

GAS STORAGE FIELD REVIEW

A completed **Standard Inspection Report** is to be submitted to the Director within 60 days from completion of the inspection. A **Post Inspection Memorandum (PIM)** is to be completed and submitted to the Director within 30 days from the completion of the inspection, or series of inspections, and is to be filed as part of the **Standard Inspection Report**. Refer to the last page of this form for **PIM** example entries.

Inspection Report	Post Inspection Memorandum	
Inspector/Submit Date: _____	Inspector/Submit Date:	
	Peer Review/Date:	
	Director Approval/Date:	
POST INSPECTION MEMORANDUM (PIM)		
Name of Operator:	OPID #:	
Name of Unit(s):	Unit #(s):	
Records Location:		
Unit Type & Commodity:		
Inspection Type:	Inspection Date(s):	
OPS Representative(s):	AFO Days:	
Summary:		
Findings:		

GAS STORAGE FIELD REVIEW

PIPE, VALVES, and FITTINGS					
PIPE					
?	Pipe Grade:	<hr/>	<hr/>	<hr/>	<hr/>
?	Outside Diameter, in.:	<hr/>	<hr/>	<hr/>	<hr/>
?	Wall Thickness, in.:	<hr/>	<hr/>	<hr/>	<hr/>
?	Pipe Wt. – lbs./ft.:	<hr/>	<hr/>	<hr/>	<hr/>
?	Specified Minimum Yield Strength, psi:	<hr/>	<hr/>	<hr/>	<hr/>
?	Footage or Miles:	<hr/>	<hr/>	<hr/>	<hr/>
?	Pre-1970 ERW Pipe:	<hr/>	<hr/>	<hr/>	<hr/>
VALVES					
?	Valve Size, in.:	<hr/>	<hr/>	<hr/>	<hr/>
?	Valve Type:	<hr/>	<hr/>	<hr/>	<hr/>
?	Working Pressure, psi:	<hr/>	<hr/>	<hr/>	<hr/>
?	Valve Actuation:	<hr/>	<hr/>	<hr/>	<hr/>
FITTINGS					
?	Fitting Size, in.:	<hr/>	<hr/>	<hr/>	<hr/>
?	Fitting Type:	<hr/>	<hr/>	<hr/>	<hr/>
?	Working Pressure, psi:	<hr/>	<hr/>	<hr/>	<hr/>

WELL STIMULATION	
ACIDIZING	
Acidizing treatments used to stimulate the wells?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Type(s) of acids used in treating the wells:	
Type(s) of inhibitors used with the acid(s):	
Frequency of the treatments:	Volume of acid per treatment:
Well cleanup procedure following treatment:	
If treatment is flowed back into the well/injection line, criteria used to determine that the treatment will not cause internal corrosion or erosion of the pipe:	
FRACTURING	
Fracturing treatments used to stimulate the wells?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Type(s) of fracturing fluids used in treating the wells:	
Type(s) of inhibitors used with the fracturing fluid(s):	
Frequency of the treatments:	Amount of sand per treatment:
Well cleanup procedure following treatment:	
If treatment is flowed back into the well/injection line, criteria used to determine that the treatment will not cause internal corrosion or erosion of the pipe:	

GAS STORAGE FIELD REVIEW

GAS and LIQUID HANDLING FACILITIES	
GAS COMPRESSION	
Location of compressors:	
Number of compressors:	Total available horsepower:
GAS DEHYDRATION	
Location of dehydration units:	
Type(s) of dehydration process used:	
Number of dehydration units:	Dehydration capacity:
GAS SWEETENING (Acid Gas Treating)	
Location of sweetening units:	
Type(s) of sweetening process used:	
Number of sweetening units:	Sweetening capacity:
GAS / LIQUID SEPARATION	
SCRUBBERS / SEPARATORS:	
Location of scrubbers/separators:	
Type(s) of scrubbers/separators used:	
Number of scrubbers/separators:	Separation capacity:
DRIPS:	
Location of drips:	
Type(s) of drips used:	
Number of drips:	
Frequency of draining or blowing drips:	

GAS STORAGE FIELD REVIEW

FIELD OPERATING PARAMETERS

PRESSURES, RATES and TEMPERATURES
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	Pressure, psi		Flow Rate, MMcf/day		Temperature, °F	
	Injection	Withdrawal	Injection	Withdrawal	Injection	Withdrawal
Maximum						
Maximum						

Maximum Allowable Operating Pressure (Field):

WATER, CO₂, and O₂ CONTENT

	Water, lbs./MMcf	CO ₂ ,	H ₂ S, ppm	O ₂ , %
Injection Cycle				
Withdrawal Cycle				

FIELD OPERATING HISTORY

LEAKS

Are leak surveys of the field being conducted? (49 CFR 192.706)	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
Have any leaks been found over the past 5 years?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Number of leaks:
Types of leaks that have occurred?			
Cause(s) of the leaks:			
Location(s) of the leaks:			
Has a trend analysis been performed?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
If a trend analysis has been done, what do the results indicate?			

FAILURES

Have any failures occurred over the past 5 years?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Number of failures:
Type(s) of failures that have occurred:			
Cause(s) of the failures:			
Location(s) of the failures:			
Has a trend analysis been performed?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
If a trend analysis has been done, what do the results indicate?			

LINE REPLACEMENTS

Have any lines been replaced over the past 5 years?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Number of replacements:
Type(s) of replacements:			
Location(s) of the replacements:			
Reason(s) for replacements:			

GAS STORAGE FIELD REVIEW

FIELD OPERATING HISTORY (con't)

LINE REPAIRS

Have any lines been repaired over the past 5 years?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Number of repairs:
Type(s) of repairs:			
Location(s) of the repairs:			
Reason(s) for the repairs:			

VALVE REPLACEMENTS

Have any valves been replaced over the past 5 years?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Number of replacements:
Type(s) of valve replacements:			
Location(s) of the replacements:			
Reason(s) for the replacements:			

GAS and LIQUID HANDLING FACILITY UPSETS

	Gas Dehydration Units	Gas Sweetening Units	Separators
Number of upsets – past 3 years			
Cause(s) of the upsets:			
Has a trend analysis been performed? <input type="checkbox"/> Yes <input type="checkbox"/> No			
If a trend analysis has been done, what do the results indicate?			

CORROSION CONTROL and MONITORING

EXTERNAL CORROSION

Are the field piping and related storage field facilities cathodically protected? (49 CFR 192 Subpart I)	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
Type(s) of cathodic protection used:	<input type="checkbox"/> Impressed Current	<input type="checkbox"/> Galvanic Anodes	<input type="checkbox"/> Combination
Criteria used to determine adequate cathodic protection:			
Does the field piping system contain any bare or ineffectively coated pipe? <input type="checkbox"/> Yes <input type="checkbox"/> No			
Location(s) of the bare or ineffectively coated pipe:			
Amount of bare of ineffectively coated pipe:			
Are corrosion monitoring procedures established for the field piping and related storage field facilities? <input type="checkbox"/> Yes <input type="checkbox"/> No			

MONITORING

Pipe-to-soil readings	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Exposed pipe reports	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Close interval surveys	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Leak surveys	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Line current surveys	<input type="checkbox"/> Yes	<input type="checkbox"/> No	Instrumented inspection surveys	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Remedial measures taken to mitigate corrosion:					

GAS STORAGE FIELD REVIEW

CORROSION CONTROL AND MONITORING (con't)

INTERNAL CORROSION

Are corrosion monitoring procedures established for the field piping and related storage field facilities? Yes No

MONITORING

Corrosion coupons <input type="checkbox"/> Yes <input type="checkbox"/> No	Pipe replacement reports surveys <input type="checkbox"/> Yes <input type="checkbox"/> No
Gas samples <input type="checkbox"/> Yes <input type="checkbox"/> No	Leak surveys <input type="checkbox"/> Yes <input type="checkbox"/> No
Liquid (water) samples <input type="checkbox"/> Yes <input type="checkbox"/> No	Instrumental inspection surveys <input type="checkbox"/> Yes <input type="checkbox"/> No

CORROSION COUPONS

Frequency coupons are analyzed:

Location(s) where coupons are installed:

GAS SAMPLES

Frequency of sampling:

Location(s) where the samples taken:

Are the gas samples analyzed for: Carbon dioxide (CO ₂) <input type="checkbox"/> Yes <input type="checkbox"/> No Hydrogen sulfide (H ₂ S) <input type="checkbox"/> Yes <input type="checkbox"/> No Oxygen (O ₂) <input type="checkbox"/> Yes <input type="checkbox"/> No Water vapor <input type="checkbox"/> Yes <input type="checkbox"/> No	Amount of the following present in the gas: Carbon dioxide (CO ₂) _____ Hydrogen sulfide (H ₂ S) _____ Oxygen (O ₂) _____ Water vapor _____
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What carbon dioxide (CO₂) partial pressure criteria are used to establish carbon dioxide (CO₂) corrosivity ranges?

What is the carbon dioxide (CO₂) corrosivity ranges?

What is the carbon dioxide (CO₂) partial pressure?

WATER SAMPLES

Frequency of sampling:

Locations where the samples taken:

What constituents are the water samples analyzed for? **(Refer to Water Analysis Checklist)**

Concentration of the following present in water: Iron (Fe ⁺⁺) _____ Manganese (Mn ⁺⁺) _____ Chlorides (Cl ⁻) _____ Sulfates (SO ₄ ⁻) _____	Amount of the following gases dissolved in the water: Carbon dioxide (CO ₂) _____ Hydrogen sulfide (H ₂ S) _____ Oxygen (O ₂) _____
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Is the pH of the water below 6.8? Yes No

GAS STORAGE FIELD REVIEW

CORROSION CONTROL AND MONITORING (con't)

INSTRUMENTED INSPECTION SURVEYS

Frequency surveys are conducted:

Lines that have been surveyed and when the survey was conducted:

INHIBITOR PROGRAM

Has a corrosion inhibitor program been established for the field piping and related storage field facilities? Yes No

When did the program start?

Type(s) of treatment method used: Batch Continuous

Type(s) of inhibitors used:

EROSION (INTERNAL)

Have erosional flow rates been determined for the field piping system? Yes No

Are injection/withdrawal flow rates kept below the erosional flow rates to reduce erosional effects? Yes No

Has erosion been observed during replacement of components (lines, valves, fittings, etc.)? Yes No

Locations where erosion has been found:

Remedial measures taken to mitigate erosion:

ATMOSPHERIC CORROSION

Are corrosion monitoring procedures established for the field piping and related storage field facilities? Yes No

Location(s) where corrosion has been found:

Remedial measures taken to mitigate corrosion:

SAFETY DEVICES and SYSTEMS

SURFACE FACILITIES

Has a system safety analysis of the field piping and related storage facilities been performed: Yes No

Has a safety analysis function evaluation chart for the field piping and related storage field facilities been prepared? Yes No

PRESSURE SAFETY DEVICES:

COMPRESSORS

Is each compressor, per 49 CFR 192.169, equipped with pressure safety devices for overpressure protection? Yes No

Pressure protection provided by: Primary _____ Secondary _____	Location of pressure safety devices: Primary _____ Secondary _____
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GAS STORAGE FIELD REVIEW

SAFETY DEVICES AND SYSTEMS (con't)

PRESSURE VESSELS		
Is the working pressure of each pressure vessel (dehydrator, scrubber, etc.) greater than the MAOP?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Is each pressure vessel equipped with pressure safety devices for overpressure protection?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Pressure protection provided by:	Location of pressure safety devices:	
Primary _____	Primary _____	
Secondary _____	Secondary _____	

HEADERS, LATERALS and WELL LINES		
Are the headers, laterals and well lines equipped with pressure safety devices for overpressure protection?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Pressure protection provided by:	Location of pressure safety devices:	
Primary _____	Primary _____	
Secondary _____	Secondary _____	

GAS DETECTION SAFETY DEVICES:		
Is each compressor, per 49 CFR 192.736, building equipped with gas detection safety devices?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Are other buildings that contain gas handling equipment equipped with gas detection safety devices?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Type(s) of gas detection safety devices: <input type="checkbox"/> Combustible gas (L.E.L.)	<input type="checkbox"/> Hydrogen Sulfide (H ₂ S)	<input type="checkbox"/> Other:
Type(s) of alarms used to notify personnel to the presence of gas:	<input type="checkbox"/> Visual	<input type="checkbox"/> Audible <input type="checkbox"/> Combination

FIRE DETECTION SAFETY DEVICES:		
Is each compressor building equipped with fire detection safety devices?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Are other buildings that contain gas handling equipment equipped with fire detection safety devices:	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Type(s) of fire detection safety devices:	<input type="checkbox"/> Flame <input type="checkbox"/> Heat <input type="checkbox"/> Smoke <input type="checkbox"/> Fusible Material	
<input type="checkbox"/> Other:		
Type(s) of alarms used to notify personnel to the presence of fire:	<input type="checkbox"/> Visual <input type="checkbox"/> Audible <input type="checkbox"/> Combination	

EMERGENCY SHUTDOWN SYSTEM:		
Is each compressor station, per 49 CFR 192.167, equipped with a remote controlled emergency shutdown system?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Does the gas detection system activate the compressor station emergency shutdown system?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Does the fire detection system activate the compressor station emergency shutdown system?	<input type="checkbox"/> Yes	<input type="checkbox"/> No

WELLS		
Is each well equipped with a well storage safety valve?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
If not, are there plans to equip each well with a well storage safety valve?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Reasons why wells should not be equipped with well storage safety valve(s)?		

GAS STORAGE FIELD REVIEW

ADDITIONAL COMMENTS

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GAS STORAGE FIELD REVIEW

WATER ANALYSIS CHECKLIST

WATER CONSTITUENTS

Constituent	Yes	No	Constituent	Yes	No
Sodium Na ⁺	<input type="checkbox"/>	<input type="checkbox"/>	Chloride Cl ⁻	<input type="checkbox"/>	<input type="checkbox"/>
Potassium K ⁺	<input type="checkbox"/>	<input type="checkbox"/>	Sulfate SO ₄ ⁼	<input type="checkbox"/>	<input type="checkbox"/>
Calcium Ca ⁺⁺	<input type="checkbox"/>	<input type="checkbox"/>	Carbonate CO ₃ ⁼	<input type="checkbox"/>	<input type="checkbox"/>
Magnesium Mg ⁺⁺	<input type="checkbox"/>	<input type="checkbox"/>	Bicarbonate HCO ₃ ⁻	<input type="checkbox"/>	<input type="checkbox"/>
Iron Fe ⁺⁺	<input type="checkbox"/>	<input type="checkbox"/>	Hydroxide OH ⁻	<input type="checkbox"/>	<input type="checkbox"/>
Barium Ba ⁺⁺	<input type="checkbox"/>	<input type="checkbox"/>	Oxygen O ₂	<input type="checkbox"/>	<input type="checkbox"/>
Strontium Sr ⁺⁺	<input type="checkbox"/>	<input type="checkbox"/>	Carbon Dioxide CO ₂	<input type="checkbox"/>	<input type="checkbox"/>
Manganese Mn ⁺⁺	<input type="checkbox"/>	<input type="checkbox"/>	Hydrogen Sulfide H _s S	<input type="checkbox"/>	<input type="checkbox"/>
_____	<input type="checkbox"/>	<input type="checkbox"/>	_____	<input type="checkbox"/>	<input type="checkbox"/>
_____	<input type="checkbox"/>	<input type="checkbox"/>	_____	<input type="checkbox"/>	<input type="checkbox"/>
_____	<input type="checkbox"/>	<input type="checkbox"/>	_____	<input type="checkbox"/>	<input type="checkbox"/>
_____	<input type="checkbox"/>	<input type="checkbox"/>	_____	<input type="checkbox"/>	<input type="checkbox"/>
_____	<input type="checkbox"/>	<input type="checkbox"/>	_____	<input type="checkbox"/>	<input type="checkbox"/>

WATER PROPERTIES

Property	Yes	No	Property	Yes	No
Acidity	<input type="checkbox"/>	<input type="checkbox"/>	Alkalinity	<input type="checkbox"/>	<input type="checkbox"/>
pH	<input type="checkbox"/>	<input type="checkbox"/>	Salinity	<input type="checkbox"/>	<input type="checkbox"/>
Total Dissolved Solids (TDS)	<input type="checkbox"/>	<input type="checkbox"/>	Carbonate	<input type="checkbox"/>	<input type="checkbox"/>
_____	<input type="checkbox"/>	<input type="checkbox"/>	_____	<input type="checkbox"/>	<input type="checkbox"/>
_____	<input type="checkbox"/>	<input type="checkbox"/>	_____	<input type="checkbox"/>	<input type="checkbox"/>

BACTERIA

Bacteria	Yes	No	Bacteria	Yes	No
Sulfate-reducing Bacteria	<input type="checkbox"/>	<input type="checkbox"/>	Acid-producing Bacteria (APB)	<input type="checkbox"/>	<input type="checkbox"/>
_____	<input type="checkbox"/>	<input type="checkbox"/>	_____	<input type="checkbox"/>	<input type="checkbox"/>
_____	<input type="checkbox"/>	<input type="checkbox"/>	_____	<input type="checkbox"/>	<input type="checkbox"/>

PIM Entry Examples

POST INSPECTION MEMORANDUM (PIM)			
Name of Operator:	NoFail Pipeline Company	OPID #:	2314
Name of Unit(s):	Boardwalk and Parkplace	Unit #(s):	234, 278
Records Location:	Pipelineville, NC		
Unit Type & Commodity:	Interstate Natural Gas (A3) – Natural Gas		
Inspection Type:	Standard	Inspection Date(s):	12/24-27/03
OPS Representative(s):	John Brown	AFO Days:	4
Summary:			
<p>On December 24-27, I performed a standard inspection of the NoFail pipeline facilities contained in units 234 and 278. The evaluation report contains a component description of the two units. The inspection included a records and facilities review. A Joint O&M inspection was conducted in 2003 and no procedures were evaluated during this inspection. Pre-inspection preparation identified previous valve inspection violations: I reviewed all of the company's valve inspection records and five aboveground valve settings and did not identify any potential non-compliances. Right-of-way inspection and periodic cathodic protection checks were conducted between Chance, NC to Community Chest, NC and from Reading, SC to Ventnor, SC. The Mighty Big-a Wet River crossing was evaluated for atmospheric corrosion.</p>			
Findings:			
<p>The pipeline facilities appeared to be well maintained and serious concerns were noted: surface rusting was observed at the Pipelineville compressor station. No pitting was observed. NoFail is in the process of repainting all of the aboveground piping at this facility.</p> <p>The following concerns were noted from the records review:</p> <ol style="list-style-type: none"> 1. The rectifiers in Unit 234 were inspected on 3 times in 2001, twice in 2002, and five times in 2003. Copies of the subject records were obtained. 2. The right-of-way in Unit 234 was densely overgrown such that aerial patrols would be ineffective. Pictures were taken of representative areas. 			