of this material until the Construction Manager has classified the materials as common excavation or rock excavation and has taken cross sections as required. Failure on the part of the Contractor to uncover such material, notify the Construction Manager, and allow ample time for classification and cross sectioning of the undisturbed surface of such material will cause the forfeiture of the Contractor's right of claim to any classification or volume of material to be paid for other than that allowed by the Construction Manager for the areas of work in which such deposits occur.

C. Unauthorized Excavation: Removal of any material beyond horizontal and vertical limits indicated on the Drawings or as specified herein, without the prior approval of the Construction Manager.

D. Scaling: Scaling shall be considered the removal of loose and broken rock from the face of rock cuts by mechanical means. Scaling shall be included in Rock Excavation item as defined above.

E. Blasting Specialty Contractor: A subcontractor approved by the Construction Manager retained by the Contractor performing all work related to drilling and blasting for rock excavating.

F. Independent Specialty Condition Survey Contractor: A subcontractor approved by the Construction Manager retained by the Contractor to perform pre and post blast condition surveys of nearby structures.

G. Independent Specialty Condition Seismic Survey Contractor: A subcontractor approved by the Construction Manager retained by the Contractor to perform seismic vibration monitoring on-site and off-site at locations specified or designated by the Construction Manager.

H. Pre-splitting: A controlled blasting method in which a smooth excavation face is created by simultaneously blasting a single row of closely spaced holes along the excavation line prior to blasting the remainder of the holes in the blast pattern. Pre-splitting blast holes shall be a minimum of 3 inches diameter at a center-to-center spacing not exceeding 24 inches.

I. Line Drilling: A controlled blasting method in which a single row of closely spaced, unloaded holes are drilled along the neat excavation line to create a plane of weakness which the primary blast can break. Center-to-center spacing of line drilled holes shall be no more than twice the hole diameter.

1.4 SUBMITTALS

A. General:

1. Submit Specialty Contractors' qualifications, to the Construction Manager for approval.

2. Submit work plans, site safety plans, proposed equipment, and a detailed outline of intended rock removal procedures and any other information listed in this specification to the Construction Manager for approval. This submittal shall not relieve the Contractor of complete responsibility for the successful performance of the method(s) used.

B. Blast Plan:

1. The Blasting Specialty Contractor shall develop a detailed written blast design plan complying with the applicable requirements in NFPA 496, "Explosive Materials Code". A copy of the blast design plan shall be furnished to the Construction Manager two weeks prior to blasting operations and shall include the types of explosive and sizes of charges to be used in each area of rock removal, types of blasting mats, sequence of blasting operations, and procedures that will prevent damage to site improvements and structures on Project site and adjacent properties. .

C. Pre and Post Blast Surveys:

1. Pre- and post-blast conditions surveys shall be completed for all nearby properties where ground vibrations will be perceptible (peak particle velocity greater than 0.1 in./sec.) prior to blasting. This survey shall include, at a minimum, all properties within a 600 ft. radius surrounding the construction area and any critical structures of interest as determined by the Construction Manager. Prior to execution of the survey, a plan noting structures to be surveyed and survey methods shall be submitted to the Construction Manager for approval.

2. During these surveys, all structures and installations, buildings, bridges, water sources, storage tanks, utilities and other significant features, etc., shall be examined and photographed as necessary. Pre and post blast surveys shall include all accessible indoor areas and outdoor sections of surveyed structures. Photographs accompanied by audio tape or written field reports, or narrated video tape shall be included as part of the

surveys. A written survey summary shall also be included with all submittals. Within thirty (30) days of completion of this survey and prior to blasting, a pre-blasting conditions survey report shall be submitted to the Construction Manager and Owner. Within thirty (30) days after completion of blasting operations, the Independent Specialty Condition Survey Contractor shall conduct a post-blasting survey of all the same properties. The post-blast conditions survey report shall be submitted to the Construction Manager and Owner within thirty (30) days.

3. Well testing shall include both quality and flow testing, both pre-blast and post-blasting, when within 600 feet of the blasting activities. Well quality shall be tested utilizing the Vermont Department of Health "Kit A", "Kit C", and "Kit RA". Well quantity shall be tested by a licensed Vermont Well Driller utilizing the "blow down" method.

D. Seismic Monitoring Plan:

1. The Seismic Specialty Contractor shall develop a written monitoring plan detailing equipment to be used, monitoring locations, seismic event record format example, and schedule. A copy of the seismic monitoring plan shall be furnished to the Construction Manager two weeks prior to blasting operations.

E. Seismic Monitoring Records:

1. A written seismic monitoring record of each monitoring/blast event shall be submitted to the Construction Manager the work day following each blast event. Monitoring shall be performed at the nearest point of the nearest structure to the blast, unless directed otherwise by the Construction Manager. The record shall include at least the following information:

   a. Location of seismic, vibration and sound level transducers;

   b. Peak Particle Velocity (PPV), Vibration Frequency (Frq), Peak Displacement (PD) and Peak Particle Acceleration (PPA) in the longitudinal, vertical, and transverse directions as well as Resultant PPV and Peak Sound levels (dB) for each event;

   c. Seismograph printout;

   d. Date and time of blast event;

   e. Distance from seismograph to the blast

   f. Monitored time interval.

2. The Seismic Specialty Contractor shall immediately inform the Construction Manager if vibration levels or sound levels exceed specified values.

F. Blast Hole Records:

1. Written records of <u>each</u> blast shall be submitted to the Construction Manager the work day after each blast event and shall include at least the following items:

   a. Surface elevation;

   b. Location;

c. Number of holes;

d. Depth of holes;

e. Water conditions in each hole (if any);

f. Quantity and type of explosives used;

g. Maximum quantity of explosives per delay and number of delays. A delay shall be considered detonations separated by a minimum of 8 milliseconds;

h. Detonation delay pattern;

i. Stemmed length of hole;

j. Date and blast time.

G. Log of Complaints:

1. A log of all complaints and responses resulting from blasting operations shall be kept by the Contractor's designated contact person. The log should include as a minimum the following information: name and address of person registering complaint/inquiry; time and date when annoyance occurred; time and date when complaint/inquiry filed; nature of complaint/inquiry; action taken by contact person; follow-up action. A copy of all complaints and responses shall be submitted to the Owner and Construction Manager by the following work day.

H. Site Safety Plan:

1. Site safety shall be coordinated through the Contractor's office. A written safety plan shall be developed and distributed to all subcontractors, the Owner and the Construction Manager.

I. Certifications/Licenses:

1. One (1) copy of each certificate, license, permit and proof of insurance required by this specification shall be submitted to the Construction Manager after award of contract and prior to commencement of work.

J. Quality Assurance:

1. The Contractor shall use the services of an experienced Specialty Contractor to perform all blasting operations.

2. The Blasting Specialty Contractor and the blasting foreman shall be regularly engaged in blasting work of similar magnitude and scope and shall be approved by the Construction Manager to perform this project. A list of prior work experience for the Blasting Specialty Contractor and foreman shall be submitted with the bid.

1.5 REGULATORY REQUIREMENTS

A. The Blasting Specialty Contractor shall obtain all required permits, certificates, and licenses (City, State, Local etc.) prior to the commencement of any blasting operations.

B. Blasting safety procedures and operations shall comply with Title 29 Code of Federal Regulations

C. Part 1910.109, and all other applicable state and local standards and regulations.

1.6 PROJECT/SITE CONDITIONS

A. Existing Conditions: Existing physical conditions as defined for design purposes are noted on the Drawings and are described in the Information Available to Bidders section of the Contract Documents.

1.7 SEQUENCING AND SCHEDULING

A. Work associated with blasting shall be performed in accordance with the following general sequence:

1. Complete and submit pre-blast survey;

2. Notify all appropriate authorities having jurisdiction of proposed activities;

3. Prepare site for blasting;

4. Notify affected utility owners, operators and nearby residents as required in Part 3 - Execution;

5. Complete test blast program simultaneously with seismic monitoring;

6. Complete production blasting work simultaneously with seismic monitoring;

7. Complete and submit post-blast survey.

1.8 MAINTENANCE

A. Any and all damage caused by the blasting operations shall be repaired or replaced to the Owner's and Construction Manager's satisfaction at the expense of the Blasting Specialty Contractor within thirty (30) days of completion of the Post-Blast Survey.

PART 2 - PRODUCTS

2.1 GENERAL

A. No perchlorates shall be acceptable in any blasting products. All caps, charges and other applicable blasting materials shall be perchlorate-free.

PART 3 - EXECUTION

3.1 PREPARATION

A. All personnel working on-site shall be instructed as to the nature, times, duration, site safety and warning signals concerning blasting operations.

B. Local residents within the Pre-Blast Survey area shall be notified at least 48 hours prior to initial blasting operations and provided with the name and phone number of one full-time, on-site contact person designated by the Contractor for handling all complaints and inquiries. Residents shall be notified of blast schedule and changes on at least a weekly basis throughout the duration of blasting operations. Residents shall also be informed of warning signals identifying an upcoming blast and all-clear signals following completion of a blast as outlined in Site Safety Plan.

C. Explosives and blasting caps shall not be brought onto the site or used without appropriate permits, licenses, certificates and/or prior written approval of authorities having jurisdiction. The Specialty Contractor is solely responsible for handling, storage, and use of explosive materials in accordance with regulatory and permit requirements.

3.2 ROCK REMOVAL

A. Remove rock as indicated by the Drawings and as necessary for the installation of the Work. Provide sufficient clearance, within the limits specified, for the proper execution of the Work.

B. Remove rock to lines and subgrade elevations indicated to permit installation of permanent construction without exceeding the following dimensions:

1. 24-inches outside of concrete forms other than at footings.

2. 12-inches outside of concrete forms at footings.

3. 6-inches outside of minimum required dimensions of concrete cast against grade.

4. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.

5. 6-inches beneath bottom of concrete slabs on grade.

6. 9-inches beneath pipe in trenches, and 12-inches on each side of the pipe..

C. Fill areas of over-excavated rock to the proposed subgrade elevations as required by Drawings with selected fill in accordance with Section "Trenching and Backfilling" or Section "Earth Moving" Over-excavation beneath foundations shall be filled with footing concrete (f'_c = 3000 psi minimum).

D. A test blast shall be performed and monitored prior to commencement of production blasting. Test blast records and seismic records shall be reported to the Construction Manager prior to continuation of blasting. If test blast indicates that the blasting plan requires modification, such changes shall be reported to the Construction Manager immediately. Reporting this information to the Construction Manager shall not relieve the Contractor(s) of complete responsibility for the successful performance of the method(s) used, nor shall the reporting constitute approval by the Construction Manager for the proposed plans.

E. The Seismic Specialty Contractor shall monitor the vibrations and sound levels caused by Blasting.

F. Seismic monitoring shall be performed for each blast, unless specified otherwise. Monitoring shall be performed at the nearest structure or at locations designated by the Construction Manager on each field day.

G. If the ground vibrations exceed specified tolerances the Blasting Specialty Contractor's operations shall cease immediately and remain stopped until the Blasting Specialty Contractor has taken all necessary additional measures to protect adjacent property and personnel.

H. The Blasting Specialty Contractor shall use steel or rubber blasting mats as may be necessary to control fly-rock.

3.3 EXCAVATION TOLERANCES

A. Blast hole drilling and overblast beyond the vertical limits indicated shall be less than 1.5 feet.

B. Rock removal limits shall include all materials defined as rock whether removal is accomplished by mechanical means (ripping, etc.) or by drilling and blasting.

3.4 VIBRATION AND SOUND TOLERANCES

A. Blast vibrations shall be maintained within safe limits as defined by the Peak Particle Velocity (in./sec.) vs. Blast Frequency (Hz) as described in the United States Bureau of Mines Publication RI-8507, Appendix B ("Siskind Curve").

B. Sound levels shall not exceed 130dB at the nearest structure.

C. Vibrations levels at new concrete structures shall be limited to the following levels:

Age of Concrete (days)	Maximum Allowable PPV
Less than 1/2	0.1 (in./sec.)
1/2 to 7	1.0 (in./sec.)
Greater than 7	2.0 (in./sec.)

END OF SECTION

SECTION 312319 DEWATERING

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes provisions for a dewatering system to continuously lower and control groundwater levels and hydrostatic pressures in order to maintain near-dry conditions for construction of the work as shown on the plans and specified herein.

B. All dewatering operations shall be in accordance with project permits and the Erosion Prevention and Sediment Control Plans.

1.2 SUBMITTALS

A. Submit the following :

1. Description: of proposed dewatering system.

2. Layout: of dewatering system, including location of sumps, deep wells, well points, header pipes, pumps, discharge lines and observation wells.

3. Details: of dewatering system, including installation methods for deep wells, well points and observation wells, depths of wells, material descriptions, pipe sizes, intake screen sizes, and pump capacities.

4. Estimate: of time required to lower groundwater levels after start of pumping

1.3 JOB CONDITIONS

A. Site soil boring data and samples, soil laboratory testing, and any soil reports shall be made available to prospective bidders for study and review. Bidders must make their own interpretation of subsurface conditions that may affect methods or the cost of construction of the Work.

PART 2 - PRODUCTS

2.1 DEWATERING SYSTEM

A. Provide a dewatering system of adequate size and capacity to lower and maintain the groundwater at the specified level. The system shall include standby pumps and power source for continuous operation.

1. Dewatering system shall consist of wellpoints, deep wells, cut-off walls, riser pipes, swing joints, header lines, valves, pumps, discharge lines, and all other necessary fittings, accessories and equipment for a complete operating system. Provide hole punches, sand backfill and clay plugs as required by soil conditions.

B. Sand: Clean concrete sand conforming to ASTM C 33.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install the dewatering system in accordance with approved Shop Drawings and as required by site conditions. Locate elements of the system to allow a continuous dewatering operation without interfering with the installation of any permanent project Work.

3.2 OPERATION

A. Keep the system in continuous operation from the time excavation is started in the dewatering area (or before if required by site conditions to lower the groundwater to the elevations specified) until the time backfilling is completed at least 2 feet above the normal groundwater level.

1. Do not discontinue dewatering operations without specific approval from the Engineer.

B. In the event excavation proceeds subsequent to dewatering as specified above, and the groundwater level is found to be within two feet of the excavation, the dewatering Contractor shall immediately continue to dewater as specified herein, including, but not limited to, additional dewatering and monitoring facilities, at no additional cost to the Owner. The excavation shall not be allowed to proceed below groundwater.

3.3 FIELD CONTROL

A. Maintain a careful check to detect any settlement in existing adjacent Work. Notify the Engineer of any signs of settlement. Establish settlement point bench marks and take periodic readings as directed. The Contractor shall take all such precautions and do any and all Work necessary to protect the stability and integrity of adjacent lands. Pavements, buildings and utilities from settlement or other movement that may be caused by his dewatering operations. The Contractor shall be solely responsible for any damage or injury to adjacent lands, pavements, buildings, or utilities caused by his dewatering or other operations or his failure to use corrective or preventive procedures or methods.

3.4 DISCHARGE

A. Dispose of all water removed from the excavation in such a manner as not to endanger public health, property, or any portion of the Work under construction or completed and shall be in accordance with all project permits and the Erosion Prevention and Sediment Control Plans.

B. Dispose of water in such a manner as to cause no inconvenience to others on or adjacent to the site.

C. Convey water from the excavation in a closed conduit. Do not use trench excavations as temporary drainage ditches.

D. Disposal of water shall be approved by the Engineer and shall not cause erosion or sedimentation to occur in existing drainage systems. All sedimentation or blocking of existing systems shall be thoroughly cleaned and returned to original condition by the Contractor, at his expense.

E. Provide approved sediment traps when water is conveyed into water courses.

3.5 REMOVAL

A. When system is no longer required, gradually decrease the pumping rate until the water table resumes its natural position so that the velocity of the returning groundwater will be low enough as not to carry fines with it.

B. When the dewatering system is no longer required and when directed by the Engineer, dismantle and remove the system and all appurtenances from the site.

3.6 CONSTRUCTION DEWATERING

A. Trench Dewatering

1. Before the pipe is lowered into the trench, dewatering may be necessary to visually inspect the trench bottom for the presence of rocks. Trench dewatering may also occur where tie-in welds are necessary, at road-boring sites adjacent to wetlands or water bodies where groundwater has seeped into the trench, locations where set-on weights are placed over the pipe, and in other areas where increased visibility or physical access to the trench is needed. Dewatering pumps and equipment placement are shown on Drawings ANGP-T-G-016 & ANGP-T-G-017. Dewatering will be performed in accordance with applicable appropriation and discharge permits, but at a minimum, will comply with the following procedures:

2. The trench will be dewatered into a well-vegetated upland area with an appropriate energy-dissipation device. Whenever possible, the slope at the point of discharge will be away from any streams or wetlands.

3. If the flow of a discharge cannot be kept out of streams, wetland, drainage ditches, etc., the discharge shall be filtered by one of the methods described below. Dewatering discharge will be directed into a sediment filter bag or a straw bale/silt fence dewatering structure which discharges into a vegetated area to prevent heavily silt-laden water from flowing into wetlands and waterbodies.

4. Only non-woven fabric filter bags will be used for dewatering.

5. Filter bags and dewatering structures must be maintained in a functional condition throughout dewatering activity (e.g., clogged or ripped bags must be replaced) and will be attended at all times during active pumping. Accumulated sediment from the filter bags shall be spread in an approved upland location.

6. The Contractor will comply with applicable permit requirements, including tracking volumes of water pumped, obtaining water samples (if needed) for testing, and taking necessary measures to meet effluent limitations.

7. The Contractor shall remove all water from the excavation promptly and continuously throughout the progress of the work and shall keep the excavation dry at all times until the work is completed and excavation is backfilled or have sufficient weight to resist uplift pressures. Groundwater levels shall be depressed to a minimum of 2 feet below excavation subgrade. No pipe or structure is to be laid in water and water shall not be allowed to rise on or flow over any pipe or structure until such time as approved by the Engineer.

8. Provide a suitable point of discharge from dewatering operations shall be conveyed in a non erosive manner satisfactory to the Engineer.

9. Precautions shall be taken to protect uncompleted work from flooding during storms or from other causes. All pipe lines or structures not stable against uplift during construction or prior to completion shall be thoroughly braced or otherwise protected.

B. Erosion Control

1. Dewatering of the trench will be conducted in a manner which will prevent soil erosion. Discharge rates will be monitored and regulated to prevent erosion. Energy-dissipation devices (i.e., filter bags or straw bale structures) will be used to prevent sediment discharge into a wetland or waterbody.

2. Contractor shall become familiar w/ VTAOT Specifications, Section 105.22 – Environmental Protection and Section 105.23 – Erosion Prevention & Sediment Control.

END OF SECTION

SECTION 312333 TRENCHING AND BACKFILLING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the excavation of trenching, backfilling, compacting, dewatering, excavation support and disposal, as shown on the Contract Drawings, and as herein specified.

B. The Engineer will determine the suitability of materials that are to be used in the work and should any materials encountered be unsatisfactory for the purpose intended, they shall be removed from the site at the Contractor's expense.

1.2 QUALITY ASSURANCE

A. Reference Standards:

1. The latest edition of the following standards, as referenced herein, shall be applicable.

a. Vermont Agency of Transportation (VTAOT), 2011 Standard Specifications for Construction Book.

b. "Standard Specifications for Highway Materials and Methods of Sampling and Testing, American Association of State Highway and Transportation Officials (AASHTO)."

c. American Society for Testing and Materials (ASTM).

d. National Electric Code(NEC)

B. The Contractor shall comply with the requirements for soil erosion and sedimentation control and other requirements of governmental authorities having jurisdiction, including the State.

C. The Contractor shall provide and pay for all costs in connection with an approved independent testing facility to determine conformance of soils and aggregate with the specifications, in accordance with Section "Quality Requirements."

1.3 SUBMITTALS

A. Samples:

1. The Contractor shall furnish representative earth materials to the testing laboratory for analysis and report, as directed by the Engineer, or as outlined in the specifications.

B. Test Results:

1. The testing laboratory shall submit written reports of all tests, investigations, findings and recommendations to the Contractor and the Engineer.

1.4 PROJECT REQUIREMENTS

A. Notify the Engineer of any unexpected subsurface condition.

B. Protect excavations by shoring, bracing, sheet piling, or by other methods, as required to ensure the stability of the excavation. Comply with OSHA requirements.

C. Underpin or otherwise support structures adjacent to the excavation which may be damaged by the excavation. This includes service lines.

D. Protection of Existing Utilities:

1. Locate existing underground utilities in areas of work. If utilities are to remain in place, provide adequate means of support and protection during earthwork operations. Comply with OSHA requirements.

2. Coordinate interruption and/or termination of utilities with the utility companies and the Owner.

3. Provide a minimum of forty-eight (48) hours notice to the Owner and receive written notice to proceed before interrupting any utility.

E. Demolish and completely remove from the site any existing underground utilities designated to be removed, as shown on the Drawings or as specified.

F. Repair any damaged utilities as acceptable to the Owner, Engineer, and utility company at no additional cost to the Owner.

G. Contractor shall comply with maintenance and protection requirements as approved by the authority having jurisdiction.

H. Protection of Persons and Property:

1. Barricade open excavations occurring as part of this work and post with warning signs & lights, if required.

2. Operate warning lights as recommended by authorities having jurisdiction, if required.

3. Protect structures, utilities, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.

4. Perform excavation within drip-line of trees to remain by hand, and protect the root system from damage or dry-out to the greatest extent possible. Maintain moist conditions for root system and cover exposed roots with burlap. Paint cut roots of 1" diameter and larger with emulsified asphalt tree paint.

PART 2 - PRODUCTS

2.1 MATERIALS

A. The backfill shall be carried to the upper-level of the trench or subgrade. No stones or blasted ledge exceeding 3 inches in diameter shall be allowable during backfill operations. If native material is unsuitable for backfill, as determined by the Construction Manager, bank run gravel meeting VTAOT Section 704.04 shall be utilized.

B. Run-of-trench material, meeting the above criteria, shall be considered suitable material and shall be used for trench backfill only after tested in accordance with Section "Quality Requirements" and approved by the Engineer. The Contractor shall pay for all additional testing required to determine the conformance of run-of-trench material, if at any time during the Work this material appears to be in non-conformance in the opinion of the Engineer.

PART 3 - EXECUTION

3.1 PRECONSTRUCTION MATERIAL QUALIFICATION TESTING

A. General:

1. Sufficient size samples shall be obtained from the potential borrow source to allow completion of tests listed in paragraph B below. Samples may be obtained from test borings, test pits, or from borrow pit faces provided that surficial dry or wet soil is removed to expose undisturbed earth. Tests listed below shall be performed on each sample obtained. A minimum of three (3) representative samples from each potential borrow source shall be furnished to the testing laboratory for prequalification testing. Test data shall be provided to the Engineer a minimum of 2 weeks prior to construction for approval of borrow source. Three test reports completed within three months prior to construction may be submitted for commercial earth borrow sources or suppliers of stone products (crushed stone or graded stone products) in lieu of prequalification tests as approved by the Engineer.

B. Material Tests:

1. Particle Size Analysis:

a. Method: ASTM D422
b. Number of Tests: One (1) per sample; three (3) per potential source.
c. Acceptance Criteria: Gradation within specified limits.

2. Maximum Density Determination:

a. Method: ASTM D1557 - Modified Proctor
b. Number of Tests: One (1) per sample; three (3) per potential source.

3. Re-establish gradation and maximum density of fill material if source is changed during construction.

3.2 PREPARATION

A. Establish required lines, levels, contours and datum.

B. Maintain benchmarks and other elevation control points; re-establish if disturbed or destroyed, at no additional cost to the Owner.

C. Establish location and extent of existing utilities prior to commencement of excavation.

3.3 EXCAVATION

A. All excavation shall be made to such depth as required and of the width shown on the Contract Drawings to provide suitable room for building the structures and laying the pipe(s) they are to contain and for sheeting, shoring, pumping and draining as necessary, and for removing peat, silt, or any other materials which the Engineer may deem unsuitable. Hand trench excavation may be required to protect existing utilities and structures.

B. Trench excavation for pipes shall be made by open cut to accommodate the pipe or structure at the depths indicated on the Contract Drawings. Excavation shall be made to such a depth and to the width indicated on the Contract Drawings so as to allow a minimum of six (6) inches of pipe zone

bedding in earth (9 inches in ledge) to be placed beneath the bottom of all structures and barrels, bells or couplings of all pipes installed unless otherwise specified on the drawings.

C. The bottom of the trench shall be accurately graded to provide a uniform layer of bedding material, as required, for each section of pipe. Trim and shape trench bottoms and leave free of irregularities, lumps, and projections.

D. Stockpile excavated subsoil for reuse where directed or approved.

E. Over excavation/under cut: If, in the opinion of the Engineer, existing material below the trench grade is unsuitable for properly placing bedding material and laying pipe, the Contractor shall excavate and remove the unsuitable material and replace the same with an approved pipe zone bedding material properly compacted.

F. Stability of Excavation: Slope sides of excavations shall comply with local codes and ordinances having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated. Maintain sides and slopes of excavation in safe condition until completion of backfilling.

G. Removal of materials beyond the indicated subgrade elevations, without authorization by the Engineer, shall be classified as unauthorized excavation and shall be performed at no additional cost to the Owner.

H. MUCK EXCAVATION (SEE VTAOT Section 203.05)

3.4 BEDDING AND BACKFILLING

A. All pipe trenches backfill (pipe zone bedding, pipe zone backfill and trench backfill) shall be compacted by tamping or rolling to achieve a minimum dry density of 90 percent of the modified Proctor maximum dry density of the material used (ASTM D1557). Backfill in pipe trenches to be covered with pavement or in roadways shall be compacted to a minimum of 95 percent of modified Proctor maximum dry density. Backfill materials shall be placed with water content within plus or minus three (3) percent of optimum moisture content per the modified Proctor method (ASTM D1557). Any water used for compaction shall be provided by the Contractor at his own expense. The Contractor is responsible for the repair of any trench settlement at no expense to the owner.

B. Bedding and backfilling shall be accomplished in three stages unless otherwise specified on the Contract Drawings. The first stage shall involve placement of "pipe zone bedding" as a layer(s) of selected material required to support, or to stabilize unsound or unsatisfactory foundation conditions. The second stage shall involve placement of "pipe zone backfill" from the top of the bedding material up to one (1) foot above the pipe. The third stage involves the placement of "trench backfill" in the remainder of the trench up to the surface of the ground or the bottom of any special surface treatment subgrade elevation.

The bedding material shall be placed in the trench after the trench has been excavated a minimum of six (6) inches in earth (9 inches in ledge) below the bell of the pipe to permit the placing of not less than six (6) inches in earth (9 inches in ledge) of bedding material unless otherwise specified on the Contract Drawings. Where, in the opinion of the Engineer, if more bedding material is required, the excavation shall be performed and bedding placed to the depth ordered by the Engineer.

D. Provide uniform bearing and support for each section of pipe at every point along the entire length, except where necessary to excavate for bell holes, pipe joints, or other required connections. Dig bell holes and depressions for joints after trench bottom has been graded. Dig no deeper, longer, or wider than needed to make the joint connection properly.

E. The bedding material shall be placed to the full width of trench. The bedding material shall be placed in loose lifts not exceeding twelve (12) inches to the elevation shown on the Contract Drawings or directed by the Engineer. The bedding material shall be tamped and compacted to form a firm and even bearing surface.

F. Pipe zone backfill shall be placed to the elevation shown on the Contract Drawings in loose lifts not-to-exceed twelve (12) inches in thickness, before compaction. The backfill shall be placed on both sides of the pipe at the same time and to approximately the same elevation. Any pipe that is damaged or moved out of alignment, regardless of cause, shall be replaced or realigned at the Contractor's expense. Each layer shall be thoroughly compacted by hand-tamping or mechanical means being careful not to damage the pipe. When the pipe zone backfill reaches one (1) foot over the top of the pipe, the entire surface shall be compacted by mechanical means.

G. The remainder, if any, of the trench above the pipe zone backfill shall be backfilled with suitable material in loose lifts not exceeding twelve(12) inches in thickness before compaction. Each layer shall be thoroughly compacted by mechanical means.

3.5 BACKFILLING AROUND STRUCTURES

A. The Contractor shall not place backfill against any structure without obtaining the approval of the Engineer. No dumping shall be allowed where materials would flow against or around such structures. Backfill material shall be deposited in horizontal layers not exceeding 6 inches in loose thickness or as shown on the Contract Drawings and thoroughly compacted by hand or by mechanical means to the satisfaction of the Engineer.

3.6 SUSPENSION OF WORK

A. Whenever the work is suspended, excavations shall be protected and the roadways, if any, left unobstructed. Within or adjacent to private property, material shall be stored at such locations as will not unduly interfere with traffic of any nature and in no case shall materials be stored in locations which will cause damage to existing improvements.

3.7 DISPOSAL OF MATERIAL

A. Excess and unsuitable materials shall be disposed of by the Contractor on the site in an area approved by the Engineer or legally disposed of off- site at the Contractors expense.

3.8 FIELD QUALITY CONTROL

A. Notify the Engineer at least three (3) working days in advance of all phases of filling and backfilling operations.

B. In-place density testing shall be performed to ascertain the compacted density of the fill and backfill materials in accordance with the following methods:

1. In-place relative density:

   a. Method: AASHTO T238, Nuclear Method

C. Perform initial density testing to verify that contractors proposed compaction effort will obtain the minimum required densities.

D. In-place density tests on trench backfills shall be provided for every 500 cubic yards of fill and in vertical lifts not exceeding two (2) feet, and at least once daily.

E. One particle size analysis (ASTM D422) and one modified Proctor compaction test (ASTM D1557) shall be competed for every 5,000 cubic yards of material placed.

F. The Engineer may direct additional tests to establish gradation, maximum density, and in-place density as required by working conditions, at the Contractor's expense.

G. Acceptance Criteria: The criteria for acceptability of in-place fill shall be in-situ dry density and moisture content. If a test fails to qualify, the fill shall be further compacted and re-tested. Subsequent test failures shall be followed by removal and replacement of the material.

END OF SECTION

SECTION 312500 EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. This Section covers work necessary for stabilization of soil to prevent erosion and sedimentation during and after construction and land disturbing activities. The work shall include the furnishing of all labor, materials, tools, and equipment to perform the work and services necessary as herein specified and as indicated on the Drawings. This shall include installation, maintenance, and final removal of all temporary soil erosion and sediment control measures. All erosion and sediment control methods and devices used shall conform to the latest requirements imposed by federal, state and local authorities.

B. Comply with applicable project permit applications [Permits Pending] for stormwater discharges from construction activities.

C. The minimum areas requiring soil erosion and sediment control measures are indicated on the Drawings. The right is reserved to modify the use, location, and quantities of soil erosion and sediment control measures based on activities of the Contractor and as the Engineer considers to be the best interest of the Owner.

D. The Contractor shall be responsible for repair of any damage caused and shall be financially responsible for any penalties imposed.

1.2 QUALITY ASSURANCE

A. Soil erosion and sediment control measures shall be implemented in accordance with the requirements and procedures outlined in this specification, contract Drawings and documents, state standards or guidelines for soil erosion and sediment control, and all regulatory authorities having jurisdiction. Where conflicts between requirements exist, the more restrictive rules shall govern.

B. The Contractor shall provide all temporary control measures shown on the Drawings, or as directed by the Owner, Owner's representative, or soil conservation district for the duration of the contract. Erosion and sediment control Drawings are intended to be a guide to address the stages of work shown. Additional measures not specified on the Drawings may be necessary and shall be implemented to address intermediary stages of work and any conditions that may develop during construction at no cost to the Owner.

C. Temporary control provisions shall be coordinated with permanent erosion control features to the extent practical to assure economical, effective and continuous erosion and sediment control throughout the construction and post-construction period.

D. Soil erosion and sediment control measures shall at all times be satisfactory to the Owner's Representative. Owner's Representative will inform the Contractor of unsatisfactory construction procedures and operations if observed. If the unsatisfactory construction procedures and operations are not responded to and corrected within 48 hours, the Owner's Representative may suspend the performance of any or all other construction until the unsatisfactory condition has been corrected. Such suspension shall not be the basis of any claim by the Contractor for additional compensation nor for an extension of time to complete the work. Any complaints, fines, etc. relating to ineffective erosion control, shall be the sole responsibility of the Contractor.

E. The Contractor shall inspect all soil erosion and sediment control measures at least at the beginning and end of each day to ascertain that all devices are functioning properly during construction. Maintenance of all soil erosion and sediment control measures on the project site shall be the responsibility of the Contractor until final stabilization is complete, and until the permanent soil erosion controls are established and in proper working condition.

F. The Contractor shall protect adjacent properties and watercourses from soil erosion and sediment damage throughout construction.

1.3 GENERAL

A. Soil erosion stabilization and sediment control measures consist of the following elements:

1. Maintenance of existing permanent or temporary storm drainage piping and channel systems, as necessary.

2. Installation and maintenance of stabilized construction entrance(s).

3. Construction of new permanent and temporary storm drainage piping and channel systems, as necessary.

4. Construction of temporary erosion control facilities such as silt fences, check dams, etc.

5. Topsoil and Seeding: Placement and maintenance of Temporary Seeding on all areas disturbed by construction. Placement of permanent topsoil, fertilizer, and seed, etc., in all areas not occupied by structures or pavement, unless shown otherwise.

6. Soil Stabilization Seeding: Placement of fertilizer and seed, etc., in areas as Specified hereinafter.

B. The Contractor shall be responsible for phasing Work in areas allocated for his exclusive use during this Project, including any proposed stockpile areas, to restrict sediment transport. This will include installation of any temporary erosion control devices, ditches, or other facilities.

C. The areas set aside for the Contractor's use during the Project may be temporarily developed to provide satisfactory working, staging, and administrative areas for his exclusive use. Preparation of these areas shall be in accordance with other requirements contained within these Specifications and shall he done in a manner to both control all sediment transport away from the area.

D. Stockpiles remaining in place longer than the durations detailed in the project permits shall be considered permanent stockpiles for purposes of erosion and sediment control.

E. All permanent stockpiles shall be seeded with soil stabilization seed and protected by construction of silt fences completely surrounding stockpiles and located within 10 feet of the toes of the stockpile slopes.

F. Sediment transport and erosion from working stockpiles shall be controlled and restricted from moving beyond the immediate stockpile area by construction of temporary toe-of-slope ditches and accompanying silt fences as necessary. The Contractor shall keep these temporary facilities in operational condition by regular cleaning, re-grading, and maintenance.

G. The Contractor shall maintain all elements of the Soil Erosion Stabilization and Sedimentation Control systems and facilities to be constructed during this Project for the duration of his activities on this Project.

H. Formal inspections made jointly by the Contractor and the Engineer shall be conducted every 2 weeks to evaluate the Contractor's conformance to the requirements of these Specifications, unless more frequent inspections are required by applicable permits.

I. Replacement or repair of failed or overloaded silt fences, check dams, or other temporary erosion control devices shall be accomplished by the Contractor within 24 hours after receiving written notice from the Engineer.

J. If the Contractor has not complied with any of the above maintenance efforts to the satisfaction of the Engineer within 2 working days after receiving written notification from the Engineer, the Owner shall have the prerogative of engaging others to perform any needed maintenance or cleanup, including removal of accumulated sediment at constructed erosion control facilities, and deduct from the Contractor's monthly partial payment the costs for such efforts in accordance with the General Condition of the Contract.

1.4 SUBMITTALS

A. Submittals shall he made in accordance with Section "Submittal Procedures"

B. Material Certificates signed by material producer and Contractor certifying that each material item complies with or exceeds specified requirements.

C. Results of all tests and investigations, including recommendations.

D. Submit product data, samples, specifications and manufacturer's installation procedures for approval as directed by Engineer prior to use.

PART 2 - PRODUCTS

2.1 GENERAL

A. Contractor shall provide all materials necessary to perform the work in accordance with the Project Manual, Permits Applications and Permits, or as shown/specified on the Drawings.

PART 3 - EXECUTION

3.1 GENERAL

A. The Contractor shall comply with and implement all necessary measures as indicated on the project plans and provided in the contract documents.

B. Review the soil erosion and sediment control Drawings as they apply to current conditions. Any deviation from the Drawings must be submitted for approval to the site Engineer in writing at least 72 hours prior to commencing that work.

C. Initial soil sediment and erosion control devices shall be in place prior to any land disturbing activity, in their proper sequence, and maintained until permanent protection is established.

D. The limit of the area of any earthwork operations in progress shall be commensurate with the Contractor's capability and progress in keeping the finished grading, mulching, seeding, and other such permanent control measures current and in accordance with the accepted schedule for construction phasing. Should seasonal limitations make such coordination unrealistic, as

determined by the Owner's Representative, temporary erosion control measures shall be provided immediately by the Contractor at no expense of the Owner.

E. Temporary erosion control measures shall be used to correct conditions which develop during construction that are needed prior to installation of permanent control features, or that are temporarily needed to control erosion that develops during normal construction practices, but are not associated with permanent control features on the project.

F. The Contractor shall incorporate all permanent erosion control features (stabilization) into the project at the earliest practical time to minimize the need for temporary controls.

G. A stabilized construction exit (SCE) shall be installed and maintained at any point where construction vehicles enter a public right-to-way, street or parking area. The SCE shall be used to eliminate mud from the construction area onto public right-of-way. The SCE shall be constructed as shown on the Drawings. Any mud or debris tracked on streets shall be cleaned up immediately.

H. Dust Control: The Contractor shall provide a commercial grade; enclosed, broom mechanical street sweeper to control sediment and/or dust that is tracked on to the adjacent streets. The street sweeper shall be equipped with a water storage tank to wet the area prior to sweeping. Where on site controls do not prevent material from being tracked on to adjacent streets, the street sweeper shall be used to clean the adjacent streets immediately. In addition, at a minimum, the adjacent streets shall be swept at the end of each week or as directed by the Engineer.

I. Any disturbed or stockpiled areas that will be left exposed more than the days required by the project Permits shall immediately receive temporary or permanent seeding. Mulch/straw shall be used if the season prevents the establishment of a temporary cover. Disturbed areas shall be limed and fertilized prior to temporary seeding.

J. Permanent vegetation shall be established as specified on all exposed areas according to project permits after final grading. Mulch as necessary for seed protection and establishment. Lime and fertilize seedbed prior to permanent seeding.

K. Slopes shall be permanently seeded and mulched. Any slopes that erode easily shall be temporarily seeded and mulched. Any slopes deeper than 3:1 or steeper or as indicated on Drawings shall be protected with Erosion Control Blanket per specifications.

L. All storm drainage outlets must be stabilized, as specified, before the discharge points become operational. Equip all inlets with inlet protection immediately upon construction.

M. Discharge from dewatering operations for the excavated areas shall not be directed to surface waters without first properly removing the suspended sediment through filtration and/or settlement. The Contractor shall obtain any required permits associated with dewatering activities.

N. Silt fence shall be installed at locations on the Drawings and any additional locations necessary for proper sediment control. The Contractor shall maintain the silt fence until the project is stabilized and shall remove and dispose of the silt fence and silt accumulation when 1/3 the height of the fence is reached.

O. Soil erosion and sediment control shall include but not be limited to the approved measures. The Contractor shall be responsible for providing all additional measures that may be necessary to accomplish the intent of the Drawings.

P. Comply with all other requirements of authorities having jurisdiction.

Q. Soil Stabilization and Temporary Seeding, except in wetland areas:

1. Soil stabilization seeding shall consist of the application of the following materials in quantities as further described herein for stockpiles and disturbed areas left inactive for more than the number of days defined by the project permits.

   a. Lime.
   b. Fertilizer.
   c. Seed.
   d. Mulch.
   e. Maintenance.

2. Hydroseeding will be permitted as an alternative method of applying seed and associated soil conditioning agents described above. Should the Contractor elect to apply soil stabilization seeding by hydroseeding methods, he shall submit his operational plan and methods to the Engineer.

3. Temporary Seeding is to be placed and maintained over all disturbed areas prior to Permanent Seeding. Maintain Temporary Seeding until such time as areas are approved for Permanent Seeding. As a minimum, maintenance shall include the following:

   a. Fix-up and reseeding of bare areas or re-disturbed areas.
   b. Mowing for stands of grass or weeds exceeding 6 inches in height.

END OF SECTION

SECTION 313710 STONE FILL

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes provisions for the placement of stone fill or riprap on embankment slopes, drainage courses, culvert inlets and outlets, and streambanks.

1.2 REFERENCES

A. 2011 Standard Specifications for Construction – Vermont Agency of Transportation.

B. "Standard Specifications for Highway Materials and Methods of Sampling and Testing, American Association of State Highway and Transportation Officials (AASHTO)."

1.3 SUBMITTALS

A. Material Certificates signed by material producer and Contractor, certifying that each material item complies with or exceeds specified requirements.

B. Results of all tests, investigations, including recommendations.

C. Manufacturer's catalog cuts, production data, and recommended installation procedures for geotextile fabric.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stone fill shall conform with VTrans Section 706.04.

B. Riprap shall conform with VTrans Section 706.03

C. Bedding shall conform with VTrans Section 704.17AGeotextile: Shall conform to the requirements of Section "Geotextiles".

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

A. Clear the surface on which the rip-rap is to be placed of brush, trees, or other objectionable material.

3.2 INSTALLATION

A. Geotextile Fabric: Shall be installed in conformance with the requirements of Section "Geotextiles."

B. Bedding

1. Place the bedding material on the geotextile to the full thickness, six (6) inch minimum, in one operation using methods that will not cause segregation of the aggregate.

2. Prevent contamination of bedding material by natural soils or other materials. Remove bedding materials that become contaminated and replace with uncontaminated bedding material.

3. Do not drop bedding material onto the geotextile from a height exceeding three (3) feet.

C. Stone Fill and Riprap

1. Place the stones so that the dimension approximately equal to the layer thickness is perpendicular to the slope surface such that the weight of the stone is carried by the underlying material, not by the adjacent stones.

2. Place stone fill to minimize void spaces between adjacent stones.

3. On slopes the largest stones shall be placed at the bottom of the slope.

4. Place stone fill to avoid disruption and damage to the bedding material.

END OF SECTION

SECTION 315000 EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes, but is not limited to, the following:

1. Shoring and bracing necessary to protect existing buildings, streets, walkways, utilities, and other improvements and excavation against loss of ground or caving embankments.

2. Maintenance of shoring and bracing.

3. Removal of shoring and bracing, as required.

B. The purpose of this work is to insure the safety of workmen and the public exposed to the hazard of falling or sliding material. It shall be the Contractor's responsibility to provide protection adequate for this purpose. Details of this sheeting must conform with the requirements of Title 29 Code of Federal Regulations, Part 1926, Safety and Health Regulations for Construction (OSHA). Contractor shall refer to Contract Plans Section 248 Stormwater Technical Memorandum, Attachment 1, Erosion Prevention and Sediment Control Plans, Sheet No. ANGP-T-G-015, "Typical Trench Detail".The Engineer shall reserve the right to increase the minimum requirements set forth therein, depending on the hazard.

1.2 PERFORMANCE REQUIREMENTS

A. Design, furnish, install, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls and of resisting soil and hydrostatic pressure and superimposed and construction loads.

1. Delegated Design: Design excavation support and protection system, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

2. Prevent surface water from entering excavations by grading, dikes, or other means.

3. Install excavation support and protection systems without damaging existing buildings, structures, and site improvements adjacent to excavation.

4. Monitor vibrations, settlements, and movements.

1.3 SUBMITTALS

A. Delegated-Design Submittal: For excavation support and protection system indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

B. Layout drawings for excavation support system and other data prepared by, or under the supervision of, a qualified professional engineer.

C. System design and calculations must be acceptable to local authorities having jurisdiction.

1.4 QUALITY ASSURANCE

A. Engineer Qualifications: A professional engineer legally authorized to practice in jurisdiction where Project is located, and experienced in providing successful engineering services for excavation support systems similar in extent required for this Project.

B. Regulations: Comply with codes and ordinances of governing authorities having jurisdiction.

1.5 PROJECT CONDITIONS

A. Project-Site Information: A geotechnical report has been prepared for this Project and is available for information only. The opinions expressed in this report are those of geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by geotechnical engineer. Owner will not be responsible for interpretations or conclusions drawn from the data

1. Make additional test borings and conduct other exploratory operations necessary for excavation support and protection.

2. The geotechnical report is included elsewhere in the Project Manual.

B. Before starting work, verify governing dimensions and elevations. Verify condition of adjoining properties. Take photographs or video tape to record any existing settlement or cracking of structures, pavements, and other improvements. Prepare a list of such damages, verified by dated photographs or video tape, and signed by Contractor and others conducting investigation.

C. During excavation, resurvey benchmarks weekly, maintaining accurate log of surveyed elevations for comparison with original elevations. Promptly notify Engineer if changes in elevations occur or if cracks, sags, or other damage is evident.

D. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

1. During installation of excavation support and protection systems, regularly resurvey benchmarks, maintaining an accurate log of surveyed elevations and positions for comparison with original elevations and positions. Promptly notify Engineer if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.

1.6 EXISTING UTILITIES

A. Protect all existing active utility services and structures.

B. Notify municipal agencies and service utility companies having jurisdiction. Comply with requirements of governing authorities and agencies for protection, relocation, removal, and discontinuing of services.

C. Interruption of Existing Utilities: Do not interrupt any utility serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:

1. Notify Construction Manager no fewer than two days in advance of proposed interruption of utility.

2. Do not proceed with interruption of utility without Construction Manager's written permission

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 GENERAL

A. In general, this item will be required wherever an excavation exceeds five feet in depth and the side slopes are not laid back to a safe gradient as set forth in Title 29 Code of Federal Requirements, Part 1926, Safety and Health Regulations for Construction (OSHA).

B. Wherever shoring is required, locate the system to clear permanent construction and to permit forming and finishing of concrete surfaces. Provide shoring system adequately anchored and braced to resist earth and hydrostatic pressures.

3.2 REMOVAL AND REPAIRS

A. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and bear soil and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils or damaging structures, pavements, facilities, and utilities.

1. Remove excavation support and protection systems to a minimum depth of 48 inches below overlaying construction and abandon remainder. Contract Plans Section 248 Stormwater Techanical Memorandum, Attachment 1, Erosion Prevention and Sediment Control Plans, Sheet No. ANGP-T-C-015, "Typical Trench Detail".

2. Fill voids immediately with approved backfill compacted to density specified in Section "Earth Moving" or "Trenching and Backfilling".

3. Repair or replace, as approved by Engineer adjacent work damaged or displaced by removing excavation support and protection systems.

4. Leave excavation support and protection systems permanently in place.

END OF SECTION

SECTION 321116 SUBBASE COURSES

PART 1 - GENERAL

1.1 SUMMARY

A. This work shall consist of furnishing and placing one or more courses of approved gravel, crushed gravel, dense graded crushed stone, or other proportioned material on a prepared surface or at other locations.

B. Proof rolling of subgrade for walks and pavements is included in this Section.

C. Replacement of unsuitable subgrade materials is included in another Section.

D. Final grading of pavement subbase is specified in this Section.

E. Stabilization fabric is included in another Section.

1.2 REFERENCES

A. VTAOT Section 301 - Subbase

B. "Standard Specifications for Highway Materials and Methods of Sampling and Testing, American Association of State Highway and Transportation Officials (AASHTO)."

C. "American Society for Testing and Materials (ASTM)."

1.3 SUBMITTALS

A. Source Quality Control Test Reports: Submit test reports directly to Owner's Representative from the testing agency with copy to Contractor.

B. Field Testing Reports: Submit results of field testing directly to Engineer with copy to Contractor. Reference testing location to plan, and cross-reference to all retesting required to accept installed subbase material.

1. Note action taken next to all sub-standard test results.

1.4 QUALITY ASSURANCE

A. Testing Laboratory Qualifications: To qualify for acceptance, the soil testing laboratory must demonstrate to Owner's Representative satisfaction, based on evaluation of laboratory-submitted criteria conforming to ASTM E 699, that it has the experience and capability to conduct the required testing without delaying the progress of the Work.

B. Field Testing and Inspection Service: Contractor shall retain the services of the same independent soil testing laboratory used for source qualification testing to provide soil testing during pavement subbase installation.

PART 2 - PRODUCTS

2.1 SOURCE QUALIFICATION TESTING

A. Contractor shall employ and pay for a qualified independent soil testing laboratory to perform soil testing services for source qualification.

1. GRAVEL FOR SUBBASE. Gravel for subbase shall consist of material reasonably free from silt, loam, clay, and organic matter. It shall be obtained from approved sources and shall meet the following requirements:

(a) Grading. Gravel for subbase shall meet the gradation requirements of the following table as determined in accordance with AASHTO T 27 and AASHTO T 11:

TABLE 704.04A - GRAVEL FOR SUBBASE

Sieve Designation	Percentage By Mass (Weight) Passing Square Mesh Sieves
4.75 mm (No. 4)	20 to 60
150 μ m (No. 100)	0 to 12
75 μ m (No. 200)	0 to 6

(b) Re-establish subbase material properties if source is changed during construction.

(c) The gravel shall be uniformly graded from coarse to fine. The maximum size stone particles shall not exceed 67 percent of the thickness of the layer being placed.

(d) Percent of Wear. Percent of wear shall not be more than 50 percent when tested in accordance with AASHTO T 96.

2. CRUSHED GRAVEL FOR SUBBASE. Crushed gravel for subbase shall be produced from natural gravels or crushed quarried rock and shall be a material reasonably free from silt, loam, clay, or organic matter. It shall be obtained from approved sources and shall meet the following requirements:

(a) Grading. Crushed gravel for subbase shall be uniformly graded from coarse to fine and shall meet the gradation requirements of the following table as determined in accordance with AASHTO T 27 and AASHTO T 11:

TABLE 704.05A - CRUSHED GRAVEL FOR SUBBASE

Grading	Sieve Designation	Percentage by Mass (Weight) Passing Square Mesh Sieves
Coarse	4 inch	95 to 100
	No. 4	25 to 50
	No. 100	0 to 12
	No. 200	0 to 6
Fine	2 inch	100
	1 ½ inch	90 to 100
	No. 4	30 to 60
	No. 100	0 to 12
	No. 200	0 to 6

(b) Percent of Wear. Percent of wear shall not be more than 40 percent when tested in accordance with AASHTO T 96.

(c) Fractured Faces. At least 50 percent by mass (weight) of the material coarser than the No. 4 sieve shall have at least one fractured face in accordance with Vermont Standard Test Procedures AOT-MRD 23.

3. DENSE GRADED CRUSHED STONE FOR SUBBASE. Dense graded crushed stone for subbase shall consist of clean, hard, uniformly graded, crushed stone. It shall be sufficiently free from dirt, deleterious material, and pieces that are structurally weak and shall meet the following requirements:

(a) Source. This material shall be obtained from approved sources. The area from which this material is obtained shall be stripped and cleaned before blasting.

(b) Grading. Dense graded crushed stone for subbase shall meet the gradation requirements of the following table as determined in accordance with AASHTO T 27 and AASHTO T 11:

TABLE 704.06A - DENSE GRADED CRUSHED STONE FOR SUBBASE

Sieve Designation	Percentage by Mass (Weight) Passing Square Mesh Sieves
3 1/2 inch	100
3 inch	90 to 100
2 inch	75 to 100
1 inch	50 to 80
1/2 inch	30 to 60
No. 4	15 to 40
No. 200	0 to 6

(c) Percent of Wear. The percent of wear of the crushed stone shall be not more than 40 percent when tested in accordance with AASHTO T 96. When the aggregate is composed of crushed igneous rock, the percent of wear of the crushed stone shall be not more than 50 percent when tested in accordance with AASHTO T 96.

(d) Thin and/or Elongated Pieces. Not more than 30 percent by mass (weight) of the material coarser than the No. 4 sieve shall consist of thin and/or elongated pieces in accordance with Vermont Standard Test Procedures AOT-MRD 22.

(d) Filler. Filler shall be obtained from approved sources and shall consist of clean, hard, uniform graded, crushed stone and/or stone screenings produced by the crushing process. The material shall consist of hard, durable particles sufficiently free from dirt, organic material, structurally weak pieces, and other deleterious materials and shall comply with the requirements of parts (a), (c), and (d) above.

Filler material shall meet the gradation requirements of the following table as determined in accordance with AASHTO T 27 and AASHTO T 11:

TABLE 704.06B - FILLER

Sieve Designation	Percentage by Mass (Weight) Passing Square Mesh Sieves
¾ inch	100
½ inch	70 to 100
No. 4	50 to 90
No. 100	0 to 12
No. 200	0 to 6

4. GRAVEL BACKFILL FOR SLOPE STABILIZATION. Gravel backfill for slope stabilization shall meet the requirements of Subsection 704.04(a).

5. GRANULAR BACKFILL FOR STRUCTURES. Granular backfill for structures shall be obtained from approved sources. It shall consist of satisfactorily graded, free draining granular material reasonably free from loam, silt, clay, and organic material.

Granular backfill for structures shall meet the gradation requirements of the following table as determined in accordance with AASHTO T 27 and AASHTO T 11:

TABLE 704.08A –
GRANULAR BACKFILL FOR STRUCTURES

Sieve Designation	Percentage by Mass (Weight) Passing Square Mesh Sieves
3 inch	100
No. 4	45 to 75
No. 100	0 to 12
No. 200	0 to 6

6. BACKFILL FOR MUCK EXCAVATION. Backfill for muck excavation shall consist of granular material or blasted rock broken into various sizes that will form a compact embankment with a minimum of voids.

When granular material is used, it shall meet the requirements of Subsection 703.04.

B. Pre-Qualified Material Sources: Contractor may submit, in lieu of independent laboratory test results, a copy of recent VTranscertification of proposed source.

1. Engineer may require additional testing by an independent testing laboratory when:

a. The latest test for the source is two (2) years old.

b. A change in the character of the material occurs.

c. The Engineer determines that additional testing is necessary due to the observed properties of the supplied material.

2.2 MATERIALS

A. Materials shall meet the requirements of the following VTAOT Subsections:

1. Coarse Aggregate for Concrete.....704.02
2. Gravel for Subbase 704.04

3. Crushed Gravel for Subbase 704.05
4. Dense Graded Crushed Stone for Subbase 704.06

B. Certifications required shall be submitted in conformance with Subsection 700.02 – Material Certification.

C. All material shall meet the specified gradation prior to placement. All processing shall be completed at the source.

D. Stabilization Fabric: Conform to Section "Geotextiles"

PART 3 - EXECUTION

3.1 PREPARATION

A. Establish required lines, levels, contours, and datum.

B. Maintain benchmarks and other elevation control points. Re-establish, if disturbed or destroyed, at no additional cost to Owner.

C. Proof-roll existing subgrade to the satisfaction of the Engineer. Should the subbase course become unstable at any time prior to the placement of the overlying course(s), correct the unstable condition to the satisfaction of the Engineer. Replace unstable or weak subgrade materials with suitable material as provided in the Specifications.

D. Place stabilization fabric in locations as directed on the plans and in accordance with Section "Geotextiles" after subgrade has been proof-rolled and accepted by the Engineer.

3.2 INSTALLATION

A. Place subbase material in uniform horizontal layers, with a maximum compacted thickness of 12 inches.

B. Place subbase in a manner to avoid segregation. Uncontrolled spreading shall not be permitted.

C. After each layer of subbase material is placed, it shall be graded to obtain a smooth, even surface as specified in VTAOT Subsection 301.05.

3.3 COMPACTION

A. Following grading operations, the subbase shall be thoroughly compacted as specified in Subsection VTAOT 301.06.

A. Where subbase courses must be moisture-conditioned before compaction, uniformly apply water to the surface. Prevent free water from appearing on the surface during or subsequent to compaction operations.

B. Compact all portions of each layer to a density not less than 95 percent of the maximum density.

C. Final tolerances for the top surface of the subbase course requires that the surface does not extend more than ¼ inch above nor more than ¼ inch below the specified grade at any location.

3.4 TRAFFIC ON SUBBASE

A. The movement of vehicular traffic over the final surface of the subbase may be permitted at locations designated by, and under such restrictions as ordered by the Engineer, provided such movements take place prior to the final finishing of this course to the specified tolerance. The movement of construction equipment on this course may be permitted, at locations designated by and under such restrictions as ordered by the Engineer at locations where permission is granted for such movement, the temporary surface of the course upon which the construction traffic is running, shall be placed and maintained for at least 2 inches above the final surface of this course. Just prior to paving, and after all construction traffic not required for the removal has ceased, remove the 2 inch protective layer, prepare the exposed surface of the course, and compact to the specified tolerance.

B. Should the subbase become mixed with the subgrade or any other material, through any cause whatsoever, remove such mixture and replace it with the specified subbase material.

3.5 FIELD QUALITY CONTROL

A. Notify the Engineer at least one (1) working day in advance of all phases of subbase installation.

B. Comply with the requirements of this Section for in-place relative density testing.

1. In-place relative density:

Method:	AASHTO T238, Nuclear Method
Number of Tests:	One (1) per specified interval.
Acceptance Criteria:	± Two (2) percent of specified percent compactions.

2. Compaction tests shall be provided for every 1000 SY of subbase placement. A minimum of three for each lift is required.

3. The Engineer may direct additional tests to establish gradation, maximum density, and in-place density as required by working conditions.

4. Acceptance Criteria: The sole criterion for acceptability of in-place subbase shall be in situ dry density. Minimum dry density for all subbase shall be 95 percent of the maximum dry density. If a test fails to qualify, the fill shall be further compacted and re-tested. Subsequent test failures shall be followed by removal and replacement of the material.

END OF SECTION

SECTION 321216 ASPHALT PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes provisions for hot-mixed asphalt concrete paving over prepared subbase.

B. This section includes provisions for replacing pavement removed during the course of the Work, or damaged resulting from Contractor's operations.

C. This work shall consist of constructing one or more courses of bituminous mixture on a prepared foundation in accordance with these specifications and the specific requirements of the type of surface being placed, and in reasonably close conformity with the lines, grades, thicknesses, and typical cross sections shown on the Plans or established by the Engineer.

D. This section does not cover porous asphalt in locations defined on the project drawings. Porous asphalt shall meet the "UNHSC Design Specifications for Porous Asphalt Pavement and Infiltration Beds".

1.2 REFERENCES

A. VTAOT Section 406 – MARSHALL BITUMINOUS CONCRETE PAVEMENT

B. "Standard Specifications for Highway Materials and Methods of Sampling and Testing, American Association of State Highway and Transportation Officials (AASHTO)."

C. "American Society For Testing and Materials (ASTM)."

1.3 SUBMITTALS

A. Material Certificates signed by material producer and Contractor, certifying that each material item complies with or exceeds specified requirements. Materials shall meet the requirements of the following Subsections:

1.	Performance-Graded Asphalt Binder	702.02
2.	Emulsified Asphalt, RS-1	702.04
3.	Aggregate for Marshall Bituminous Concrete Pavement	704.10(a)

B. Field Test Reports: Submit results of field testing directly to the Engineer.

1.4 SITE CONDITIONS

A. WEATHER AND SEASONAL LIMITATIONS.

1. The bituminous material shall not be placed when the ambient air temperature and temperature at the paving site in the shade and away from artificial heat is below 40°F for courses 1 ¼ inches or greater in compacted thickness or below 50°F for courses less than 1 ¼ inches in compacted thickness.

2. Bituminous material shall not be placed on a wet or frozen surface or when weather or other conditions would prevent the proper handling, finishing, or compacting of the material, unless otherwise approved by the Engineer.

3. Bituminous material shall not be applied between November 1st and May 1st. Bituminous wearing course materials shall not be applied before May 15th or after October 15th.

4. When it is in the public interest, the Construction Engineer may adjust the ambient air temperature requirements, pavement temperature requirements, or extend the dates of the paving season.

5. The road surface is sufficiently dry.

6. Weather conditions or other conditions are favorable and are expected to remain so for the performance of satisfactory work.

C. Grade Control: Establish and maintain required lines and elevations.

D. In no instance shall the materials and thicknesses of pavement and subbase courses replaced be less than that removed, unless approved by the Engineer.

1.5 SEQUENCING AND SCHEDULING

A. Coordinate the placement of asphalt concrete pavement with the completion of underground work by other trades.

B. VTAOT Section 406.17 - TRAFFIC CONTROL. Whenever traffic must be maintained during a paving operation, uniformed traffic officers and/or flaggers shall be stationed at each end of the section being paved and at such other locations as may be required by the Engineer. The uniformed traffic officers or flaggers shall conform to the requirements of VTAOT Section 630.

Whenever one-way traffic is maintained by the Contractor, the traveling public shall not be delayed more than 10 minutes unless otherwise directed by the Engineer. Two-way traffic shall be maintained during non-working hours.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Unless otherwise noted on the Drawings, all bituminous concrete pavement shall be designed in conformance with the design criteria for Bituminous Concrete Pavement. Unless otherwise specified for highways, Type I shall be used for base course, Types I or II shall be used for binder course, and Types II, III, or IV shall be used for wearing course. Unless otherwise specified for bridges, Type IV shall be used for binder course. Refer to VTATO Section 406, Table 406.03A – Percentage by Mass Passing Square Mesh Sieve.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

A. General: Remove loose material from compacted subbase surface immediately before commencing paving operations.

B. Proof-roll prepared subbase surface with a ten-ton static, steel-wheel roller to check for unstable areas and areas requiring additional compaction, witnessed by the Engineer at least forty-eight (48) hours prior to scheduled paving operations.

C. Do not begin paving work until deficient subbase areas have been corrected and are ready to receive paving.

D. Sawcut edges of existing pavement to achieve straight line transitions between old and new pavement. Make a second sawcut through the top course of existing pavement, 18 inches from the first cut to provide a staggered joint.

E. Tack Coat: Apply to contact surfaces of previously constructed asphalt or Portland cement concrete and surfaces abutting or projecting into asphalt concrete pavement. Distribute at rate of 0.03 to 0.07 gallons per square yard of surface.

F. Allow to dry until at proper condition to receive paving.

G. Exercise care in applying bituminous materials to avoid smearing of adjoining surfaces. Remove and clean damaged surfaces.

H. Do not commence pavement replacement operations until all buried work beneath pavement repair has been completed to the satisfaction of the Engineer.

I. Where trench dimensions preclude the use of proof rolling equipment, demonstrate the stability of the subgrade and subbase through other means, as acceptable to the Engineer.

3.2 PLACING AND COMPACTING MIX

A. General: Place and compact asphalt pavement courses in accordance with VTAOT Section 406 unless otherwise specified.

B. Place inaccessible and small areas by hand, and compact with hot hand tampers or vibrating plate compactors.

C. Chamfer edges of walks at 45° angle where walks do not abut curb.

D. Joints: Make joints between old and new pavements, or between successive days' work, to ensure continuous bond between adjoining work. Construct joints to have same texture, density, and smoothness as other sections of asphalt concrete course. Clean contact surfaces and apply tack coat.

E. Place tack coat between successive courses if more than forty-eight (48) hours have elapsed after placing the preceding course. Apply tack coat at a rate of 0.03 to 0.07 gallons per square yard of surface.

F. Compaction: Compact asphalt pavement courses with a static steel wheel roller only, unless otherwise approved by the Engineer, based upon work conditions.

G. Remove and patch areas of any asphalt concrete course deemed unsatisfactory by the Engineer, at the Contractor's expense. Remove hardened or set asphalt by saw cutting.

H. Adhere to VTAOT Section 406.14 for compaction requirements. This, however, shall not relieve the Contractor of his responsibility to provide a well densified pavement. It shall be the Contractor's obligation to recognize difficulties in compacting the mix, and to make appropriate corrections.

I. Roll and compact the asphalt concrete course until the finished surface is free from depressions, waves or other defects that would prevent proper drainage. The finished surface shall be uniform in texture and appearance.

J. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened. No traffic will be permitted on placed material until the material has been thoroughly compacted and has cooled to 140°F unless otherwise authorized by the Engineer.

K. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.3 FIELD QUALITY CONTROL

A. General: Testing in-place asphalt concrete courses for compliance with requirements for thickness and surface smoothness will be done by Owner's testing laboratory. Repair or remove and replace unacceptable paving as directed by Engineer.

1. For material with an average density that is less than 90.5% or in excess of 98.5%, the Construction Engineer will evaluate whether the material will be removed and replaced by the Contractor at no expense to the Agency or a greater penalty imposed.

B. Joints: Shall comply in accordance with VTAOT Section 406.15, Joints between old and new pavements, or between successive day's work, shall have a thorough and continuous bond between the old and new mixtures.

C. Thickness: In-place compacted thickness tested in accordance with ASTM D 3549 will not be acceptable if exceeding following allowable variations:

1. Base Course: Plus or minus 1/2 inch.

2. Binder and Surface Course: Plus or minus 1/4 inch.

3. Cumulative Thickness Tolerances: Plus or minus 1/4 inch for nominal cumulative thicknesses less than or equal to 4 inches. Plus or minus 1/2 inch for nominal cumulative thicknesses greater than 4 inches.

D. Surface Smoothness: Contractor shall comply with VTAOT Section 406.16 – Surface Tolerances. Test finished surface of each asphalt concrete course for smoothness, using 10-foot straightedge applied parallel with and at right angles to centerline of paved area. Surfaces will not be acceptable if exceeding the following tolerances for smoothness:

1. Base and Binder Course Surfaces: 1/4 inch.

2. Wearing Course Surface: 3/16 inch.

3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

E. Check surface areas at intervals as directed by Engineer.

F. On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impracticable, the mixture shall be spread, raked, luted, and compacted by hand methods.

END OF SECTION

SECTION 321500 CRUSHED STONE SURFACING

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes the placement of crushed stone pavement.

B. Place crushed stone pavement in conformance with the lines, grades, thicknesses and typical sections as shown or detailed on the Drawings.

1.2 REFERENCES

A. VTAOT Section 401 – Aggregate Surface Courses, This work shall consist of furnishing and placing a wearing course of approved aggregate on a prepared surface.

B. "Standard Specifications for Highway Materials and Methods of Sampling and Testing, American Association of State Highway and Transportation Officials (AASHTO)."

C. "American Society for Testing and Materials (ASTM)."

1.3 SUBMITTALS

A. Samples:

1. The Contractor shall furnish earth materials to the testing laboratory for analysis and report, as directed by the Engineer, or as outlined in the specifications VTAOT Section 700.02 – Materials Certification

B. Test Reports:

1. The testing laboratory shall submit written reports of all tests, investigations, findings, and recommendations to the Contractor and the Engineer.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aggregate for Surface Course and Shoulders: Aggregate for surface course and shoulders shall consist of clean, hard gravel, crushed gravel, or crushed stone. It shall be reasonably free from silt, loam, clay, or organic matter. It shall be obtained from approved sources and shall meet the requirements of VTAOT Section 401 and meeting the following gradation requirements VTAOT Section 704.12A – Aggregate for Surface Course and Shoulders:

Sieve	Percent Passing
1-1/2"	100
1"	90 - 100
No. 4	–45 - 65
No. 100	0 - 15
No. 200	0 - 12

1. Grading. Aggregate for surface course and shoulders shall be uniformly graded from coarse to fine and shall meet the gradation requirements of the following table as determined in accordance with AASHTO T 27 and AASHTO T 11:

2. Percent of Wear. The percent of wear when tested in accordance with AASHTO T 96 shall be not more than 40 percent for material used as aggregate surface course or not more than 50 percent for material used as aggregate shoulders.

B. It shall be the Contractor's responsibility to provide a material which meets this specification and is within his capabilities to fine grade to the required tolerances. Should the subbase course become unstable at any time prior to the placement of the overlying course due to the gradation of the material furnished, the Contractor shall, at his own expense, correct the unstable condition to the satisfaction of the Engineer.

C. All material shall meet the specified gradation prior to placement. All processing shall be completed at the source.

PART 3 - EXECUTION

3.1 PREPARATION

A. Establish required lines, levels, contours, and datum.

B. Maintain benchmarks and other elevation control points. Re-establish, if disturbed or destroyed at no additional cost to the Owner.

C. Place aggregate surface course only after subgrade and subbase has been proof-rolled and approved by the Engineer. Unstable or weak subgrade materials shall be replaced with suitable material at the Contractor's expense.

3.2 PLACING

A. Place soil stabilization fabric in accordance with VTAOT Section 720 "Stabilization or Geotextile Fabric," if required by the Drawings or otherwise specified.

B. The maximum layer thickness for placement of any aggregate surface material shall be 6 ± 2 inches after compaction. All layers shall be placed and compacted at approximately equal thickness. In the placement of layers, all joints shall be staggered at least 12 inches.

C. The aggregate shall be placed and properly shaped using equipment that allows the typical cross-section and design grade to be attained. Should aggregate segregation occur, the Contractor shall remove and replace the segregated material or manipulate it until uniform gradation is obtained.

3.3 COMPACTION

A. After each layer of surface material is placed, it shall be thoroughly compacted to a uniform density of not less than 95 percent of the maximum dry density determined by AASHTO T 99, Method C. Suitable and effective equipment, meeting the approval of the Engineer, shall be used to obtain a true and even surface during compaction. All holes or depressions found during the compacting shall be filled with additional material, reworked, and compacted. If required, water shall be uniformly applied over the aggregate material during compaction in an amount necessary to produce proper consolidation. The aggregate shall be thoroughly compacted with an approved power roller with a mass (weight) not less than 8 tons, or an approved rubber tired roller, or by other approved methods.

END OF SECTION

SECTION 011000- SUMMARY

PART 1 - GENERAL

1.1 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: Project consists of Vermont Gas Systems - Addison Natural Gas Project – Meter & Regulation Stations.

1. Project Location: Chittenden County and Addison County Vermont.
2. Owner: Vermont Gas Systems, Inc., 85 Swift Street, South Burlington 05403

B. Engineer Identification: The Contract Documents, dated October, 2013were prepared for Project by CHA, III Winners Circle, Albany, NY 12205.

C. Construction Manager: CHA Tech Services, LLC has been engaged as Construction Manager for this Project to serve as an advisor to Owner and to provide assistance in administering the Contract for Construction between Owner and Contractor, according to a separate contract between Owner and Construction Manager.

D. The Work consists of the following:

E. Facilities Contractor scope is the installation of all components required for a fully operational site including, but not limited to: piping, valves, fittings, mechanical, civil & electrical works, site improvements and other necessary appurtenances.

1. Williston Meter and Regulation Station:

F. The Williston Station is located on the south side of Route 2 (Williston Road) approximately 850' east of the Williston Road and Talcott Road intersection, in Williston. Boundaries of Pipeline Contractor and Facilities Contractor responsibility are shown on project drawings.

G. Facilities Contractor scope is the installation of all components required for a fully operational station including, but not limited to: piping, valves, fittings, regulators, mechanical work, civil & electrical works, site improvements and other necessary appurtenances. Plantings and associated landscaping items are not included in this Contract.

1. Plank Road Meter and Regulation Station:

H. The Plank Road Station is located on the south side of Plank Road approximately 1,050 feet west of the Plank Road and North Street intersection, in New Haven. Boundaries of Pipeline Contractor and Facilities Contractor responsibility are shown on project drawings.

I. Facilities Contractor scope is the installation of all components required for a fully operational station including, but not limited to: piping, valves, fittings, regulators, mechanical work, civil & electrical works, site improvements and other necessary appurtenances. Plantings and associated landscaping items are not included in this Contract.

1. Middlebury Meter and Regulation Station:

J. The Middlebury station is located on the west side of Route 7 approximately 2,600 feet north of the Route 7 and Exchange Street intersection. It is also the terminus of the transmission mainline.

Boundaries of Pipeline Contractor and Facilities Contractor responsibility are shown on project drawings.

K. Facilities Contractor scope is the installation of all components required for a fully operational station including, but not limited to: piping, valves, fittings, regulators, mechanical work, civil & electrical works, site improvements and other necessary appurtenances. Plantings and associated landscaping items are not included in this Contract.

L. All stations will be located on parcels that are owned by Vermont Gas Systems. Stations shall be constructed in accordance with CFR Title 49, Part 192 and all other applicable codes and standards stated in the contract specifications. Further details on each station are provided in station specific drawings.

1.2 CONTRACTS

A. Project will be constructed under multiple contracts.

B. Multiple contracts are separate contracts, representing significant construction activities, between Owner and separate contractors. See Section "Summary of Multiple Contracts" for a description of work included under each separate contract. Each contract is performed concurrently and coordinated closely with construction activities performed on Project under other contracts. Contracts for this Project include the following:

1. Vermont Gas Systems Addison Natural Gas Project – Horizontal Directional Drill Design/Build

2. Vermont Gas Systems Addison Natural Gas Project – Transmission Main

3. Vermont Gas Systems Addison Natural Gas Project – Meter and Regulation Stations

4. Vermont Gas Systems Addison Natural Gas Project – Distribution Mains

1.3 USE OF PREMISES

A. General: Each Contractor shall have full use of premises for construction operations, including use of Project site and pipe yards during construction period. Each Contractor's use of premises is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

B. The Owner has obtained necessary easements for the Project. The list of Property Owner's is included as an attachment to the Supplemental Conditions of the Project Manual. The Contractor shall be responsible for complying with all terms, requirements, and conditions of these easements.

1.4 WORK UNDER OTHER CONTRACTS

A. Work under other contracts listed in section 1.2 will be carried out in conjunction with this contract. Dependent on overall project construction planning, work on this contract may be conducted before, after or concurrently with other contracts.

B. The Contractor is expected to cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract.

C. Where two contractors are working concurrently at a scope boundary, it is expected that the Contractor plans work effectively to minimize any delay.

1.5 OWNER-FURNISHED PRODUCTS

A. Owner will furnish the following products:

1. Piping, valves/actuators, fittings that are two-inch, in nominal size, and greater.
2. Mechanical/electrical/control components listed on the project plans as "By Owner"
3. Precast concrete structures including doors, louvers, and lighting.

B. The Contractor shall provide/furnish all other labor, materials and equipment not specifically listed in Section 1.5A for a complete installation of all work at each site.

C. The Contractor shall include providing support systems to receive Owner's equipment and furnished products.

1. Contractor is responsible for receiving at the Owner's stockyard, loading, transporting, unloading, and handling Owner-furnished items at Project site.

2. After delivery, Owner will inspect delivered items for damage. Contractor shall be present for and assist in Owner's inspection.

3. If Owner-furnished items are damaged, defective, or missing, Owner will arrange for replacement.

4. Contractor is responsible for protecting Owner-furnished items from damage during storage and handling, including damage from exposure to the elements.

5. If Owner-furnished items are damaged as a result of Contractor's operations, Contractor shall repair or replace them.

1.6 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are generally organized into Divisions and Sections.

1. Section Identification: The Specifications use section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of sections in the Contract Documents.

B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.

2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.

a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF PRODUCTS ORDERED IN ADVANCE – Refer to Section 1.5A of this Specification.

END OF SECTION

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for alternates.

1.2 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.3 PROCEDURES

A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.

C. Execute accepted alternates under the same conditions as other work of the Contract.

D. Schedule: A Schedule of Alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No. 1 – NGA OQ Alternative

1. Alternate #1 shall be a Lump Sum deducted cost to the overall project Lump Sum amount. If accepted by the Owner, the Contractor will provide an acceptable alternative to the specification requirement as described in the Instructions to Bidders, Item 21.1 Operator Qualification Requirements, whereby the Contractor will meet the requirements for any covered task performed by the Northeast Gas Association (NGA). Include with the deduct price, the name of the proposed OQ service provider.

END OF SECTION

SECTION 012600- CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.

1.2 MINOR CHANGES IN THE WORK

A. Owner's Consultant will issue through Construction Manager supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time.

1.3 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Construction Manager will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Proposal Requests issued by Construction Manager are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.

2. Within time specified in Proposal Request after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.

b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.

c. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to Construction Manager.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.

2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.

3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.

4. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

5. Comply with requirements in Division 1 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.

C. Proposal Request Form: For Change Order proposals use CSI Change Order Request (proposal format).

1.4 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Proposal Request, Construction Manager will issue a Change Order for signatures of Owner and Contractor on form.

1.5 WORK CHANGE DIRECTIVE

A. Work Change Directive: Construction Manager may issue a Work Change Directive. Work Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Work Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Work Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 012900- PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.2 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.3 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.

1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:

a. Contractor's progress schedule.
b. Application for Payment form.
c. List of subcontractors.
d. List of products.
e. List of principal suppliers and fabricators.
f. Schedule of submittals.

2. Submit the Schedule of Values to Owner's Consultant through Construction Manager at earliest possible date but no later than 21 days before the date scheduled for submittal of initial Applications for Payment.

3. Subschedules: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values correlated with each phase of payment.

B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the Schedule of Values:

a. Project name and location.
b. Name of Engineer.
c. Project number.
d. Contractor's name and address.
e. Date of submittal.

2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:

   a. Generic Name
   b. Related Specification Section or Division.
   c. Description of the Work.
   d. Name of subcontractor.
   e. Name of manufacturer or fabricator.
   f. Name of supplier.
   g. Change Orders (numbers) that affect value.
   h. Dollar value.

      1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.

4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.

5. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

   a. Differentiate between items stored on-site and items stored off-site. Include evidence of insurance or bonded warehousing if required.

6. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.

7. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

   a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.

8. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.4 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by Owner's Consultant and Construction Manager and paid for by Owner.

   1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.

C. Payment Application Forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets for Applications for Payment or use forms provided by Owner for Applications for Payment. Sample copies will be provided, if requested.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Construction Manager will return incomplete applications without action.

1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.

2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

E. Transmittal: Submit 3 signed and notarized original copies of each Application for Payment to Construction Manager by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.

1. Submit partial waivers on each item for amount requested, before deduction for retainage, on each item.

2. When an application shows completion of an item, submit final or full waivers.

3. Owner reserves the right to designate which entities involved in the Work must submit waivers.

4. Waiver Delays: Submit each Application for Payment with Contractor's waiver of mechanic's lien for construction period covered by the application.

a. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.

5. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.

G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.

2. Schedule of Values.

3. Contractor's Construction Schedule (preliminary if not final).

4. Products list.

5. Submittals Schedule (preliminary if not final).

6. List of Contractor's staff assignments.

7. List of Contractor's principal consultants.

8. Copies of permits, if required to be obtained by Contractor.

9. Initial progress report.

10. Report of preconstruction conference.

11. Certificates of insurance and insurance policies.

H. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.

2. This application shall reflect Certificates of Partial Substantial Completion issued previously for designated portions of the Work.

I. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.

2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.

3. Updated final statement, accounting for final changes to the Contract Sum.

4. AIA Document G706 "Contractor's Affidavit of Payment of Debts and Claims."

5. AIA Document G706A "Contractor's Affidavit of Release of Liens."

6. AIA Document G707 "Consent of Surety to Final Payment."

7. Evidence that claims have been settled.

8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.

9. Final, liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 013000- PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. Coordination.
2. Submittals.
3. Administrative and supervisory personnel.
4. Project meetings.
5. General installation provisions.
6. Cleaning and protection.

B. Where applicable, each prime Contractor shall participate in these coordination requirements, even though certain areas of responsibility are assigned to a specific prime Contractor.

1.2 COORDINATION

A. Coordination: Coordinate construction activities included under various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections of these Specifications that are dependent upon each other for proper installation, connection, and operation.

B. Coordination: Each prime contractor shall cooperate with Owner's, coordinate construction activities to assure efficient and orderly installation of each part of the Work.

1. Where installation of one part of the Work is dependent on installation of other components, either before or after its own installation, cooperate with scheduled construction activities in the sequence required to obtain the best results.

2. Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair.

3. Make adequate provisions to accommodate items scheduled for later installation.

4. Coordinate construction activities with public and private utilities.

a. Notify Dig Safe® a minimum of 48 hours prior to excavation or blasting.

b. Notify the Owner, Construction Manager, and the Owner's Representative of any utility locations encountered which conflict with the work. Coordinate with the Owner and Utility Company in the protection, removal, relocation or replacement of conflicting utility locations.

C. Where necessary, prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.

1. Prepare similar memoranda for the Owner and separate Contractors where coordination of their Work is required.

D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's Construction Schedule.
2. Preparation of the Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Pre-installation conferences.
7. Project closeout activities.

E. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

1.3 SUBMITTALS

A. Coordination Drawings: Prepare and submit coordination Drawings where close and careful coordination is required for installation of products and materials fabricated off-site by separate entities, and where limited space availability necessitates maximum utilization of space for efficient installation of different components.

1. Show the interrelationship of components shown on separate Shop Drawings.
2. Indicate required installation sequences.
3. Comply with requirements contained in Section "Submittals Procedures."

B. Staff Names: Within 15 days of starting construction operations, submit a list of principal staff assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone.

1.4 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Construction Manager of scheduled meeting dates and times.

2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.

3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Owner's Representative, within 3 days of the meeting.

B. Preconstruction Conference: Schedule a preconstruction conference and organizational meeting at the Project site or other convenient site prior to commencement of construction activities. Conduct the meeting to review responsibilities and personnel assignments.

1. Attendees: Authorized representatives of Owner, the Owner's Consultants, and their consultants; the Contractor and its superintendent; major subcontractors; manufacturers; suppliers and other concerned parties shall each be represented at the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Discuss items of significance that could affect progress, including the following:

   a. Tentative construction schedule.
   b. Phasing.
   c. Critical work sequencing.
   d. Designation of responsible personnel.
   e. Procedures for processing field decisions and Change Orders.
   f. Procedures for processing Applications for Payment.
   g. Distribution of the Contract Documents.
   h. Submittal procedures.
   i. Preparation of Record Documents.
   j. Use of the premises.
   k. Responsibility for temporary facilities and controls.
   l. Parking availability.
   m. Office, work, and storage areas.
   n. Equipment deliveries and priorities.
   o. Safety procedures.
   p. First aid.
   q. Security.
   r. Progress cleaning.
   s. Working hours.
   t. Housekeeping.
   u. Subcontractors.
   v. Preliminary Schedule of Shop Drawings and Samples.
   w. Co-ordination with other contractors.
   x. Insurance in Force.
   y. Contractor's Schedule of Values.

C. Progress Meetings: Conduct progress meetings at the Project Site at regularly scheduled intervals. Coordinate dates of meetings with preparation of payment requests.

1. Attendees: In addition to representatives of the Owner and Owner's Consultants, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the current status of Project.

   a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how

construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

b. Review present and future needs of each entity present, including the following:

1) Interface requirements.
2) Time.
3) Sequence of operations.
4) Status of submittals.
5) Deliveries.
6) Off-site fabrication.
7) Access.
8) Site utilization.
9) Temporary facilities and controls.
10) Work hours.
11) Hazards and risks.
12) Progress cleaning.
13) Quality and work standards.
14) Change Orders.
15) Documentation of information for payment requests.

3. Reporting: No later than 3 days after each progress meeting date, distribute copies of minutes of the meeting to each party present and to parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.

a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION PROVISIONS

A. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

B. Manufacturer's Instructions: Comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.

C. Inspect materials or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items.

D. Provide attachment and connection devices and methods necessary for securing Work. Secure Work true to line and level. Allow for expansion and building movement.

E. Recheck measurements and dimensions, before starting each installation.

F. Install each component during weather conditions and Project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.

G. Coordinate temporary enclosures with required inspections and tests, to minimize the necessity of uncovering completed construction for that purpose.

3.2 CLEANING AND PROTECTION

A. During handling and installation, clean and protect construction in progress and adjoining materials in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

B. Clean and maintain completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

C. Limiting Exposures: Supervise construction activities to ensure that no part of the construction completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Where applicable, such exposures include, but are not limited to, the following:

1. Excessive static or dynamic loading.
2. Excessive internal or external pressures.
3. Excessively high or low temperatures.
4. Thermal shock.
5. Excessively high or low humidity.
6. Air contamination or pollution.
7. Water or ice.
8. Solvents.
9. Chemicals.
10. Light.
11. Radiation.
12. Puncture.
13. Abrasion.
14. Heavy traffic.
15. Soiling, staining and corrosion.
16. Combustion.
17. Electrical current.
18. Unusual wear or other misuse.
19. Contact between incompatible materials.
20. Destructive testing.
21. Misalignment.
22. Excessive weathering.
23. Unprotected storage.
24. Improper shipping or handling.
25. Theft.
26. Vandalism.

END OF SECTION

SECTION 013200- CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Preliminary Construction Schedule.
2. Contractor's Construction Schedule.
3. Submittals Schedule.
4. Daily construction reports.
5. Material location reports.
6. Field condition reports.
7. Special reports.
8. Construction photographs.

1.2 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.

2. Predecessor activity is an activity that must be completed before a given activity can be started.

B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

C. Critical Path: The longest continuous chain of activities through the network schedule that establishes the minimum overall Project duration and contains no float.

D. Event: The starting or ending point of an activity.

E. Float: The measure of leeway in starting and completing an activity.

1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.

2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the following activity.

3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

F. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.

G. Major Area: A story of construction, a separate building, or a similar significant construction element.

H. Milestone: A key or critical point in time for reference or measurement.

I. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.

1.3 SUBMITTALS

A. Qualification Data: For firms and persons specified in "Quality Assurance" Articleto demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

B. Submittals Schedule: Submit 3 copies of schedule. Arrange the following information in a tabular format:

1. Scheduled date for first submittal.
2. Specification Section number and title.
3. Submittal category (action or informational).
4. Name of subcontractor.
5. Description of the Work covered.
6. Scheduled date for Engineer's and Construction Manager final release or approval.

C. Preliminary Construction Schedule: Submit 2 printed copies; and one electronic copy. Preliminary Network Diagram: Submit 2 printed copies; one a single sheet of reproducible media, and one electronic copy; large enough to show entire network for entire construction period.

D. Contractor's Construction Schedule: Submit 2 printed copies of initial schedule, one a reproducible print and one a blue- or black-line print, large enough to show entire schedule for entire construction period.

1. Submit an electronic copy of schedule on CD or DVD. Include type of schedule (Initial or Updated) and date on label.

E. CPM Reports: Concurrent with CPM schedule, submit 3] printed copies of each of the following computer-generated reports. Format for each activity in reports shall contain activity number, activity description, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float.

1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.

2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.

3. Total Float Report: List of all activities sorted in ascending order of total float.

4. Earnings Report: Compilation of Contractor's total earnings from commencement of the Work until most recent Application for Payment.

F. Construction Photographs: Submit a digital photo of each view within 7 days of taking photographs.

1. Format: Digital JPG image with minimum resolution of 2584x1936 and image quality set to fine/high or better.

2. Identification: A photo-log shall be provided containing a record for each submitted photo with the following information:

   a. File Name of Photo.

   b. Name of Project.

   c. Name and address of photographer.

   d. Name of Engineer [and Construction Manager].

   e. Name of Contractor.

   f. Date photograph was taken.

   g. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

   Photo-logs may be scanned hard-copy forms, though digital formats such as MS Word, MS Excel or MS Access are preferred. If the delivery method for the photos is via an online file management system, photo-log records should be entered into that system provided it supports entering the above information.

3. Delivery: All photos and accompanying identification will be uploaded to the Project's Collaboration Website.

G. Daily Construction Reports: Submit 2 copies at monthly intervals.

H. Material Location Reports: Submit 2 copies at monthly intervals.

I. Field Condition Reports: Submit 2 copies at time of discovery of differing conditions.

J. Special Reports: Submit 2 copies at time of unusual event.

1.4 QUALITY ASSURANCE

A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting.

1.5 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from parties involved.

2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

C. Auxiliary Services: Cooperate with photographer and provide auxiliary services requested, including access to Project site and use of temporary facilities including temporary lighting.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE

A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.

1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.

2. Initial Submittal: Submit concurrently with preliminary network diagram. Include submittals required during the first 60 days of construction. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.

a. At Contractor's option, show submittals on the Preliminary Construction Schedule, instead of tabulating them separately.

3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."

B. Time Frame: Extend schedule from date established for the Notice of Award.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

C. Activities: Treat each separate area as a separate numbered activity for each principal element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Construction Manager.

2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.

3. Submittal Review Time: Include review and resubmittal times indicated in Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.

4. Startup and Testing Time: Include not less than 30 days for startup and testing.

5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for the Owner's Consultant and Construction Manager's administrative procedures necessary for certification of Substantial Completion.

D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Phasing: Arrange list of activities on schedule by phase.

2. Work under More Than One Contract: Include a separate activity for each contract.

3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.

4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.

5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.

6. Work Restrictions: Show the effect of the following items on the schedule:

   a. Coordination with existing construction.
   b. Limitations of continued occupancies.
   c. Uninterruptible services.
   d. Use of premises restrictions.
   e. Provisions for future construction.
   f. Seasonal variations.
   g. Environmental control.

7. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

   a. Subcontract awards.
   b. Submittals.
   c. Purchases.
   d. Fabrication.
   e. Sample testing.
   f. Deliveries.
   g. Installation.
   h. Tests and inspections.
   i. Adjusting.
   j. Curing.
   k. Startup and placement into final use and operation.

E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to the Notice to Proceed, Substantial Completion, and Final Completion.

F. Cost Correlation: At the head of schedule, provide a cost correlation line, indicating planned and actual costs. On the line, show dollar volume of the Work performed as of dates used for preparation of payment requests.

1. Refer to Section "Payment Procedures" for cost reporting and payment procedures.

G. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall project schedule.

H. Computer Software: Prepare schedules using a program that has been developed specifically to manage construction schedules.

1. Microsoft Project, Version 2010, for Windows XP Professional operating system.

2.3 PRELIMINARY CONSTRUCTION SCHEDULE

A. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.4 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

A. General: Prepare network diagrams using AON (activity-on-node) format.

B. Preliminary Network Diagram: Submit diagram within 14 days of date established for the Notice of Award. Outline significant construction activities for the first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

C. CPM Schedule: Prepare Contractor's Construction Schedule using a CPM network analysis diagram.

1. Develop network diagram in sufficient time to submit CPM schedule so it can be the Notice of Award.

2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
4. Use "one workday" as the unit of time.

D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the preliminary network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:

a. Preparation and processing of submittals.
b. Purchase of materials.
c. Delivery.
d. Fabrication.
e. Installation.

2. Processing: Process data to produce output data or a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.

3. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.

   a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.

E. Initial Issue of Schedule: Prepare initial network diagram from a list of straight "early start-total float" sort. Identify critical activities. Prepare tabulated reports showing the following:

1. Contractor or subcontractor and the Work or activity.
2. Description of activity.
3. Principal events of activity.
4. Immediate preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.
7. Activity duration in workdays.
8. Total float or slack time.
9. Average size of workforce.
10. Dollar value of activity (coordinated with the Schedule of Values).

F. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity durations in workdays.
5. Changes in the critical path.
6. Changes in total float or slack time.
7. Changes in the Contract Time.

G. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.

1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.

2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.

3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.

4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.

   a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.

   b. Submit value summary printouts one week] before each regularly scheduled progress meeting.

2.5 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel, by spread and crew, at Project site.
4. List of both active and in-active equipment
5. High and low temperatures and general weather conditions.
6. Accidents.
7. Meetings and significant decisions.
8. Unusual events (refer to special reports).
9. Stoppages, delays, shortages, and losses.
10. Meter readings and similar recording.
11. Emergency procedures.
12. Orders and requests of authorities having jurisdiction.
13. Change Orders received and implemented.
14. Work Change Directives received.
15. Service connected and disconnected.
16. Equipment or system tests and startups.
17. Partial Completions and occupancies.
18. Substantial Completions authorized.

B. Material Location Reports: At monthly intervals, prepare a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with lit a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.

C. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare a detailed report. Submit with a request for information on CSI Form 13.2A. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.6 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, and response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule 1 week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.

2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.

3. As the Work progresses, indicate Actual Completion percentage for each activity.

B. Distribution: Distribute copies of approved schedule to the Owner's Representative, Construction Manager, Owner, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.

2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

3.2 CONSTRUCTION PHOTOGRAPHS

A. Date Stamp: Unless otherwise indicated, date and time stamp each photograph as it is being taken so stamp is integral to photograph.

B. Preconstruction Photographs: Before starting construction, take photographs of Project site and surrounding properties from different vantage points, as directed by Construction Manager. Show existing conditions adjacent to property.

C. Periodic Construction Photographs: Take color photographs monthly, coinciding with cutoff date associated with each Application for Payment. Photographer shall select vantage points to best show status of construction and progress since last photographs were taken.

1. Field Office Prints: Retain an electronic set of photographs in field office at Project site, available at all times for reference. Identify photographs the same as for those submitted to the Owner's Representative and Construction Manager.

D. Final Completion Construction Photographs: Take photographs after date of Substantial Completion for submission as Project Record Documents. Construction Manager will direct photographer for desired vantage points.

END OF SECTION

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other miscellaneous submittals.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Owner Consultant's and Construction Manager's responsive action.

B. Informational Submittals: Written information that does not require Owner Consultant's and Construction Manager's approval. Submittals may be rejected for not complying with requirements.

C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.

D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1. Submittal Administrative Requirements:

a. Engineer's Digital Data Files: Electronic digital data files of the Contract Drawings will be provided by Owner's Representative for Contractor's use in preparing submittals.

1) Owner's Consultant will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings.

a) Owner's Consultant makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.

b) Digital Drawing were prepared using AutoCAD Software.

c) Digital data drawing files will made available after signing a CAD release form.

b. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1) Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

2) Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.

3) Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.

4) Retain subparagraph below if one submittal has an impact on another submittal. Submittals that require concurrent review should be so indicated in those Sections.

5) Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

a) Owner's Consultant's and Construction Manager reserve the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

c. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Construction Manager's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1) Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Construction Manager will advise Contractor when a submittal being processed must be delayed for coordination.

2) Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.

3) Resubmittal Review: Allow 15 days for review of each resubmittal.

4) Sequential Review: Where sequential review of submittals by Owner's Consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.

5) Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Owner's Consultants and Construction Manager, allow 15 days for review of each submittal. Submittal will be returned to Construction Manager, before being returned to Contractor.

E. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.

2. Name file with submittal number or other unique identifier, including revision identifier.

   a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).

3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Owner's Consultant and Construction Manager.

4. Transmittal Form for Electronic Submittals: Use software-generated form from electronic project management software acceptable to Owner, containing the following information:

   a. Project name.

   b. Date.

   c. Name and address of Owner's Consultant

   d. Name of Contractor.

   e. Name of firm or entity that prepared submittal.

   f. Names of subcontractor, manufacturer, and supplier.

   g. Category and type of submittal.

   h. Submittal purpose and description.

   i. Specification Section number and title.

   j. Specification paragraph number or drawing designation and generic name for each of multiple items.

   k. Drawing number and detail references, as appropriate.

   l. Location(s) where product is to be installed, as appropriate.

   m. Related physical samples submitted directly.

   n. Indication of full or partial submittal.

   o. Transmittal number, numbered consecutively.

   p. Submittal and transmittal distribution record.

   q. Other necessary identification.

   r. Remarks.

5. Metadata: Include the following information as keywords in the electronic submittal file metadata:

   a. Project name.
   b. Number and title of appropriate Specification Section.
   c. Manufacturer name.
   d. Product name.

F. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Owner's Representative and Construction Manager on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

   1. Note date and content of previous submittal.

   2. Note date and content of revision in label or title block and clearly indicate extent of revision.

   3. Resubmit submittals until they are marked with approval notation from Owner's Consultant and Construction Manager's action stamp.

H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

I. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Owner's Consultant's and Construction Manager's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

   1. Post electronic submittals as PDF electronic files directly to Project Web site specifically established for Project.

      a. Owner's Consultant, through Construction Manager, will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

   2. Submit electronic submittals via email as PDF electronic files.

      a. Owner's Consultant, through Construction Manager, will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

   3. Action Submittals: Submit three paper copies of each submittal unless otherwise indicated. Owner's Representative, through Construction Manager, will return two copies.

4. Informational Submittals: Submit two paper copies of each submittal unless otherwise indicated. Owner's Consultant and Construction Manager will not return copies.

5. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

   a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.

   b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.

2. Mark each copy of each submittal to show which products and options are applicable.

3. Include the following information, as applicable:

   a. Manufacturer's catalog cuts.
   b. Manufacturer's product specifications.
   c. Standard color charts.
   d. Statement of compliance with specified referenced standards.
   e. Testing by recognized testing agency.
   f. Application of testing agency labels and seals.
   g. Notation of coordination requirements.
   h. Availability and delivery time information.

4. Submit Product Data before or concurrent with Samples.

5. Submit Product Data in the following format:

   a. PDF electronic file.

   b. Three paper copies of Product Data unless otherwise indicated. Consultant, through Construction Manager, will return two copies.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based on Owner's Consultant's digital data drawing files is otherwise permitted.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

   a. Identification of products.
   b. Schedules.
   c. Compliance with specified standards.
   d. Notation of coordination requirements.
   e. Notation of dimensions established by field measurement.

f. Relationship and attachment to adjoining construction clearly indicated.
g. Seal and signature of professional engineer if specified.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least [8-1/2 by 11 inches (215 by 280 mm), but no larger than 30 by 42 inches (750 by 1067 mm)]

3. Submit Shop Drawings in the following format:

a. PDF electronic file.

D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.

2. Manufacturer and product name, and model number if applicable.

3. Number and name of room or space.

4. Location within room or space.

5. Submit product schedule in the following format:

a. PDF electronic file.

E. Coordination Drawing Submittals: Comply with requirements specified in Division 01 Section "Project Management and Coordination."

F. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."

G. Application for Payment and Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."

H. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Division 01 Section "Quality Requirements."

I. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section "Closeout Procedures."

J. Maintenance Data: Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."

K. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of Engineers and owners, and other information specified.

L. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

M. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

N. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

O. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

P. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

Q. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

R. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

S. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

T. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

U. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

V. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

W. Construction Photographs and Videotapes: Comply with requirements in Division 1 Section "Construction Progress Documentation."

2.2 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Owner's Representative.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file and three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

2.3 CONTRACTOR'S PROJECT HEALTH & SAFETY PLAN

A. No later than the Pre-construction meeting, the Contractor shall submit to the Construction Manager a written Health & Safety Plan which states the Contractor's company policy relative to safety. The plan must also address specific health and safety concerns which are expected to be encountered on the project. As a minimum this plan shall include:

1. Listing of project and company safety officers
2. Specific company safety policies
3. Employee Safety Training Program
4. Administrative procedures to handle employee health & safety concerns
5. Procedures for insuring worker compliance with health and safety requirements.

B. The Contractor shall be responsible to insure that each Subcontractor employed on the project complies with the requirements of this section either by submitting a copy of the subcontractor's Project Health & Safety Plan or by submitting a letter from the Subcontractor stating that they will comply with the provisions of the Contractor's Project Health & Safety Plan.

C. Submission of the required Project Health & Safety Plan by the Contractor is primarily for information or record purposes and shall not be construed to imply approval by the Owner or to relieve the Contractor from the responsibility to adequately protect the health & safety of all workers involved in the project.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Review each submittal and check for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Construction Manager.

B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 OWNER'S CONSULTANT'S AND CONSTRUCTION MANAGER'S ACTION

A. General: Owner's Consultant and Construction Manager will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: Owner's Consultant and Construction Manager will review each submittal, make marks to indicate corrections or modifications required, and return it. Owner's Representative and Construction Manager will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:

1. Final Unrestricted Release: Where submittals are marked "No Exceptions Taken," that part of the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents; final acceptance will depend upon that compliance.

2. Final-But-Restricted Release: When submittals are marked "Make Corrections Noted," that part of the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents; final acceptance will depend on that compliance.

3. Returned for Resubmittal: When submittal is marked "Revise and Resubmit," "Rejected," or "Submit Specified Item," do not proceed with that part of the Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal in accordance with the notations; resubmit without delay. Repeat if necessary to obtain a different action mark.

    a. Do not permit submittals marked "Revise and Resubmit," "Rejected," or "Submit Specified Item" to be used at the Project site, or elsewhere where Work is in progress.

4. Other Action: Where a submittal is primarily for information or record purposes, special processing or other activity, the submittal will be returned, marked "Action Not Required."

C. Informational Submittals: Owner's Consultant and Construction Manager will review each submittal and will not return it, or will reject and return it if it does not comply with requirements. Owner's Representative and Construction Manager will forward each submittal to appropriate party.

D. Submittals not required by the Contract Documents will not be reviewed and may be discarded.

END OF SECTION

SECTION 014000- QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.

2. Specified tests, inspections, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with the Contract Document requirements.

3. Requirements for Contractor to provide quality-control services required by Owner's Representative, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.2 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction complies with requirements. Services do not include contract enforcement activities performed by Engineer.

C. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

1.3 DELEGATED DESIGN

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Owner's Representative.

1.4 SUBMITTALS

A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

C. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Description of test and inspection.
3. Identification of applicable standards.
4. Identification of test and inspection methods.
5. Number of tests and inspections required.
6. Time schedule or time span for tests and inspections.
7. Entity responsible for performing tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

D. Reports: Prepare and submit certified written reports, that include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Ambient conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

E. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, notices, receipts for fee payments, , correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

C. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

D. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance.

E. Engineering services are defined as those performed for installations of the system, assembly, or products that are similar to those indicated for this Project in material, design, and extent.

F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirement for specialists shall not supersede regulations governing the Work, nor interfere with local trade-union jurisdictional settlements and similar conventions.

G. Testing Agency Qualifications: An agency with the experience and capability to conduct testing and inspecting indicated, as documented by ASTM E 548, that specializes in types of tests and inspections to be performed. Each testing agency shall be authorized by the authorities having jurisdiction in the state in which the project is located.

H. Preconstruction Testing: Testing agency shall perform preconstruction testing for compliance with specified requirements for performance and test methods.

1. Contractor responsibilities include the following:

a. Provide test specimens and assemblies representative of proposed materials and construction. Provide sizes and configurations of assemblies to adequately demonstrate capability of product to comply with performance requirements.

b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.

c. Fabricate and install test assemblies using installers who will perform the same tasks for Project.

d. When testing is complete, remove assemblies; do not reuse materials on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Owner's Representative through Construction Manager, with copy to Contractor. Interpret tests and inspections and state in each report

whether tested and inspected work complies with or deviates from the Contract Documents.

1.6 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of the types of testing and inspecting they are engaged to perform.

2. Costs for retesting and re-inspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

B. Contractor Responsibilities: Unless otherwise indicated, provide quality-control services specified and required by authorities having jurisdiction.

1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services. Contractor will furnish Owner with names, addresses, and telephone numbers of testing agencies engaged and a description of the types of testing and inspecting they are engaged to perform.

a. Contractor shall not employ the same entity engaged by Owner, unless agreed to in writing by Owner.

2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.

3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.

4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.

5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Tests and Inspections: Owner will engage a testing agency to conduct special tests and inspections required by authorities having jurisdiction and identified as the responsibility of Owner.

1. Testing Agency will notify Construction Manager and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.

2. Testing Agency will submit a certified written report of each test, inspection, and similar quality-control service to Construction Manager with copy to Contractor and to authorities having jurisdiction.

3. Testing Agency will submit a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.

4. Testing Agency will interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

5. Testing Agency will retest and reinspect corrected work.

D. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing.

E. Retesting/Re-inspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and re-inspecting, for construction that revised or replaced Work that failed to comply with requirements established by the Contract Documents.

F. Testing Agency Responsibilities: Cooperate with Owner's Representative and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Owner's Representative and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.

2. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.

3. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service.

4. Do not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.

5. Do not perform any duties of Contractor.

G. Associated Services: The Contractor shall cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify Testing Agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.

2. Incidental labor and facilities necessary to facilitate tests and inspections.

3. Adequate quantities of representative samples of materials that require testing and inspecting.

4. Assist agency in obtaining samples.

5. Provide facilities for storage and field-curing of test samples.

6. Delivery of samples to testing agencies.

7. Preliminary design mix proposed for use for material mixes that require control by testing agency.

8. Security and protection for samples and for testing and inspecting equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within 10 days of date established for commencement of the Work (i.e., Notice to Proceed).

1. Distribution: Distribute schedule to Owner, Construction Manager, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Sections of these Specifications. Restore patched areas and extend restoration into adjoining areas in a manner that eliminates evidence of patching.

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

SECTION 014200 - REFERENCES

PART 1 - GENERAL

1.1 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": The term "approved," when used in conjunction with Owner's Representative's action on Contractor's submittals, applications, and requests, is limited to Owner's Representative's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean directed by Engineer, requested by Engineer, and similar phrases.

D. "Indicated": The term "indicated" refers to graphic representations, notes, or schedules on Drawings; or to other paragraphs or schedules in Specifications and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the user locate the reference.

E. "Regulations": The term "regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": The term "furnish" is used to mean supply and deliver to Project site.

G. "Install": The term "install" is used to describe operations at Project site including unloading, temporary storage, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": The term "provide" means to furnish and install, complete and ready for the intended use.

I. "Installer": An installer is the Contractor or another entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier, to perform a particular construction operation, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.

J. The term "experienced," when used with the term "installer," means having successfully completed previous projects similar in size and scope to this Project; being familiar with the special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1. Trades: Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individual of a corresponding generic name, such as "carpenter". It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.

2. Assignment of Specialists: Certain Sections of the Specifications require that specific construction activities shall be performed by specialists who are recognized experts in the operations to be performed. The specialists must be engaged for those activities, and assignments are requirements over which the Contractor has no choice or option.

Nevertheless, the ultimate responsibility for fulfilling Contract requirements remains with the Contractor.

a. This requirement shall not be interpreted to conflict with enforcement of regulations governing the Work. It is also not intended to interfere with local trade union jurisdictional settlements and similar conventions.

K. "Project Site" is the space available by Permit and easements to the Contractor for performing construction activities, either exclusively or in conjunction with others performing other work as part of Project. The extent of Project site is shown on the Drawings.

L. Testing Laboratories: A "testing laboratory" is an independent entity engaged to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1.2 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of the date of the Contract Documents, unless otherwise indicated.

C. Conflicting Requirements: Where compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Construction Manager for a decision before proceeding.

1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. In complying with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements. Refer uncertainties to Construction Manager for a decision before proceeding.

D. Copies of Standards: Each entity engaged in construction on the Project must be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, the Contractor shall obtain copies directly from the publication source and make them available on request.

E. Abbreviations and Names: Abbreviations and acronyms are frequently used in the Specifications and other Contract Documents to represent the name of a trade association, standards-developing organization, and authorities having jurisdiction, or other entity in the context of referencing a standard or publication. Where abbreviations and acronyms are used in the Specifications or other Contract Documents, they mean the recognized name of these entities. Refer to Gale Research's "Encyclopedia of Associations" or Columbia Books' "National Trade & Professional Associations of the U.S.," which are available in most libraries.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements

1. The Owner's Consultants have contacted authorities having jurisdiction over the Work in obtaining information necessary for preparation of Contract Documents and Permits. Contact authorities having jurisdiction directly for information and decisions having a bearing on the Work. The Contractor shall execute the Work in accordance with Permit requirements.

2. Copies of Regulations and Permits: The Contractor shall obtain copies of regulations governing and project permits issued to the Project. Contractor shall retain copies at the Project Site, and make them available to the Construction Manager for reference by parties who have a reasonable need for such reference.

1.4 SUBMITTALS

A. Permits, Licenses, and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, and similar documents, correspondence, and records established for compliance with standards and regulations bearing upon performance of the Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 015700 MAINTENANCE AND PROTECTION OF TRAFFIC

PART 1 - GENERAL

1.1 SUMMARY

A. This section specifies the requirements for maintenance and protection of Traffic during construction of the Project.

B. General:

1. All streets and travel ways shall remain open to the passage of vehicular and pedestrian traffic during the construction period, unless prior written consent is obtained from the Construction Manager and the governing body having jurisdiction over the street or travel way.

2. Maintenance and protection of traffic shall be provided in accordance with the Manual of Uniform Traffic Control Devices (MUTCD) and any provisions contained in the plans or the contract documents.

3. Safe and adequate ingress and egress to and from intersecting highways, town roads, access roads, homes, adjoining properties and commercial establishments shall be provided and maintained at all times to the satisfaction of the Construction Manager.

4. The traffic maintenance schemes shown in the MUTCD describe the minimum methods and control devices necessary. The Construction Manager may order additional devices and/or methods to meet field conditions. No additional payment will be made for additional devices ordered.

5. The Contractor shall give the required advance notice, as indicated in the contract document or by agreement with the Construction Manager, of his proposed operations to affected police, fire, and other emergency response departments. The Contractor shall give reasonable notice of his proposed operations to owners and tenants of private properties which will be affected by the construction operations.

6. Traffic Control Plans for work within VAOT right-of-ways has been prepared as part of the VGS ANGP – 19 V.S.A. 1111 Permit Application, and upon approval will become a part of this Contract.

C. Submittals:

1. Prior to the start of work, the Contractor must submit any proposed changes to the traffic control plan to the Construction Manager for approval. Any changes which alters the basic concept of the plan must be approved by the Construction Manager.

PART 2 - PRODUCTS

2.1 DEVICES AND EQUIPMENT

A. All signing, operations, safety, and directive devices shall conform to the Manual of Uniform Traffic Control Devices and the Authority having jurisdiction.

1. Delineators: Delineators shall be of the reflectorized plastic drum type.

2. Warning Signs: Advance warning signs shall be diamond shaped and have black lettering on an orange background.

PART 3 - EXECUTION

3.1 MAINTENANCE OF TRAFFIC

A. The Contractor shall provide signs, signals, barricades, flares, lights, and all other equipment, service, and personnel necessary to regulate and protect traffic and warn of hazards. The Contractor shall remove temporary equipment and facilities when no longer required, and restore area to original or specified conditions upon removal.

B. When crossings, obstructions, or the temporary closures of street or travelway are required, the Contractor shall provide and maintain suitable bridges, detours or other temporary measures, all of which must be to the satisfaction of the Construction Manager, for the accommodation of traffic. The duration of the operation shall be for the minimum time practical. Traffic shall be restored as soon as the street or travelway is safely passable.

3.2 WORK ZONES

A. Work zones on opposite sides of the road shall not overlap. A work zone is defined as that area in which traffic is restricted because of construction activities, or that area which involves a drop-off within 10 feet of the edge of pavement.

B. The Contractor shall delineate areas where there is a drop-off near the edge of the traveled way and areas on which it is unsafe to travel. The provisions for delineation shall be as approved by the Construction Manager, and the governing body having jurisdiction over the street, travelway, or site.

C. Excavations that produce drop-offs on both sides of the traveled way at the same time shall not be permitted.

D. Reflectorized plastic drum delineators shall be used along embankments and at other hazardous locations determined by the Construction Manager. Delineators shall remain in place until satisfactory protection is provided. Delineators shall be spaced at a distance not to exceed 50 feet, or as directed by the Construction Manager.

E. The Contractor shall provide 1-inch steel plates to provide for traffic movement over narrow, open excavations. Excavations made for the installation of the pipes will be backfilled at the close of each day.

F. No material is to be stored on the shoulder or within the 20-foot roadside clear area, except that which is to be placed that day.

G. Construction equipment shall be removed from the roadside clear area of all highway pavement during the hours that the Contractor is not working. This requirement shall not be limited to the contract limits.

H. Traffic Signals and Signs:

1. The Contractor shall provide and operate traffic control and directional signals required to direct and maintain an orderly flow of traffic in areas affected by the Contractor's operations.

2. The Contractor shall provide traffic control and direction signs, mounted on barricades or standard posts at each change of direction of a roadway, at each crossroad, at detours, at hazardous areas, and at parking areas.

3. The correct sequence and spacing of signs, either permanent or temporary must be maintained at all times in accordance with MUTCD unless shown otherwise on the plans. All signs, including guide signs, shall indicate actual conditions at all times and shall be covered, moved, removed, or changed immediately as ordered by the Construction Manager.

4. In order to maintain effective traffic control, the contractor shall be responsible for the maintenance of all signs, cones, flashers, barrels, and other devices the Contractor shall ensure that they are in place and in good condition.

I. Flag Personnel:

1. The Contractor shall provide suitably qualified and equipped flag personnel when construction operations encroach on traffic lanes. The regulation of traffic by flag personnel shall be in accordance with the requirements of the MUTCD or the Authority having jurisdiction.

J. Flares and Lights:

1. During periods of low visibility the Contractor shall provide flares and lights to guide traffic, to clearly delineate traffic lanes, and to warn of hazardous areas. Flag personnel shall use lights in directing traffic during periods of low visibility. Illumination of critical traffic and parking areas shall be provided by the Contractor during periods of low visibility.

K. Parking Control:

1. The Contractor shall control all Contractor related vehicular parking such that it does not interfere with public traffic and parking, access to emergency vehicles, Owner's operations, or construction operations. The Contractor shall provide temporary parking facilities for the public as construction operations dictate.

2. The Contractor shall provide parking areas for workman's private vehicles that comply with applicable laws, regulations, codes, and ordinances. The Contractor shall ensure free vehicular access to and through the parking areas. The Contractor shall not permit parking on or adjacent to access roads or in non-designated areas.

L. Haul Routes:

1. The Contractor shall consult with governing authorities and establish thorough fares which shall be used as haul routes and site access. The Contractor shall confine construction traffic to designated haul routes. The Contractor will be required to provide traffic control at critical points of haul routes to expedite traffic flow and minimize interference with normal public traffic. Where required by governing authorities, the Contractor shall prepare and submit traffic control plans for approval by both the Construction Manager and the governing Authority prior to commencement of work.

M. Contractor Operations:

1. If the Construction Manager notifies the Contractor or his superintendent of any hazardous construction practices, all operations in that area shall be discontinued and immediate remedial action shall be taken to the satisfaction of the Construction Manager before work is resumed.

END OF SECTION

SECTION 017300- EXECUTION REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. General installation of products.
4. Coordination of Owner-installed products.
5. Progress cleaning.
6. Starting and adjusting.
7. Protection of installed construction.
8. Correction of the Work.

1.2 SUBMITTALS

A. All information identified in Contract Documents.

B. Requests for Information made by Construction Manager.

C. Qualification Data: Sufficient information to demonstrate capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of engineers and owners, and other information specified.

1.3 QUALITY ASSURANCE

A. Quality Assurance and Quality Control as identified in Section 014000 – Quality Requirements.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.

2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Acceptance of Conditions: Examine substrates, TWS and ATWS areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations. Report to the Construction Manager any unresolvable issues.

1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

   a. Description of the Work.
   b. List of detrimental conditions, including substrates.
   c. List of unacceptable installation tolerances.
   d. Recommended corrections.

2. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Existing Utility Interruptions: Do not interrupt utilities unless permitted, then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Construction Manager and Owner not less than 48 hours in advance of proposed utility interruptions.

2. Do not proceed with utility interruptions without Construction Manager's and Utility's written permission.

C. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication/installation schedule with construction progress and work of others to avoid unnecessary delay of the Work.

D. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

E. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Construction Manager. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding with the Work, verify layout information shown on Drawings, in relation to the survey control and field layout. If discrepancies are discovered, notify Construction Manager promptly.

B. General: Owner will provide project lay out using accepted surveying practices, as follows:

1. Establish benchmarks and control points to set lines and levels and elsewhere as needed to locate each element of Project.

2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.

3. Inform installers of lines and levels to which they must comply.

4. Check the location, level and plumb, of every major element as the Work progresses.

5. Notify Construction Manager when deviations from required lines and levels exceed allowable tolerances.

6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Engineer and Construction Manager.

F. Contractor is responsible for protecting and maintaining all construction layout information at no additional cost to the Owner.

3.4 FIELD ENGINEERING

A. Alignment of the pipeline is depicted on the ANGP Transmission Pipeline alignment sheets and associated drawings. VGS will have the pipeline alignment staked along the centerline of the proposed pipeline. Survey stakes will be set at minimum 200-feet spacing. The Contractor is responsible for preserving and replacing all layout controls, existing survey stakes, and monuments as noted in the Contract Documents.

B. Identification: Owner will identify existing benchmarks and control points.

C. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Construction Manager. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to and Construction Manager before proceeding.

2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

3. Contractor shall install temporary markers with survey station numbers at minimum 200-feet spacing to facilitate location and progress reporting. These shall be located on the boundary of the working side of the right-of-way, with station numbers visible. Contractor shall also flag the right of way boundaries at 200 feet intervals to eliminate off right of way damage. Contractor shall maintain all temporary markers and boundary flagging throughout construction.

4. Contractor shall replace any pipeline trench centerline markers disturbed by construction operations ahead of the trenching operation in their original location. Owner may check and adjust the location of these markers as necessary.

D. Benchmarks: Establish and maintain permanent benchmarks on Project site, as necessary, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.

3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

E. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, Owner shall prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.

F. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous. Provide MSDS on all products or provide controls in accordance with proper use.

3.6 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning of joint-use areas where more than one Contractor is working with the others. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.

2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F (27 deg C).

3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.

2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration.

G. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.

H. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

I. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration.

J. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period.

K. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.7 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 1 Section "Quality Requirements."

3.8 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.9 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Inspection procedures.
2. Project Record Documents.
3. Warranties.
4. Instruction of Owner's personnel.
5. Final Cleaning and restoration.

1.2 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.

2. Advise Owner of pending insurance changeover requirements.

3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.

4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.

5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs, damage or settlement surveys, property surveys, and similar final record information.

6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.

7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.

8. Complete startup testing of systems.

9. Submit test records.

10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.

11. Submit changeover information related to Owner's use, operation, and maintenance.

12. Complete final cleaning requirements, including touchup painting.

13. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Construction Manager will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Construction Manager, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

2. Results of completed inspection will form the basis of requirements for Final Completion.

1.3 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment according to Division 1 Section "Payment Procedures."

2. Submit certified copy of Construction Manager's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Construction Manager. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.

3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

4. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.4 PROJECT RECORD DOCUMENTS

A. General: Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for Construction Manager's reference during normal working hours.

B. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications. Mark copy to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.

3. Note related Change Orders, Record Drawings, and Product Data, where applicable.

C. Record Product Data: Submit one copy of each Product Data submittal. Mark one set to indicate the actual product installation where installation varies substantially from that indicated in Product Data.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.

3. Note related Change Orders, Record Drawings, and Record Specifications, where applicable.

D. Miscellaneous Record Submittals: Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

E. Provide Construction Manager and Owner with an electronic (PDF) copy of all record documents on collaboration website.

1.5 OPERATION AND MAINTENANCE MANUALS

A. Assemble a complete set of operation and maintenance data indicating the operation and maintenance of each system, subsystem, and piece of equipment not part of a system. Include operation and maintenance data required in individual Specification Sections and as follows:

1. Operation Data:

a. Emergency instructions and procedures.

b. System, subsystem, and equipment descriptions, including operating standards.

c. Operating procedures, including startup, shutdown, seasonal, and weekend operations.

d. Description of controls and sequence of operations.

e. Piping diagrams.

2. Maintenance Data:

a. Manufacturer's information, including list of spare parts.
b. Name, address, and telephone number of Installer or supplier.
c. Maintenance procedures.

d. Maintenance and service schedules for preventive and routine maintenance.
e. Maintenance record forms.
f. Sources of spare parts and maintenance materials.
g. Copies of maintenance service agreements.
h. Copies of warranties and bonds.

B. Organize operation and maintenance manuals into suitable sets of manageable size. Bind and index data in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, with pocket inside the covers to receive folded oversized sheets. Identify each binder on front and spine with the printed title "OPERATION AND MAINTENANCE MANUAL," Project name, and subject matter of contents. Also include a PDF file with the applicable information.

1.6 WARRANTIES

A. Submittal Time: Submit written warranties on request of Engineer for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, 3-ring, "D" ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.

2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.

3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

C. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 DEMONSTRATION AND TRAINING

A. Instruction: Instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Provide instructors experienced in operation and maintenance procedures.

2. Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.

3. Schedule training with Owner through Construction Manager, with at least 7 days advance notice.

4. Coordinate instructors, including providing notification of dates, times, length of instruction, and course content.

B. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections. For each training module, develop a learning objective and teaching outline. Include instruction for the following:

1. System design and operational philosophy.
2. Review of documentation.
3. Operations.
4. Adjustments.
5. Troubleshooting.
6. Maintenance.
7. Repair.

3.2 FINAL CLEANING

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers for final cleaning. Clean each surface or unit to condition expected in an average industrial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.

b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.

c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.

d. Remove tools, construction equipment, machinery, and surplus material from Project site.

e. Remove snow and ice, where applicable, to provide safe access.

f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.

g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.

h. Sweep concrete floors broom clean in unoccupied spaces.

i. Remove labels that are not permanent.

j. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

k. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

l. Replace parts subject to unusual operating conditions.

m. Clean exposed surfaces of diffusers, registers, and grills.

n. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

o. Leave Project clean and ready for operation.

C. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.
4. Record Documentation specified elsewhere with this Specification
5. Record Samples.

1.2 SUBMITTALS

A. Record Drawings: Owner's representative shall bear the responsibility of the Record Drawings. Contractor shall assist and coordinate with the Owner, as necessary, to complete this task.

B. Record Specifications: Submit 1 copy of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit 1 copy of each approved Product Data submittal.

1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in the manual instead of submittal as Record Product Data.

D. Record Documentation: See subsequent specification Sections for task specific documentation requirements.

PART 2 - PRODUCTS

2.1 AS-BUILT INFORMATION TO BE COLLECTED

A. Contractor will provide labor and equipment, when necessary, to assist the Owner with the collection of as-built information to accurately document the installation of the pipeline. All as-built locations will be with reference to the actual distance in feet along the top of pipe.

B. Contractor shall not cover up any piping before Owner has recorded as-built data.

C. Contractor shall provide VGS with marked-up drawings of any changes to dimensions or configuration of fabricated components. Contractor shall also provide VGS with all original hydrostatic test records, including yield plots, charts, limits of each mainline test section, and the minimum and maximum test pressures realized for each test or test section

2.2 RECORD DRAWINGS

A. Record Prints: Owner shall bear the responsibility of Record Prints.

B. Record CAD Drawings: Owner shall bear the responsibility of Record CAD Drawings.

2.3 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.

3. Record the name of the manufacturer, supplier, installer, and other information requested by task Specification to provide a record of selections made.

4. Note related Change Orders, Record Drawings, and Product Data where applicable.

2.4 RECORD PROJECT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.

2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.

3. Note related Change Orders, Record Drawings, and Product Data where applicable.

2.5 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.

B. Maintenance of Record Documents: Store Record Documents in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Owner, Owner Consultants, and Construction Manager's reference during normal working hours.

C. Post Record Documents on project collaboration website.

END OF SECTION

SECTION 099000 PAINTING & CORROSION COATING

PART 1 - GENERAL

1.1 WORK TO BE DONE

A. Furnish all labor, materials, scaffolding, tools, and equipment necessary to complete the painting and finishing requirements of the project.

B. Included in the painting and coating work are the following:

1. Above Grade Coatings

a. All above grade piping, valves, fittings, support steel and miscellaneous steel structures.

2. Below Grade Coatings

a. All below grade piping, valves and fittings, support steel and miscellaneous steel structures

b. All below ground field joints

3. Transition Coatings

a. All transitions from below to above ground piping.

C. The work shall include cleaning and surface preparation, supply and application of primer, if required, supply and application of top coating and the supply of all consumable materials required for performing and completing the work.

1.2 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Structural and Miscellaneous Steel primed and finish painted.

1.3 SURFACE CONDITION OF RECEIVED MATERIALS

A. For equipment supplied and installed under this contract it is the Contractor's responsibility to ensure that the equipment is suitably primed, if required, and final painted after installation.

B. All above ground piping will be received unpainted with a thin layer of mill applied lacquer.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Below Ground Coatings:

1. Mill applied coatings shall be fusion bonded epoxy (FBE), manufactured by 3M or equal. Product shall be:

2. Scotchkote 6233, 206N or approved equal – 14 mils cured film thickness minimum

B. Field Joints on Below Ground Piping:

1. Coating shall be Canusa HBE-95 or approved equal. – 20 mils dry film thickness (DFT) minimum

C. Pipe and Fittings in Air / Soil Transitions (12" Above and Below Grade):

1. Coating shall be Carboline Bitumastic 300M or equal - 14 to 16 mils DFT.

2. Carboline Bitumastic should be applied in two coats to minimize both dry time and excessive film application.

D. Above Ground Coatings:

1. Coatings shall be manufactured by PPG Amercoat or approved equal. Coatings shall be:

a. Primer coat: Amerlock 2 or Amerlock 400 – 3 to 4 mils thick DFT
b. Second coat: Amerlock 2 or Amerlock 200 – 3 to 4 mils thick DFT
c. Top Coat: Amercoat 450 Series – 3 to 4 mils thick DFT

2. Coating shall be 9 to 12 mils DFT overall.

3. Amerlock 2/400 should be applied in two coats to minimize both dry time and excessive film thickness application.

2.2 GENERAL

A. All materials shall be delivered in unopened containers as packed by the Manufacturer. Each container shall bear the Manufacturer's standard label for the catalog item as approved showing trade name and number, formula, and directions for use. Containers shall not be opened until contents are to be used.

B. No coating shall be thinned more than specifically recommended in the Manufacturer's printed directions and thinner used shall be the highest type of those recommended. No coating ready prepared for use shall be thinned without the approval of the Company. No driers shall be added at the job unless approved by the Company.

C. All auxiliary materials shall be pure, of highest quality, and approved by the Company. Such materials shall bear identifying labels on the containers.

PART 3 - EXECUTION

3.1 GENERAL

A. All coatings shall be applied as per the Manufacturer's printed instructions by brush or roller unless spray application is specifically named as acceptable in the description of required treatment, when air or airless spray shall be acceptable.

B. Coatings shall be thoroughly stirred and kept at a uniform consistency during application.

C. No work shall be done on damp surfaces unless printed instructions on label so recommend for the particular coating being used.

D. Exterior painting shall not be done during or immediately following rainy or frosty weather or when the temperature is below 508F or likely to drop to freezing. The application of treatments while surfaces are exposed to hot sun or when temperature is above 908F or likely to be during the drying period shall be avoided.

E. All work shall be done by skilled mechanics in a workmanlike manner; all coats flowed on or brushed out to a uniform film. Completed work shall be free of runs, sags, blocked angles, raised grain, and all other evidence of poor or careless workmanship.

F. Allow sufficient time before recoating to ensure proper drying of the preceding coat.

G. For enamel finishes on metal of shop-primed surfaces sand original surface between coats with fine sandpaper and remove all resulting grit and dust before application of each coat.

H. Raised face surfaces of flanges shall be protected from blasting medium and paint.

3.2 SURFACE PREPARATION

A. Prior to all surface preparation, Contractor shall protect all gasket surfaces, flange faces, valve stems, nameplates, pressure gauges, instrument cases, gauge glasses, electrical conduit and fixtures, instrument tubing, aids to navigation and all previously installed and coated equipment, including galvanized equipment and all specialty items.

B. Where practical, electrical cable and instrument tubing will be installed after blasting and coating has been completed. During all blasting operations, Contractor shall exercise caution and employ masks, shields, etc. to assure that coated surfaces adjacent to the blast area are protected from overblast damage by stray or rebounding blast particles.

C. Prior to all surface preparation, all surfaces shall be cleaned as necessary to remove oil, grease, dirt, salts, and other foreign matter, in accordance with SSPC-SP1, "Solvent Cleaning". A biodegradable water-soluble cleaner such as PPG Amercoat Prep 88, or approved equal, shall be used, followed by a fresh water wash with a minimum of 3000 psi. Surfaces to be coated shall be tested for chloride contamination prior to abrasive blasting or surface preparation using the CHLOR*TEST™ test kit or equivalent.

D. All surfaces shall be blasted to a "near-white metal" blast cleaned surface finish as per NACE 2/SSPC-SP10/ ISO SA2.5 and will demonstrate an angular anchor pattern of at least 1.5 to 4.0 mils peak to peak. Coater shall strive to have an anchor pattern of 3.0 to 3.5 mils peak to peak.

E. Mechanical cleaning in accordance with SSPC-SP2, SSPC-SP3 or SSPC-SP11 and solvent cleaning in accordance with SSPC-SP1 may be required separately or in conjunction with each other when blasting cannot achieve a near-white metal surface or when blasting will damage fragile components

F. The abrasive may be coal slag, refractory slag, garnet, aluminum oxide or flint, sized to produce the required anchor profile and graded to be free from clay, silt or other matter likely to become embedded in the steel surface.

G. Blast cleaning operations will not be conducted on surfaces that will be wet after blasting and before coating, when the surfaces are less than 5°F (30C) above dew point as measured by a sling psychrometer or digital hygrometer, or when the relative humidity of the air is greater than 85% without permission of Company. Paint manufacturer's alternate recommendations for conditions for blasting may be acceptable, with Company approval.

H. It is desired that outdoor abrasive blasting be done during daylight hours, unless the blasting is done inside humidity and temperature controlled blasting booths/buildings. If outdoor blasting is allowed during the night, the surface will be swept clean and bright the next morning with fresh, light blasting to provide a "white" blasted surface.

I. Blasting will be done in an area removed from coating operations and freshly coated surfaces to prevent contamination. Contaminated coatings will be reblasted by Contractor to bare metal and re-applied as originally specified.

J. After blasting, Contractor will thoroughly clean all blast grit and dust from both internal and external surfaces, including from crevices, recesses, etc.

3.3 COATING APPLICATION

A. Blast-cleaned surfaces will be coated during the same day as blasting and at least one hour prior to sundown of that day and also before any rusting occurs. A minimum of 3 inches around edges of blasted areas will be left unprimed. Blasting will continue a minimum of 1-inch into adjoining coated surface. Any blast-cleaned surfaces that are not primed and are wet by rain or moisture will be re-blasted prior to application of primer.

B. The coating film thickness is specified in Section 2.0 and is subject to inspection by the Company Inspector.

C. No coating will be placed on or within 3 inches of edges prepared for field welds. Succeeding coats of paint will be stopped a minimum of 3 inches from the edge of the previous coat at the field weld location (i.e. primer coat stops 3 inches from field weld, intermediate coat stops 6 inches from field weld, etc.).

D. The finished job will not contain sags, runs, wrinkles, spots, blisters or other application flaws. Holidays in the final coat at edges, corners, welds and inaccessible areas may be repaired by spraying or hand brushing an additional layer of top coat provided excessive buildup does not occur.

E. The coatings described in this specification may contain flammable solvents. The vapor from these solvents may be harmful and cause skin and eye irritation. The resinous components of the primers and laminating resin may cause serious delay dermatitis. Employees involved in coating work will be provided with breathing apparatus, eye and skin protection by the Contractor as necessary.

F. Succeeding coats of paint will be of colors that contrast to the color of the previous coat. Contractor will verify the finish coat color with Company prior to the initiation of material procurement.

3.4 STEELWORK

A. Note that all steelwork is to be sandblasted before applying paint.

3.5 PROTECTION AND SURFACES NOT TO BE PAINTED

A. The Contractor shall use tarpaulins, drops, and coverings as much as possible to protect floors, equipment, etc., from over-spray, spatter, droppings, etc.

B. The following are not to be painted:

a. Nameplates, tags, or labels.
b. Machined surfaces.
c. Valve stems (remove handles and paint separately).
d. Swagelok or other compression fittings.
e. Lubrication points.
f. Pivot points involving mechanical movement.

3.6 CLEANING UP AND REPAINTING

A. The Contractor shall remove all paint where it has been spilled, splashed, or spattered on surfaces.

B. The Contractor shall touch up or repaint, as required by the Company all painted surfaces that are marred, marked, chipped, spalled, defaced, or deficient in any way before it is turned over to the Company.

3.7 REPAIRS TO COATINGS

A. Below Ground Coatings:

1. Grinding or filing shall prepare defective and/or damaged coating including pinholes with a flat file. The surface shall be abraded or "feathered" with a fine sand paper or emery cloth.

2. Catalyzed Epoxy Patching Compound shall be applied to prepared surface or holidays and/or defective or damaged coating, excluding pinholes in accordance with the manufacturer's recommendations to attain a uniform minimum thickness of 25 mils. Pipe with unacceptable coating, excessively low mils (thickness), separation of bond and/or holidays shall be completely reblasted to NACE Near-White finish and recoated as bare pipe. Hot melt patch stick shall be used for pinholes up to 1/4" diameter.

3. After repairs, pipe shall be re-inspected with an electrical holiday detector set at the appropriate voltage.

B. Above Ground Coatings:

1. Coating damage shall be repaired as follows:

2. Top coat damaged, but base coat undamaged: Repair by removing damaged coating with 3M Clean-N-Strip, abrasive cloth, or other means acceptable to Company (wire brushing will not be acceptable), feather edges of adjacent coated surfaces and applying top coat as specified.

3. Coating damaged to base metal: Repair by blasting and/or mechanical cleaning of the damaged area to NACE 2/SSPC-SP10/ISO Sa2.5 Near White Metal, feather adjoining paint

surfaces with grit paper to provide a smooth surface transition and apply the coating system as specified in Section 2.0.

4. Care will be taken to avoid damaging the coatings surrounding repaired areas and to assure complete tie-in of the coating with surrounding area.

3.8 INSPECTION

A. Coating application in accordance with this procedure shall be subject to inspection by Company Inspector at all times.

B. Company inspector or his representative shall have access to all work while being performed.

C. Contractor will provide and utilize wet and dry film thickness, temperature and humidity gauges as required by the performance of the work. Paint foreman shall inspect and monitor the work of painters and blasters under his direction. Daily painting logs and inspection reports shall be kept by the Contractor. Replica tape of surface profile shall be attached to inspection report.

D. Contractor will maintain all necessary measuring and test equipment in good working order with up to date calibration records that are available for Company inspector's review. Magnetic Dry film thickness (DFT) gauges will be calibrated using either test blocks bearing nonmagnetic coatings that are traceable to a known standard or plastic shims provided by maker of electronic DFT gauges.

E. Work shall be rejected because of poor workmanship. Poor workmanship is defined as, but not limited to improper surface preparation, inadequate drying or curing, excessive paint build-up, dirt or dust inclusions, overspray, pinholes, runs and sags or inadequate film build. Rejected work will be repaired as originally specified in this specification, at no additional cost to Company.

3.9 FUSION BONDED EPOXY COATING SPECIFIC REQUIREMENTS

A. Pipe shall be uniformly preheated to a temperature range of 450°F to 475°F. Temperatures shall be monitored by means of suitable temperature indicating devices. The duration of preheated temperature shall be kept to the absolute minimum required for proper application. Temperatures shall comply with the manufactures recommendations but not to exceed 500°F. Pipe that is "blued" in the heating operation shall be rejected and replaced at the Coater's expense.

B. External pipe coating shall be electrostatically sprayed.

C. Sufficient "Gel" time shall be allowed for liquefying powder, wetting of pipe and flow out followed by sufficient "Cure" time prior to quenching or forced cooling. "Gel" and "Cure" times shall vary with each powder and manufacturer's recommendation. Therefore, the manufacturer's recommendation shall be followed.

END OF SECTION

SECTION 130000 MINIMUM REQUIREMENTS FOR PIPELINE CONSTRUCTION PARALLELING OVERHEAD ELECTRIC LINES

PART 1 - GENERAL

1.1 MINIMUM REQUIREMENTS FOR PIPELINE CONSTRUCTION PARALLELING OVERHEAD ELECTRIC LINES

A. This construction specification applies to pipeline construction that parallels overhead high voltage electric transmission lines and represents minimum requirements only.

B. The purpose of this specification is to cover the procedures and construction techniques which must be used during the construction period to reduce potentials on the pipe and construction equipment to a level less than 15 volts Root Mean Square (RMS) measured between the structure and ground. This is measured using a digital voltmeter.

C. This specification is not all inclusive and is intended to remind the installer of the potential hazards which may be associated with pipeline construction in the vicinity of induced voltage, fault current, and contact to high voltage electric transmission lines.

D. The Designer should review the project and initiate additional requirements deemed necessary to ensure the safety of persons and property affected thereby. The company shall furnish any special materials required to comply with this section. Consult with the company Electrical Transmission & Distribution Engineering for specific applications and requirements.

1.2 REFERENCES

A. National Electric Safety Code (NESC)

B. Occupational Safety and Health Administration (OSHA)

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 STEEL PIPE INSTALLATIONS PARALLELING HIGH VOLTAGE ELECTRIC LINES

A. When exposed metallic piping is run parallel to overhead A.C. electric lines, the pipe is subject to induced voltages and currents that are the result of electromagnetic, electrostatic and resistive coupling.

B. Induced voltages and currents may cause coating damage as well as damage to cathodic protection and electronic monitoring equipment.

C. Induced voltages and current can be hazardous to personnel working on the pipeline during the construction period when long sections of pipe are exposed above ground. Lightning and faults on the transmission line can be especially dangerous.

3.2 ELECTRICAL SAFETY

A. The contractor will furnish a responsible person that can understand and follow the Technical Specifications and Electrical Safety required for the specific project. The responsible person for electrical safety must be approved by the Owner.

B. The person in charge of electrical safety shall:

1. Assure that all electrical safety requirements and devices are fully understood by all members of the construction forces.

2. Be fully aware of proper grounding procedures and with the dangers associated with electromagnetic and electrostatic couplings, resistive coupling, ground fault current discharge, lightning, etc.

3. Know the proper OSHA and NESC safeguards for the construction equipment being used related to the company's "limit of approach" regulations to the specific overhead transmission circuits that will be paralleled.

4. Have the necessary instrumentation, equipment and authority to implement and maintain safe working conditions.

5. Assure all safety devices and practices are properly employed during all periods of construction activity in the proximity of electric overhead transmission systems. This includes the choice of the appropriate rubber gloves for the situation.

6. Communicate at least daily with the dispatcher controlling the involved electric lines to ascertain any scheduled changes in loading, outages and switching operations and to notify of work on their Right-of-Way.

3.3 EQUIPMENT SAFETY

A. Each piece of equipment utilized to handle pipe in any way such as unloading, picking up, transporting, bending or setting-in shall be grounded and shall be equipped with a cable assembly capable of grounding the sections of pipe to the piece of equipment handling that pipe.

B. Before any section of pipe is picked up or moved in any way, the ground shall be completed between the section of pipe and the equipment moving that pipe. "Setting-In" booms shall be equipped with ground cable and the ground must be maintained at least until the stringer bead is completed. The ground connection on cranes shall be also made to the upper rotating structure supporting the boom.

C. Pipe shall be unloaded from stringing trucks by a side boom equipped with grounding cable as described above. A ground shall be completed between all sections of pipe to be unloaded and the side boom before unloading cables or slings are attached to the pipe.

3.4 GROUNDING

A. Each continuous segment of pipeline being worked on should be grounded to at least two separate points. This grounding should consist of one of the following alternatives:

B. Grounding should be established by driving one or more ground rods to at least a four-foot depth and connecting these ground rods to each other and the pipeline with a #2 A.W.G. stranded copper cable. Suitable connectors should be utilized to connect the #2 A.W.G. cable to the individual ground rods and to the pipeline. No ground connections should be removed without the knowledge and concurrence of the person responsible for electric safety.

C. Should sub-surface conditions prohibit the driving of ground rods, temporary grounding can be established with one or more ground rods, conduits of aluminum foil installed horizontally and covered with a minimum 4 inches of dirt. The segment of the pipeline being worked on should be bonded to the temporary grounding. This bond should consist of an insulated #2 A.W.G. jumper cable. The grounding cable should first be securely attached to the temporary grounding and then attached to the pipeline. Removal should be in reverse order.

D. It is of the utmost importance that the person making or breaking the connection at the ground rod connection not "bridge the gap" between the ground rod and bond clamp.

E. When installing or removing a grounding or bonding facility, personnel shall wear the class of rubber insulating gloves selected by the person responsible for electrical safety. The following procedures for making and breaking grounding connections shall be strictly adhered to:

1. Using Jumper Cable with End Clamps

   a. Making grounding connections

      1) Establish temporary grounds (ground rods, bare casings, other appropriate ground).

      2) Using jumper cable with end clamps, connect one end clamp to the temporary ground.

      3) Using rubber gloves, connect the other end clamp to the structure to be grounded.

   b. Disconnecting grounding connections

      1) Using rubber gloves, disconnect the clamp attached to the structure end.

      2) Disconnect the clamp connected to the temporary ground.

2. Using Clamp Around the Pipe and Jumper Cable with End Clamps

   a. Making ground connections

      1) Establish temporary ground (ground rods, bare casing, other appropriate ground).

      2) Using rubber gloves, connect grounding clamp around the pipe.

      3) Connect one end of the grounding cable to the temporary ground.

      4) Using rubber gloves, connect the other end of the grounding cable to the grounding clamp around the pipe.

b. Disconnecting grounding connections

1) Using rubber gloves, disconnect the grounding cable from the grounding clamp around the pipe.

2) Using rubber gloves, disconnect the grounding clamp around the pipe.

3) Disconnect the grounding cable from the temporary ground.

4) Proper work procedures related to electrical safety shall be established for all construction activities associated with this project.

F. The person in charge of electrical safety shall check the integrity of each connection by measuring the resistance from a near point on the copper cable to the ground rod or pipeline steel using a suitable Ohm Meter. A good electrical connection will have a resistance of 0.1 Ohm or less.

G. Pipe shall be hauled to the right-of-way and stored in stacks of ten sections or less. Each section of pipe in the stack shall be grounded with a 5/8" min. diameter ground rod driven into the ground at least four (4) feet. All sections in one stack shall be grounded together. This ground shall be maintained until each individual section of pipe has been removed from the stack.

H. When grounding sections of pipe, the ground rod shall be driven and the grounding cable connected to the ground rod first. The grounding cable shall then be connected to the pipe. Cables used for temporary grounding attachments shall have good mechanical strength as well as high conductivity. The cable shall be single conductor #2 A.W.G. stranded copper, cable or equivalent. Cable attachments to temporary grounding systems shall be made by a method that assures good electrical contact while applying firm pressure to the pipe metal. This method of attachment should have a current carrying capacity of at least 200 amperes. When removing grounding cable, the cable shall be removed from the pipe or equipment first and then from the ground rod.

I. All grounding attachments and removals shall be made by or under the direct supervision of the person responsible for electrical safety.

J. Temporary ground connections should be made by electrically connecting the pipeline to each casing. Prior to the installation of the cathodic protection test leads, a bond should be installed using an insulated #2 A.W.G. jumper cable with suitable clamps. Connection shall be made first to the casing and then to the pipe. Removal of bond shall be made on reverse order.

K. If electrolytic grounding cells are to be installed between the pipe and casing as part of the final installation, the bonds shall not be removed until the grounding cells are installed.

L. Before any casing-pipeline temporary bond is removed, the person in charge of electrical safety shall determine that all permanent test wire connections to the pipeline and casing are intact. This shall be done by measuring the potential of the wire to a close copper-sulfate reference electrode using a suitable high resistance volt-meter. A wire connection with good metallic contact will show a potential of from 0.3 to 0.7 volt. A broken or disconnected wire connection will show a potential of 0.2 volt or less.

M. Insulating joints shall be installed with a bond cable shorting out the insulating material. This bond cable shall remain in place until the insulating joint has been welded into the pipeline and a

grounding cell has been connected across the insulating flange. The grounding cell with test station must be in service and the bond cable removed before the insulating joint is buried.

N. Each person coming in contact with the pipeline during construction should do so only when:

1. Using rubber-insulating gloves. The person in charge of electrical safety should be in charge of insuring that all rubber-insulating gloves are kept in good insulating condition by following accepted test procedures. All gloves that are damaged (punctured, ripped, torn, etc.) shall be immediately replaced.

2. Standing on a grounding mat that is electrically connected to the pipeline at two separate locations. The grounding mat could consist of a copper weld wire mesh of #8 A.W.G. wire with a 4" x 4" mesh spacing. The mat should be electrically connected to the pipeline through a minimum #2 A.W.G. insulated jumper cables thermo welded to the mat and connected to the pipe using suitable clamps.

O. Temporary gradient control mats shall extend a minimum of 1 meter in all directions outside the work area. There shall be no contact between persons over the gradient mat and those not over the mat, including the handing over of tools, instruments or other materials.

P. Regardless of the approach selected, it is always advisable to handle the pipe (whenever possible) by the coated area of the pipe.

Q. All piping at tie-ins shall be bonded across the gap. All piping at cut-outs shall be bonded across before the cut-out is started. Prior to installing the cable bond at tie-ins and prior to removing the cable bond across cut-outs, each side shall be properly grounded as indicated in Item 6.1.

R. Whenever a section of pipe must be lifted free of the earth on a web sling or equivalent for transport, the pipe steel so lifted should be electrically connected to a metallic portion of the tractor doing the lifting and transporting. This requirement may be waived if the lifting and/or transporting of the pipe can be accomplished with connections called for in Item 6 of these recommendations.

S. A grounding strap or chain shall be attached to each rubber tired vehicle with a secure electrical connection to provide a ground contact for the vehicle during both mobile and stationary operations. The grounding strap or chain shall be of sufficient length to provide three (3) feet of earth contact immediately after the vehicle comes to a stop within 200 feet from the centerline of high voltage overhead conductors.

T. If steel chain is used for the grounding connection, it shall be of a minimum 1/4" size. If a strap is used for the grounding connection, it must be approved by the Owner before utilization.

U. All bonding connections shall be made to driven ground rods as described above. Bonding connections shall not be made between the pipeline and the electric transmission line ground. Such a connection can result in high pipeline potentials during power line faults with current flow through the pipeline that could damage the steel as well as the coating.

V. The pipeline shall not be bonded or grounded to foreign structures without permission of the Owner of the foreign structure. If permission is not granted, the foreign structure shall be electrically isolated from the pipeline under construction.

W. Workers shall avoid at all times making simultaneous contact to a grounded and ungrounded structure.

X. Other grounding materials and suppliers can be used subject to approval by Owner. Examples of other cable jumpers that could be used are:

1. Cable jumpers using 50 lb. minimum pull magnet for connection to pipe, heavy equipment, fuel trucks and general use.

2. Standard welding or battery jumper clamps with well-insulated handles, and teeth to bite into the metal.

Y. All grounding attachments and removals should be made by or under the direct supervision of the person in charge of electrical safety.

3.5 VOLTAGE MEASUREMENT

A. The voltage to ground of any string of pipe exposed to contact by personnel shall be measured periodically by reading the voltage between the pipe and a clean steel pin driven in the ground.

B. If the A-C voltage exceeds 15 volts above ground, supplementary grounds must be used to reduce this voltage to less than 15 volts. In the event that measured A-C voltage above ground exceeds 15 volts, the person in charge of electrical safety shall issue appropriate warnings and all work on the pipe string shall be suspended until potential is reduced to less than 15 volts.

C. These grounds shall be maintained at all times. A record of a periodic measurement of induced voltage shall be obtained and the record of these readings maintained. The bonding entities shall be as widely separated as is possible. As the "still-above ground" portion of the construction advances, bonds should be kept close to the construction end. This may only be done by installation of a third or higher number bond near the "construction end" before removing a bond near the completed end.

3.6 VEHICLES

A. Rubber tired equipment parked for any appreciable time on a power line right-of-way can obtain a significant static charge. Vehicles should be parked no closer than 200 feet from the centerline of high voltage overhead conductors.

B. Refueling of any motor vehicles or construction equipment shall not be permitted within 100 yards of any electric overhead transmission facility unless right-of-way conditions are such that this distance is unobtainable. If the 100 yards minimum cannot be complied with, the maximum distance possible shall be obtained, then each fuel truck shall be grounded and shall be equipped with a cable assembly capable of completing an electrical bond between the truck and any piece of equipment to be fueled. This bond must be made each and every time the refueling takes place within 100 yards of any electric overhead transmission facility prior to any part of refueling operation. This bond shall not be removed until all refueling operations are completed. Care should be taken where the cable attachments are made so that good electrical continuity is established. No fueling operations shall be carried out within 50 feet of the power transmission line.

C. At all times during construction, care must be exercised to assure that booms, cables and other equipment are no closer than 25 feet from overhead power lines. Height of conductors above

ground shall never be taken for granted but should be investigated in each case. Where operator of equipment is unable to personally assess that minimum distance is maintained, a second person shall be designated to guide the operator. Consideration must also be given to the possibilities of broken cables whip lashing close to power lines. It is recommended that each piece of equipment be positioned so that, should this occur, the cable would not come closer than 25 feet to a power line.

3.7 WEATHER LIMITATIONS

A. All construction work shall be suspended in the area of overhead high voltage power lines during any potential lightning activity.

3.8 WARNING SIGNS

A. The Contractor should post adequate signs warning of possible electrical hazards at each access to the right-of-way and any other measures required to prevent public access to temporary grounding installations.

B. Warning signs shall be posted on all cranes and other hoisting equipment at locations that will always be in plain view of the operator. Said signs shall state: "Danger, do not operate any part of this equipment within 25 feet of the High-Voltage Lines." Similar warning signs shall be posted on various parts of the equipment.

END OF SECTION

SECTION 136000 M&R STATION PIPING FABRICATION

PART I - GENERAL

1.1 SCOPE OF WORK

A. The Contractor shall furnish all labor, materials as shown on project drawings, scaffolding, tools, and equipment necessary to complete the piping fabrication requirements of the project. Company supplied materials are shown on project drawings.

B. Included in the piping fabrication work is the following:

1. All above and below ground piping inside Launcher and Metering & Regulation (M&R) station boundary limits as shown on project drawings.

C. This specification defines the minimum requirements for shop and field fabrication, erection, inspection and testing of process and utility piping by the CONTRACTOR.

D. The construction drawings and COMPANY specifications indicate the required piping class, materials and valve type. CONTRACTOR shall strictly adhere to the requirements of the COMPANY specifications for the materials, fabrication erection, inspection and testing procedures.

E. This specification covers the fabrication of metallic pipe only.

1.2 REFERENCES

A. Materials and installation shall be in accordance with the latest revisions of the following codes, standards and specifications, except where more stringent requirements have been specified herein:

1. Part 192, Title 49, Code of Federal Regulation, including section 192.112 covering additional design requirements for steel pipe.

2. API 1104 – Welding of Pipelines and Related Facilities

3. ASME B31.8 – Gas Transmission and Distribution Piping Systems

4. ASME Boiler & Pressure Vessel Code (BPVC) Section IX "Welding and Brazing Qualifications"

5. ASTM material standards as shown in M&R station drawings.

1.3 CONTRACT DRAWINGS

A. The Company shall provide the contractor with one set of general construction drawings for each M&R station.

1.4 SHOP AND AS-BUILT DRAWINGS

A. If not provided by COMPANY, the CONTRACTOR shall prepare piping isometrics and spool drawings for all piping. The isometric drawings shall show all spool numbers, welded attachments,

location and type of welds (shop or field), type of pressure test and test pressure, other notes on construction, post weld heat treatment requirements, NDE requirements and a complete bill of materials. Where the COMPANY has supplied isometrics the CONTRACTOR shall review, annotate and prepare all additional isometrics in accordance with the above to fully define the piping spool fabrication and piping installation scope of work. The COMPANY will carry out spot checks on the isometrics to ensure that the correct materials are called out.

B. The CONTRACTOR shall ensure that all positions and locations of piping components, piping runs and terminal points are maintained.

C. The CONTRACTOR shall verify that all spools, whether built from isometrics or shop drawings, are of a length which will enable the spool to be trucked if necessary and enable spools to be easily installed. Spools requiring field weld connections shall have ample length at weld connection ends to allow for trim for proper fit and weld bevel preparation.

D. CONTRACTOR shall maintain an up to date, complete and accurate record of all minor changes made to design drawings during the fabrication and erection of the piping. Upon completion of the project, the CONTRACTOR shall mark all changes on one set of shop drawings and "As Built" construction drawings. COMPANY will not consider that Work is completed until the as-built drawings are received. If CONTRACTOR was responsible for piping design, the as-built marks shall be incorporated into CONTRACTOR's drawings for issue with final documentation.

PART 2 - MATERIALS

2.1 GENERAL

A. Upon delivery of any COMPANY supplied material, the CONTRACTOR shall assume responsibility of the materials and the certification covering the materials. The CONTRACTOR shall be responsible for the supply of all other materials including temporary material and consumables to enable the work to be completed.

B. The CONTRACTOR shall be responsible for ensuring that all materials fully comply with applicable COMPANY specifications. Materials shall not be considered for use unless the CONTRACTOR is in possession of the necessary documentation, e.g., Material Test Reports and other specialized test data as required by the references shown in section 1.2 of this specification.

C. No substitution of materials shall be permitted unless prior written approval is obtained from the COMPANY.

D. Should the COMPANY discover that "out of specification" material has been utilized, or material has been substituted without the written approval of the COMPANY, the CONTRACTOR shall replace all non-specification materials and take remedial actions as required to ensure compliance with specifications. The cost of this work shall be borne by the CONTRACTOR.

E. Material Test Reports (MTR's) shall be provided by CONTRACTOR for all pipe and fittings. Complete traceability of piping material, is required for all piping. Traceability shall be recorded by noting heat number of piping components on piping isometric on spool drawing markups. Heat numbers shall also be marked on the piping components, and be maintained until shop fabrication is completed and numbers are recorded on isometrics.

F. All piping materials must comply with Part 192, Title 49, Code of Federal Regulation, including section 192.112 covering additional design requirements for steel pipe.

2.2 GENERAL FABRICATION

A. All materials which require documentation in use during fabrication or installation that cannot be identified with documentation shall be immediately removed from the area and replaced at the CONTRACTOR's expense.

B. The CONTRACTOR shall maintain "clean" fabrication areas for the fabrication of stainless steel and nickel alloy piping to minimize the possibility of contamination.

C. The CONTRACTOR shall pay specific attention to the segregation of tools and the protection of materials.

D. The CONTRACTOR shall utilize shop tools and equipment compatible with materials in fabrication, including but not limited to grinding discs and power brushes designed for use with stainless steel and/or other high alloy materials.

E. All spools shall have their piece number clearly designated on each spool piece, corresponding to the appropriate drawing.

PART 3 - EXECUTION

3.1 PIPING FABRICATION & ASSEMBLY

A. All pipe, fittings, flanges, in-line, on-line and piping specialty items shall be provided and installed in accordance with the COMPANY construction drawings.

B. Flange bolt holes shall straddle horizontal and vertical center lines unless noted otherwise on the construction drawings.

C. All flanged connections shall be made up by tightening the flange bolts in an accepted pattern to an even torque. CONTRACTOR shall torque all flange connections with a calibrated torque wrench per a COMPANY approved procedure. CONTRACTOR shall hang a torque tag on the flange connection after torquing.

D. Dimensional tolerances for fabrication and installation of piping shall be plus or minus 1/8" at equipment tie-in points unless otherwise noted on the drawings.

E. Flange faces shall be aligned within ± ½° from square with pipe, regardless of orientation.

F. The CONTRACTOR shall be responsible for locating required assembly/field welds. Inclusion of field welds on COMPANY provided piping drawings shall not relieve the CONTRACTOR of the responsibility of providing additional assembly/field welds which may be required.

G. CONTRACTOR shall also be responsible for allowing additional cut length at field/assembly welds adequate to accommodate normal fabrication variations in both CONTRACTOR's fabrication and fabrication of COMPANY supplied equipment. Unless otherwise noted, minimum 6" of extra cut length shall be provided at field welds indicated on COMPANY provided piping isometrics.

H. Piping shall be installed plumb, level and square unless designated otherwise on the construction drawings.

I. Screwed threads shall be clean cut with no burrs or stripping. Dies shall be new, sharp, and properly designed for the piping material. Immediately before erecting the piping, all pipe threads and fittings shall be thoroughly cleaned of cuttings, dirt, oil or other foreign matter. Teflon tape shall be used for all screwed connections. Care shall be taken to ensure that the tape is wound in the correct direction and that the tape does not enter the inside of the pipe.

J. Piping shall be erected and supported in a manner that will not put undue strain on equipment. All equipment, prefabricated piping, and appurtenances shall be fitted and assembled strain-free. The CONTRACTOR shall be prepared to demonstrate, by disassembly of the spool, the strain-free state of all fabricated piping.

K. For screwed or socketweld pipe installations, CONTRACTOR shall install sufficient unions to allow for convenient removal of any spool or component without disassembly or removal of any piece of equipment or major inline instrumentation.

L. Valve handles and wrenches shall be modified by CONTRACTOR where necessary for proper valve operation, and when the valve cannot be otherwise rotated to clear the obstruction.

M. Thread-O-Lets shall not be installed on elbows. Elbow-Lets shall be used for branch connections at elbows.

3.2 PIPE SUPPORT FABRICATION

A. CONTRACTOR shall procure, fabricate, and install all pipe supports as noted on project drawings. CONTRACTOR shall also design pipe supports, if this design is not provided by COMPANY, or for supports required which are not included in COMPANY designed items.

B. Welding of attachments for the purposes of supports shall be carried out as part of the piping fabrication in accordance with the applicable codes and standards. All other parts shall be fabricated in accordance with ANSI/AWS D1.1 and the guidelines in AISC, "Manual of Steel Construction".

C. If not provided by COMPANY, the CONTRACTOR shall purchase and install all support specialty items in accordance with construction drawings, COMPANY specifications, and good engineering practice.

D. All relief, blowdown and safety head discharge piping shall be securely braced for relieving conditions.

3.3 WELDING

A. General

1. All piping welding shall be carried out to an approved weld procedure specification by a welder qualified in accordance with the ASME Code for the procedure and in the position the welding shall be carried out in accordance with this specification.

3.4 CUTTING AND PREPARATION

A. The ends of all pipe to be butt welded shall be prepared in accordance with ASME B31.8 and the governing welding procedure specification.

B. Bevels shall be made by machine tool or machine thermal cutting. Manual thermal cutting shall not be permitted unless specifically approved by COMPANY on a one by one basis. The bevelled ends shall be smooth and uniform, and dimensions shall be in accordance with the qualified welding procedure/drawing requirements. Burrs, small scuff marks, indentations or small defects within the joint preparation area shall be blended out by grinding, otherwise the joint should be re-prepared.

C. The pipe ends and faces forming part of a welded joint shall be cleaned down to sound metal immediately prior to making the joint. All paint, grease, scale, rust, and other extraneous matter shall be removed. The cleaning shall extend for at least 1" from the edge of the bevel on both the internal and external faces of the components to be welded.

3.5 WELD PROCEDURE SPECIFICATIONS

A. All welding shall be carried out to approved welding procedure specifications. Each welding procedure specification and supporting procedure qualification records shall be submitted to COMPANY for approval prior to starting any fabrication.

B. Welding procedures shall be in accordance with ASME Boiler & Pressure Vessel Code (BPVC) Section IX "Welding and Brazing Qualifications" or API 1104.

C. The CONTRACTOR shall bear all costs for preparation and qualification of all weld procedures required for the work.

D. CONTRACTOR shall employ a welding procedure that provides a smooth, regular fully penetrated inner surface for meter tubes.

3.6 WELDER QUALIFICATIONS

A. Welders to be used on the project shall be qualified for each welding process they will use in the position they will use it in accordance with ASME B31.8 and CFR Title 49, Part 192 Code requirements.

B. The CONTRACTOR shall bear all costs for qualifying all welders. For each welder qualification test, laboratory tests shall be carried out as required by the applicable code.

3.7 IDENTIFICATION OF WELDERS AND WELDS

A. Each welder shall be assigned a unique identifying number or symbol that identifies each individual welder's work.

B. All welds shall be stenciled (stamped) with the welder's number or symbol within 1½" of the weld using low stress concentration dies. Pipe with wall thickness too thin to apply stencils without deforming or alloy pipe is to be marked with approved markers or engraved. Stencils are to be recorded on the weld map or spool drawings and included in manufacturing data Welds not stenciled shall be removed and replaced at the CONTRACTOR's expense.

3.8 PIPE WELDING REQUIREMENTS

A. Preheat shall be in accordance with ASME B31.8 requirements.

B. When the ambient temperature is less than 40 °F, carbon steel shall be pre-heated to a minimum of 150 °F prior to welding. Preheat temperatures for low and high alloy steels shall be stated in the welding procedure specifications. Preheat and interpass heating requirements and methods shall be addressed in the appropriate Welding Procedure Specifications. The temperature shall be monitored with the use of temperature indicating crayons placed a minimum of 3" from the edge of the heat affected zone.

C. Any pinholes, cold lap, slag, flux, or other impurities that appear on any surface during or after welding shall be removed by grinding or chipping before depositing the next successive bead.

D. All passes of all welds shall have all oxides and slag removed to permit clear visual inspection and to prevent unacceptable slag indications in radiography film.

3.9 WELD REPAIRS

A. All weld repairs shall be carried out to an approved weld repair procedure. The approved procedure shall include for the mechanical removal of defective material, and blending of excavation.

B. Weld repairs shall be inspected and tested in accordance with Section 5. NDE of repairs to be completed using the same method that detected the defect.

C. Additional examination of welds completed by the welding operator is to be completed as required by the governing ASME / API welding code.

3.10 INSPECTION

A. General

1. COMPANY reserves the right to inspect all materials, fabrication, workmanship, welding of materials and fabricated components. COMPANY or its representative shall have free entry at all times to any part of the CONTRACTOR's or subcontractor's facility where manufacture of COMPANY components occurs.

2. The approval of any work by COMPANY and their release of piping for shipment shall in no way relieve CONTRACTOR of any responsibility for carrying out the provisions of this specification, or for compliance with applicable codes.

3. The COMPANY shall be responsible for Non-Destructive Testing (NDT) as stated in this specification.

4. The inspection and NDT requirements of this section are those required by the COMPANY and are not intended to restrict in any way whatsoever the good working practice and internal QA / QC of the CONTRACTOR.

5. The COMPANY reserves the right to carry out NDT in addition to that required by the scope of work. Where the additional NDT shows unacceptable defects then all remedial works for rectification shall be considered wholly within the CONTRACTOR's scope of work.

6. COMPANY NDT operators will be trained and qualified in accordance with guidelines SNT-TC-1A of the American Society of Non-Destructive Testing.

B. Non Destructive Testing (NDT)

1. The COMPANY shall be responsible for Non-Destructive Testing (NDT) as stated in Table 1 of this specification, and for all other NDT requirements specified herein. The definition of 10% inspection shall be 100% of 10% of the welds designated by the COMPANY for the designated pipe size and specification.

2. NDT as shown in table 1 shall apply to both CONTRACTOR shop and field welding activities.

3. If NDT shows unacceptable defects, then all remedial works for rectification shall be considered wholly within the CONTRACTOR's scope of work. Further NDT due to unacceptable defects, shall be charged to the CONTRACTOR.

Pipe Class	Minimum Inspection Required	
	Threaded / Socketweld	Buttwelded
150# Class Piping	10% Magnetic Particle	10% Radiography
600# Class Piping	10% Magnetic Particle	100% Radiography

C. Radiographic Inspection

1. Radiographic inspection methods and acceptance criteria will be in accordance with API 1104. All radiographic inspection shall be at COMPANY's expense and performed by a third party.

2. Each radiographic film will be properly identified with a corresponding weld map marked drawing, or NDT map.

D. Ultrasonic Inspection

1. Where a weld is subject to 100% radiography but will not yield an interpretable radiograph then the weld shall be subject to ultrasonic inspection in lieu of radiography.

2. Ultrasonic inspection methods and acceptance criteria shall be in accordance with API 1104.

E. Magnetic Particle Inspection

1. Magnetic particle inspection shall be used only on carbon steel.

2. Where magnetic particle inspection is specified, only the "wet" method will be used. MT procedures shall detail types of particle suspension fluids, contrast paints, and types of devices used for the inspection.

3. Welds to be examined by magnetic particle inspection shall be sufficiently smooth to

4. avoid false defect indications.

5. Magnetic Particle inspection methods and acceptance criteria shall be in accordance with API 1104.

3.11 TESTING

A. General

1. A pressure test shall be performed on facilities piping with piping spools assembled and joined in the final location. A minimum number of tie-in welds will be permitted with company approval

2. The CONTRACTOR shall develop procedures covering system preparation, flushing, pressure testing, drying and preservation and submit for approval. The procedures shall define the methodology, materials, safety equipment, and instrumentation for documentation, testing media, duration and disposal. The procedures shall provide sufficient detail for the COMPANY to evaluate the work to be performed. The CONTRACTOR shall be responsible for ensuring the safety of all personnel engaged in and witnessing of the tests. The safety provisions shall be clearly stated in the hydrostatic and pneumatic testing procedures. Pneumatic testing will only be performed with prior written approval from COMPANY. A separate procedure shall be submitted outlining all steps of the testing including a safety plan to protect personnel.

3. The CONTRACTOR shall provide all equipment, materials and consumables required for the system preparation, flushing pressure testing, drying, preservation and reinstatement. All test equipment and temporary materials shall be compatible with the pressure rating and material of the system under test. Gaskets intended for final assembly shall not be used for test purposes. The welding of temporary fittings for test purposes shall be carried out to the same standards as the piping under test. No NDT (except for welding attachments to permanent job piping) will be required by the COMPANY on these welds unless otherwise stated by COMPANY or required by COMPANY Inspector.

4. Recorders utilized for testing shall be capable of recording pressure & temperature. Recorders, and pressure gauges shall be rated at not more than double the test pressure (300 psi gauge for a 150 psi test, etc.)

5. All pressure tests shall be witnessed and accepted by the COMPANY, its representatives or a third party inspector authorized by the COMPANY.

6. Hydrotest water shall be clean, fresh, non-corrosive water, free of undissolved solids and available at a minimum of 45 °F.

3.12 SYSTEM PREPARATION

A. Prior to system preparation all piping shall have been cleaned to remove mill scale, weld spatter, dirt and other foreign matter. All welding, NDT and stress relieving shall be complete and accepted by COMPANY as complete. All welds and flanges shall be clean and exposed for external inspection.

B. All in-line equipment or devices which may be damaged or hamper the test shall be removed from the system. All sensitive in-line and on-line instrumentation items shall be removed or isolated and this shall include, but not limited to the following:

1. Pressure vessels or any mechanical equipment
2. Check valves or check valve flappers
3. Restriction orifices / orifice plates

4. Positive displacement meters
5. Turbine type meters
6. Self regulated controllers
7. Relief valves
8. Rupture Discs
9. Level controls and switches
10. Filter elements
11. Diffusers
12. Transmitters

C. Equipment removed for pressure test shall have documentation of manufacturer's pressure ratings and/or factory test records.

3.13 PRESSURE TESTING

A. All piping shall be subject to a hydrostatic test or pneumatic test in accordance with CFR Title 49, Part 192, Subpart J. Piping shall be tested to 1.5 times MAOP. Test media shall be approved by COMPANY and shall not be harmful to the piping materials or the environment.

B. Hydrostatic Test

1. Valves shall generally be in the open, or half open, position for test, as recommended by manufacturer. A closed valve may be used as isolation of a test only with specific approval of COMPANY, and after confirmation that the valve seats are rated for the test pressure. Provisions to vent air from the test arrangement shall be made prior to filling with test media.

2. The area where testing is to be performed is to be barricaded to prevent access by unauthorized personnel during the testing.

3. The piping shall be slowly filled with water until all air is evacuated. Temperature of the pipe shall be allowed to equalize with that of the test media prior to applying pressure. The vents shall be closed and the piping shall be slowly pressurized to 50% of the test pressure and visually inspected for leaks. When it is confirmed no leaks exist, pressure shall be increased in increments of 25% of test pressure until the test pressure is reached. When leaks are identified, the pressure shall be reduced to the level not greater than the previous increment 0 psi before flange bolts shall be torqued to stop the leak. Flange bolts shall not be torqued over allowable stresses. Where the leak cannot be stopped, pressure shall be relieved from the arrangement and inspection to determine the cause of the leak shall be carried out; this may require disassembling connections.

4. The piping shall be carefully inspected for leaks or distortions during the test. Inspection may require remote observation depending on test pressure and/or test media in order to safeguard personnel. For acceptance, no leaks or distortions in the piping are permitted.

C. Pneumatic Testing

1. All applicable guidelines for hydrostatic testing shall be followed. In addition, the space between the faces of all flanges connections shall be wrapped with duct tape shrink wrap, or other media that will seal the area and a small hole shall be punched through the tape, plastic, or other media at the top of the flange.

2. The piping shall be pressurized to 25 PSI and gross air leaks shall be remedied. The piping shall be slowly pressurized to 50% of the test pressure, then increased in increments of 10% until the test pressure is reached. Leak detector solution shall be applied to all threaded connections, welds, and at the holes in the sealing material applied at flange connections. When leaks are identified, the pressure shall be reduced to 0 PSI before flange bolts are retorqued or threaded connections tightened to stop the leak. Where the leak cannot be stopped. Pressure shall be relieved from the arrangement and inspection carried out; this may require disassembling connections.

3.14 READING, MEASUREMENTS & TEST DURATION

A. Pressure test duration shall be 8 hours, maintained at a pressure equal to or above the test pressure. Both chart recorders and hydraulic deadweight gauges shall be used for test measurement. Deadweight gauge readings shall be taken every hour. Chart recorders and pressure gauges shall have a valid calibration certificate within 6 months.

3.15 RECORDS

A. The CONTRACTOR shall provide documentation to record each pressure test. CONTRACTOR shall provide test records in accordance with CFR Title 49, Part 192, Subpart J. CONTRACTOR

B. If the piping fails the pressure test then no test chart will be signed off. The CONTRACTOR shall be responsible for all remedial work, repairs and retesting of piping that fails during testing. All rework shall be carried out in accordance with the relevant specifications and procedures.

3.16 REINSTATEMENT

A. After a successful test, the piping shall be emptied of the test medium. Where applicable, pressure tested piping shall be reinstated in accordance with project drawings. Where a hydrotest has been completed, pipe shall be dried post-hydrotest using a suitable method. The piping shall be subject to preservation to ensure no deterioration prior to system commissioning.

END OF SECTION

SECTION 260501 ELECTRICAL – GENERAL INSTALLATION REQUIREMENTS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. This specification covers the requirements for the supply of equipment, material, labor, tools, services and supervision as required for the installation, testing and placing into satisfactory operation of the electrical systems detailed in this specification and the attached drawings.

B. Any equipment and materials, other than those identified as being pre-purchased by the Company, necessary for the installation and wiring of the equipment within the scope of this contract shall be supplied by the Contractor.

C. The drawings presented outline the scope of the work required of the Contractor and are to be the basis of the Contractor's bid. The Contractor may offer for consideration alternates that are cost effective so long as these are clearly defined and approved by the Company.

D. The Contractor shall be responsible for sizing of all junction boxes and splitter boxes, verification of conduit sizes, conduit fill and loadings, cable ampacities and short circuit ratings for all Contractor-supplied equipment and materials.

1.2 REFERENCES

A. Materials and installation shall be in accordance with the latest revisions of the following codes, standards and specifications, except where more stringent requirements have been specified herein:

1. Local Building Codes
2. Building Code of Vermont
3. Fire Code of Vermont
4. National Fire Protection Association (NFPA)
5. National Electrical Code(NEC)
6. Underwriters Laboratories, Inc. (UL)
7. National Electrical Manufacturers Association (NEMA)
8. Institute of Electrical and Electronic Engineers (IEEE)
9. American Society of Testing Materials (ASTM)
10. Insulated Cable Engineers Association (ICEA)
11. Association of Edison Illuminating Companies (AEIC)
12. American National Standard Institute (ANSI)

B. In general, all electrical equipment furnished shall be listed and labeled by Underwriters Laboratories, Inc. (UL) or another acceptable organization to the "Authority having Jurisdiction" and the Company. This requirement will be waived only when the specified equipment is not available from any manufacturer with such a label or listing.

1.3 WORK TO BE DONE

A. The work to be done by the Contractor under this specification consists of the installation, supply of materials, off-loading of equipment, and inspection and testing, as specified.

B. Electrical equipment installed by the Contractor shall include equipment in Vermont Gas Systems – Addison Natural Gas Project M&R Stations.

C. In general, the equipment to be supplied and installed by the Contractor shall consist of, but not be limited to the following:

1. Supply and installation of all low voltage, control, signal and communication conduits and cabling.

2. Installation of any Company pre-purchased equipment.

3. Installation and termination of all RTU / DAC Panels in electronics buildings as shown on Drawings.

4. Supply, installation and termination of all junction boxes as shown on Drawings.

5. All conduit and raceway systems.

6. Lighting transformers and distribution panels

7. Building and equipment grounding system

8. Electrical check-out of all equipment installed and provide assistance to Company with commissioning and operational testing of all equipment and facility systems.

1.4 QUALITY ASSURANCE

A. Uniformity: Unless otherwise specified, equipment or material of same type of classification, used for the same purpose shall be products of same manufacturer. All material shall be new and of the current design of manufacturer providing equipment or material. All materials shall be as stated on project drawings. Any substitutions by contractor shall be approved by Company.

B. Design: Equipment and accessories not specifically described or identified by manufacturer's catalog numbers shall be designed in conformity with NEMA, IEEE, or other applicable technical standards and shall have neat and finished appearance.

C. Installation: Erect equipment in neat and workmanlike manner; align, level and adjust for satisfactory operation; install so that parts are easily accessible for inspection, operation, maintenance and repair. Minor deviations from indicated arrangements may be made, but only after obtaining approval from Company.

1.5 CONTRACT DRAWINGS

A. Location Approximate

1. The locations of equipment, fixtures, outlets and similar devices shown on the Contract Drawings are approximate only.

2. The Contractor shall determine the exact locations of the equipment, outlets, box-outs, sleeves and of similar items required for the coordination of electrical work with the structural, architectural, mechanical and other work as necessary.

B. Drawings Diagrammatic

1. Circuit diagrams shown are diagrammatic and functional only and are not intended to show exact circuit layouts, number of fittings, or other installation details.

2. The Contractor shall furnish all labor and materials necessary to install and place in satisfactory operation all power, lighting and other electrical systems.

1.6 CONTINUITY OF SERVICES

A. When buildings are in use during construction operations, keep all electrical systems in operation within all rooms of building at all times.

B. Schedules for various phases of Work shall be coordinated with all other trades and with Company.

C. Provide necessary and temporary connections and relocations as required to maintain systems in operation.

D. When connecting new facilities, do not shut off any Mechanical/Electrical facilities or services without prior written approval of the Company.

1.7 PROTECTED WORK

A. Hazardous Locations

1. In the areas designated as Hazardous and where explosion-proof work is shown or specified, all work and electrical equipment shall meet the requirements of the NEC for Class I Division 1 and 2 Group D locations unless otherwise noted.

B. Wet Locations

1. Where installed outdoors or in areas designated as Wet Locations, all work and electrical equipment shall meet the requirements of the NEC for Wet Locations.

1.8 INSPECTIONS AND APPROVAL

A. The Contractor shall have all electrical work inspected by the following agencies and this work shall pass such inspection:

1. Vermont Division of Fire Safety

B. The Contractor shall furnish to the Company a certificate of compliance stating that the completed installation complies with the requirements of the National Electrical Code. This certificate shall be completed by the agency listed above.

C. Any changes required by the authorities resulting from deficiencies in the Contactor's workmanship shall be implemented by the Contractor without cost to the Company.

1.9 SUBMITTALS

A. Contractor shall supply a submittal for all Contractor-supplied materials and equipment as indicated in the Electrical Technical Specifications.

PART 2 - PRODUCTS

2.1 EQUIPMENT AND MATERIALS SUPPLIED BY CONTRACTOR

A. The Contractor shall supply all equipment and materials needed for the electrical installation as shown on drawings.

2.2 MATERIAL CONTROL

A. The Contractor shall establish a very strict and comprehensive material control scheme, to warn of any potential material shortages.

2.3 DELIVERY, HANDLING AND STORAGE OF MATERIAL

A. Materials and equipment shall be delivered to the site of the work in their original containers, and containers shall not be opened until inspected by the Company.

B. Electrical equipment shall at all times during construction be adequately protected against mechanical injury or damage by weather.

C. If any materials or apparatus have been damaged, the apparatus or materials shall be restored to a new condition, subject to the inspection and approval of the Company, or replaced with new materials or apparatus.

D. Equipment shall be stored in accordance with manufacturer's recommendations. Temporary heaters shall be provided as required to prevent buildup of condensation in the equipment.

PART 3 - EXECUTION

3.1 GENERAL EQUIPMENT INSTALLATION

A. The installation of equipment shall be defined as the receiving, off-loading, storing where necessary, moving into its designated location, uncrating, assembly, setting up, connection to other equipment and preparing for operation, all in accordance with the Specification and with the Vendor's instructions and Installation Manuals.

B. The installation of cables shall be defined as the receiving, off-loading, storing where necessary, pulling out of cables, placing in conduit as required, entering the cables into panels and terminating.

C. The Contractor shall ensure that the cables and equipment are kept clean and are protected against damage, dust and moisture.

D. Cable ends shall be kept sealed to prevent the ingress of moisture.

E. Unless otherwise specified, the Contractor shall supply, fabricate, construct and erect all support brackets on mountings for all equipment supplied by the Contractor.

3.2 MAIN EQUIPMENT INSTALLATION

A. Wall mounted equipment shall be fastened to steel brackets to provide an installation that is true, plumb, secure and safe.

B. Vendor drawings and instructions for the installation of Company pre-purchased equipment will be made available to the Contractor. It shall be the responsibility of the Contractor to follow these documents during the installation, wiring, testing and energization of the equipment.

C. Installation of safety signs as required by code regulations or stipulated by the Engineer shall be the responsibility of the Contractor.

3.3 IDENTIFICATION

A. Equipment and Devices

1. All electrical equipment shall be clearly identified with its equipment number, function and voltage.

2. Each power and distribution panelboard, circuit breaker, junction box, etc. shall be identified with white lamacoid nameplate with black engraving, mechanically secured to the front with the screws or rivets to indicate function, voltage and equipment number as specified on the drawings. Enclosure ratings shall not be compromised in the attachment of labels. Labeling in accordance with NFPA70E must be applied where required.

3. Each power and distribution panelboard shall be equipped with a directory card, neatly typed with the final circuit designation and placed in the card holder under a transparent cover on the inside of the door of each panelboard.

4. The Contractor shall install "High Voltage" warning signs and "Danger" signs as called for by the safety regulations as required by code.

B. Cables and Conductors

1. All cables in panels, pullboxes, junction boxes and switchboards shall be tagged at both ends with the cable number assigned in the cable schedule/drawings. Tags shall be non-aging, labels which encircle the cable.

2. Both ends of all wires of each cable shall be clearly and permanently identified with wire markers, at the terminal to which they connect, with the proper wire number as shown on the drawings or wire termination sheets. Non-aging approved markers which encircle the wire shall be used.

3. All terminals for external connection shall be plainly and permanently marked, on approved marking strips as shown on the drawings or wire termination sheets.

3.4 AREA CLASSIFICATION

A. If the scope of work includes installations in hazardous area, the Contractor will be issued an area classification drawing indicating the Class, Division and Group designations in accordance with the NFPA classification for the different work areas.

B. The Contractor shall ensure that all equipment, materials and installation methods are suitable for the area classifications and shall report any discrepancies to the Company for correction.

3.5 SEALS AND FIRE STOPS

A. In hazardous locations, sealing fittings (seal offs) shall be installed in all conduit runs on the outside of buildings where the conduits enter the building. In addition, approved drain fittings

shall be installed at the bottom of these conduit runs and in all outdoor junction boxes to drain off any accumulated moisture.

B. Sealing fittings shall be installed for explosion proof work in accordance with in accordance with the provisions of Article 501 of the National Electric Code for Class I, Group D, Division 1 and 2 locations. Compound filled seal off fittings as specified shall be installed as required.

C. Seal offs shall be located in conduits not more than 16 inches from points of penetrations through floors or walls and where emerging from earth. Seal offs shall be sized in accordance with the latest requirements of the NEC.

D. Fire stops shall be provided for all cable penetration in floors and walls to prevent spread of fire, dust, water and gases from one area to another. The material used for sealing of all cable penetrations shall be non-combustible and shall have low heat transfer. The sealed opening shall have a fire rating equal to that of the surrounding wall or floor.

E. Use 3M fire Barrier Caulk CP-25 or Putty 303 or equal.

3.6 ELECTRICAL EQUIPMENT PAINTING AND CLEANUP

A. All distribution panels, steel work and similar indoor and outdoor equipment furnished with enameled epoxy or lacquered finish or which are galvanized and which are scratched or defaced during construction shall be refinished and restored to the original finish by the Contractor.

B. All exposed steel surfaces on electrical equipment/panels, unless already supplied galvanized or epoxy painted, shall be cleaned, prime coated and finish coated with an epoxy enamel.

C. The Contractor shall make a thorough inspection of all electrical equipment, remove any left over packing braces, shipping supports and thoroughly clean all equipment by hand operated vacuum machine.

D. The Contractor shall clean up all lighting fixtures. Damaged parts shall be removed and replaced. All burned out lamps shall be replaced.

END OF SECTION 26 05 01

SECTION 260521 WIRE & CABLE (600V OR LESS)

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide a cable system complete with all materials, including cables, wire, connectors, lugs and fittings as indicated in the specification or as indicated on the drawings. All cables and wiring shall be complete with identification tags per this Specification Section.

1.2 STANDARDS

A. Furnish cable, wire and wiring accessories listed by Underwritters' Laboratories (UL) as meeting National Electrical Code requirements and bearing the UL label where available for the equipment specified. In addition, the cable type shall have been submitted to standard tests established or approved by ASTM, ANSI, ICEA and NEMA.

1.3 SUBMITTALS

A. Submit Vendor data for all types and sizes of cables and wires being supplied by the Contractor. Identify material, construction data, color coding, insulation and jacket thickness and typical test data.

B. Submit Vendor data for the cable and wire identification tags to be supplied.

PART 2 - PRODUCTS

2.1 LOW VOLTAGE POWER CABLES (600 VOLTS OR LESS)

A. Multi-conductor low voltage power cables when installed in cable tray shall be type "MC", Class B stranded copper conductor, 600 Volt rated, XHHW or THHN conductor insulation, 90°C conductor temperature, with bare copper ground wire, binder tape and overall black, flame retardant PVC jacket.

B. Low voltage power cables installed in conduit shall as listed below. A suitable insulated ground conductor shall be installed adjacent to the phase conductors and must not be less than 45% of the phase conductor cross sectional area.

1. THHN (90°C damp or dry) insulation shall be used in damp or dry locations for all sizes.
2. XHHW (75°C wet or 90°C dry) insulation shall be used in wet locations for all sizes.

C. Conductors shall be annealed copper, 98% conductivity.

D. Minimum size conductor for general wiring shall be #12 AWG.

2.2 CONTROL CABLING

A. Multi-conductor control cable shall be 600 Volt rated, type "MC" when installed in cable tray, Class B stranded copper conductor, PVC/nylon insulated, UL type THHN 90°C, with an overall flame retardant PVC jacket rated at 90°C and overall aluminum mylar shield when indicated on the drawings. Conductors shall be color coded per ICEA S-66-524 Method 1, Table K-2 and shall be number printed.

B. Single conductor control wiring for insulation in conduit shall be of insulation type THHN for damp and dry locations and XHHW when installed in wet locations.

C. Minimum size conductor for control wiring shall be #14 AWG.

2.3 INSTRUMENTATION AND SIGNAL CABLE

A. Instrumentation and signal cables, shall be 300 Volt rated type "MC" when installed in cable tray, Class B stranded copper conductor, flame retardant, 105°C PVC conductor insulation, color coded, twisted pairs, triplets or quads, with aluminum mylar shield, stranded tinned copper drain wire and overall PVC jacket rated at 90°C. Belden Type or approved equal.

B. Minimum size of instrumentation and signal wiring shall be #18 AWG.

2.4 THERMOCOUPLE CABLE

A. Thermocouple cable shall be 300 Volt rated type "MC" when installed in cable tray, Class B stranded copper conductor, flame retardant, 105°C PVC conductor insulation, color coded, twisted pairs, triplets or quads, with aluminum mylar shield, stranded tinned copper drain wire and overall PVC jacket rated at 90°C. Belden Type or approved equal.

B. Minimum size of instrumentation and signal wiring shall be #18 AWG.

2.5 DIRECT BURIAL CABLES

A. Not used.

2.6 WIRE CONNECTION DEVICES FOR SPLICING

A. No splicing shall be permitted.

2.7 TERMINATING LUGS

A. Lugs for terminating power conductors up to and including #8 AWG shall be color coded, solderless compression or bolted type, unless otherwise indicated.

B. Lugs for terminating power conductors #6 AWG and larger shall be color coded, solderless compression type, one-hole for #6 AWG through #4 AWG inclusive, and two-hole for larger sizes.

C. Lugs for terminating control and switchboard wiring shall be color coded, solderless compression type with tinned copper ring tongue. Spade type lugs are not permitted in any control, protection or alarm circuits.

2.8 WIRE AND CABLE LABELS

A. Labels shall be non-aging, labels which encircle the cable or wire as applicable.

B. Refer to section 26 05 01 for cable and wire identification requirements.

PART 3 - EXECUTION

3.1 INSTALLATION

A. No cables or wires shall be installed in conduits or ducts until the entire installation is completed and cleaned inside and out. When installing cables, the Contractor shall exercise due care to prevent damage to cables and raceways; avoid undue tension, bending and kinks.

B. Only approved cable lubricants, expressly manufactured for this purpose shall be used.

C. The Contractor shall install conductors in such a manner that the bending radius of any wire or cable is not less than the minimum recommended by ICEA and/or the manufacturer. Do not exceed the manufacturer's recommended values for maximum pulling tension applied to any cable or wire.

D. All power conductors and cables shall be run full length without splices and shall be continuous from origin to termination. Where splices are necessary and approved, they shall be made in approved splice boxes with suitable connectors. All splices shall be insulated with heat-shrinkable heavy-wall flame-retardant cable sleeves.

E. Thoroughly clean wire ends before connectors or lugs are applied.

F. Jumpers shall be installed inside the various panels as indicated in the cable termination sheets/drawings.

G. All power conductors in multi-color cables shall be color coded consistently, distinctly and continuously throughout the work. Color coding tape shall be utilized and applied at all terminations, junctions, pull boxes and condulet fittings.

H. Single conductor cables having black insulation for power feeders and sub-feeders shall be identified by colored tape as to phase connections.

I. Conductor terminators for all power cables sizes shall result in a connection both mechanically and electrically secure and approved for the application regarding dissimilar metals.

J. Control and instrument cables shall be terminated at panels, junction boxes and individual device enclosures using approved fittings.

K. The Contractor shall install phase and neutral conductors of each branch or feeder circuit in a single conduit except where paralleling circuits are indicated on the circuit schedule. Install paralleling circuits of identical makeup and length as the paralleled circuit, and terminate conductors at the same location, mechanically and electrically, at both ends, to ensure equal division of the total current between conductors.

L. The Contractor shall connect all AC power wiring to equipment.

END OF SECTION

SECTION 260527 GROUNDING & BONDING SYSTEMS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide grounding and bonding system as specified or indicated on the drawings.

1.2 STANDARDS

A. Ground the electrical system neutrals and bond the non-current carrying parts of electrical equipment as indicated in the specification or drawings and as a minimum the grounding and bonding must meet the requirements of the National Electrical Code.

1.3 SUBMITTALS

A. Submit product data for conductors, connectors and devices supplied for use with the grounding system.

PART 2 - PRODUCTS

2.1 GROUNDING AND BONDING CONDUCTORS, CONNECTORS AND DEVICES

A. Provide the grounding and bonding conductors, connectors and devices of the type specified on the drawings.

PART 3 - EXECUTION

3.1 EQUIPMENT AND BUILDING BONDING

A. Static grounding (bonding) of equipment shall be by means of bonding the equipment to the embedded ground grid as indicated on the drawings.

B. Bolted connections shall be used on all equipment and building bonding. A washer shall be used between the bolt head and terminal lug. Surfaces shall be free from paint, rust, dirt, grease and corrosion.

C. Holding down bolts or flange bolts shall not be used for bonding connections. Holes, if not provided, shall be drilled and tapped to suit the grounding bolt.

D. Building structural steel, steel structures, vessels, tanks and other similar process equipment, which is not in direct contact with the building steel structures, shall be bonded as noted on the drawing.

3.2 ELECTRICAL SYSTEM SERVICE GROUNDING

A. Service grounding of equipment (grounding) shall be by means of grounding the equipment to a continuous ground conductor, including all connections from source of power to the equipment. All grounding shall meet the requirements of the National Electrical Code.

B. Where UL type "MC" cable is specified, the bare internal copper ground wire shall be used for service grounding.

C. Service grounding shall be provided for all motors, housing of electrical equipment, transformers, transformer neutrals, grounding resistors, distribution equipment, lighting panel board and other similar equipment as required by the National Electrical Code and as indicated on the drawings.

D. The neutral conductor of any electrical distribution system shall not be used as an equipment grounding conductor. System neutrals shall be grounded in accordance with the National Electrical Code.

3.3 INSTALLATION

A. Immediately after installation, the equipment shall be grounded and bonded as indicated on the grounding layout and detail drawings.

B. Exposed grounding or bonding conductors shall not be routed across sections where they may be subject to damage or interfere with the movement of equipment or personnel .In such cases and as required, the conductor may be embedded in the floor, protected by conduit or copper strap of equivalent size shall be used.

C. Ground and bonding conductors shall be installed in a neat manner and rigidly supported by clips or straps at intervals not greater than 5 feet.

D. Install conductors of size required by the National Electrical Code unless otherwise indicated or specified on the drawings.

E. Power, control and instrumentation cable shields and/or sheaths shall be grounded in accordance with instructions contained in the cable schedules or wire termination sheets.

F. When it is indicated on the drawings that the conduit system serves as the equipment service grounding, the means and continuity of ground shall be permanent, effective and maintained throughout. Threaded couplings or double locknuts and bushings shall be used at all boxes and equipment enclosures, including lighting fixtures. All flexible conduits shall be properly grounded through a grounding jumper and the necessary fittings. A separate ground conductor shall be installed in epoxy coated or PVC coated conduit, or other non-metallic duct runs and so connected to maintain the ground continuity of the conduit or duct system.

G. Conduit expansion joints, not thoroughly bonded otherwise, shall be provided with approved bonding jumpers of not less than No. 6 AWG green insulated stranded copper.

H. A minimum No. 6 AWG green insulated stranded copper ground conductor shall be run in all cable tray and bonded to each tray section at intervals not exceeding 50 ft.

END OF SECTION

SECTION 260534 CONDUITS

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes the conduit systems required, specified, and/or shown on Contract Drawings including conduits, fittings, boxes, hangers, and accessories being installed for Vermont Gas Systems, Inc. (Company).

1.2 REFERENCES

A. Material and installation shall be in accordance with the latest revisions of the following codes, standards and specifications, except where more stringent requirements have been specified herein:

1. American National Standard Institute (ANSI)
2. National Electric Code (NEC)
3. National Electrical Manufacturers Association (NEMA)
4. Underwriters Laboratories, Inc. (UL)

1.3 QUALITY ASSURANCE

A. Qualifications of Manufacturer

1. All equipment furnished under this Section shall be furnished by manufacturers who meet the quality, workmanship, and experience requirements as specified and approved by Company.

1.4 SUBMITTALS

A. General

A. Submittals and samples shall be submitted upon Company's request.

B. Prior to obtaining any material in connection with this Section, detailed shop drawings on all material shall be submitted upon Company's request.

C. Submittals shall contain a material list with manufacturer's name and data describing the material and showing its compliance with specifications and associated standards.

PART 2 PRODUCT

2.1 CONDUIT

A. Rigid Galvanized Steel Conduit (RGS)

1. Rigid metal conduit shall be galvanized steel, hot-dipped with zinc over the entire length, both exterior and interior including threads.

2. Each conduit shall have a coupling on one end and a thread protector on the other.

3. Conduit shall meet ANSI Standards C80.1 and C80.4 latest revisions. The conduit shall be manufactured by Allied Tube & Conduit Corporation, Pittsburgh Standard Conduit Company, Triangle PWC Co. or equal.

B. Rigid PVC Coated Galvanized Steel (RPGS) Conduit

1. The conduit, prior to PVC coating, shall meet the requirements for RGS conduit above.

2. A PVC coating shall be bonded to the outer surface of the galvanized conduit. The bond between the coating and the conduit surface shall be greater than the tensile strength of the coating. The inside surface of the conduit shall have a urethane coating.

3. PVC coating thickness shall be not less than 40 mils.

4. PVC coated RGS shall be manufactured in accordance with ANSI C80.1, UL-6, Federal Specification WW-C-581E and NEMA RN1 – PVC Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit standards.

5. Manufacturers or Equal

   a. Robroy
   b. Thomas & Betts

C. Electrical Metallic Tubing (EMT)

1. EMT shall be galvanized steel, hot-dipped with zinc over the entire length, both exterior and interior.

2. EMT shall be in accordance with ANSI Standards C80-3 latest revisions.

3. EMT shall be manufactured by Pittsburgh Standard Conduit Co., Allied Tube & Conduit Corporation, Triangle PWC Co., or equal.

D. Flexible Conduit

1. Flexible metallic conduit (Greenfield) - Shall be hot dipped zinc galvanized flexible steel or aluminum and shall comply with UL Standard No. 1, latest revisions. Conduit shall be manufactured by Anaconda Metal Hose Company, Triangle PWC Co. or equal.

2. Liquid-tight flexible metal conduit (Seal-tite) - Shall be constructed of flexible corrosion resistant zinc galvanized steel conduit with an extruded plastic jacket and built-in continuous copper ground strap under the jacket. Conduit shall be Type UA manufactured by Anaconda Metal Hose Company, Type LA manufactured by Electri-Flex Co. or equal.

3. Liquid-tight Flexible Non-Metallic Conduit - Shall be constructed of corrugated flexible PVC. Fittings shall be identified for use with flexible non-metallic conduit. Flexible non-metallic conduit shall be Carflex as manufactured by Carlon or equal.

4. Hazardous Area Flexible Metal Conduits - Flexible metal conduits installed in areas classified as Hazardous shall be Crouse-Hinds Series EC, Killark Series EK or equal.

2.2 JUNCTION, DEVICE AND PULL BOXES

A. Junction Boxes

1. Junction boxes and pull boxes shall be sized as required for the quantity and size of conductors to be installed within the box. Sizes shall comply with the requirements of the National Electric Code for wire bending space and radius.

2. Junction boxes installed in all non-hazardous open, wet areas or outdoors shall be NEMA type 4X with mounting lugs. Junction boxes shall have drilled and tapped holes for conduit terminations, gasketed covers secured by galvanized steel screws and drain holes.

3. Stamped Steel Junction Boxes -Junction boxes installed in areas approved for use with EMT conduit may be constructed of code-gaged galvanized steel.

4. Cast Junction Boxes -Junction boxes for use with RSC shall be constructed of hot dipped galvanized cast iron or copper free aluminum and shall be sized per NEC requirements. Boxes shall be manufactured by Crouse-Hinds Co., Killark Co. or equal.

5. Hazardous Area Junction Boxes - Junction boxes in areas classified as Hazardous shall be Series EJB or GU manufactured by Crouse-Hinds Co., Series XB or GR as manufactured by Killark Co., or equal.

B. Device Boxes for Outlets and Switches

1. Stamped Steel Device Boxes -In areas approved for use with EMT Conduit may be constructed of code-gage galvanized steel with required knockouts. Boxes shall be manufactured by Steel City Co., Raco Co. or equal.

2. Cast Device Boxes -In areas using exposed RSC boxes shall be constructed of hot dipped galvanized cast iron or copper free aluminum and sized per NEC requirements. Boxes shall be Series FD manufactured by Crouse-Hinds Co., Series FD, manufactured by Killark Co., or equal. (Use copper free aluminum boxes with RAC)

3. Hazardous Area Device Boxes -In areas classified as Hazardous, shall be Series ED manufactured by Crouse-Hinds; series SWB manufactured by Killark Co., or equal.

C. Pull Boxes

1. Pull boxes shall be used in dry locations only for pulling. No splicing of conductors shall be allowed. The boxes shall be constructed of galvanized steel, 12 gauge sheet metal, angle and frame members with welded joints. The box cover shall be gasketed and attached with stainless steel screws. A ground lug shall be provided, sized in accordance with the NEC.

2.3 CONDUIT OUTLET BODIES, FITTINGS, COUPLINGS AND EXPANSION COUPLINGS

A. Conduit Outlet Bodies

1. Conduit outlet bodies shall be used where required to permit ready fishing and withdrawing of wires. Conduit bodies not located in areas classified as Hazardous shall be gasketed. Bodies shall be of the cast iron or copper-free aluminum type. Bodies shall be Condulet series manufactured by Crouse-Hinds Co., Electrolet series manufactured by Killark Co., or equal.

B. Fittings and Couplings

1. EMT - All couplings and connectors for EMT shall be of the raintight cadmium plated, malleable iron gland compression type manufactured by O.Z. Gedney Co., Steel City Company, or equal.
2. Hazardous Areas - Seal off fittings in areas classified as Hazardous or Corrosive shall be Series EYS manufactured by Crouse-Hinds Co., Series E manufactured by Killark Co., or equal. Sealing compound shall be Chico manufactured by Crouse-Hinds or series SC manufactured by Killark or equal. Damming material shall be of the ceramic fiber type.

C. Flexible metallic conduit (Greenfield), Liquid-tight flexible metal conduit (Sealtite), and Liquid-tight Flexible Non-Metallic Conduit -Fittings shall be compatible with raceway material and in conformance with NEMA FB-1 and UL 514B. C. Expansion Couplings

1. Expansion couplings shall be a water-tight, corrosion resistant coupling with flexible neoprene outer jacket, stainless steel jacket clamp, flexible copper ground strap, and internal hub bushing.

2. Coupling shall compensate for the following movements:
   a. Axial expansion or contraction
   b. Angular misalignment
   c. Parallel misalignment

3. Coupling shall be Type XD as manufactured by Crouse-Hinds Company, Type DX as manufactured by O-Z Gedney Co., or equal.

2.4 CONDUIT SLEEVES

A. Where conduits pass through the walls of structures, they shall be installed in suitable sleeves. Sleeves, installed in the outside walls of structures or elsewhere where watertightness is required, shall be cast iron and shall be equal to thruwall and floor seals manufactured by O.Z. Gedney Electrical Manufacturing Company, Inc. Types No. FSK, WSK, FSC or WSC as required, or Link-Seal as manufactured by Thunderline Corp. When Link-Seal is used, a wall sleeve, with waterstop, shall be installed. All other sleeves shall be galvanized steel pipe.

2.5 CONDUIT HANGERS AND SUPPORTS

A. General

1. Hangers and supports for conduits shall be adequate to support conduit systems with a minimum safety factor of 10.

2. All steel parts of the conduit support systems shall be galvanized, cadmium plated or PVC coated.

3. Perforated strap hangers will not be accepted.

4. Conduit supports shall be as manufactured by T&B (Steel City-Kindorf or Superstrut), Unistrut, Allied, Globe, or B-Line.

5. One hole malleable iron pipe clamps shall be hot dipped galvanized. Pipe spacers shall be of malleable iron and have a hot dip galvanized finish.
6. Hanger rods shall be continuous thread and galvanized not less than 3/8" inch in diameter.

B. Slotted Channel Framing: Cold-Formed Metal Channels with Continuous Slot.

1. Size of Channels: Nominal 1-5/8 by 1-5/8 inches, 12 gauge unless otherwise indicated or required for the application.
2. Finish:
   a. Indoor Dry Applications: Electro-plated zinc coating (Super-strut Gold- Galv, Kindorf Gold Galv-Krom, etc.).
   b. Outdoor, wet applications: Hot dipped galvanized (Superstrut HDG, Kindorf HD, etc.).
   c. Corrosive applications: PVC coated (Superstrut PVC, Kindorf "P", etc.).
3. Fittings
   a. Channel attachment nuts shall be prelocated in channel and be self supporting (spring type).
   b. Conduit straps shall be of the notched type to fit channel with captured nut and bolt for tightening.
   c. Beam clamps shall be provided with jaw openings to accommodate selected beam and provided with tapped holes and/or captured nuts for support of threaded rods.
4. Manufacturer (refer to Finish above for correct product)
   a. Kindorf B-900, 905 series
   b. Superstrut A-1200, A-1200P series
   c. Globe G-5812, G-5812PO series
   d. B-Line B-22, B-22-1-7/8 H series
   e. Unistrut P-1000, P-1000-HS series
   f. Power Strut PS-200, PS-200-H-1-7/8 series
   g. Equal

C. Fasteners

1. All fasteners shall be stainless steel or silicon bronze.
2. All expansion anchors shall be self-drilling type.

2.6 MISCELLANEOUS ACCESSORIES

A. Warning Tape

1. Tape shall be of the detectable type and shall consist of a polyethylene tape with aluminum foil coil. Tape shall be 6" wide and shall have the legend "CAUTION ELECTRIC LINE BURIED BELOW". Lettering shall be black, on a red background. Tape shall be Panduit HTDU6R-E, Seton 37236, or equal.

B. Duct Bank Conduit Spacers

1. Underground ductbank conduit spacers shall provide stability and consistent separation of conduits within duct banks. Spacers shall be sized for the conduits with which they are used. They shall provide both vertical and horizontal spacing with interlocking intermediate and base spacers.
2. The separation between adjacent conduits shall be in accordance with NEC Article 310.
3. Manufacturer:
   a. Carlon
   b. Equal

PART 3 EXECUTION

3.1 INSTALLATION

A. General

1. All interior conduit work shall be installed exposed except areas in which there is a finished ceiling, or as indicated on the Contract Drawings, "Room Finish Schedule," a finished ceiling will be installed. These areas shall have all conduit work concealed.
2. No exterior conduits shall be run exposed on outside walls of buildings or structures.
3. Minimum size shall be 3/4 inch unless specifically shown otherwise.
4. Terminations of metallic conduits shall be furnished with grounding bushings.
5. Where exposed conduit requires clamping to the building structure, clamps shall consist of galvanized iron one-hole pipe straps and expansion shields.
6. Support outlets; pull boxes and junction boxes separately from building construction, not from conduit.
7. Where exposed conduit is permitted, install conduit parallel to or at right angles with lines of building in neat and organized configurations.
8. Coordinate all conduit installations with other trades in advance of installation.
9. Plug conduit openings until wires are installed.
10. Conduit reducers shall not be allowed.
11. Expansion couplings shall be installed in conduits crossing buildings expansion joints.
12. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
13. Complete raceway installation before starting conductor installation.
14. Install temporary closures to prevent foreign matter from entering raceways.
15. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above the finished slab.
16. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and keep straight legs of offsets parallel, unless otherwise indicated.
17. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.
18. Run parallel or banked raceways together on common supports.
19. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.
20. Join raceways with fittings designed and approved for that purpose and make joints tight.
21. Provide insulating bushings to meet NEC requirements.

B. Conduit Supports and Hangers

1. Conduit supports shall be spaced at intervals of 8 feet or less as required to obtain rigid construction.
2. Single conduits shall be supported by pipe clamps with clamp backs to raise conduits at least ¼ inch from the surface.
3. Multiple runs of conduits shall be supported on trapeze type hangers with steel horizontal members and threaded hanger rods.
4. Trapeze hangers shall be crossed braced to prevent spreading.
5. Conduit hangers shall be attached to structural steel by means of beam or channel clamps.
6. Supports located in corrosive areas and or where shown shall be PVC coated.

3.2 UNDERGROUND CONDUITS

A. Conduits shall be buried to a minimum depth of 30 inches unless otherwise shown or specified.

B. All buried conduits or groups of conduits shall have a warning tape buried 12 inches under finished grade and located directly over the centerline of the conduits. A second tape shall be buried 12 inches above the top of the highest conduit in the group. Where shown on the drawings, additional tapes shall be provided for ductbanks wider than 30 inches.

C. Underground conduits exiting and entering structures shall have expansion couplings as specified.

D. Where conduit is buried below grade, Contractor shall excavate, install, backfill and compact buried conduit prior to final compaction by General Contractor.

E. Any Earthwork shall be in accordance with Division 31 – Earthworks.

F. All conduits shall be cleaned and tested with a mandrel, prior to pulling cables.

G. The transition from the underground conduit system to the building interior conduit system shall occur at the first junction box, device, or equipment enclosure within the building. Conduit seals shall be provided at this location. Such seals shall minimize the circulation of air between the underground conduit system and the indoor enclosures. Seals shall be composed of Duct Seal sealing compound or similar non-hardening removable sealant.

H. Conduit bends in underground conduits shall have a minimum centerline radius as follows:

Conduit Size	Radius (inches)
3 inch	36
4 inch	42
5 inch	48

I. Conduit spacers shall be used when installing two or more underground conduits. Conduit spacers shall be located at intervals of 8 feet or less.

3.3 CONDUITS IN CORROSIVE AREAS

A. Where conduits pass through Corrosive Area walls and/or floors, seal off fittings as specified shall be installed to prevent gas leakage through conduit system.

3.4 CONDUITS IN HAZARDOUS AREAS

A. All conduit and equipment, in or through areas classified as Hazardous and all conduit and equipment for explosion proof work, shall be in accordance with the provisions of Article 501 of the National Electric Code for Class 1, Group D, Division 1 and 2 locations. Compound filled sealoff fittings as specified shall be installed as required.

3.5 CONDUIT TYPES

A. Rigid steel conduit shall be provided unless specifically noted otherwise on the Contract Drawings.

END OF SECTION

SECTION 260550 LIGHTING SYSTEMS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide lighting systems as specified or indicated on the drawings associated with the M&R sites for the Addison Natural Gas Project with all materials and equipment, including high efficiency lighting fixtures, raceways, accessories and associated systems.

1.2 STANDARDS

A. Furnish lighting fixtures and associated equipment, including component electrical parts, approved by Underwriters' Laboratories (UL) as meeting National Electrical Code requirements and bearing the UL label where available for equipment specified.

1.3 SUBMITTALS

A. Submit product data for each lighting fixture type complete with any accessory device or associated equipment. Identify each item by fixture specification type number, manufacturer catalog number, coefficients of utilization and detailed product data to allow accurate evaluation of the product.

PART 2 - PRODUCTS

2.1 LIGHTING FIXTURES

A. Provide lighting fixtures and associated control devices of the types specified on the lighting layout drawings.

2.2 BUILDING WIRING FOR LIGHTING SYSTEMS

A. Wiring for lighting systems shall be as listed for power cables in Section 26 05 21.

B. Conductors shall be sized to limit voltage drop in lighting and receptacle branch circuits as per requirements of the National Electrical Code.

PART 3 - EXECUTION

3.1 INSTALLATION

A. It shall be the responsibility of the Contractor to coordinate the installation of the lighting systems with the installation of other services with in the building structures and to report to the Company any conflicts for proper adjustments. The circuiting of fixtures shall be in accordance with the panel schedules.

B. Lighting fixtures shall be installed plumb and true. Fixtures shall be installed only after all work that might damage or soil the fixture, lamps or diffusers has been completed.

C. Install lighting fixtures as recommended by the manufacturer, complete with lamps of wattage indicated, bases, hardware and hangers to provide a complete working installation.

D. Fixtures to be installed at elevations shown on the drawings. Contractor to provide fluorescent lights / fixtures and associated hardware as required.

E. All lamps shall be supplied and installed by the Contractor.

END OF SECTION 260550

SECTION 260800 ELECTRICAL ACCEPTANCE TESTING

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. All electrical equipment, devices, electrical systems installed or provided by the Contractor under this Section shall be inspected and tested by the Contractor to ensure that they operate correctly for the specific installation and are operating as designed, based on the associated layout drawings.

B. Refer to Section 2.0 for the Contractors' responsibilities related to inspection, testing, and commissioning of Company Furnished equipment.

C. Any defects in the Contractor's workmanship disclosed by such tests shall be corrected by the Contractor at the expense of the Contractor and the work shall be tested again. All changes made in the installation shall be marked by the Contractor on a master set of "As-Built" drawings.

D. When required by the Company, the Contractor shall provide at the Contractor's expense, equipment field Representatives for Contractor supplied equipment to perform equipment tests and train Company's operating staff.

E. The Company will provide specialized commissioning personnel when required to complete the commissioning of Company pre-purchased equipment, wire terminations or for other specialized testing when and as needed. The Contactor will provide support personnel as needed during system checkout , start up, commissioning and acceptance testing.

F. The Contractor shall provide instruments, meters, equipment and qualified personnel required to conduct tests and studies during and at the conclusion of the project .

G. The Contractor shall implement a safety test and commissioning tagging procedure. The tags shall be dated and signed and shall indicate equipment checked, equipment tested, equipment energized and equipment commissioned.

H. The Contractor shall perform all the equipment field tests as required to support Company commissioning plan.

I. In general, the work shall be performed in three stages as outlined in the following sections.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 INSPECTION

A. The first stage shall be inspection of all equipment associated with the Contractor installation responsibility, including Company Pre-Purchased equipment and prefabricated buildings and Contractor supplied equipment.

B. The Contractor shall confirm that all equipment and required quantities are complete and that equipment make and model specifications comply with the specified Project drawings and documentation.

C. The Contractor shall record that all equipment is without defects or damage. Any deviations shall be recorded and the Company immediately informed of any discrepancy.

3.2 TESTING (PRE-COMMISSIONING)

A. The second stage shall be Testing (Pre-Commissioning), prior to system power up, consisting of the following items.

1. Check that the installation is complete and that all interconnections are correct.

2. Check all power, control and signal wiring for continuity to ensure a clear path has been maintained. A formal sign off list of all wiring checks shall be provided to the Company prior to equipment energization.

3. Perform all equipment testing and correct deficiencies.

4. Provide assistance for third party commissioning and testing of the equipment:

5. Perform function tests to confirm correct operation of all devices, subsystems and systems, and correct all deficiencies.

3.3 COMMISSIONING (START-UP)

A. Commissioning (Start-up) M&R & Tap Station equipment and systems will be carried out by the Company or equipment manufacturer. The Contractor shall provide personnel throughout the commissioning period to assist and carry out any equipment adjustments, corrections or repairs, as required.

3.4 TEST PROCEDURES AND RECORD FORMS

A. The Contractor shall work with Company, develop and submit for approval to the Company's Representative an outline of proposed inspection and test procedures, checklists and test record forms for each system or piece of equipment, prior to the start of testing.

B. Test record forms shall include equipment number and system, method of testing, test equipment used, final readings obtained, adjustments made, test results and associated data.

C. The Contractor shall submit inspection and test results including complete data on actual readings taken and corrected values, to the Company's Representative for approval after each test period.

3.5 TESTING AND PRE-COMMISSIONING OF COMPANY FURNISHED EQUIPMENT

A. The Contractor shall provide testing and pre-commissioning of Company-furnished equipment. The Contractor shall submit for approval to the Company's Representative an outline of proposed tests for approval 30 days prior to the scheduled testing. The Contractor shall be responsible to thoroughly checkout, test and pre-commission all Company-furnished and Contractor supplied equipment and materials.

B. Field Representatives shall be provided by the Company for specialized testing and commissioning of the Company furnished equipment.

C. The Contractor will assist the Manufacturers' field representatives and Company's Field Personnel or commissioning representatives, as required, to complete final commissioning, startup and acceptance testing up to and including placing all equipment into Service.

D. The Contractor shall assist in correcting any manufacturer defects in the Company-furnished equipment, as required by the Company. The Contractor will be reimbursed under the terms of the Contract.

3.6 GENERAL GUIDELINES

A. All inspections and testing shall be performed in accordance with, OEM instructions, applicable codes and standards including but not limited to NEC, ANSI, IEEE, NFPA, NEMA, and OSHA.

B. All testing and commissioning shall also be performed in accordance with the following guidelines, as a minimum:

1. NETA Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

2. Equipment Manufacturer Guidelines

C. In general the Contractor's tests shall include the items listed in this specification and as further detailed in the following sections.

D. Verify that the installed equipment and systems are installed correctly with respect to the site layout and interconnection drawings, schematics, and drawings and specifications, and bill of materials

E. Check that all grounding terminals are connected to the correct grounding terminal and verify there are no ground loops.

3.7 DETAILED GUIDELINES

A. The Contractor shall test all equipment or devices in accordance with the equipment manuals and manufacturer's instructions. The test shall include as a minimum the items covered in the following sections.

3.8 GROUNDING

A. The grounding system shall be tested to ensure that all parts of the steel structures, motor frames, switchgear, trays, conduit and other electrical equipment will be at a potential in accordance with specifications.

3.9 LOW VOLTAGE (POWER & CONTROL) CABLES

A. Testing of all low voltage cable shall be performed by Company personnel. Contractor shall retain the responsibility for correction of any faulty installation or replacement of defective equipment as identified by the Company.

3.10 FINAL TEST REPORTS AND ACCEPTANCE

A. The Contractor shall submit the final approved test reports to the Company at the completion of the work under this Section.

B. Inspection and approval of Contractor tests will not constitute a waiver of his responsibility for the successful operation of the installed systems.

C. When all tests and commissioning have been completed to the satisfaction of the Company, the work shall be released by the Contractor to the Company.

END OF SECTION 26 08 00

SECTION 270000 DATA & COMMUNICATIONS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide data and communication system raceways, equipment mounting backboards, wall jacks and cabling as specified or indicated on the drawings.

B. Data and communication systems shall include telephone systems and data/computer communications systems, as specified or indicated on the drawings.

1.2 STANDARDS

A. Furnish communication systems cabling, and wall jacks listed by Underwriters' Laboratories as meeting National Electrical Code requirements and bearing the UL label where available for equipment specified.

1.3 SUBMITTALS

A. Submit product data for the communication systems cabling and wall jacks. Include manufacturer model number and detailed product data to evaluate the products.

PART 2 - PRODUCTS

2.1 CABLING

A. System cabling, wall jacks and raceway systems shall be of the type indicated or specified on the drawings.

PART 3 - EXECUTION

3.1 GENERAL

A. Provide and install the data and communication raceway system, including conduits complete with pull boxes, as specified or indicated on the drawings.

B. All openings for cables or conduit that penetrate exit corridors or as indicated on the drawings shall be sealed to maintain the fire ratings and integrity of these areas.

C. Provide pull lines in all spare conduits or ducts.

END OF SECTION

SECTION 311000 SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Protecting existing trees, shrubs, groundcovers, plants, and grass to remain as specified on the Drawings.
2. Removing existing trees, shrubs, groundcovers, plants, and grass.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Removing above- and below-grade site improvements.

1.2 DEFINITIONS

A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches in diameter; and free of subsoil and weeds, roots, toxic materials, or other non-soil materials.

B. Tree Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and defined by the drip line of individual trees or the perimeter drip line of groups of trees, unless otherwise indicated.

C. Grubbing: Removal of vegetation and other organic matter including stumps, buried logs, and roots.

1.3 MATERIAL OWNERSHIP

A. Cleared materials shall become Contractor's property and shall be removed from Project site, unless otherwise approved by the Construction Manager.

1.4 SUBMITTALS

A. Photographs or videotape, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.

B. Record drawings, according to Section "Project Record Documents," identifying and accurately locating capped utilities and other subsurface structural, electrical, and mechanical conditions.

C. Certification: Submit written certification by qualified arborist that trees indicated to remain have been protected during the course of construction in accordance with recognized standards and that where damage did occur, trees were promptly and properly treated. Indicate which damaged trees (if any) are incapable of retaining full growth potential and are recommended to be replaced.

1.5 QUALITY ASSURANCE

A. Engineer or Construction Manager shall stake limits of clearing, grubbing, and stripping, prior to commencing of work.

1.6 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.

2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction. Detour routes shall be identified by adequate signs in accordance with the MUTCD.

B. Protect areas outside limits of disturbance from encroachment by construction personnel or equipment, regardless of property Ownership. Access shall be by specific, written permission or easement only

C. Improvements on Adjoining Property: Authority for performing site clearing indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.

1. Do not proceed with work on adjoining property until directed by Construction Manager.

D. Utility Locator Service: Properly notify utility locator service for area where Project is located before site clearing in accordance with local protocol.

E. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place in accordance with project environmental permits.

F. Contractor shall verify existing grades prior to performing work under this section. If existing grades are at variance with the drawings, notify the Owner and receive instructions prior to proceeding. No additional compensation will be considered resulting from grade variances once site clearing has commenced.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Locate and clearly flag, fence and protect trees and vegetation to remain or to be relocated.

1. Remove branches from trees that are to remain, if required to clear new construction and only if specifically approved by Engineer.

2. Where directed by Engineer, extend pruning operation to restore natural shape of entire tree.

3. Cut branches and roots, if required, with sharp pruning instruments; do not break or chop.

C. Protect existing site improvements to remain from damage during construction.

1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TREE PROTECTION

A. Erect and maintain temporary fencing around tree drip line before starting site clearing. Remove fence when construction is complete.

1. Do not store construction materials, debris, or excavated material within fenced area.
2. Do not permit vehicles, equipment, or foot traffic within fenced area.
3. Maintain fenced area free of weeds and trash.

B. Do not machine excavate within tree drip line.

C. Where excavation for new construction is required within tree drip line, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.

D. Do not allow exposed roots to dry out before permanent backfill is placed; provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in moist condition and temporarily support and protect from damage until permanently relocated and covered with earth.

1. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.

2. Coat cut faces of roots more than 1-1/2 inches in diameter with an emulsified asphalt or other approved coating formulated for use on damaged plant tissues.

3. Backfill with soil as soon as possible.

4. Where trenching for utilities is required within drip line, tunnel under or around roots by hand digging. Do not cut main lateral roots or tap roots; cut only smaller roots that interfere with installation of new work. Cut roots with sharp pruning instruments; do not break or chop.

E. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by Engineer and acceptable to the owner

1. Employ an arborist, licensed in jurisdiction where Project is located, to submit details of proposed repairs and to repair damage to trees and shrubs.

2. Replace trees that cannot be repaired and restored to full-growth status, as determined by Engineer and acceptable

3.3 UTILITIES

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Construction Manager and owner not less than two days in advance of proposed utility interruptions.

2. Do not proceed with utility interruptions without Construction Manager permission.

3.4 CLEARING AND GRUBBING

A. Completely remove obstructions, trees, shrubs, stumps, roots, grass, and other vegetation to permit installation of new construction.

1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.

2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.

3. Chip removed tree branches and dispose of off-site, unless otherwise approved by the Construction Manager.

B. Fill depressions caused by clearing and grubbing operations in accordance with Section "Earth Moving," unless further excavation or earthwork is indicated.

1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

3.5 TOPSOIL STRIPPING

A. Where trees are designated to remain, stop topsoil stripping and adequate distance from the trees to prevent damage to the main root system.

B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.

1. Remove subsoil and non-soil materials from topsoil, including trash, debris, \ and other waste materials.

C. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover, if necessary, to prevent windblown dust.

1. Do not stockpile topsoil within tree protection zones, natural resource areas, or RTE areas.

2. Dispose of excess topsoil as specified for waste material disposal.

3.6 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.

1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.

2. Paint cut ends of steel reinforcement in concrete to remain to prevent corrosion.

3.7 DISPOSAL

A. Burning of debris onsite is not permitted.

B. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property, right-of-ways and easements.

1. Separate recyclable materials produced during site clearing from other non-recyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities.

END OF SECTION

SECTION 312000 EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the preparation of the site, protection, excavation, embankment, drainage, dewatering, for site grading, excavating, and backfilling as shown on the Drawings, and as herein specified.

B. The Contractor shall accept the site in the condition in which it exists at the time of the award of the Contract.

C. The Construction Manager shall determine the suitability of materials that are to be used in the work and should any materials encountered be unsatisfactory for the purpose intended, they shall be removed from the site at the Contractor's expense.

1.2 QUALITY ASSURANCE

A. Reference Standards:

1. The latest edition of the following standards, as referenced herein, shall be applicable.

a. Vermont Agency of Transportation (VTAOT), 2011 Standard Specifications for Construction Book.

b. "Standard Specifications for Highway Materials and Methods of Sampling and Testing, American Association of State Highway and Transportation Officials (AASHTO)."

B. The Contractor shall comply with the requirements for soil erosion and sedimentation control, and other requirements of governmental authorities having jurisdiction, including the Vermont Agency of Natural Resources, Department of Environmental Conservation (DEC) and United States Army Corp of Engineers – New England Branch.

C. The Contractor shall provide and pay for all costs in connection with an approved independent testing facility to determine conformance of soils and aggregate with the specifications in accordance with Section "Quality Requirements."

1.3 SUBMITTALS

A. Samples:

1. The Contractor shall furnish earth materials to the testing laboratory for analysis and report, as directed by the Engineer, or as outlined in the specifications.

B. Test Results:

1. The testing laboratory shall submit written reports of all tests, investigations, and recommendations to the Contractor and the Engineer.

1.4 PROJECT REQUIREMENTS

A. Notify the Engineer of any unexpected subsurface condition.

B. Protection of Existing Utilities:

1. Locate existing underground utilities in areas of work. If utilities are to remain in place, provide adequate support and protection during earthwork operations, comply with OSHA requirements.

2. Coordinate interruption and/or termination of utilities with the utility companies and the Owner.

3. Provide a minimum of forty-eight (48) hours notice to the Owner and Utility and receive written notice to proceed before interrupting any utility.

4. Repair any damaged utilities as acceptable to the Construction Manager, at no additional cost to the Owner.

C. Protection of Persons and Property:

1. Barricade open excavations occurring as part of this work, and post with warning signs and lights.

2. Operate warning lights as recommended by authorities having jurisdiction.

3. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Select Granular Material: Sound, durable, sand, gravel, stone or blends with these materials, free from organic, frozen, or other deleterious materials, conforming to the requirements of VTAOT Div. 301 - Subbase and meeting the following gradation requirements Subsection Div. 704.05 – Crushed Gravel for Subbase:

Grading	Sieve	Percent Passing
Course	4"	95 to 100
	No. 4	25 to 50
	No. 100	0 - 12
	No. 200	0 - 6
Fine	2"	100
	1-1/2"	90 to 100
	No. 4	30 - 60
	No. 100	0 to 12
	No. 200	0 - 6

B. Selected Fill: Sound, durable, sand, gravel, stone, or blends of these materials, free from organic, frozen or other deleterious materials, conforming to the requirements of VTAOT Div. 301 - Subbase

and meeting the following gradation requirements for Subsection 704.06 – Dense Graded Crushed Stone for Subbase:

Sieve	Percent Passing
3/4"	100
1/2"	70 to 100
No. 4	50 to 90
No. 100	0 to 12
No. 200	0 – 6

1. Fines passing No. 200 shall be non-plastic.
2. Particle size analysis shall show no gap grading.

C. Bank Run Gravel: Shall conform with Section 704.04 of the VTrans Standard Specification for Construction.

D. Bank Run Sand: Shall conform with Section 703.03 of the VTrans Standard Specification for Construction.

E. ¾-inch Crushed Stone: Shall conform with Section 704.02B of the VTrans Standard Specification for Construction

F. 1-inch Crushed Stone: Shall conform with Section 7.04.02C of the VTrans Standard Specification for Construction

PART 3 - EXECUTION

3.1 PRECONSTRUCTION MATERIAL QUALIFICATION TESTING

A. A 30-pound minimum representative sample shall be obtained from each potential borrow source. If different material gradations are known to exist in the pit, samples shall be obtained for each material. Each sample shall be mixed thoroughly and reduced to test specimen size, in accordance with AASHTO T87. The test shall be performed in the order shown. Failure to pass any test is grounds for disqualification and shall lead to cessation of the test program for that material.

1. Particle Size Analysis:

   a. Method: ASTM D422.
   b. Number of Tests: One (1) per potential source.
   c. Acceptance Criteria: Gradation within specified limits.

2. Maximum Density Determination:

   a. Method: ASTM D1557, Modified Proctor.
   b. Number of Tests: One (1) per potential source.

3. Re-establish gradation and maximum density of fill material if source is changed during construction.

3.2 PREPARATION

A. Establish required lines, levels, contours and datum.

B. Maintain benchmarks and other elevation control points. Re-establish, if disturbed or destroyed, at no

additional cost to the Owner.

C. Establish location and extent of utilities before commencement of grading operations.

3.3 EXCAVATION

A. Excavation shall consist, in general, of the excavation of whatever substance is encountered to the lines, grades and sections shown on the Drawings, including excavation as necessary for grading and other similar features.

B. All suitable materials removed in excavation shall be used in the construction of embankments, subgrade, shoulders, slopes and at such other places as directed. The Engineer shall be the sole judge of what constitutes suitable material.

3.4 During construction, the grading operations shall be executed in such a manner that the excavation will be well drained at all times. All grading shall be finished on neat, regular lines conforming to the sections and contours shown on the Drawings.

A. Removal of materials beyond the indicated subgrade elevations, without authorization by the Engineer, shall be classified as unauthorized excavation and shall be performed at no additional cost to the Owner.

B. Excavation shall be performed in proper sequence with all other associated operations.

C. Maintain the slopes of excavation in a safe condition until completion of the grading operation.

D. All excavation work shall be inspected and approved by the Engineer before proceeding with construction.

E. Any excess excavation shall be removed from the site to disposal areas at the Contractor's expense.

3.5 FILL

A. When native soil conditions are not acceptable for pipe bedding and pipe envelope backfill, "bank run sand" shall be utilized.

B. When native soil conditions are not acceptable for trench backfill, "bank run gravel", "selected granular fill", "selected fill", or approved equal backfill shall be utilized.

C. All site fill not included within the trench limits shall be "selected fill" unless otherwise shown on the Drawings, or directed by the Engineer. "Select granular fill" shall be placed in lieu of selected fill where directed by the Engineer.

D. Before depositing fills, the surface of the ground shall be cleared of all refuse, brush and large stones. Conform to Section "Site Clearing."

E. Prior to placing fill over undistributed material, scarify to a minimum depth of six (6) inches.

F. Where fills are made on hillsides or slopes, the slope of the original ground upon which the fill is to be placed shall be plowed or scarified deeply or where the slope ratio of the original ground is steeper than 2 horizontal to 1 vertical, the bank shall be stepped or benched.

G. A thoroughly and satisfactorily subgrade is defined as having a minimum dry density of 95 percent of the maximum density of the material used. The subgrade material shall be compacted at a moisture content suitable for obtaining the required density.

H. Place backfill and fill materials in layers not more than 12" in loose depth unless shown otherwise on the Drawings. Lift height shall be governed by the ability of the compaction equipment to obtain the required compaction with 12" as a maximum lift height. Before compaction, moisten or aerate each layer as necessary to facilitate compaction to the required density. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost, ice, ponded water or extraneous debris.

I. When work is suspended during periods of freezing weather, measures shall be taken to prevent fill already in place from freezing. Upon resumption of work after any inclement weather, prepare the exposed surface by proof rolling to identify any zones of soft/loose soils. Soft/loose materials or frozen soils shall be removed and replaced by compacted granular fill.

J. Moisture Control:

1. Where fill or backfill must be moisture conditioned before compaction, uniformly apply water to the surface and to each layer of fill or backfill. Prevent ponding or other free water on surface subsequent to, or during, compaction operations.

2. Remove and replace, or scarify and air dry, soil that is too wet to permit compaction to specified density. Soil that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing or pulverizing, until moisture content is reduced to a value which will permit compaction to the percentage of maximum density specified.

K. All fill shall be thoroughly and satisfactorily compacted to 95 percent of the maximum dry density of material used when under pavements or roadways. All other fill shall be thoroughly and satisfactory compacted to 90 percent of the maximum dry density.

3.6 GRADING

A. The present and finished grade lines are shown on the contract drawings. Grade over the entire area, as shown on the drawings, shall be to the finished subgrade levels. Upon completion of this work, all debris shall be cleaned out and removed from the premises.

B. All cutting, filling, backfilling and grading necessary shall be done to bring the area to the following grade or subgrade levels:

1. For roadway surface areas; to the finished subgrade levels specified on the contract drawings.
2. For areas to be topsoiled and seeded; to within 6-inches of the finished grade.
3. For other surface treatments; as detailed on the Drawings.

C. Sufficient grading must be done during the progress of the work so that the entire site shall be well drained and free from water pockets.

D. Finish grading, including dressing swales, cleaning up excess footing excavation, dressing terraces, disposing of excess material and all other work necessary to prepare the site for topsoil and seeding shall be done after construction of structures and roadway surface areas is substantially complete.

3.7 COMPACTION EQUIPMENT

A. Compaction equipment used for the Work is subject to approval by the Engineer. Any equipment not originally manufactured for compaction purposes and equipment which is not in proper working order will not be approved. Furnish manufacturer's specifications covering data not obvious from a visual inspection of the equipment and necessary to determine its classification and performance characteristics.

B. Vibratory Drum Compactors: A self-propelled compactor classified for use according to the developed compactive force rating per linear inch of drum width (PLI). The actual operating frequency of the compactor will determine the PLI rating.

1. Approval of vibratory compactors usage is contingent upon proper operation of equipment at all times during compaction operations.

2. Compaction equipment other than vibratory drum compactors may be used subject to the approval of the Owner's Representative. Submit specifications at least 2 weeks prior tot use of this equipment.

3. Do not use vibratory drum compactors after concrete is poured.

3.8 DRAINAGE AND DEWATERING

A. Prevent surface, subsurface or ground water from flowing into excavation and from flooding project area, as well as surrounding areas.

B. Do not allow water to accumulate in excavations. Remove water to prevent soil changes detrimental to the stability of subgrades.

C. Provide and maintain the pumps, well points, sumps, suction and discharge lines, and other dewatering components necessary to convey water away from excavations.

D. Provide and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water and water removed from excavations by dewatering, to collection or run-off areas.

E. Dewatering operations shall be as directed by the Engineer and performed in accordance with Section 312319 "Dewatering."

3.9 FIELD QUALITY CONTROL

A. Notify the Engineer at least one (1) working day in advance of all phases of filling and backfilling operations.

B. Compaction testing shall be performed to ascertain the compacted density of the fill and backfill materials in accordance with the following methods:

1. In-place relative density:

a. Method: AASHTO T238, Nuclear Method
b. Number of Tests: One (1) per 12" vertical lift.

C. The Construction Manager may direct additional tests to establish gradation, maximum density, and in-place density as required by working conditions, at the Contractor's expense.

D. Acceptance Criteria: The sole criterion for acceptability of in-place fill shall be in situ dry density. Minimum dry density for all fill or backfill under pavement or roadways shall be 95 percent of the maximum dry density (90 percent for all other areas). If a test fails to qualify, the fill shall be further compacted and re-tested. Subsequent test failures shall be followed by removal and replacement of the material. (See VTAOT Specs. 203.11 (d) regarding moisture content to be determined by Engineer)

3.10 CLEAN UP

A. Provide and maintain protections or newly filled areas against damage. Upon completion or when directed, correct all damaged and deficient work by building up low spots and remove temporary protections, fencing, shoring and bracing.

B. Remove all surplus excavated material not required for filling and backfilling and legally dispose of same away from premises.

C. Leave the premises and work in clean, satisfactory condition, ready to receive subsequent operations.

END OF SECTION

SECTION 312316.26 ROCK REMOVAL

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes drilling, blasting, excavation, removal and disposal of rock as necessary for the installation of the Work, and as indicated and specified herein.

1.2 REFERENCES

A. The latest edition of the following standards, as referenced herein, shall be applicable.

1. "Structure Response and Damage Produced by Ground Vibration From Surface Mine Blasting," U.S. Bureau of Mines Publication RI 8507.

1.3 DEFINITIONS

A. Rock: Limestone, sandstone, shale, granite, quartz, and formations of other varying mineral or aggregate composition in solid beds or masses in its original or stratified position that exceed 1 cubic yard and that cannot be excavated with one of the following

1. A crawler tractor having a minimum draw bar pull rated at not less than 71,000 lbs. (Caterpillar D9N or equivalent), and occupying an original volume of at least 1 cubic yards or more.

2. A backhoe having a break out force rated at not less than 44,000 lbs. (Caterpillar 235D or equivalent), and occupying an original volume of at least 1 cubic yards.

B. Rock Excavation: Removal of rock by means of drilling, blasting, or use of pneumatic tools or expansive chemical agents. Removal of materials which, in the opinion of the Construction Manager, can be loosened and excavated by mechanical means (ripping, etc.) including frozen materials, soft laminated shale or hardpan, pavements, curbs and similar materials shall be classified as earth excavation with the exception of rock face scaling. Do not proceed with the excavation of this material until the Construction Manager has classified the materials as common excavation or rock excavation and has taken cross sections as required. Failure on the part of the Contractor to uncover such material, notify the Construction Manager, and allow ample time for classification and cross sectioning of the undisturbed surface of such material will cause the forfeiture of the Contractor's right of claim to any classification or volume of material to be paid for other than that allowed by the Construction Manager for the areas of work in which such deposits occur.

C. Unauthorized Excavation: Removal of any material beyond horizontal and vertical limits indicated on the Drawings or as specified herein, without the prior approval of the Construction Manager.

D. Scaling: Scaling shall be considered the removal of loose and broken rock from the face of rock cuts by mechanical means. Scaling shall be included in Rock Excavation item as defined above.

E. Blasting Specialty Contractor: A subcontractor approved by the Construction Manager retained by the Contractor performing all work related to drilling and blasting for rock excavating.

F. Independent Specialty Condition Survey Contractor: A subcontractor approved by the Construction Manager retained by the Contractor to perform pre and post blast condition surveys of nearby structures.

G. Independent Specialty Condition Seismic Survey Contractor: A subcontractor approved by the Construction Manager retained by the Contractor to perform seismic vibration monitoring on-site and off-site at locations specified or designated by the Construction Manager.

H. Pre-splitting: A controlled blasting method in which a smooth excavation face is created by simultaneously blasting a single row of closely spaced holes along the excavation line prior to blasting the remainder of the holes in the blast pattern. Pre-splitting blast holes shall be a minimum of 3 inches diameter at a center-to-center spacing not exceeding 24 inches.

I. Line Drilling: A controlled blasting method in which a single row of closely spaced, unloaded holes are drilled along the neat excavation line to create a plane of weakness which the primary blast can break. Center-to-center spacing of line drilled holes shall be no more than twice the hole diameter.

1.4 SUBMITTALS

A. General:

1. Submit Specialty Contractors' qualifications, to the Construction Manager for approval.

2. Submit work plans, site safety plans, proposed equipment, and a detailed outline of intended rock removal procedures and any other information listed in this specification to the Construction Manager for approval. This submittal shall not relieve the Contractor of complete responsibility for the successful performance of the method(s) used.

B. Blast Plan:

1. The Blasting Specialty Contractor shall develop a detailed written blast design plan complying with the applicable requirements in NFPA 496, "Explosive Materials Code". A copy of the blast design plan shall be furnished to the Construction Manager two weeks prior to blasting operations and shall include the types of explosive and sizes of charge to be used in each area of rock removal, types of blasting mats, sequence of blasting operations, and procedures that will prevent damage to site improvements and structures on Project site and adjacent properties. .

C. Pre and Post Blast Surveys:

1. Pre- and post-blast conditions surveys shall be completed for all nearby properties where ground vibrations will be perceptible (peak particle velocity greater than 0.1 in./sec.) prior to blasting. This survey shall include, at a minimum, all properties within a 600 ft. radius surrounding the construction area and any critical structures of interest as determined by the Construction Manager. Prior to execution of the survey, a plan noting structures to be surveyed and survey methods shall be submitted to the Construction Manager for approval.

2. During these surveys, all structures and installations, buildings, bridges, water sources, storage tanks, utilities and other significant features, etc., shall be examined and photographed as necessary. Pre and post blast surveys shall include all accessible indoor areas and outdoor sections of surveyed structures. Photographs accompanied by audio tape or written field reports, or narrated video tape shall be included as part of the

surveys. A written survey summary shall also be included with all submittals. Within thirty (30) days of completion of this survey and prior to blasting, a pre-blasting conditions survey report shall be submitted to the Construction Manager and Owner. Within thirty (30) days after completion of blasting operations, the Independent Specialty Condition Survey Contractor shall conduct a post-blasting survey of all the same properties. The post-blast conditions survey report shall be submitted to the Construction Manager and Owner within thirty (30) days.

3. Well testing shall include both quality and flow testing, both pre-blast and post-blasting, when within 600 feet of the blasting activities. Well quality shall be tested utilizing the Vermont Department of Health "Kit A", "Kit C", and "Kit RA". Well quantity shall be tested by a licensed Vermont Well Driller utilizing the "blow down" method.

D. Seismic Monitoring Plan:

1. The Seismic Specialty Contractor shall develop a written monitoring plan detailing equipment to be used, monitoring locations, seismic event record format example, and schedule. A copy of the seismic monitoring plan shall be furnished to the Construction Manager two weeks prior to blasting operations.

E. Seismic Monitoring Records:

1. A written seismic monitoring record of each monitoring/blast event shall be submitted to the Construction Manager the work day following each blast event. Monitoring shall be performed at the nearest point of the nearest structure to the blast, unless directed otherwise by the Construction Manager. The record shall include at least the following information:

   a. Location of seismic vibration and sound level transducers;

   b. Peak Particle Velocity (PPV), Vibration Frequency (Frq), Peak Displacement (PD) and Peak Particle Acceleration (PPA) in the longitudinal, vertical, and transverse directions as well as Resultant PPV and Peak Sound levels (dB) for each event;

   c. Seismograph printout;

   d. Date and time of blast event;

   e. Distance from seismograph to the blast

   f. Monitored time interval.

2. The Seismic Specialty Contractor shall immediately inform the Construction Manager if vibration levels or sound levels exceed specified values.

F. Blast Hole Records:

1. Written records of <u>each</u> blast shall be submitted to the Construction Manager the work day after each blast event and shall include at least the following items:

   a. Surface elevation;

   b. Location;

c. Number of holes;

d. Depth of holes;

e. Water conditions in each hole (if any);

f. Quantity and type of explosives used;

g. Maximum quantity of explosives per delay and number of delays. A delay shall be considered detonations separated by a minimum of 8 milliseconds;

h. Detonation delay pattern;

i. Stemmed length of hole;

j. Date and blast time.

G. Log of Complaints:

1. A log of all complaints and responses resulting from blasting operations shall be kept by the Contractor's designated contact person. The log should include as a minimum the following information: name and address of person registering complaint/inquiry; time and date when annoyance occurred; time and date when complaint/inquiry filed; nature of complaint/inquiry; action taken by contact person; follow-up action. A copy of all complaints and responses shall be submitted to the Owner and Construction Manager by the following work day.

H. Site Safety Plan:

1. Site safety shall be coordinated through the Contractor's office. A written safety plan shall be developed and distributed to all subcontractors, the Owner and the Construction Manager.

I. Certifications/Licenses:

1. One (1) copy of each certificate, license, permit and proof of insurance required by this specification shall be submitted to the Construction Manager after award of contract and prior to commencement of work.

J. Quality Assurance:

1. The Contractor shall use the services of an experienced Specialty Contractor to perform all blasting operations.

2. The Blasting Specialty Contractor and the blasting foreman shall be regularly engaged in blasting work of similar magnitude and scope and shall be approved by the Construction Manager to perform this project. A list of prior work experience for the Blasting Specialty Contractor and foreman shall be submitted with the bid.

1.5 REGULATORY REQUIREMENTS

A. The Blasting Specialty Contractor shall obtain all required permits, certificates, and licenses (City, State, Local etc.) prior to the commencement of any blasting operations.

B. Blasting safety procedures and operations shall comply with Title 29 Code of Federal Regulations

C. Part 1910.109, and all other applicable state and local standards and regulations.

1.6 PROJECT/SITE CONDITIONS

A. Existing Conditions: Existing physical conditions as defined for design purposes are noted on the Drawings and are described in the Information Available to Bidders section of the Contract Documents.

1.7 SEQUENCING AND SCHEDULING

A. Work associated with blasting shall be performed in accordance with the following general sequence:

1. Complete and submit pre-blast survey;

2. Notify all appropriate authorities having jurisdiction of proposed activities;

3. Prepare site for blasting;

4. Notify affected utility owners, operators and nearby residents as required in Part 3 - Execution;

5. Complete test blast program simultaneously with seismic monitoring;

6. Complete production blasting work simultaneously with seismic monitoring;

7. Complete and submit post-blast survey.

1.8 MAINTENANCE

A. Any and all damage caused by the Blasting operations shall be repaired or replaced to the Owner's and Construction Manager's satisfaction at the expense of the Blasting Specialty Contractor within thirty (30) days of completion of the Post-Blast Survey.

PART 2 - PRODUCTS

2.1 GENERAL

A. No perchlorates shall be acceptable in any blasting products. All caps, charges and other applicable blasting materials shall be perchlorate-free.

PART 3 - EXECUTION

3.1 PREPARATION

A. All personnel working on-site shall be instructed as to the nature, times, duration, site safety and warning signals concerning blasting operations.

B. Local residents within the Pre-Blast Survey area shall be notified at least 48 hours prior to initial blasting operations and provided with the name and phone number of one full-time, on-site contact person designated by the Contractor for handling all complaints and inquiries. Residents shall be notified of blast schedule and changes on at least a weekly basis throughout the duration of blasting operations. Residents shall also be informed of warning signals identifying an upcoming blast and all-clear signals following completion of a blast as outlined in Site Safety Plan.

C. Explosives and blasting caps shall not be brought onto the site or used without appropriate permits, licenses, certificates and/or prior written approval of authorities having jurisdiction. The Specialty Contractor is solely responsible for handling, storage, and use of explosive materials in accordance with regulatory and permit requirements.

3.2 ROCK REMOVAL

A. Remove rock as indicated by the Drawings and as necessary for the installation of the Work. Provide sufficient clearance, within the limits specified, for the proper execution of the Work.

B. Remove rock to lines and subgrade elevations indicated to permit installation of permanent construction without exceeding the following dimensions:

1. 24-inches outside of concrete forms other than at footings.

2. 12-inches outside of concrete forms at footings.

3. 6-inches outside of minimum required dimensions of concrete cast against grade.

4. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.

5. 6-inches beneath bottom of concrete slabs on grade.

6. 9-inches beneath pipe in trenches, and 12-inches on each side of the pipe..

C. Fill areas of over-excavated rock to the proposed subgrade elevations as required by Drawings with selected fill in accordance with Section "Trenching and Backfilling" or Section "Earth Moving" Over-excavation beneath foundations shall be filled with footing concrete ($f' = 3000$ psi minimum).

D. A test blast shall be performed and monitored prior to commencement of production blasting. Test blast records and seismic records shall be reported to the Construction Manager prior to continuation of blasting. If test blast indicates that the blasting plan requires modification, such changes shall be reported to the Construction Manager immediately. Reporting this information to the Construction Manager shall not relieve the Contractor(s) of complete responsibility for the successful performance of the method(s) used, nor shall the reporting constitute approval by the Construction Manager for the proposed plans.

E. The Seismic Specialty Contractor shall monitor the vibrations and sound levels caused by Blasting.

F. Seismic monitoring shall be performed for each blast, unless specified otherwise. Monitoring shall be performed at the nearest structure or at locations designated by the Construction Manager on each field day.

G. If the ground vibrations exceed specified tolerances the Blasting Specialty Contractor's operations shall cease immediately and remain stopped until the Blasting Specialty Contractor has taken all necessary additional measures to protect adjacent property and personnel.

H. The Blasting Specialty Contractor shall use steel or rubber blasting mats as may be necessary to control fly-rock.

3.3 EXCAVATION TOLERANCES

A. Blast hole drilling and overblast beyond the vertical limits indicated shall be less than 1.5 feet.

B. Rock removal limits shall include all materials defined as rock whether removal is accomplished by mechanical means (ripping, etc.) or by drilling and blasting.

3.4 VIBRATION AND SOUND TOLERANCES

A. Blast vibrations shall be maintained within safe limits as defined by the Peak Particle Velocity (in./sec.) vs. Blast Frequency (Hz) as described in the United States Bureau of Mines Publication RI-8507, Appendix B ("Siskind Curve").

B. Sound levels shall not exceed 130dB at the nearest structure.

C. Vibrations levels at new concrete structures shall be limited to the following levels:

Age of Concrete (days)	Maximum Allowable PPV
Less than 1/2 (in./sec.)	0.1
1/2 to 7 (in./sec.)	1.0
Greater than 7 (in./sec.)	2.0

END OF SECTION

SECTION 312333 TRENCHING AND BACKFILLING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the excavation of trenching, backfilling, compacting, dewatering, excavation support and disposal, as shown on the Contract Drawings, and as herein specified.

B. The Engineer will determine the suitability of materials that are to be used in the work and should any materials encountered be unsatisfactory for the purpose intended, they shall be removed from the site at the Contractor's expense.

1.2 QUALITY ASSURANCE

A. Reference Standards:

1. The latest edition of the following standards, as referenced herein, shall be applicable.

a. Vermont Agency of Transportation (VTAOT), 2011 Standard Specifications for Construction Book.

b. "Standard Specifications for Highway Materials and Methods of Sampling and Testing, American Association of State Highway and Transportation Officials (AASHTO)."

c. American Society for Testing and Materials (ASTM).

d. National Electric Code(NEC)

B. The Contractor shall comply with the requirements for soil erosion and sedimentation control and other requirements of governmental authorities having jurisdiction, including the State.

C. The Contractor shall provide and pay for all costs in connection with an approved independent testing facility to determine conformance of soils and aggregate with the specifications, in accordance with Section "Quality Requirements."

1.3 SUBMITTALS

A. Samples:

1. The Contractor shall furnish representative earth materials to the testing laboratory for analysis and report, as directed by the Engineer, or as outlined in the specifications.

B. Test Results:

1. The testing laboratory shall submit written reports of all tests, investigations, findings and recommendations to the Contractor and the Engineer.

1.4 PROJECT REQUIREMENTS

A. Notify the Engineer of any unexpected subsurface condition.

B. Protect excavations by shoring, bracing, sheet piling, or by other methods, as required to ensure the stability of the excavation. Comply with OSHA requirements.

C. Underpin or otherwise support structures adjacent to the excavation which may be damaged by the excavation. This includes service lines.

D. Protection of Existing Utilities:

1. Locate existing underground utilities in areas of work. If utilities are to remain in place, provide adequate means of support and protection during earthwork operations. Comply with OSHA requirements.

2. Coordinate interruption and/or termination of utilities with the utility companies and the Owner.

3. Provide a minimum of forty-eight (48) hours notice to the Owner and receive written notice to proceed before interrupting any utility.

E. Demolish and completely remove from the site any existing underground utilities designated to be removed, as shown on the Drawings or as specified.

F. Repair any damaged utilities as acceptable to the Owner, Engineer, and utility company at no additional cost to the Owner.

G. Contractor shall comply with maintenance and protection requirements as approved by the authority having jurisdiction.

H. Protection of Persons and Property:

1. Barricade open excavations occurring as part of this work and post with warning signs & lights, if required.

2. Operate warning lights as recommended by authorities having jurisdiction, if required.

3. Protect structures, utilities, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.

4. Perform excavation within drip-line of trees to remain by hand, and protect the root system from damage or dry-out to the greatest extent possible. Maintain moist conditions for root system and cover exposed roots with burlap. Paint cut roots of 1" diameter and larger with emulsified asphalt tree paint.

PART 2 - PRODUCTS

2.1 MATERIALS

A. The backfill shall be carried to the upper-level of the trench or subgrade. No stones or blasted ledge exceeding 3 inches in diameter shall be allowable during backfill operations. If native material is unsuitable for backfill, as determined by the Construction Manager, bank run gravel meeting VTAOT Section 704.04 shall be utilized.

Run-of-trench material, meeting the above criteria, shall be considered suitable material and shall be used for trench backfill only after tested in accordance with Section "Quality Requirements" and approved by the Engineer. The Contractor shall pay for all additional testing required to determine the conformance of run-of-trench material, if at any time during the Work this material appears to be

in non-conformance in the opinion of the Engineer.

PART 3 - EXECUTION

3.1 PRECONSTRUCTION MATERIAL QUALIFICATION TESTING

A. General:

1. Sufficient size samples shall be obtained from the potential borrow source to allow completion of tests listed in paragraph B below. Samples may be obtained from test borings, test pits, or from borrow pit faces provided that surficial dry or wet soil is removed to expose undisturbed earth. Tests listed below shall be performed on each sample obtained. A minimum of three (3) representative samples from each potential borrow source shall be furnished to the testing laboratory for prequalification testing. Test data shall be provided to the Engineer a minimum of 2 weeks prior to construction for approval of borrow source. Three test reports completed within three months prior to construction may be submitted for commercial earth borrow sources or suppliers of stone products (crushed stone or graded stone products) in lieu of prequalification tests as approved by the Engineer.

B. Material Tests:

1. Particle Size Analysis:

   a. Method: ASTM D422
   b. Number of Tests: One (1) per sample; three (3) per potential source.
   c. Acceptance Criteria: Gradation within specified limits.

2. Maximum Density Determination:

   a. Method: ASTM D1557 - Modified Proctor
   b. Number of Tests: One (1) per sample; three (3) per potential source.

3. Re-establish gradation and maximum density of fill material if source is changed during construction.

3.2 PREPARATION

A. Establish required lines, levels, contours and datum.

B. Maintain benchmarks and other elevation control points; re-establish if disturbed or destroyed, at no additional cost to the Owner.

C. Establish location and extent of existing utilities prior to commencement of excavation.

3.3 EXCAVATION

A. All excavation shall be made to such depth as required and of the width shown on the Contract Drawings to provide suitable room for building the structures and laying the pipe(s) they are to contain and for sheeting, shoring, pumping and draining as necessary, and for removing peat, silt, or any other materials which the Engineer may deem unsuitable. Hand trench excavation may be required to protect existing utilities and structures.

B. Trench excavation for pipes shall be made by open cut to accommodate the pipe or structure at the depths indicated on the Contract Drawings. Excavation shall be made to such a depth and to the

width indicated on the Contract Drawings so as to allow a minimum of six (6) inches of pipe zone bedding in earth (9 inches in ledge) to be placed beneath the bottom of all structures and barrels, bells or couplings of all pipes installed unless otherwise specified on the drawings.

C. The bottom of the trench shall be accurately graded to provide a uniform layer of bedding material, as required, for each section of pipe. Trim and shape trench bottoms and leave free of irregularities, lumps, and projections.

D. Stockpile excavated subsoil for reuse where directed or approved.

E. Over excavation/under cut: If, in the opinion of the Engineer, existing material below the trench grade is unsuitable for properly placing bedding material and laying pipe, the Contractor shall excavate and remove the unsuitable material and replace the same with an approved pipe zone bedding material properly compacted.

F. Stability of Excavation: Slope sides of excavations shall comply with local codes and ordinances having jurisdiction. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated. Maintain sides and slopes of excavation in safe condition until completion of backfilling.

G. Removal of materials beyond the indicated subgrade elevations, without authorization by the Engineer, shall be classified as unauthorized excavation and shall be performed at no additional cost to the Owner.

H. MUCK EXCAVATION (SEE VTAOT Section 203.05)

3.4 BEDDING AND BACKFILLING

A. All pipe trenches backfill (pipe zone bedding, pipe zone backfill and trench backfill) shall be compacted by tamping or rolling to achieve a minimum dry density of 90 percent of the modified Proctor maximum dry density of the material used (ASTM D1557). Backfill in pipe trenches to be covered with pavement or in roadways shall be compacted to a minimum of 95 percent of modified Proctor maximum dry density. Backfill materials shall be placed with water content within plus or minus three (3) percent of optimum moisture content per the modified Proctor method (ASTM D1557). Any water used for compaction shall be provided by the Contractor at his own expense. The Contractor is responsible for the repair of any trench settlement at no expense to the owner.

B. Bedding and backfilling shall be accomplished in three stages unless otherwise specified on the Contract Drawings. The first stage shall involve placement of "pipe zone bedding" as a layer(s) of selected material required to support, or to stabilize unsound or unsatisfactory foundation conditions. The second stage shall involve placement of "pipe zone backfill" from the top of the bedding material up to one (1) foot above the pipe. The third stage involves the placement of "trench backfill" in the remainder of the trench up to the surface of the ground or the bottom of any special surface treatment subgrade elevation.

C. The bedding material shall be placed in the trench after the trench has been excavated a minimum of six (6) inches in earth (9 inches in ledge) below the bell of the pipe to permit the placing of not less than six (6) inches in earth (9 inches in ledge) of bedding material unless otherwise specified on the Contract Drawings. Where, in the opinion of the Engineer, if more bedding material is required, the excavation shall be performed and bedding placed to the depth ordered by the Engineer.

D. Provide uniform bearing and support for each section of pipe at every point along the entire length, except where necessary to excavate for bell holes, pipe joints, or other required connections. Dig bell holes and depressions for joints after trench bottom has been graded. Dig no deeper, longer, or wider than needed to make the joint connection properly.

E. The bedding material shall be placed to the full width of trench. The bedding material shall be placed in loose lifts not exceeding twelve (12) inches to the elevation shown on the Contract Drawings or directed by the Engineer. The bedding material shall be tamped and compacted to form a firm and even bearing surface.

F. Pipe zone backfill shall be placed to the elevation shown on the Contract Drawings in loose lifts not-to-exceed twelve (12) inches in thickness, before compaction. The backfill shall be placed on both sides of the pipe at the same time and to approximately the same elevation. Any pipe that is damaged or moved out of alignment, regardless of cause, shall be replaced or realigned at the Contractor's expense. Each layer shall be thoroughly compacted by hand-tamping or mechanical means being careful not to damage the pipe. When the pipe zone backfill reaches one (1) foot over the top of the pipe, the entire surface shall be compacted by mechanical means.

G. The remainder, if any, of the trench above the pipe zone backfill shall be backfilled with suitable material in loose lifts not exceeding twelve(12) inches in thickness before compaction. Each layer shall be thoroughly compacted by mechanical means.

3.5 BACKFILLING AROUND STRUCTURES

A. The Contractor shall not place backfill against any structure without obtaining the approval of the Engineer. No dumping shall be allowed where materials would flow against or around such structures. Backfill material shall be deposited in horizontal layers not exceeding 6 inches in loose thickness or as shown on the Contract Drawings and thoroughly compacted by hand or by mechanical means to the satisfaction of the Engineer.

3.6 SUSPENSION OF WORK

A. Whenever the work is suspended, excavations shall be protected and the roadways, if any, left unobstructed. Within or adjacent to private property, material shall be stored at such locations as will not unduly interfere with traffic of any nature and in no case shall materials be stored in locations which will cause damage to existing improvements.

3.7 DISPOSAL OF MATERIAL

A. Excess and unsuitable materials shall be disposed of by the Contractor on the site in an area approved by the Engineer or legally disposed of off- site at the Contractors expense.

3.8 FIELD QUALITY CONTROL

A. Notify the Engineer at least three (3) working days in advance of all phases of filling and backfilling operations.

B. In-place density testing shall be performed to ascertain the compacted density of the fill and backfill materials in accordance with the following methods:

1. In-place relative density:

a. Method: AASHTO T238, Nuclear Method

C. Perform initial density testing to verify that contractors proposed compaction effort will obtain the minimum required densities.

D. In-place density tests on trench backfills shall be provided for every 500 cubic yards of fill and in vertical lifts not exceeding two (2) feet, and at least once daily.

E. One particle size analysis (ASTM D422) and one modified Proctor compaction test (ASTM D1557) shall be competed for every 5,000 cubic yards of material placed.

F. The Engineer may direct additional tests to establish gradation, maximum density, and in-place density as required by working conditions, at the Contractor's expense.

G. Acceptance Criteria: The criteria for acceptability of in-place fill shall be in-situ dry density and moisture content. If a test fails to qualify, the fill shall be further compacted and re-tested. Subsequent test failures shall be followed by removal and replacement of the material.

END OF SECTION

SECTION 312500 EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. This Section covers work necessary for stabilization of soil to prevent erosion and sedimentation during and after construction and land disturbing activities. The work shall include the furnishing of all labor, materials, tools, and equipment to perform the work and services necessary as herein specified and as indicated on the Drawings. This shall include installation, maintenance, and final removal of all temporary soil erosion and sediment control measures. All erosion and sediment control methods and devices used shall conform to the latest requirements imposed by federal, state and local authorities.

B. Comply with applicable project permit applications |Permits Pending| for stormwater discharges from construction activities.

C. The minimum areas requiring soil erosion and sediment control measures are indicated on the Drawings. The right is reserved to modify the use, location, and quantities of soil erosion and sediment control measures, based on activities of the Contractor and as the Engineer considers to be in the best interest of the Owner.

D. The Contractor shall be responsible for repair of any damage caused and shall be financially responsible for any penalties imposed.

1.2 QUALITY ASSURANCE

A. Soil erosion and sediment control measures shall be implemented in accordance with the requirements and procedures outlined in this specification, contract Drawings and documents, state standards or guidelines for soil erosion and sediment control, and all regulatory authorities having jurisdiction. Where conflicts between requirements exist, the more restrictive rules shall govern.

B. The Contractor shall provide all temporary control measures shown on the Drawings, or as directed by the Owner, Owner's representative, or soil conservation district for the duration of the contract. Erosion and sediment control Drawings are intended to be a guide to address the stages of work shown. Additional measures not specified on the Drawings may be necessary and shall be implemented to address intermediary stages of work and any conditions that may develop during construction at no cost to the Owner.

C. Temporary control provisions shall be coordinated with permanent erosion control features to the extent practical to assure economical, effective and continuous erosion and sediment control throughout the construction and post-construction period.

D. Soil erosion and sediment control measures shall at all times be satisfactory to the Owner's Representative. Owner's Representative will inform the Contractor of unsatisfactory construction procedures and operations if observed. If the unsatisfactory construction procedures and operations are not responded to and corrected within 48 hours, the Owner's Representative may suspend the performance of any or all other construction until the unsatisfactory condition has been corrected. Such suspension shall not be the basis of any claim by the Contractor for

additional compensation nor for an extension of time to complete the work. Any complaints, fines, etc. relating to ineffective erosion control, shall be the sole responsibility of the Contractor.

E. The Contractor shall inspect all soil erosion and sediment control measures at least at the beginning and end of each day to ascertain that all devices are functioning properly during construction. Maintenance of all soil erosion and sediment control measures on the project site shall be the responsibility of the Contractor until final stabilization is complete, and until the permanent soil erosion controls are established and in proper working condition.

F. The Contractor shall protect adjacent properties and watercourses from soil erosion and sediment damage throughout construction.

1.3 GENERAL

A. Soil erosion stabilization and sediment control measures consist of the following elements:

1. Maintenance of existing permanent or temporary storm drainage piping and channel systems, as necessary.

2. Installation and maintenance of stabilized construction entrance(s)

3. Construction of new permanent and temporary storm drainage piping and channel systems, as necessary.

4. Construction of temporary erosion control facilities such as silt fences, check dams, etc.

5. Topsoil and Seeding: Placement and maintenance of Temporary Seeding on all areas disturbed by construction. Placement of permanent topsoil, fertilizer, and seed, etc., in all areas not occupied by structures or pavement, unless shown otherwise.

6. Soil Stabilization Seeding: Placement of fertilizer and seed, etc., in areas as Specified hereinafter.

B. The Contractor shall be responsible for phasing Work in areas allocated for his exclusive use during this Project, including any proposed stockpile areas, to restrict sediment transport. This will include installation of any temporary erosion control devices, ditches, or other facilities.

C. The areas set aside for the Contractor's use during the Project may be temporarily developed to provide satisfactory working, staging, and administrative areas for his exclusive use. Preparation of these areas shall be in accordance with other requirements contained within these Specifications and shall he done in a manner to both control all sediment transport away from the area.

D. Stockpiles remaining in place longer than the durations detailed in the project permits shall be considered permanent stockpiles for purposes of erosion and sediment control.

E. All permanent stockpiles shall be seeded with soil stabilization seed and protected by construction of silt fences completely surrounding stockpiles and located within 10 feet of the toes of the stockpile slopes.

F. Sediment transport and erosion from working stockpiles shall be controlled and restricted from

moving beyond the immediate stockpile area by construction of temporary toe-of-slope ditches and accompanying silt fences as necessary. The Contractor shall keep these temporary facilities in operational condition by regular cleaning, re-grading, and maintenance.

G. The Contractor shall maintain all elements of the Soil Erosion Stabilization and Sedimentation Control systems and facilities to be constructed during this Project for the duration of his activities on this Project.

H. Formal inspections made jointly by the Contractor and the Engineer shall be conducted every 2 weeks to evaluate the Contractor's conformance to the requirements of these Specifications, unless more frequent inspections are required by applicable permits.

I. Replacement or repair of failed or overloaded silt fences, check dams, or other temporary erosion control devices shall be accomplished by the Contractor within 24 hours after receiving written notice from the Engineer.

J. If the Contractor has not complied with any of the above maintenance efforts to the satisfaction of the Engineer within 2 working days after receiving written notification from the Engineer, the Owner shall have the prerogative of engaging others to perform any needed maintenance or cleanup, including removal of accumulated sediment at constructed erosion control facilities, and deduct from the Contractor's monthly partial payment the costs for such efforts in accordance with the General Condition of the Contract.

1.4 SUBMITTALS

A. Submittals shall he made in accordance with Section "Submittal Procedures"

B. Material Certificates signed by material producer and Contractor, certifying that each material item complies with or exceeds specified requirements.

C. Results of all tests and investigations, including recommendations.

D. Submit product data, samples, specifications and manufacturer's installation procedures for approval as directed by Engineer prior to use.

PART 2 - PRODUCTS

2.1 GENERAL

A. Contractor shall provide all materials necessary to perform the work in accordance with the Project Manual, Permits Applications and Permits, or as shown/specified on the Drawings.

PART 3 - EXECUTION

3.1 GENERAL

A. The Contractor shall comply with and implement all necessary measures as indicated on the project plans and provided in the contract documents.

B. Review the soil erosion and sediment control Drawings as they apply to current conditions. Any deviation from the Drawings must be submitted for approval to the site Engineer in writing at least 72 hours prior to commencing that work.

C. Initial soil sediment and erosion control devices shall be in place prior to any land disturbing activity, in their proper sequence, and maintained until permanent protection is established.

D. The limit of the area of any earthwork operations in progress shall be commensurate with the Contractor's capability and progress in keeping the finished grading, mulching, seeding, and other such permanent control measures current and in accordance with the accepted schedule for construction phasing. Should seasonal limitations make such coordination unrealistic, as determined by the Owner's Representative, temporary erosion control measures shall be provided immediately by the Contractor at no expense of the Owner.

E. Temporary erosion control measures shall be used to correct conditions which develop during construction that are needed prior to installation of permanent control features, or that are temporarily needed to control erosion that develops during normal construction practices, but are not associated with permanent control features on the project.

F. The Contractor shall incorporate all permanent erosion control features (stabilization) into the project at the earliest practical time to minimize the need for temporary controls.

G. A stabilized construction exit (SCE) shall be installed and maintained at any point where construction vehicles enter a public right-to-way, street or parking area. The SCE shall be used to eliminate mud from the construction area onto public right-of-way. The SCE shall be constructed as shown on the Drawings. Any mud or debris tracked on streets shall be cleaned up immediately.

H. Dust Control: The Contractor shall provide a commercial grade; enclosed broom mechanical street sweeper to control sediment and/or dust that is tracked on to the adjacent streets. The street sweeper shall be equipped with a water storage tank to wet the area prior to sweeping. Where on site controls do not prevent material from being tracked on to adjacent streets, the street sweeper shall be used to clean the adjacent streets immediately. In addition, at a minimum, the adjacent streets shall be swept at the end of each week or as directed by the Engineer.

I. Any disturbed or stockpiled areas that will be left exposed more than the days required by the project Permits shall immediately receive temporary or permanent seeding. Mulch/straw shall be used if the season prevents the establishment of a temporary cover. Disturbed areas shall be limed and fertilized prior to temporary seeding.

J. Permanent vegetation shall be established as specified on all exposed areas according to project permits after final grading. Mulch as necessary for seed protection and establishment. Lime and fertilize seedbed prior to permanent seeding.

K. Slopes shall be permanently seeded and mulched. Any slopes that erode easily shall be temporarily seeded and mulched. Any slopes deeper than 3:1 or steeper or as indicated on Drawings shall be protected with Erosion Control Blanket per specifications.

L. All storm drainage outlets must be stabilized, as specified, before the discharge points become operational. Equip all inlets with inlet protection immediately upon construction.

M. Discharge from dewatering operations for the excavated areas shall not be directed to surface

waters without first properly removing the suspended sediment through filtration and/or settlement. The Contractor shall obtain any required permits associated with dewatering activities.

N. Silt fence shall be installed at locations on the Drawings and any additional locations necessary for proper sediment control. The Contractor shall maintain the silt fence until the project is stabilized and shall remove and dispose of the silt fence and silt accumulation when 1/3 the height of the fence is reached.

O. Soil erosion and sediment control shall include but not be limited to the approved measures. The Contractor shall be responsible for providing all additional measures that may be necessary to accomplish the intent of the Drawings.

P. Comply with all other requirements of authorities having jurisdiction.

Q. Soil Stabilization and Temporary Seeding, except in wetland areas:

1. Soil stabilization seeding shall consist of the application of the following materials in quantities as further described herein for stockpiles and disturbed areas left inactive for more than the number of days defined by the project permits.

    a. Lime.
    b. Fertilizer.
    c. Seed.
    d. Mulch.
    e. Maintenance.

2. Hydroseeding will be permitted as an alternative method of applying seed and associated soil conditioning agents described above. Should the Contractor elect to apply soil stabilization seeding by hydroseeding methods, he shall submit his operational plan and methods to the Engineer.

3. Temporary Seeding is to be placed and maintained over all disturbed areas prior to Permanent Seeding. Maintain Temporary Seeding until such time as areas are approved for Permanent Seeding. As a minimum, maintenance shall include the following:

    a. Fix-up and reseeding of bare areas or re-disturbed areas.
    b. Mowing for stands of grass or weeds exceeding 6 inches in height.

END OF SECTION

SECTION 323113 CHAIN LINK FENCE AND GATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section. See VTAOT Section 620 - FENCES.

1.2 DESCRIPTION

A. The Contractor shall provide all labor, materials, equipment, and services necessary for, and incidental to, the installation of chain link fence, gates, barb wire, and appurtenances as shown on the Drawings and as specified herein.

B. All chain link fence, hardware and appurtenances shall be galvanized.

1.3 QUALITY ASSURANCE

A. Comply with standards of the Chain Link Fence Manufacturer's Institute.

B. Provide steel fence and related gates as a complete system produced by a single manufacturer, including necessary erection accessories, fittings and fastenings.

C. Comply with ASTM A-53 for requirements of Schedule 40 piping.

D. Height of fence shall be measured from the top of concrete footing to the top of post.

1.4 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for chain-link fences and gates.
   1. Fence and gate posts, rails and fittings
   2. Chain link fabric, reinforcements, and attachments.
   3. Gates and hardware.
   4. Barbwire and accessories.

B. Shop Drawings: Show locations of fences, gates, posts, rails, tension wires, details of extended posts, extension arms, gate swing, or other operation, hardware, and accessories. Indicate materials, dimensions, sizes, weights, and finishes of components. Include plans, gate elevations, sections details of post anchorages, attachment, bracing, and other required installation and operational clearances.

C. Samples for Verification: for each type of chain-link fence and gate indicated.
   1. Galvanized steel wire (for fabric) in 6-inch lengths on shapes for posts, rails, wires and gate framing.

D. Product Certificates: For each type of chain-link fence and gate, signed by product manufacturer.
   1. A Type A Certification shall be furnished according to VTAOT Subsection 700.02
   2. Strength test results for framing according to ASTM F 1043.

E. Qualification Data: For installer

F. Field quality-control test reports.

G. Maintenance Data: For the following to include in maintenance manuals:

1. Galvanized Finishes

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed chain-link fences and gates similar in material, design and extent to those indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Include 10 ft. length of fence and gate complying with requirements.

2. Approval of mockups is also for other material and construction qualities specifically approved by Engineer in writing.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Engineer in writing.

4. Approved mockups may become part of the completed work if undisturbed at time of Substantial Completion.

C. Pre-installation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination"

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

PART 2 - PRODUCTS

2.1 STEEL FRAME WORK

A. Unless noted otherwise on drawings, minimum Nominal Framework Sizes shall be the following:

Fence Height	Line Posts	End, Corner & Pull Posts	Rails & Braces	Gate Frames	*Gate Posts	Concrete Foundation Dia. Diameters Line Posts	Concrete Foundation Dia. Corner/End Pull & Gate Posts	Depth
3'	1-1/2"	2"	1-1/4"	1-1/2"	3"	12"	12"	4'
3'-6"	2"	3"	1-1/4"	1-1/2"	4"	12"	12"	4'
4'	2"	3"	1-1/4"	1-1/2"	4"	12"	12"	4'
4'-6"	2"	3"	1-1/4"	1-1/2"	4"	12"	12"	4'
5'	2"	3"	1-1/4"	1-1/2"	4"	12"	12"	4'
6'	2"	3"	1-1/4"	1-1/2"	4"	12"	18"	4'
7'	2"	2-1/2'	1-1/4"	1-1/2"	3"	12"	12"	4'
8'	2"	3"	1-1/4"	1-1/2"	4"	12"	18"	4'
10'	3"	4"	1-1/4"	1-1/2"	4"	18"	18"	4'
12'	3"	4"	1-1/4"	1-1/2"	4"	18"	18"	5'

Fence Height	Line Posts	End, Corner & Pull Posts	Rails & Braces	Gate Frames	*Gate Posts	Concrete Foundation Dia. Diameters Line Posts	Concrete Foundation Dia. Diameters Corner/End Pull & Gate Posts	Depth
16'	3-1/2"	4"	1-1/4"	1-1/2"	4"	18"	18"	5'

Schedule 40 S/L Pipe Table		
Nominal Size (In.)	Actual Outside Diameter (In.)	Weight *(lb/ft)
1	1.315	1.67
1-1/4	1.660	2.27
1-1/2	1.900	2.71
2	2.375	3.65
2-1/2	2.875	5.79
3	3.500	7.58
3-1/2	4.000	9.11

50,000 psi Hot Dipped Aluminized Steel Tubing		
Nominal Size (In.)	Actual Outside Diameter (In.)	Weight *(lb/ft)
1	1.315	
1-1/4	1.660	1.83
1-1/2	1.900	2.28
2	2.375	3.12
2-1/2	2.875	4.64
3	3.500	5.71
3-1/2	4.000	6.56

2.2 CHAIN LINK FABRIC

A. General: Height indicated on Drawings. Provide fabric in one-piece heights for fence heights up to 10 feet measured between top and bottom of outer edge of selvage knuckle or twist. Comply with ASTM A 392, CLFMI CLF 2445, and requirements indicated below:

1. Steel Wire Fabric: Galvanized wire

a. 0.148 inch (9 gauge) diameter for fences and gates

B. Galvanized Woven Wire Fabric Mesh Size:
1. 2 inches for fences

C. Selvages: Knuckled top and bottom.

D. Woven Wire Fabric for Plank Road Station fencing shall be vinyl coated (black).

2.3 SWING GATE FRAMES

A. Assemble gate frames with fully coped welds as shown on the Drawings or on Shop Drawings approved by the Engineer.

1. All ferrous metal components shall be blast cleaned to and SSPC-6 commercial blast clean.

2.4 GATE HARDWARE

A. Hinges: Non-lift-off type, offset to permit 180 degree swing, and of suitable size and weight to support gate. Provide 1-1/2 pair of hinges for each leaf over 6 feet high. Personnel gates shall be equipped with self-closing spring loaded hinges.

B. Latch: Fork latch with locking device for double swing gates and self-closing fork latch with locking device for personnel gates.

C. On double swing gates there shall be a Drop Rod with Ground Socket as shown per Drawing.

D. Keeper for Vehicle Gates: Provide keeper which automatically engages the gate leaf and holds it in open position until manually released

2.5 MISCELLANEOUS MATERIALS AND ACCESSORIES

A. Post Tops: Steel, wrought iron, or malleable iron with 45 degree extension arms as shown on Drawings.

B. 12-1/2 gage, 4-point barbed wire

C. Stretcher Bars (Tension Flat Bar): One piece equal to full height of fabric, minimum cross-section 1/4 inch x 3/4 inch.

D. Metal Bands (for stretcher bars/tension flat bars): Steel, wrought iron, or malleable iron, to secure stretcher bars/tension flat bars to end, corner, pull and gate posts.

E. Wire Ties:

1. For tying fabric to line posts, rails and braces: 9 gauge steel wire.
2. For tying fabric to tension wire: 11 gauge steel hog rings.

F. 5/16" diameter Adjustable Brace Rod with Turnbuckle.

G. Tension Wire: 7 gauge coiled spring steel wire.

H. Extension Sleeves for 1-1/4" Schedule 40 Galv. Steel Pipe Top Rail & Mid Rail Assembles.

I. Bolts and Nuts: ASTM A-307, Grade A.

J. Concrete shall meet the requirements of Section 541 for Concrete, Class B., Mortar, Type I as specified in Section 707.01

2.6 FINISHES

A. Steel Framework:

1. Galvanized Pipe:

a. Metallic coating: Weight of Zn-5-Al-MM Aluminum-Mischmetal Alloy Coating, ASTM F 1345, Type III, Class 2, 1.0 OZ./SQ. ft.

B. Chain Link Fabric:

1. Galvanized Fabric:

a. Metallic coating: Weight of Zn-5-Al-MM Aluminum-Mischmetal Alloy Coating: ASTM F 1345, Type III, Class 2, 1.0 OZ./SQ. ft.

b. Plank Road Meter and Regulation Fencing fabric shall be black vinyl coated complying with ASTM F 934.

C. Gates:

1. Galvanized Framework:

a. Weight of Zn-5-Al-MM Aluminum-Mischmetal Alloy Coating: ASTM F 1345, Type III, Class 2, 1.0 OZ./SQ. ft.

2. Chain Link Fabric on gate same as finish same for fencing

D. Fence and Gate Hardware, Miscellaneous Materials, Accessories:

1. Fence Hardware, Materials and Accessories:

a. Per fence finish requirements

2. Gate Hardware, Materials and Accessories:

a. Per gate finish requirements

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for a verified survey of property lines and legal boundaries, site clearing, earthwork, pavement work and other conditions affecting performance.

3.2 PREPARATION

A. All trees, brush, and other obstructions which interfere with proper grade, alignment, and construction of fences shall be removed and disposed of as specified in VTAOT Section 201, unless otherwise directed by the Engineer. Modification of the alignment may be made as directed by the Engineer to preserve valuable trees or other features.

B. Stake locations of fence lines, gates and terminal posts. Indicate locations of utilities, irrigation system, underground structures, benchmarks and property monuments.

3.3 INSTALLATION

A. Space posts equidistant in the fence line with a maximum of 10 feet on center or as shown on drawings.

B. Footings: Excavate holes as indicated for fence and gate posts. Excavate footings to depths and widths as noted in Specifications or on drawings.

1. Where the ground is too soft to firmly hold the line, end, corner, pull, or gate posts, a post of sufficient length shall be used to obtain stability as directed by the Engineer.

2. Where rock is encountered, the posts shall be set in drilled holes to the depth shown on the Drawings and grouted with Mortar, Type I (VTAOT Section 707.01) so they are firmly held in position. When boulders are encountered, they shall be removed, the hole backfilled with suitable materials, thoroughly compacted, and the hole redrilled before installing the posts in the usual manner.

C. Setting Posts and Footings: Set posts in center of hole. Embed post so that bottom of post is 6" above the bottom of concrete footing as specified on the Drawing. Fill hole with concrete. Plumb and align posts. Vibrate or tamp concrete for consolidation. Finish concrete in a dome shape 1" above ground to shed water. Do not attach fabric to posts until concrete has cured a minimum of 7

days.

D. Install top rail continuously through post caps or extension arms. Install expansion couplings as recommended by fencing manufacturers.

E. Install intermediate rails in one piece between posts and flush with post on fabric side using special offset fittings where necessary.

F. Diagonally brace corner posts, pull posts, and terminal posts to adjacent line posts with truss rods and turnbuckles.

G. Attach fabric to the outside steel framework. Maintain a maximum 1 inch clearance above finished grade except when indicated otherwise. Thread stretcher bars through fabric using one bar for each gate and end post and two for each corner and pull post. Pull fabric tight so that the maximum deflection of fabric is 2 inches when a 30 pound pull is exerted perpendicular to the center of a panel. Maintain tension by securing stretcher bars to posts with metal bands spaced 15 inches oc. Fasten fabric to steel framework with wire ties spaced 12 inches o/c for line posts and 24 inches o/c for rails and braces. Bend back wire ends to prevent injury. Tighten stretcher bar bands, wire ties, and other fasteners securely.

H. Position bolts for securing metal bands and hardware so nuts are located opposite the fabric side of fence. Tighten nuts and score excess threads.

1. Secure post tops, extension arms, and caps with one-way cadmium plated steel screws.

I. Tension Wire: Support bottom edge of fabric with coil spring tension wire. Weave tension wire through fabric or fasten with hog rings spaced 24 inches oc. Tie tension wire to posts with 9 gauge wire ties.

J. Install gates plumb and level and adjust for full opening without interference. The top rail of the gates shall be level along the entire top rail of the steel fence framework. Install ground-set items in concrete for anchorage, as recommended by fence manufacturer. Adjust hardware for smooth operation and lubricate where necessary. Attach fabric as for fencing.

K. Touch Up: Small nicks or other blemishes shall be touched up with paint materials suitable for and matching the finish of the damaged material. Severely damaged fencing /gates deemed as unacceptable at the sole discretion of the Owner or its representatives shall be replaced at the contractor's expense.

END OF SECTION

ADDENDUMS TAB

ENGINEER'S ADDENDUM NO. 01
TO THE BID DOCUMENTS (PLANS AND SPECIFICATIONS) FOR
Proposed System Expansion
Addison Natural Gas Project (ANGP)
Meter & Regulation Contract
October 18, 2013

The following changes and/or additions shall be made to the plans and/or specifications. All other requirements of the contract documents shall remain the same. Acknowledge receipt of this addendum by inserting its number and date in the Bid Proposal.

Changes/Additions to the Bid Documents:

THIS ADDENDUM is hereby made a part of the contract documents on the subject work as though originally included therein. The following amendments, additions and/or corrections shall govern this work.

This Addendum is in the following parts as follows:

Part I	- Pertaining to Drawings
Part II	- Pertaining to Technical Specifications
Part III	- Clarifications to Contractor's Questions
Part IV	- List of Attachments
Part V	- Additional Information

PART I - PERTAINING TO DRAWINGS

1. ADD the following drawings to the Contract Documents:
    a. "AC Mitigation System Design – Valve Site Grounding Installation Drawings" dated 9/30/13 produced by ARK Engineering & Technical Services, Inc. NOTE: Only the drawings applicable to the M&R Stations are included in the scope of work.
    b. "Cathodic Protection System Design" dated 9/30/13 produced by ARK Engineering & Technical Services, Inc.
2. DELETE the following drawings from the Contract Documents (NOTE: These drawings have been removed from the Project website):
    a. "Colchester Launcher and Tie-In Site" dated 9/24/13 produced by CHA. The entire scope of the Colchester Launcher and Tie-In Site is now a requirement of the Transmission Contract and is NOT part of this contract.

PART II - PERTAINING TO TECHNICAL SPECIFICATIONS

1. Table of Contents: REPLACE with the attached REVISED Table of Contents.
2. Invitation to Bid
    a. Sixth paragraph, last sentence shall be REPLACED with the following: "This bid shall remain valid for a period of ***sixty (60)*** days from the bid due date."
3. Instruction to Bidders
    a. Item 14 – REPLACE "forty-five (45)" with "sixty (60)".
    b. Item 15.6 – REPLACE "forty-five (45)" with "sixty (60)".

c. Item 21.1 – REPLACE the second sentence with the following: "All Contractors must be qualified under the NGA Operator Qualification Plan."

4. Agreement
   a. Section 5.1 – REPLACE the first sentence as follows: "OWNER shall make progress payments on account of the Contract Price on the basis of CONTRACTOR's Application for Payment as recommended by ENGINEER, on a Net 30 day basis during construction as provided in paragraphs 5.1.1 and 5.1.2 below."
   b. Section 5.1.2 – DELETE entire second paragraph "If Work has been 50% completed…equal to 90% of the Work completed."
   c. Section 7.8 – REPLACE the listed drawing sets with the drawings listed on the attached Table of Contents.
5. Bid Form: REPLACE with the attached REVISED Bid Form.
6. Bid Summary Form: REPLACE with the attached REVISED Bid Summary Form.
7. Supplemental Conditions: ADD the following:

   "SC-14.2

   The first sentence of paragraph 14.2 shall be REVISED as follows: "At least ten days before the date established for each progress payment, which shall be **bi-weekly**, CONTRACTOR shall submit to ENGINEER for review an Application for Payment filled out and signed by CONTRACTOR covering the work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents."
8. Division 01 – General Requirements
   a. Section 011000 Summary – DELETE Items 1.1.D.1 and 1.1.E.

PART III – CLARIFICATIONS TO CONTRACTOR QUESTIONS

1. Answers to questions asked during the Pre-bid meeting have been addressed in the Pre-Bid Meeting Minutes (Refer to Part IV Below).
2. 10/15/2013 Q: "*As discussed at the pre bid that the access driveways for all sites will be by others. What does this include and where does our contract begin?*" A: The Transmission Contractor's scope of work for M&R access roads is defined as follows: "The civil/site construction of the M&R Station access roads is a responsibility of the Transmission Contractor. Coordination and scheduling between the Transmission Contractor and M&R Contractor for complete M&R station installations is a requirement of this contract. The Transmission Contractor access road limits of work shall be from the existing roads to the fence line of the M&R stations. The scope shall include all required stormwater and erosion prevention/sediment control measures. The scope shall include, but not be limited to, all earthwork, temporary access, drainage, subbase prepration, finished surfaces, and site restoration (within the defined limits of work)." **Coordination and scheduling between the Transmission Contractor and M&R Contractor is a requirement of this contract.** The M&R limits of work shall be the fence line adjacent to the access road. Limits not abutting the access road will include all civil/site and erosion prevention and sediment control measures shown on the civil drawings in each set of M&R Station Plans.

PART IV – LIST OF ATTACHMENTS

1. Pre-Bid Meeting Minutes titled "Addison Natural Gas Project Phase 1 – Facilities Pre-Bid Minutes of Meetings."
2. Drawings noted in PART I
3. Project Manual Table of Contents
4. Project Manual Bid Form
5. Project Manual Bid Summary Form
6. Project Manual Specification 012300 Alternates
7. Blasting Plan for Addison Natural Gas Project dated June 25, 2012. (ADD to Supplemental Condition Attachments)
8. Environmental Permits Key Points Slideshow presented by Josh Sky and Krista Reinhart VHB.

PART V – ADDITIONAL INFORMATION

1. If Contractors plan on submitting bids on multiple contracts (two or three) together, a cover letter stating specifics of combining the contracts shall be submitted. The letter, at a minimum, should discuss whether receiving one contract is contingent upon receiving other contracts, cost savings for "bundling" projects, logistics of approaching all three contracts, and other pertinent items for consideration by Vermont Gas Systems. This cover letter shall be attached with each bid package submitted.

END OF ENGINEER'S ADDENDUM

Date: October 18, 2013
Submitted by: CHA

V:\ProjectSpecs\24381\Final\ANGP Project\M & R\Conformed Set for Contract - current\addendums 1 - 4\24381 MR Addendum 1 2013-10-18.doc

ENGINEER'S ADDENDUM NO. 02
TO THE BID DOCUMENTS (PLANS AND SPECIFICATIONS) FOR
Proposed System Expansion
Addison Natural Gas Project (ANGP)
Meter & Regulation Contract
October 29, 2013

The following changes and/or additions shall be made to the plans and/or specifications. All other requirements of the contract documents shall remain the same. Acknowledge receipt of this addendum by inserting its number and date in the Bid Proposal.

Changes/Additions to the Bid Documents:

THIS ADDENDUM is hereby made a part of the contract documents on the subject work as though originally included therein. The following amendments, additions and/or corrections shall govern this work.

This Addendum is in the following parts as follows:

Part I	- Pertaining to Drawings
Part II	- Pertaining to Technical Specifications
Part III	- Clarifications to Contractor's Questions
Part IV	- List of Attachments
Part V	- Additional Information

PART I - PERTAINING TO DRAWINGS

1. For sleeper details at the Middlebury and Plank Road M&R Stations, refer to the Williston M&R plan set.

PART II - PERTAINING TO TECHNICAL SPECIFICATIONS

1. None.

PART III – CLARIFICATIONS TO CONTRACTOR QUESTIONS

1. **Q:** *"Currently, we would like to bid all three contracts of the Addison Natural Gas Project. In order to maximize economies of scale and better utilize resources, we request the bids for all contracts be due on 11-20-13."* **A:** **The bid due dates for the Distribution Contract and Meter & Regulation Contract are rescheduled for November 20, 2013 at 2:00 p.m.**
2. **Q:** *"Is there a physical address to which we can overnight the hard copy proposal? The P.O. Box address in the RFP will only accept documents via USPS."* **A:** Yes. Hard copies can be overnight shipped to: 90 Mechanicsville Road, Suite 7, Hinesburg, VT 05461"

3. **Q:** *"The drawings for the grounding plan are (pending) on each separate project. Can you find out the status on these for me?"* **A:** Electrical grounding plans were issued in Addendum 1.
4. **Q:** *"When will VGS provided material be ready for shipment to contractor pre-fab site? This includes all piping, equipment, etc as noted on the Bill of Materials.* **A:** Equipment and material has not yet been ordered. Expected lead times should be known at the end of the month but we fully expect all equipment and material to be available for shipping to the selected contractor pre-fab site by the end of March 2014. Refer to Pre-bid Meeting Minutes (Item 3.8) for additional information.
5. **Q:** *"When will the building be available for delivery to contractor pre-fab site? Are there any milestone dates that should be included in the construction schedule?"* **A:** Refer to Pre-bid Meeting Minutes (Item 3.8) regarding delivery of materials, including buildings, to fabrication facilities. Please note the "Post Meeting Clarification" in Item 3.8. Milestone dates supplied in the construction schedule shall include: mobilization to each site, delivery of structures from pre-fab site (if utilized), and anticipated completion dates for each station.
6. **Q:** *"Please provide weights of buildings. Please also confirm that building vendor will be responsible for off-loading building at delivery location."* **A:** See meeting minutes, Addendum #1 for weights (Item 3.6). CONTRACTOR will be responsible for offloading and handling at delivery location, refer to Pre-Bid Meeting Minutes (Item 3.8) for additional clarification handling of the structures.
7. **Q:** *"Will all access roads be constructed prior to the commencement of M&R construction?"* **A:** The scope of work, scheduling and coordination of the access roads are included in the Transmission Contract – Refer to Specification Section 011000 "Summary" that was issued in Addendum 1.
8. **Q:** *"Drawing 15-713-M-301 shows the 12" Mainline valve in the pipeline contractors scope. Drawing 15-713-M-305 shows the mainline valve in our drawing set. Should this be deleted or is this in the facility's scope?* **A:** All mainline valves are in the Transmission Contract, even when mainline valves are located within the fence line of a M&R Station. Coordination between the M&R Contractor and Transmission Contractor is a requirement of both contracts.
9. **Q:** *"Please confirm if the contractor is responsible purchasing/furnishing and installing ALL materials for the M&R grounding and cathodic protection systems."* **A:** Contractor is responsible for purchasing/furnishing and installing all materials for the grounding systems. VGS will furnish all materials for the cathodic protection systems – Contractor shall install.
10. **Q:** *"Please provide a complete list of contractors that attended each pre bid meeting on 10-8-13."* **A:** The Pre-bid Meeting sign in sheet was included as an attachment to Addendum 1.
11. **Q:** *"For the concrete supports below grade, would it be possible to place sleepers instead of piers?"* **A:** No. Concrete supports shall be constructed per plans.
12. **Q:** *"How many sections do the buildings come in? Are shop drawings available for the different structures?"* **A:** Shop drawings are not yet available. The number of sections for each structure has not yet been determined.

PART IV – LIST OF ATTACHMENTS

1. None.

PART V – ADDITIONAL INFORMATION

1. None.

END OF ENGINEER'S ADDENDUM

Date: October 29, 2013
Submitted by: CHA

V:\ProjectSpecs\24381\Final\ANGP Project\M & R\Conformed Set for Contract - current\addendums 1 - 4\24381 MR Addendum 2 2013-10-29.doc

ENGINEER'S ADDENDUM NO. 03
TO THE BID DOCUMENTS (PLANS AND SPECIFICATIONS) FOR
Proposed System Expansion
Addison Natural Gas Project (ANGP)
Meter & Regulation Contract
November 13, 2013

The following changes and/or additions shall be made to the plans and/or specifications. All other requirements of the contract documents shall remain the same. Acknowledge receipt of this addendum by inserting its number and date in the Bid Proposal.

Changes/Additions to the Bid Documents:

THIS ADDENDUM is hereby made a part of the contract documents on the subject work as though originally included therein. The following amendments, additions and/or corrections shall govern this work.

This Addendum is in the following parts as follows:

Part I	- Pertaining to Drawings
Part II	- Pertaining to Technical Specifications
Part III	- Clarifications to Contractor's Questions
Part IV	- List of Attachments
Part V	- Additional Information

THE BID DUE DATES FOR THE TRANSMISSION CONTRACT, METER & REGULATION CONTRACT AND DISTRIBUTION CONTRACT ARE ***RESCHEDULED FOR DECEMBER 4, 2013 AT 2:00 P.M. QUESTIONS ARE DUE WEDNESDAY, NOVEMBER 20 AT 2:00.*** *ANSWERS TO QUESTIONS WILL BE ISSUED BY ADDEDUM THE FOLLOWING WEEK.*

PART I - PERTAINING TO DRAWINGS

1. Refer to Part III below for clarifications/revisions to project drawings.

PART II - PERTAINING TO TECHNICAL SPECIFICATIONS

1. None.

PART III – CLARIFICATIONS TO CONTRACTOR QUESTIONS

1. **Q:** "*Refer to sheets E-110; E-210 and E-310. Our electrician pointed out that some of the conduit sizes may me undersized for what is in them. We are going to qualify what we think should be included but wanted to flag this in case there need to be changes made and so all bidders are on the same level.*" **A:** Correct, several conduits are inadequate. Contractor shall ensure all conduits are properly sized to adequately accept all wiring per applicable electrical codes.

2. **Q:** "*Please reference Williston M&R drawing 15-713-M-105. Will mark #501 be provided with the proper transition to weld to the 0.312" 12" line pipe?*" **A:** Mark #501 on Williston drawing 15-713-M-105 is incorrect. 6" wall thickness on tee reduced outlet is 0.432", and matches 6" 600# class, 0.432" WT pipe.
3. **Q:** "*How many pieces will the dry line heater at Williston Station be? What assembly will be required?*" **A:** Details from the operating and instruction manual are attached to this Addendum. The equipment is shipped without the vent stack. These details are applicable to heaters at all M&R Station sites (Plank Road, Williston, Middlebury) Mechanical assembly would be installing the vent stack onto the connection flange. Electrical and instrumentation assembly & connections required are noted in the attached manual.
4. **Q:** "*Please provide a specification for the M&R anchor bolt material and installation.*" **A:** Anchor Bolt material shall be galvanized carbon steel, high strength bolts ASTM A325 or zinc plated bolts to SAE J429, or other Owner approved equivalent bolts. Installation would either be expansion bolts or grouted/epoxied anchor bolts. Bolt type, size and connection detail is dependent on equipment / material to be anchored or supported, location and contractor experience.
5. **Q:** "*Please provide the make and model specifications for mark #140 (Inline Straightening Vane) on the Williston BOM M&R drawings. We would like to understand what it is take to install this piece.*" **A:** Please see attached document for straightening vane information. Current design welds the flow conditioner into the inlet spool.
6. **Q:** "*Please reference Williston M&R drawing 15-713-C-102, Section B-B. A quick internet search for frost line depths in the Burlington Vermont area netted several results. The results varied from 2 FT deep up to 5 FT deep. Please clarify how deep the Contractor should figure for the thickened edges for the Gas Heater Concrete Pad.*" **A:** Frost depth is 5.5 feet below grade. The gas heater concrete pad detail shall be deleted from the contract. Instead, the gas heater skids shall be placed on four (one centered on each skid corner) 12-inch sonotubes placed on BigFoot BF36 footings. Bottom of footing shall be 5.5 feet below grade and shall be placed on 12" of compacted crushed stone. A 5,000 psi minimum, non-shrink, non-metallic grout leveling pad shall be utilized between top of sonotube and bottom of skid to ensure equal loading of each sonotube.
7. **Q:** "*Please reference Williston M&R drawing 15-713-C-100, note 3. Please verify we have permission to have a local electrician check the existing service to determine if meets the minimum 200 amp service.*" **A:** Company will check existing overhead services and determine if service requirements of the station can be met. Load list is being developed and will be confirmed as equipment orders are placed. It is not expected the station load will exceed 200 amps. The Contractor shall be responsible for electric meter socket, conduits from station to the existing overhead pole, and conductor from meter to pole base at each station.
8. **Q:** "*Drawing 15-713-E-102 in the Williston M&R plans states "conduit for electrical/telephone (by others). Is this statement applicable to conduits outside the fenced M&R stations only or inclusive of all conduits shown on the plans?*" **A:** This note is incorrect. Contractor shall be responsible for electrical/telephone conduit from existing overhead pole to the station. Contractor shall be responsible for meter socket and conductor from pole base to station. Conductors and conduits inside the fence line are the responsibility of the contractor.
9. **Q:** "*Please refer to specification section 260501 Section 1.3.C, 7&8 which indicates the Contractor is to supply the building lighting system & building receptacles. This is contrary to section 01100 1.5.3 and the note on Williston dwg E-102 indicates the building lighting & receptacles to be supplied by the building supplier. Which prevails?*" **A:** The information on the drawing set prevails. United concrete buildings are supplied

pre-wired with building lighting and receptacles. Contractor responsibility is all necessary electrical conductor and conduit installation and completion to provide a fully functional site.

10. **Q:** "*We are having difficulty locating drawing 15-713-C-203. Can you assist with a electronic copy or point us in the right direction?*" **A:** The reference to drawing 15-713-C-203 appears to be relating to sleeper details and the heater pad detail. Reference 15-713-C-102 for these details.
11. **Q:** "*Which contract include the access road gates?*" **A:** Access road gates will be included with the Transmission Contract.
12. **Q:** "*Does contractor's scope of work include the instrumentation conduit and wire inside the M&R building and DAC room ?*" **A:** Yes.

PART IV – LIST OF ATTACHMENTS

1. Synopsis of Vermont Gas Systems, Inc. – Operator Qualification Plan
2. VGS Transmission Construction Contractor OQ List
3. VGS Transmission Construction Inspector OQ List
4. CWT Heater Details
5. Straightening Vane Details
6. ANGP Construction Conditions_131211 (This replaces the previously issued Construction Condition Line list).
7. ANGP_Project_Data_131211 KMZ (This replaces the previously issued Construction Condition Line list).

PART V – ADDITIONAL INFORMATION

1. None.

END OF ENGINEER'S ADDENDUM

Date: November 13, 2013
Submitted by: CHA

V:\ProjectSpecs\24381\Final\ANGP Project\M & R\Conformed Set for Contract - current\addendums 1 - 4\24381 MR Addendum 3 2013-11-13.doc

ENGINEER'S ADDENDUM NO. 04
TO THE BID DOCUMENTS (PLANS AND SPECIFICATIONS) FOR
Proposed System Expansion
Addison Natural Gas Project (ANGP)
Meter & Regulation Contract
November 26, 2013

The following changes and/or additions shall be made to the plans and/or specifications. All other requirements of the contract documents shall remain the same. Acknowledge receipt of this addendum by inserting its number and date in the Bid Proposal.

Changes/Additions to the Bid Documents:

THIS ADDENDUM is hereby made a part of the contract documents on the subject work as though originally included therein. The following amendments, additions and/or corrections shall govern this work.

This Addendum is in the following parts as follows:

Part I	- Pertaining to Drawings
Part II	- Pertaining to Technical Specifications
Part III	- Clarifications to Contractor's Questions
Part IV	- List of Attachments
Part V	- Additional Information

PART I - PERTAINING TO DRAWINGS

1. The Precast Concrete Leaching Basin detailed on the Civil sheets of each M&R set shall be replaced with a Nyoplast 24-inch incline drain basin with a H-20 rated 24-inch drop in Nyoplast grate. ½" diameter leaching holes shall be drilled per manufacturer's recommendations at 4-inches O/C vertically and at 15-degree increments horizontally. Nyoplast Leaching Basins shall be have an 18-inch deep sump and be backfilled with ¾-inch crushed stone. Rims of the leaching basins shall be set slightly below finished grade to allow for positive drainage in the paved area.

PART II - PERTAINING TO TECHNICAL SPECIFICATIONS

1. None.

PART III – CLARIFICATIONS TO CONTRACTOR QUESTIONS

1. **Q:** "*Will fill dirt be needed at any of the M & R Station locations? If so, can you provide existing and finish elevations for each location?*" **A:** Both existing and proposed grades are indicated on the C-series drawings for each site. Where plans note "Common Fill", bank run gravel shall be utilized.
2. **Q:** "*Please provide the bollard locations at the M&R and MLV stations that correspond to the bollard details in the drawings.*" **A:** Contractor shall include eight bollards in their

scope of work. They shall be located on the corners of the DAC building in Williston and New Haven. Bollards at the Middlebury M&R Station and MLV Sites are not necessary.

3. **Q:** "*Please reference Addendum #3, Part 1, #3. Please clarify that that the permanent access road cross section called out on sheet 15-713-C-506 is to be used for the entire length of the access road into MLV into MLV #4.*" **A:** This is correct – all permanent access roads shall be constructed per the cross section called out on sheet 15-713-506.
4. **Q:** "*Please clarify what material is to be used for the 6x4 and 4x4 landings shown on drawing 15-713-C-505.*" **A:** Pressure treated lumber. Landings and stairs shall have handrails compliant with the International Building Code (IBC). Landings and stairs shall be adequately secured to concrete piers/blocks.
5. **Q:** "*Addendum 3 stated the Owner is providing the fencing for the Colchester launcher site which raises the question of whether the Owner is providing the fence and gates for all M&R and MLV stations.*" **A:** Yes, all permanent fencing by Owner.
6. **Q:** "*Please clarify which of the following items is included in the M&R Stations scope of work for the Williston site*":
    a. **Q:** "*Elec & Tel Service from the existing pole to the building via 3 – 2" conduits (not on the plans says by others)*" **A:** Refer to Part III – Clarifications to Contractor Questions, Addendum 3, Question 8.
    b. **Q:** "*Elec conduits under the stone site pad (1" & ¾")*" **A:** All Conduits and conductors are within the Contractors Scope of Work. Refer to Part III – Clarifications to Contractor Questions, Addendum 3, Question 1 for additional clarification.
    c. **Q:** "*200 amp Elec Service – upgrading and connection costs*" **A:** Refer to Part III – Clarifications to Contractor Questions, Addendum 3, Question 7.
    d. **Q:** "*Plans show a bollard detail – I don't find any on the plans – are there any bollards?*" **A:** Contractor shall include eight bollards in their scope of work. They shall be located on the corners of the DAC building in Williston and New Haven. Bollards at the Middlebury M&R Station and MLV Sites are not necessary.
    e. **Q:** "*Grounding system for the fence, buildings & gates*" **A:** Included in contractors scope of work.
    f. **Q:** "*¾" Fuel line*" **A:** ¾" fuel line is within contractor's scope of work. Owner will supply all piping, valves/actuators, and fittings that are two-inch, in nominal size, and greater per Specification 011000, Section 1.5.A.1.

PART IV – LIST OF ATTACHMENTS

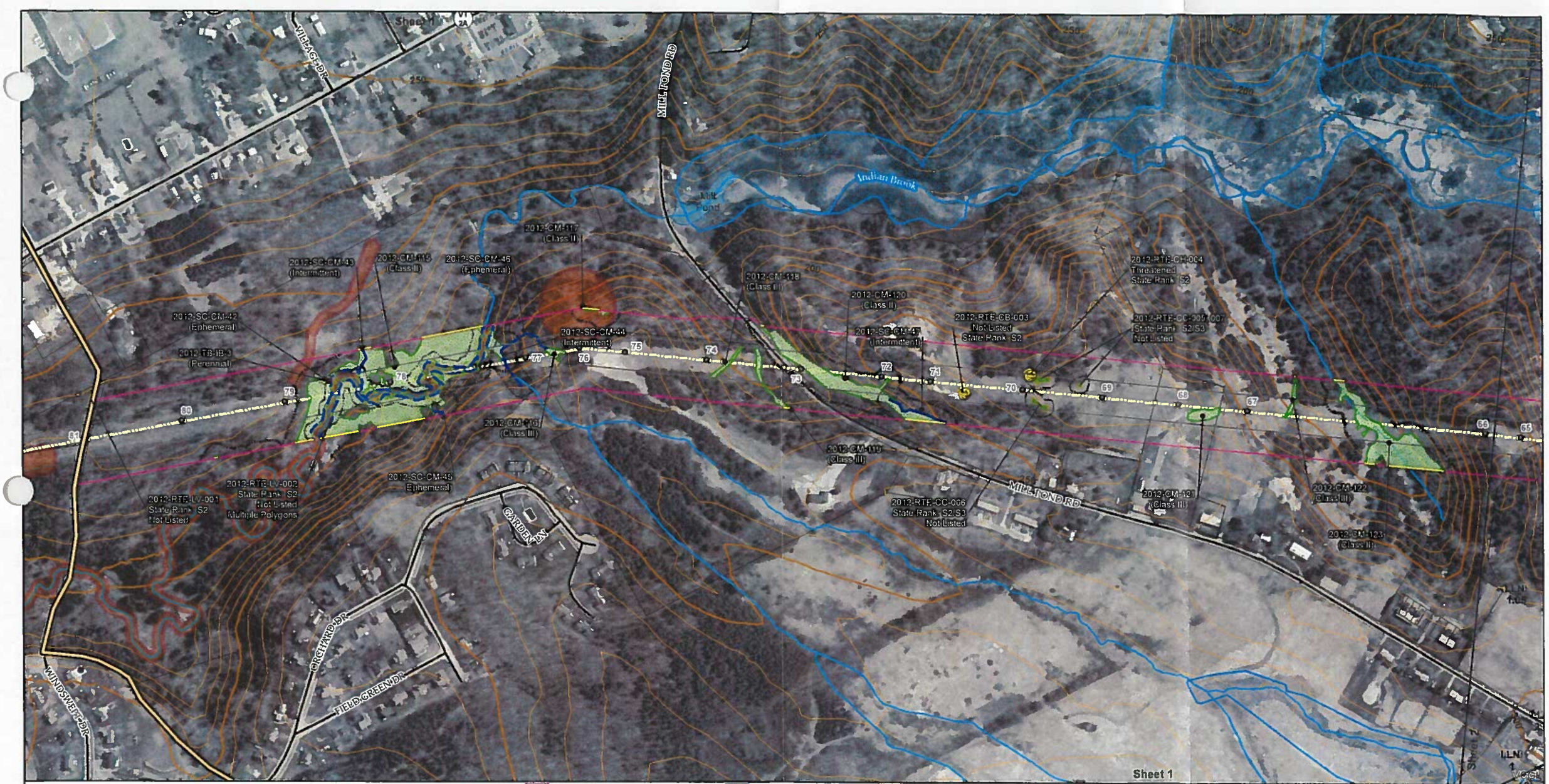
1. None.

PART V – ADDITIONAL INFORMATION

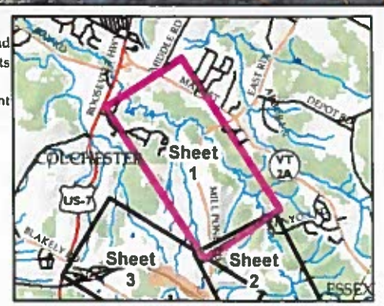
1. None.

END OF ENGINEER'S ADDENDUM

Date: November 26, 2013
Submitted by: CHA



Sources: Background By VMP (2005-2011); Study Areas by VHB (2012-2014), Delineated and Approximate Wetlands and Streams, Vernal Pools, Ordinary High Water, & Bridge/Culverts by VHB (2011-2014), RTE Species, Veg. Nat. Communities, & Bat Trees surveyed by Gilman & Briggs (2012/13), WDP Element Occurences by ANR (2013), VSWI Wetlands by ANR (2010); Deer Wintering Areas by VHB (2012/13); 10' Contours generated by VHB from HydroDEM by VCGI (2008); Statewide datasets from VCGI (2010) include: Roads by VTrans (2012), Town and County Boundaries by VCGI (2008), Streams and Waterbodies by VHD (2008), Railroads by VTrans (2003), Parcel Boundaries provided by CHA (2013), VELCO Structures from VELCO (2012); Proposed Transmission/Distribution/Network by CHA (2012-2014).



- VHB Study Area
- Approximate Study Area (2013/14)
- Existing Gas Transmission Main
- Proposed Transmission Mainline
- Proposed Distribution Mainline
- Proposed Distribution Local Network
- Wetland (Proposed Class)
- Approximate Wetland (Proposed Class)

Stream (Proposed Type)

- Stream Centerline
- Stream Top of Bank or Slope
- Ditch
- Vernal Pool
- Potential Vernal Pool
- RTE Plant Area (G&B)
- RTE Plant Location (G&B)
- Surveyed Potential Bat Tree
- Potential Bat Tree
- Potential Bat Tree Area
- Deer Wintering Area (VHB)
- 50 ft. Class II Wetland Buffer
- Natural Resource Buffer
- Veg. Natural Community (G&B)
- Natural Resouce Feature Continues
- Mitigation Plant Sites PreExisting
- RTE Species/Communities
- VELCO Structure Location
- Transmission Lines (VELCO)
- Deer Wintering Area (ANR)
- Bridge
- Culvert
- VSWI Wetland
- Parcel Boundary
- Railroad (VTrans)
- Roads (VTrans)
- 10' Contour
- 50' Contour
- Stream (VHD)
- Proposed Access Road

400 200 0 400 Feet

Vermont Gas - ANGP Phase I
Chittenden and Addison Counties, VT
Natural Resource Series

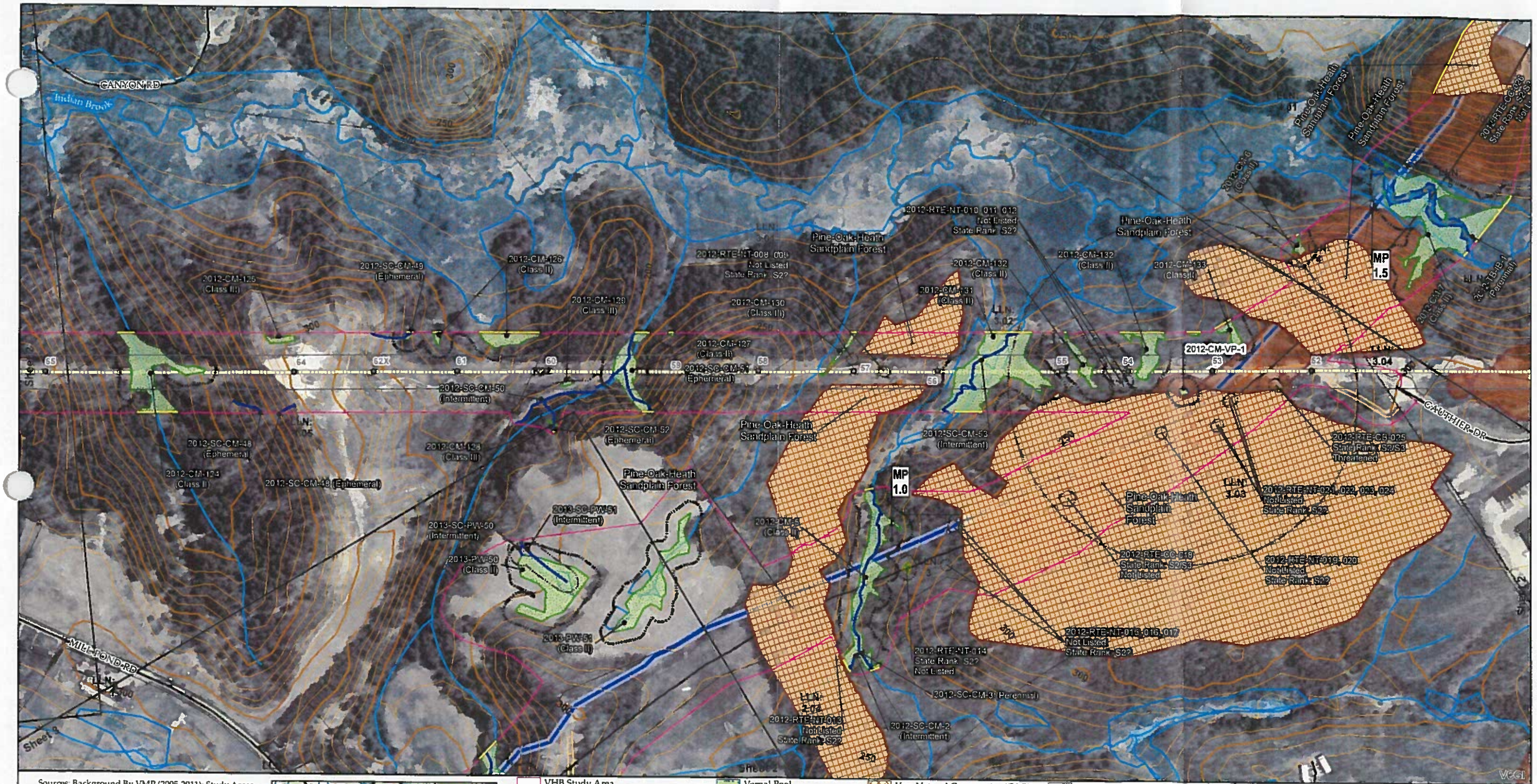
Sheet Number 1 of 64

December 13, 2012

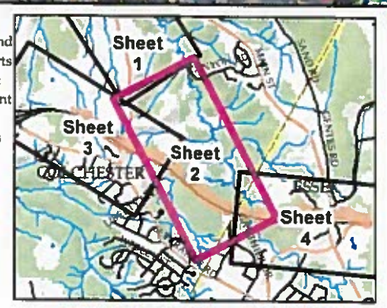
Last Revised: March 31, 2014

Vanasse Hangen Brustlin, Inc.

F:\57563.00 VGS Addison Expansion\GIS\Project\NR_Theme\SinglePanel_NR\NRAssessment_11x17_400scale.mxd Prepared by mbrumberg on September 26, 2013



Sources: Background By VMP (2005-2011); Study Areas by VHB (2012-2014); Delineated and Approximate Wetlands and Streams, Vernal Pools, Ordinary High Water, & Bridge/Culverts by VHB (2011-2014), RTE Species, Veg. Nat. Communities, & Bat Trees surveyed by Gilman & Briggs (2012/13), WDP Element Occurences by ANR (2013), VSWI Wetlands by ANR (2010), Deer Wintering Areas by VHB (2012/13); 10' Contours generated by VHB from HydroDEM by VCGI (2008); Statewide datasets from VCGI (2010) include: Roads by VTrans (2012), Town and County Boundaries by VCGI (2008), Streams and Waterbodies by VHD (2008), Railroads by VTrans (2003), Parcel Boundaries provided by CHA (2013); VELCO Structures from VELCO (2012); Proposed Transmission/Distribution/Network by CHA (2012-2014).



- VHB Study Area
- Approximate Study Area (2013/14)
- Existing Gas Transmission Main
- Proposed Transmission Mainline
- Proposed Distribution Mainline
- Proposed Distribution Local Network
- Wetland (Proposed Class)
- Approximate Wetland (Proposed Class)

Stream (Proposed Type)

- Stream Centerline
- Stream Top of Bank or Slope
- Ditch
- Vernal Pool
- Potential Vernal Pool
- RTE Plant Area (G&B)
- RTE Plant Location (G&B)
- Surveyed Potential Bat Tree
- Potential Bat Tree
- Potential Bat Tree Area
- Deer Wintering Area (VHB)
- 50 ft. Class II Wetland Buffer
- Natural Resource Buffer
- Veg. Natural Community (G&B)
- Natural Resouce Feature Continues
- Mitigation Plant Sites PreExisting
- RTE Species/Communities
- VELCO Structure Location
- Transmission Lines (VELCO)
- Deer Wintering Area (ANR)
- Bridge
- Culvert
- VSWI Wetland
- Parcel Boundary
- Railroad (VTrans)
- Roads (VTrans)
- 10' Contour
- 50' Contour
- Stream (VHD)
- Proposed Access Road

400 200 0 400 Feet

F:\57563.00 VGS Addison Expansion\GIS\Project\NR_Theme\SinglePanel_NR\NRAssessment_11x17_400scale.mxd Prepared by mbrumberg on September 26, 2013

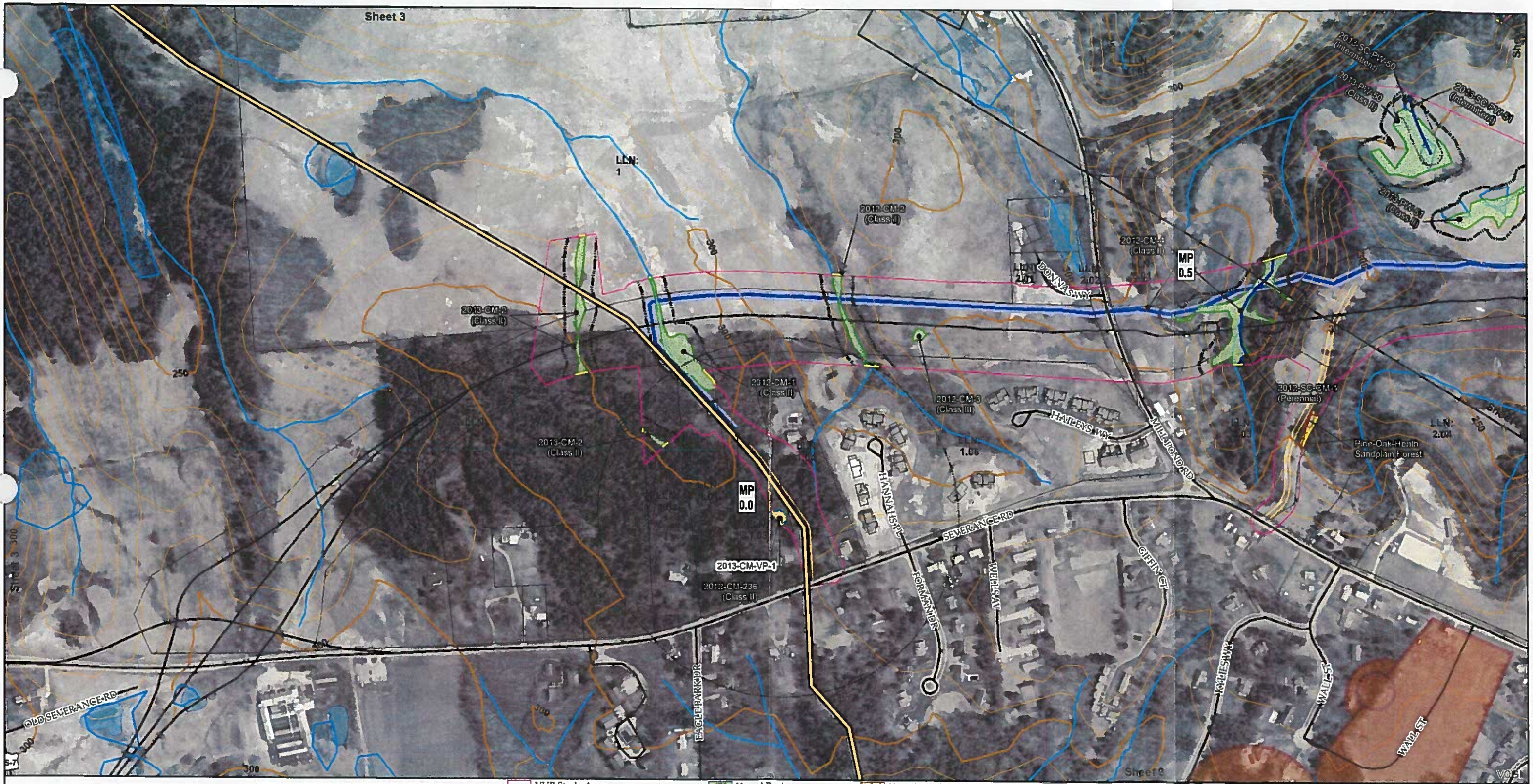
Vermont Gas - ANGP Phase I
Chittenden and Addison Counties, VT
Natural Resource Series

Sheet Number 2 of 64

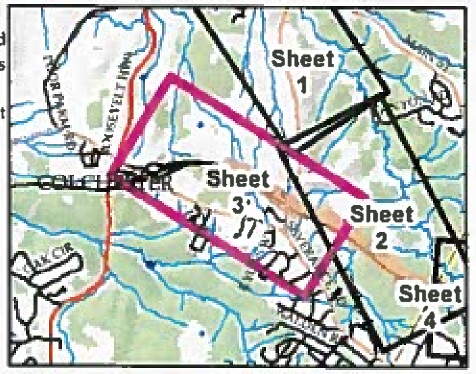
December 13, 2012

Last Revised: March 31, 2014

VHB *Vanasse Hangen Brustlin, Inc.*



Sources: Background By VMP (2005-2011); Study Areas by VHB (2012-2014); Delineated and Approximate Wetlands and Streams, Vernal Pools, Ordinary High Water, & Bridge/Culverts by VHB (2011-2014); RTE Species, Veg. Nat. Communities, & Bat Trees surveyed by Gilman & Briggs (2012/13); WDP Element Occurences by ANR (2013); VSWI Wetlands by ANR (2010); Deer Wintering Areas by VHB (2012/13); 10' Contours generated by VHB from HydroDEM by VCGI (2008); Statewide datasets from VCGI (2010) include: Roads by VTrans (2012), Town and County Boundaries by VCGI (2008), Streams and Waterbodies by VHD (2008), Railroads by VTrans (2003), Parcel Boundaries provided by CHA (2013); VELCO Structures from VELCO (2012); Proposed Transmission/Distribution/Network by CHA (2012-2014).



- VHB Study Area
- Approximate Study Area (2013/14)
- Existing Gas Transmission Main
- Proposed Transmission Mainline
- Proposed Distribution Mainline
- Proposed Distribution Local Network
- Wetland (Proposed Class)
- Approximate Wetland (Proposed Class)
- Stream (Proposed Type)
- Stream Centerline
- Stream Top of Bank or Slope
- Ditch
- Vernal Pool
- Potential Vernal Pool
- RTE Plant Area (G&B)
- RTE Plant Location (G&B)
- Surveyed Potential Bat Tree
- Potential Bat Tree
- Potential Bat Tree Area
- Deer Wintering Area (VHB)
- 50 ft. Class II Wetland Buffer
- Natural Resource Buffer
- Veg. Natural Community (G&B)
- Natural Resouce Feature Continues
- Mitigation Plant Sites PreExisting
- RTE Species/Communities
- VELCO Structure Location
- Transmission Lines (VELCO)
- Deer Wintering Area (ANR)
- Bridge
- Culvert
- VSWI Wetland
- Parcel Boundary
- Railroad (VTrans)
- Roads (VTrans)
- 10' Contour
- 50' Contour
- Stream (VHD)
- Proposed Access Road

400 200 0 400 Feet

Vermont Gas - ANGP Phase I
Chittenden and Addison Counties, VT
Natural Resource Series

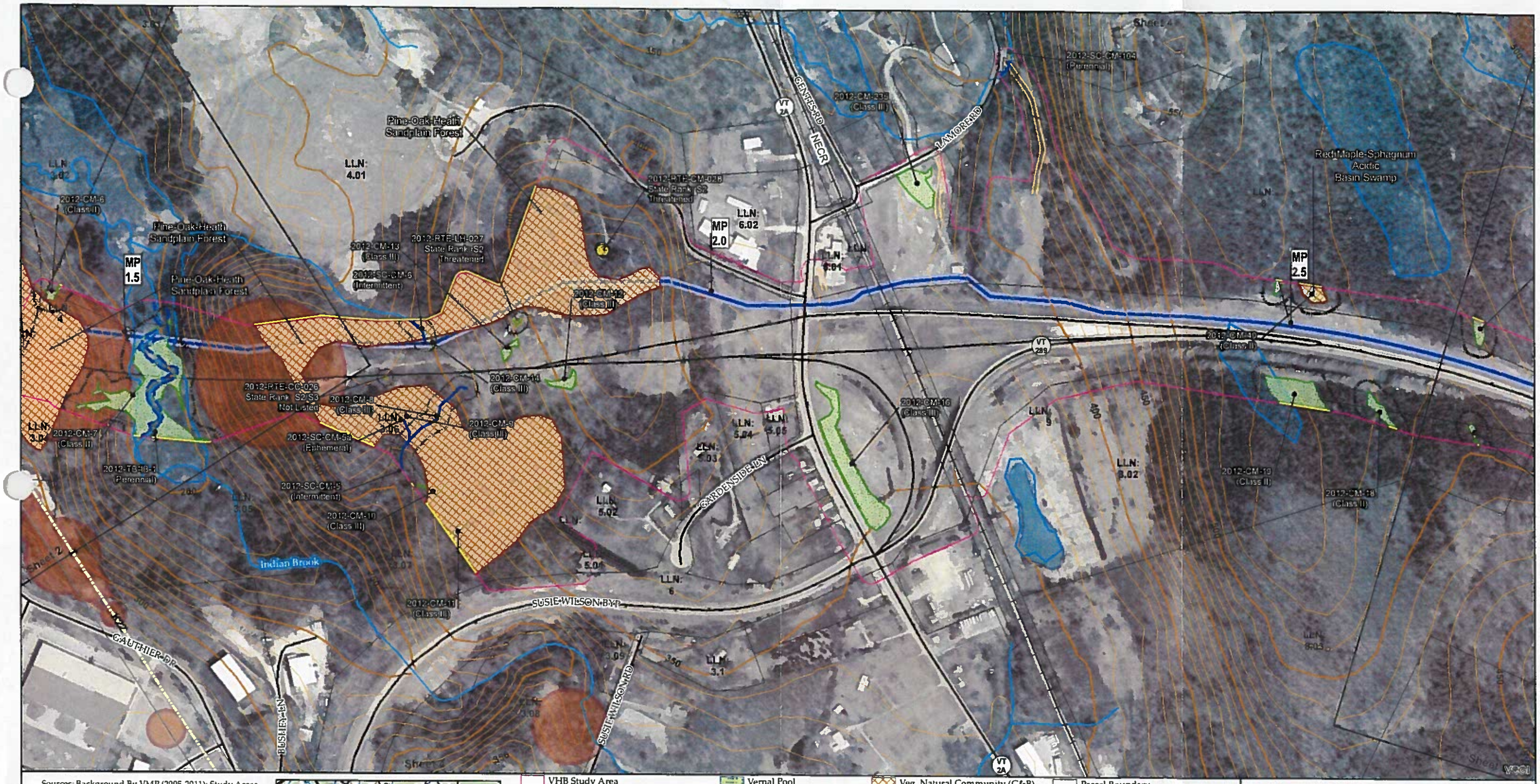
Sheet Number 3 of 64

December 13, 2012

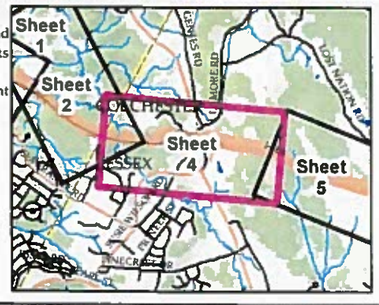
Last Revised: March 31, 2014

Vanasse Hangen Brustlin, Inc.

F:\57563.00 VGS Addison Expansion\GIS\Project\NR_Theme\SinglePanel_NR\NRAssessment_11x17_400scale.mxd Prepared by: mbrumberg on September 26, 2013



Sources: Background By VMP (2005-2011); Study Areas by VHB (2012-2014); Delineated and Approximate Wetlands and Streams, Vernal Pools, Ordinary High Water, & Bridge/Culverts by VHB (2011-2014); RTE Species, Veg. Nat. Communities, & Bat Trees surveyed by Gilman & Briggs (2012/13), WDP Element Occurences by ANR (2013); VSWI Wetlands by ANR (2010); Deer Wintering Areas by VHB (2012/13); 10' Contours generated by VHB from HydroDEM by VCGI (2008); Statewide datasets from VCGI (2010) include: Roads by VTrans (2012), Town and County Boundaries by VCGI (2008), Streams and Waterbodies by VHD (2008), Railroads by VTrans (2003), Parcel Boundaries provided by CHA (2013); VELCO Structures from VELCO (2012); Proposed Transmission/Distribution/Network by CHA (2012-2014).



- VHB Study Area
- Approximate Study Area (2013/14)
- Existing Gas Transmission Main
- Proposed Transmission Mainline
- Proposed Distribution Mainline
- Proposed Distribution Local Network
- Wetland (Proposed Class)
- Approximate Wetland (Proposed Class)

Stream (Proposed Type)

- Stream Centerline
- Stream Top of Bank or Slope
- Ditch

- Vernal Pool
- Potential Vernal Pool
- RTE Plant Area (G&B)
- RTE Plant Location (G&B)
- Surveyed Potential Bat Tree
- Potential Bat Tree
- Potential Bat Tree Area
- Deer Wintering Area (VHB)
- 50 ft. Class II Wetland Buffer
- Natural Resource Buffer

- Veg. Natural Community (G&B)
- Natural Resouce Feature Continues
- Mitigation Plant Sites PreExisting
- RTE Species/Communities
- VELCO Structure Location
- Transmission Lines (VELCO)
- Deer Wintering Area (ANR)
- Bridge
- Culvert
- VSWI Wetland

- Parcel Boundary
- Railroad (VTrans)
- Roads (VTrans)
- 10' Contour
- 50' Contour
- Stream (VHD)
- Proposed Access Road

400 200 0 400 Feet

F:\37563.00 VGS Addison Expansion\GIS\Project\NR_Theme\SinglePane_NR\NRAssessment_11x17_400scale.mxd Prepared by: mbrumberg on September 26, 2013

Vermont Gas - ANGP Phase I
Chittenden and Addison Counties, VT
Natural Resource Series

Sheet Number 4 of 64

December 13, 2012

Last Revised: March 31, 2014

VHB Vanasse Hangen Brustlin, Inc.

Sheet 5

LOST NATION RD

Indian Brook

MP 3.5

MP 3.0

VT 289

2012-CM-41 (Class II)

2012-CM-42 (Class III)

2012-CM-43 (Class III)

2012-CM-44 (Class II)

2012-CM-45 (Class II)

2012-TB-IB-2 (Perennial)

2012-CM-25 (Class II)

2012-CM-17 (Class II)

2012-CM-21 (Class III)

2012-CM-22 (Class III)

2012-CM-23 (Class III)

2012-CM-24 (Class II)

2012-TB-IB-2 (Perennial)

2012-SC-CM-8 (Ephemeral)

2012-CM-20 (Class III)

L.L.N: 7.01

L.L.N: 7.02

L.L.N: 7.03

L.L.N: 9.02

L.L.N: 9.03

L.L.N: 9.04

L.L.N: 9.05

L.L.N: 9.06

Sheet 6

Sheet 5

Sheet 5

Sheet 4

Sheet 5

Sheet 6

Sources: Background By VMP (2005-2011); Study Areas by VHB (2012-2014), Delineated and Approximate Wetlands and Streams, Vernal Pools, Ordinary High Water, & Bridge/Culverts by VHB (2011-2014); RTE Species, Veg. Nat. Communities, & Bat Trees surveyed by Gilman & Briggs (2012/13), WDP Element Occurences by ANR (2013); VSWI Wetlands by ANR (2010); Deer Wintering Areas by VHB (2012/13); 10' Contours generated by VHB from HydroDEM by VCGI (2008); Statewide datasets from VCGI (2010) include: Roads by VTrans (2012), Town and County Boundaries by VCGI (2008), Streams and Waterbodies by VHD (2008), Railroads by VTrans (2003), Parcel Boundaries provided by CHA (2013); VELCO Structures from VELCO (2012); Proposed Transmission/Distribution/Network by CHA (2012-2014).

- VHB Study Area
- Approximate Study Area (2013/14)
- Existing Gas Transmission Main
- Proposed Transmission Mainline
- Proposed Distribution Mainline
- Proposed Distribution Local Network
- Wetland (Proposed Class)
- Approximate Wetland (Proposed Class)

Stream (Proposed Type)

- Stream Centerline
- Stream Top of Bank or Slope
- Ditch
- Vernal Pool
- Potential Vernal Pool
- RTE Plant Area (G&B)
- RTE Plant Location (G&B)
- Surveyed Potential Bat Tree
- Potential Bat Tree
- Potential Bat Tree Area
- Deer Wintering Area (VHB)
- 50 ft. Class II Wetland Buffer
- Natural Resource Buffer
- Veg. Natural Community (G&B)
- Natural Resouce Feature Continues
- Mitigation Plant Sites PreExisting
- RTE Species/Communities
- VELCO Structure Location
- Transmission Lines (VELCO)
- Deer Wintering Area (ANR)
- Bridge
- Culvert
- VSWI Wetland
- Parcel Boundary
- Railroad (VTrans)
- Roads (VTrans)
- 10' Contour
- 50' Contour
- Stream (VHD)
- Proposed Access Road

400 200 0 400 Feet

Vermont Gas - ANGP Phase I
Chittenden and Addison Counties, VT
Natural Resource Series

Sheet Number 5 of 64

December 13, 2012

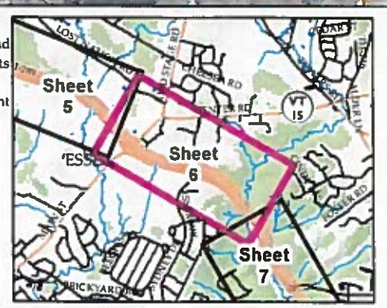
Last Revised: March 31, 2014

VHB Vanasse Hangen Brustlin, Inc.

P:\57363.00 VGS Addison Expansion\GIS\Project\NR_Theme\SinglePanel_NR\NRAssessment_11x17_400scale.mxd Prepared by: mbrumberg on September 26, 2013

Sheet 6
CRAFTSBURY CT
LOST NATION RD
OLD STAGE RD
COMMONWEALTH AVE
CARMICHAEL ST
ESSEX WAY
SAYBROOK RD
Alder Brook
FREEMAN WOODS DR
LANG DR
VT 15
VT 289
MP 4.0
MP 4.5
MP 5.0
LLN: 9.1
LLN: 9.09
LLN: 9.08
LLN: 9.07
LLN: 9.06
LLN: 9.05
LLN: 9.04
LLN: 9.14
LLN: 7.04
LLN: 8.09
LLN: 8.08
LLN: 8.07
LLN: 8.06
LLN: 8.05
LLN: 8.04
LLN: 8.03
2012-CM-46 (Class III)
2012-SC-CM-17 (Ephemeral)
2012-SC-CM-16 (Intermittent)
2012-CM-47 (Class III)
2012-TB-AB-1 (Perennial)
2012-CM-48 (Class II)
2012-DITCH-CM-21 (Ditch)
2012-SC-CM-20 (Ephemeral)
(Class III)
2012-SC-CM-19 (Intermittent)
2012-CM-30 (Class III)
2012-SC-CM-11 (Perennial)
2012-SC-CM-10a (Ephemeral)
2012-CM-29 (Class II)
2012-TB-AB-1 (Perennial)
2012-CM-28 (Class III)
2012-SC-CM-105 (Ephemeral)
2012-SC-CM-9 (Intermittent)
2012-CM-43 (Class III)
2012-CM-28 (Class III)
450

Sources: Background By VMP (2005-2011); Study Areas by VHB (2012-2014); Delineated and Approximate Wetlands and Streams, Vernal Pools, Ordinary High Water, & Bridge/Culverts by VHB (2011-2014); RTE Species, Veg. Nat. Communities, & Bat Trees surveyed by Gilman & Briggs (2012/13); WDP Element Occurences by ANR (2013); VSWI Wetlands by ANR (2010); Deer Wintering Areas by VHB (2012/13); 10' Contours generated by VHB from HydroDEM by VCGI (2008); Statewide datasets from VCGI (2010) include: Roads by VTrans (2012), Town and County Boundaries by VCGI (2008), Streams and Waterbodies by VHD (2008), Railroads by VTrans (2003), Parcel Boundaries provided by CHA (2013); VELCO Structures from VELCO (2012); Proposed Transmission/Distribution/Network by CHA (2012-2014)



VHB Study Area
Approximate Study Area (2013/14)
Existing Gas Transmission Main
Proposed Transmission Mainline
Proposed Distribution Mainline
Proposed Distribution Local Network
Wetland (Proposed Class)
Approximate Wetland (Proposed Class)
Stream (Proposed Type)
Stream Centerline
Stream Top of Bank or Slope
Ditch

Vernal Pool
Potential Vernal Pool
RTE Plant Area (G&B)
RTE Plant Location (G&B)
Surveyed Potential Bat Tree
Potential Bat Tree
Potential Bat Tree Area
Deer Wintering Area (VHB)
50 ft. Class II Wetland Buffer
Natural Resource Buffer

Veg. Natural Community (G&B)
Natural Resouce Feature Continues
Mitigation Plant Sites PreExisting
RTE Species/Communities
VELCO Structure Location
Transmission Lines (VELCO)
Deer Wintering Area (ANR)
Bridge
Culvert
VSWI Wetland

Parcel Boundary
Railroad (VTrans)
Roads (VTrans)
10' Contour
50' Contour
Stream (VHD)
Proposed Access Road

400 200 0 400 Feet

Vermont Gas - ANGP Phase I
Chittenden and Addison Counties, VT
Natural Resource Series

Sheet Number 6 of 64
December 13, 2012
Last Revised: March 31, 2014

VHB Vanasse Hangen Brustlin, Inc.

F:\35\63100 VGS Addison Expansion\GIS\Project\NR_Theme\SinglePanel_NR\NRAssessment_11x17_400scale.mxd Prepared by: mbrumberg on September 26, 2013

Sheet 7

MP 5.5

MP 6.0

2012-CM-50 (Class II)
2012-SC-CM-22 (Intermittent)
2012-CM-51 (Class III)
2012-CM-52 (Class III)
2012-CM-53 (Class II)
2012-CM-54 (Class II)
2012-CM-49 (Class III)
2012-SC-CM-10a (Ephemeral)
2012-CM-34 (Class III)
2012-TB-AB-3 (Perennial)
2012-CM-31 (Class II)
2012-CM-35 (Class II)
2012-CM-33 (Class II)
2012-SC-CM-11a (Ephemeral)
2012-TB-AB-5 (Perennial)
2012-TB-AB-2 (Perennial)
2012-CM-32 (Class II)
2012-CM-36 (Class III)
2012-TB-AB-4 (Perennial)
2012-CM-37 (Class III)
2012-PW-57 (Class III)
2012-DITCH-PW-22 (Ditch)
2012-PW-58 (Class III)
2012-PW-59 (Class III)
2012-PW-60 (Class III)
2012-DITCH-PW-23 (Ditch)
2012-TB-AB (Perennial)
2012-DITCH-PW-24 (Ditch)
2012-SC-PW-25-CM-81 (Perennial)
2012-TB-AB (Perennial)
2012-SC-CM-82 (Intermittent)
2012-SC-CM-83 (Ephemeral)
2012-SC-CM-12 (Ephemeral)
2012-CM-38 (Class III)
2012-SC-CM-13 (Intermittent)
2012-TB-AB (Perennial)
2012-CM-39 (Class II)
2012-SC-CM-40 (Ephemeral)
2012-CM-113 (Class II)
2012/2013-CM-193 (Class II)

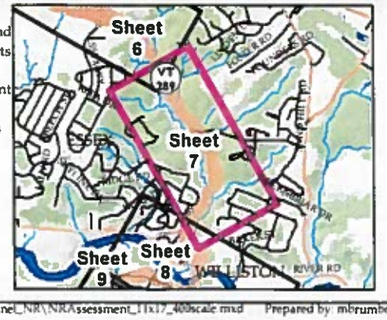
Miller Brook

ALLEN MARTIN PKWY
LAUREL DR
INDIGO LN
ALDERBROOK RD
GREENBRIAR DR
GREENFIELD RD EXT
EVERGREEN DR
STONEBROOK CIR
WINDRIDGE RD
TIMBERLANE DR
WINTERLANE CIR
HEATHERBUSH RD
RAYMOND DR

VT 289

VCGI

Sources: Background By VMP (2005-2011); Study Areas by VHB (2012-2014), Delineated and Approximate Wetlands and Streams, Vernal Pools, Ordinary High Water, & Bridge/Culverts by VHB (2011-2014); RTE Species, Veg. Nat. Communities, & Bat Trees surveyed by Gilman & Briggs (2012/13); WDP Element Occurences by ANR (2013); VSWI Wetlands by ANR (2010); Deer Wintering Areas by VHB (2012/13); 10' Contours generated by VHB from HydroDEM by VCGI (2008); Statewide datasets from VCGI (2010) include: Roads by VTrans (2012), Town and County Boundaries by VCGI (2008), Streams and Waterbodies by VHD (2008), Railroads by VTrans (2003). Parcel Boundaries provided by CHA (2013); VELCO Structures from VELCO (2012); Proposed Transmission/Distribution/Network by CHA (2012-2014).



- VHB Study Area
- Approximate Study Area (2013/14)
- Existing Gas Transmission Main
- Proposed Transmission Mainline
- Proposed Distribution Mainline
- Proposed Distribution Local Network
- Wetland (Proposed Class)
- Approximate Wetland (Proposed Class)

Stream (Proposed Type)

- Stream Centerline
- Stream Top of Bank or Slope
- Ditch
- Vernal Pool
- Potential Vernal Pool
- RTE Plant Area (G&B)
- RTE Plant Location (G&B)
- Surveyed Potential Bat Tree
- Potential Bat Tree
- Potential Bat Tree Area
- Deer Wintering Area (VHB)
- 50 ft. Class II Wetland Buffer
- Natural Resource Buffer
- Veg. Natural Community (G&B)
- Natural Resouce Feature Continues
- Mitigation Plant Sites PreExisting
- RTE Species/Communities
- VELCO Structure Location
- Transmission Lines (VELCO)
- Deer Wintering Area (ANR)
- Bridge
- Culvert
- VSWI Wetland
- Parcel Boundary
- Railroad (VTrans)
- Roads (VTrans)
- 10' Contour
- 50' Contour
- Stream (VHD)
- Proposed Access Road

400 200 0 400 Feet

F:\37563.00 VCGS Addison Expansion\GIS\Project\NR_Theme\SinglePanel_NR\NRAssessment_11x17_400scale.mxd Prepared by: mbrumberg on September 26, 2013

Vermont Gas - ANGP Phase I
Chittenden and Addison Counties, VT
Natural Resource Series

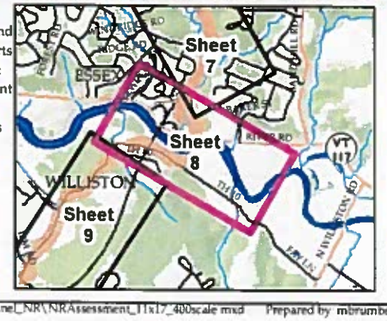
Sheet Number 7 of 64

December 13, 2012

Last Revised: March 31, 2014

VHB Vanasse Hangen Brustlin, Inc.

Sources: Background By VMP (2005-2011); Study Areas by VHB (2012-2014), Delineated and Approximate Wetlands and Streams, Vernal Pools, Ordinary High Water, & Bridge/Culverts by VHB (2011-2014), RTE Species, Veg. Nat. Communities, & Bat Trees surveyed by Gilman & Briggs (2012/13), WDP Element Occurences by ANR (2013), VSWI Wetlands by ANR (2010); Deer Wintering Areas by VHB (2012/13); 10' Contours generated by VHB from HydroDEM by VCGI (2008); Statewide datasets from VCGI (2010) include: Roads by VTrans (2012), Town and County Boundaries by VCGI (2008), Streams and Waterbodies by VHD (2008), Railroads by VTrans (2003), Parcel Boundaries provided by CHA (2013); VELCO Structures from VELCO (2012); Proposed Transmission/Distribution/Network by CHA (2012-2014).



- VHB Study Area
- Approximate Study Area (2013/14)
- Existing Gas Transmission Main
- Proposed Transmission Mainline
- Proposed Distribution Mainline
- Proposed Distribution Local Network
- Wetland (Proposed Class)
- Approximate Wetland (Proposed Class)

Stream (Proposed Type)

- Stream Centerline
- Stream Top of Bank or Slope
- Ditch
- Vernal Pool
- Potential Vernal Pool
- RTE Plant Area (G&B)
- RTE Plant Location (G&B)
- Surveyed Potential Bat Tree
- Potential Bat Tree
- Potential Bat Tree Area
- Deer Wintering Area (VHB)
- 50 ft. Class II Wetland Buffer
- Natural Resource Buffer
- Veg. Natural Community (G&B)
- Natural Resouce Feature Continues
- Mitigation Plant Sites PreExisting
- RTE Species/Communities
- VELCO Structure Location
- Transmission Lines (VELCO)
- Deer Wintering Area (ANR)
- Bridge
- Culvert
- VSWI Wetland
- Parcel Boundary
- Railroad (VTrans)
- Roads (VTrans)
- 10' Contour
- 50' Contour
- Stream (VHD)
- Proposed Access Road

400 200 0 400 Feet

Vermont Gas - ANGP Phase I
Chittenden and Addison Counties, VT
Natural Resource Series

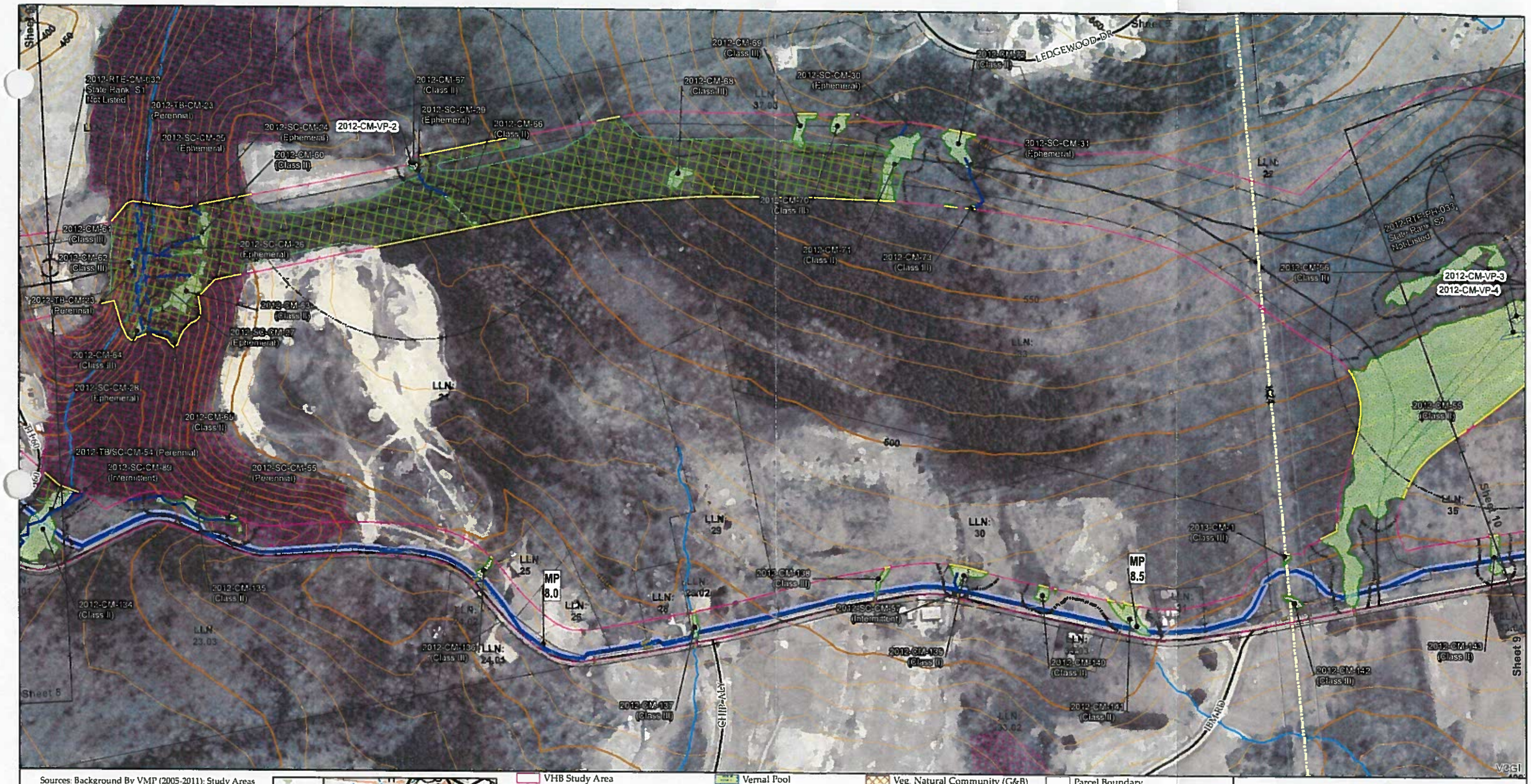
Sheet Number 8 of 64

December 13, 2012

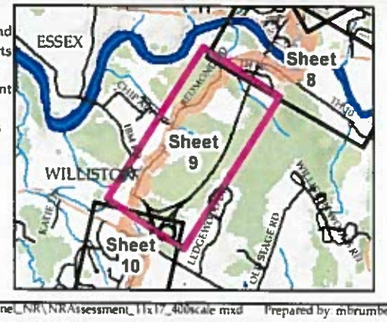
Last Revised: March 31, 2014

Vanasse Hangen Brustlin, Inc.

P:\57563.00 VGS Addison Expansion\GIS\Project\NR_Theme\SinglePanel_NR\NRAssessment_11x17_400scale.mxd Prepared by: mbrumberg on September 26, 2013



Sources: Background By VMP (2005-2011); Study Areas by VHB (2012-2014); Delineated and Approximate Wetlands and Streams, Vernal Pools, Ordinary High Water, & Bridge/Culverts by VHB (2011-2014); RTE Species, Veg. Nat. Communities, & Bat Trees surveyed by Gilman & Briggs (2012/13), WDP Element Occurences by ANR (2013); VSWI Wetlands by ANR (2010); Deer Wintering Areas by VHB (2012/13); 10' Contours generated by VHB from HydroDEM by VCGI (2008); Statewide datasets from VCGI (2010) include: Roads by VTrans (2012), Town and County Boundaries by VCGI (2008), Streams and Waterbodies by VHD (2008), Railroads by VTrans (2003), Parcel Boundaries provided by CHA (2013); VELCO Structures from VELCO (2012); Proposed Transmission/Distribution/Network by CHA (2012-2014).



- VHB Study Area
- Approximate Study Area (2013/14)
- Existing Gas Transmission Main
- Proposed Transmission Mainline
- Proposed Distribution Mainline
- Proposed Distribution Local Network
- Wetland (Proposed Class)
- Approximate Wetland (Proposed Class)

Stream (Proposed Type)

- Stream Centerline
- Stream Top of Bank or Slope
- Ditch
- Vernal Pool
- Potential Vernal Pool
- RTE Plant Area (G&B)
- RTE Plant Location (G&B)
- Surveyed Potential Bat Tree
- Potential Bat Tree
- Potential Bat Tree Area
- Deer Wintering Area (VHB)
- 50 ft. Class II Wetland Buffer
- Natural Resource Buffer
- Veg. Natural Community (G&B)
- Natural Resouce Feature Continues
- Mitigation Plant Sites PreExisting
- RTE Species/Communities
- VELCO Structure Location
- Transmission Lines (VELCO)
- Deer Wintering Area (ANR)
- Bridge
- Culvert
- VSWI Wetland
- Parcel Boundary
- Railroad (VTrans)
- Roads (VTrans)
- 10' Contour
- 50' Contour
- Stream (VHD)
- Proposed Access Road

400 200 0 400 Feet

F:\37563.00 VGS Addison Expansion\GIS\Project\NR_Theme\SinglePanel_NR\NRAssessment_11x17_400scale.mxd Prepared by mbrumberg on September 26, 2013

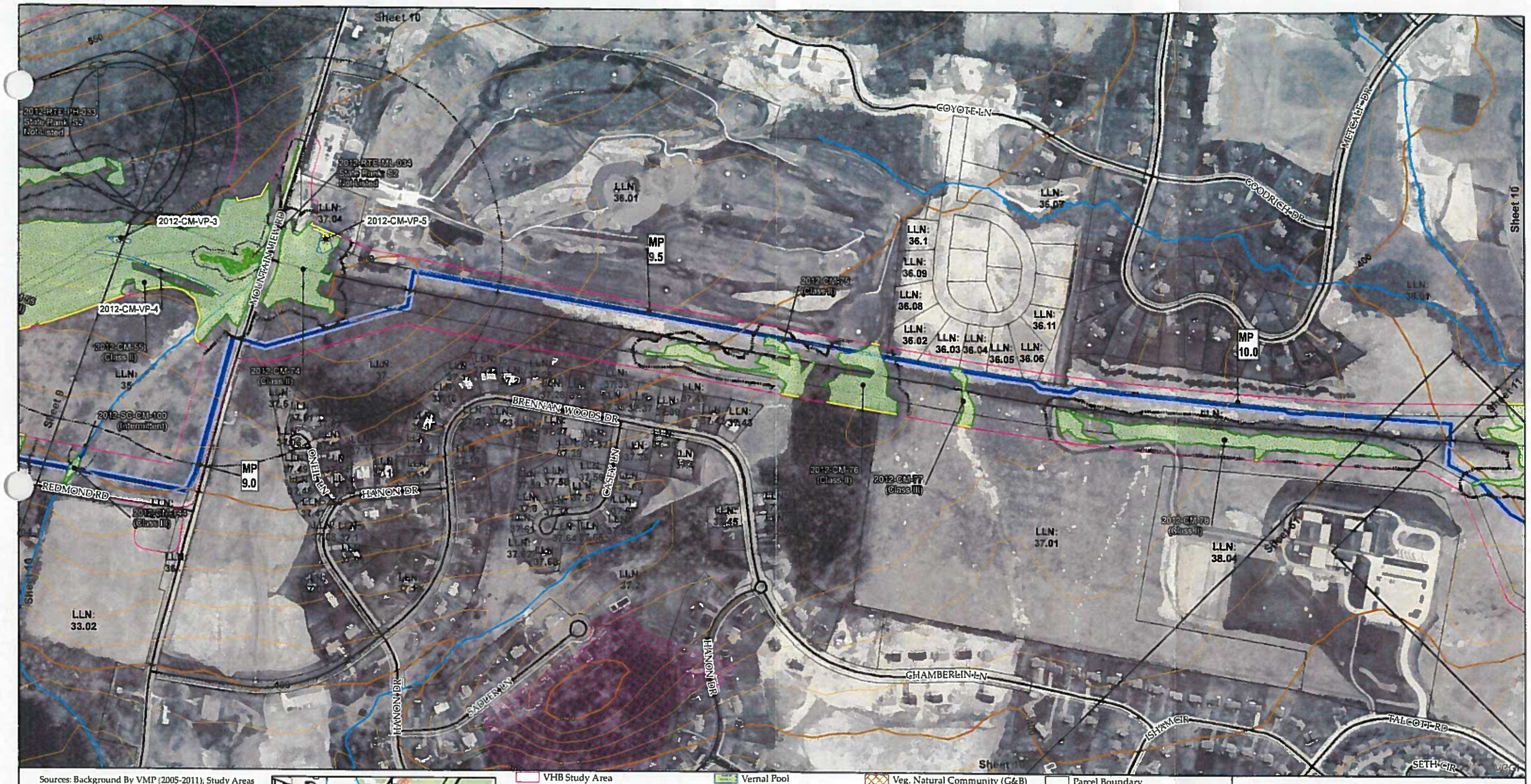
Vermont Gas - ANGP Phase I
Chittenden and Addison Counties, VT
Natural Resource Series

Sheet Number 9 of 64

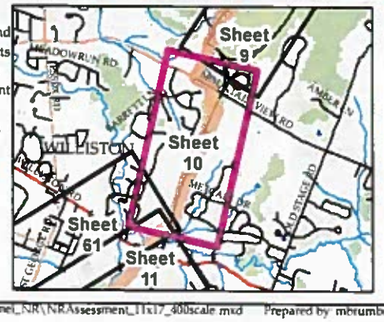
December 13, 2012

Last Revised: March 31, 2014

VHB Vanasse Hangen Brustlin, Inc.



Sources: Background By VMP (2005-2011); Study Areas by VHB (2012-2014); Delineated and Approximate Wetlands and Streams, Vernal Pools, Ordinary High Water, & Bridge/Culverts by VHB (2011-2014); RTE Species, Veg. Nat. Communities, & Bat Trees surveyed by Gilman & Briggs (2012/13); WDP Element Occurences by ANR (2013); VSWI Wetlands by ANR (2010); Deer Wintering Areas by VHB (2012/13); 10' Contours generated by VHB from HydroDEM by VCGI (2008); Statewide datasets from VCGI (2010) include: Roads by VTrans (2012), Town and County Boundaries by VCGI (2008), Streams and Waterbodies by VHD (2008), Railroads by VTrans (2003), Parcel Boundaries provided by CHA (2013); VELCO Structures from VELCO (2012); Proposed Transmission/Distribution/Network by CHA (2012-2014).



- VHB Study Area
- Approximate Study Area (2013/14)
- Existing Gas Transmission Main
- Proposed Transmission Mainline
- Proposed Distribution Mainline
- Proposed Distribution Local Network
- Wetland (Proposed Class)
- Approximate Wetland (Proposed Class)

Stream (Proposed Type)

- Stream Centerline
- Stream Top of Bank or Slope
- Ditch
- Vernal Pool
- Potential Vernal Pool
- RTE Plant Area (G&B)
- RTE Plant Location (G&B)
- Surveyed Potential Bat Tree
- Potential Bat Tree
- Potential Bat Tree Area
- Deer Wintering Area (VHB)
- 50 ft. Class II Wetland Buffer
- Natural Resource Buffer
- Veg. Natural Community (G&B)
- Natural Resouce Feature Continues
- Mitigation Plant Sites PreExisting
- RTE Species/Communities
- VELCO Structure Location
- Transmission Lines (VELCO)
- Deer Wintering Area (ANR)
- Bridge
- Culvert
- VSWI Wetland
- Parcel Boundary
- Railroad (VTrans)
- Roads (VTrans)
- 10' Contour
- 50' Contour
- Stream (VHD)
- Proposed Access Road

400 200 0 400 Feet

Vermont Gas - ANGP Phase I
Chittenden and Addison Counties, VT
Natural Resource Series

Sheet Number 10 of 64

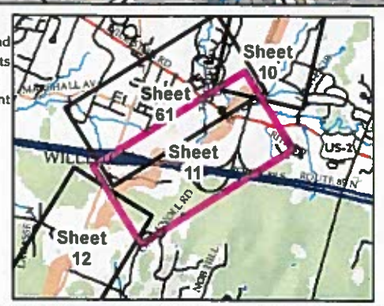
December 13, 2012

Last Revised: March 31, 2014

VHB Vanasse Hangen Brustlin, Inc.

P:\57503.00 VGS Addison Expansion\GIS\Project\NR_Theme\SinglePanel_NR\NRAssessment_11x17_400scale.mxd Prepared by: mbrumberg on September 26, 2013

Sources: Background By VMP (2005-2011); Study Areas by VHB (2012-2014); Delineated and Approximate Wetlands and Streams, Vernal Pools, Ordinary High Water, & Bridge/Culverts by VHB (2011-2014); RTE Species, Veg. Nat. Communities, & Bat Trees surveyed by Gilman & Briggs (2012/13); WDP Element Occurences by ANR (2013), VSWI Wetlands by ANR (2010); Deer Wintering Areas by VHB (2012/13); 10' Contours generated by VHB from HydroDEM by VCGI (2008); Statewide datasets from VCGI (2010) include: Roads by VTrans (2012), Town and County Boundaries by VCGI (2008), Streams and Waterbodies by VHD (2008), Railroads by VTrans (2003), Parcel Boundaries provided by CHA (2013); VELCO Structures from VELCO (2012); Proposed Transmission/Distribution/Network by CHA (2012-2014).



- VHB Study Area
- Approximate Study Area (2013/14)
- Existing Gas Transmission Main
- Proposed Transmission Mainline
- Proposed Distribution Mainline
- Proposed Distribution Local Network
- Wetland (Proposed Class)
- Approximate Wetland (Proposed Class)

Stream (Proposed Type)

- Stream Centerline
- Stream Top of Bank or Slope
- Ditch
- Vernal Pool
- Potential Vernal Pool
- RTE Plant Area (G&B)
- RTE Plant Location (G&B)
- Surveyed Potential Bat Tree
- Potential Bat Tree
- Potential Bat Tree Area
- Deer Wintering Area (VHB)
- 50 ft. Class II Wetland Buffer
- Natural Resource Buffer
- Veg. Natural Community (G&B)
- Natural Resouce Feature Continues
- Mitigation Plant Sites PreExisting
- RTE Species/Communities
- VELCO Structure Location
- Transmission Lines (VELCO)
- Deer Wintering Area (ANR)
- Bridge
- Culvert
- VSWI Wetland
- Parcel Boundary
- Railroad (VTrans)
- Roads (VTrans)
- 10' Contour
- 50' Contour
- Stream (VHD)
- Proposed Access Road

400 200 0 400 Feet

Vermont Gas - ANGP Phase I
Chittenden and Addison Counties, VT
Natural Resource Series

Sheet Number 11 of 64
December 13, 2012
Last Revised: March 31, 2014

VHB *Vanasse Hangen Brustlin, Inc.*

F:\37536100 VGS Addison Expansion\GIS\Project\NR_Theme\SinglePanel_NR\NRAssessment_11x17_400scale.mxd Prepared by: mbrumberg on September 26, 2013