

# PACIFIC GAS AND ELECTRIC COMPANY

## ENGINEERING & OPERATIONS GAS TRANSMISSION AND DISTRIBUTION GAS ENGINEERING GAS SYSTEM INTEGRITY Risk Management



### Procedure for Risk Management

Procedure No. RMP-04

Rev. 5

### Ground Movement and Natural Forces Threat Algorithm

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## 1.0 PURPOSE

The purpose of this procedure is to provide a guideline for calculating the Ground Movement and Material Process Threats Algorithm by the determination of likelihood of Failure and Risk for PG&E's Gas Transmission and Distribution Risk Management Programs (RMP) and Integrity Management Programs.



## 2.0 SCOPE

This guideline is applicable to all PG&E's gas transmission pipeline and distribution facilities and is to be used in conjunction with RMP Protective 2. The algorithm provided in this procedure is for the gas pipelines. It is not applicable to regulator, compressor, or underground storage facility facilities.

The Integrity Management Group is responsible for managing risk within the scope of this procedure. The Integrity Management Group shall establish and manage the max. of a gas pipeline facility by utilizing industry and regulatory accepted methodologies appropriate for PG&E's transmission and distribution facilities and shall be in conformance with this procedure. The Integrity Management Program Manager shall be responsible for compliance with this procedure.

## 3.0 INTRODUCTION

**Gas Transmission:** The risk management process is a process of integrating data to calculate risk, assessing risk mitigation plans to bring and maintain risk within an acceptable risk profile, and monitoring risk to and terminate changes in the factors which affect risk. The Transmission Integrity Management Program (TIMP) is a program established by PG&E to address the integrity management rules in 49 CFR Part 192 Subpart G. Procedure RMP-01 provides a procedure for the Risk Management Process. Procedure RMP-06 provides procedures for compliance with the Transmission Integrity Management Program. This procedure supports the calculation of risk, required by Procedure RMP-01, due to one of the basic threats imposed on gas pipelines, Ground Movement (GM).

As described in RMP-01, Risk is defined as the product of the Likelihood of Failure (LOF) and the Consequence of Failure (COF).  $Risk = LOF \times COF$ . A relative risk calculation methodology is used to calculate risk for all pipeline segments within the scope of RMP-01. The method used to calculate risk is based on an index model and qualitative scoring approach. Likelihood of Failure (LOF) is defined as the sum of the following threat categories: External Corrosion (EC), Third Party (TP), Ground Movement (GM), and Deep Watering (DW).

Each threat category is weighted in proportion to PG&E and industry failure experience. GM is weighted at 25%. The weightings of the threat categories will be reviewed and approved annually by the Consequence Modeling Committee. For each threat category, the appropriate scoring committee will identify the significant factors that influence the threat's likelihood of failure. For each factor, a percentage weighting will be established to identify the factor's relative significance in determining the threat's likelihood of failure within the threat algorithm. Points will be established based on criteria that the

operator error is significant to determining the threat likelihood of failure due to each factor and the relative severity of failure classification, nature). (Negative points may be assigned where prior assessments have been done to confirm pipeline integrity and/or mitigation efforts have eliminated or lowered susceptibility to a threat.) Generally, the determination of the percentage weightings for all of the factors within each asset will be 100%. (There may be exceptions to permit the consideration of very unusual conditions.)

For the threat of GSI, the scoring is based on duration from the OIA Scoring Calendar. The OIA Scoring Calendar shall meet once each calendar year and shall review this procedure per the requirements of RMP-04.

### 4.2 Roles and Responsibility

Specific responsibilities for ensuring compliance with this procedure are as follows:

Title	Reports to:	Responsibilities
Integrity Management Program Manager	Operations Programs Management	<ul style="list-style-type: none"> <li>• Establishes structure for IWP (including staff)</li> <li>• Monitor compliance of operations with prescriptive actions as necessary.</li> <li>• Assign qualified individuals</li> <li>• Ensure training of staff for IWP role</li> <li>• Assign Standing Committee Chairperson and ensure that meetings are held each year calendar year.</li> </ul>
Standing Committee Chairman (Risk Management Program)	Integrity Management Program Manager	<ul style="list-style-type: none"> <li>• Convene meetings</li> <li>• Provide procedure with committee per RMP-04</li> <li>• Provide meeting minutes.</li> <li>• Ensure actions taken per committee</li> </ul>
Standing Committee Members (Subject Matter Experts)	Various	<ul style="list-style-type: none"> <li>• Attend meetings as requested by Standing Committee Chairman.</li> <li>• Provide review and direction to procedure.</li> </ul>
Risk Management Engineer	Integrity Management Program Manager	<ul style="list-style-type: none"> <li>• Perform calculations per procedure.</li> </ul>



### 5.0 Training and Qualifications

See RMP-04 for qualification requirements. Specific training to ensure compliance with this procedure is as follows:

Position	Type of Training:	How Often
Emergency Management Program Manager	Procedure review of RMP-04 and RMP-04	<ul style="list-style-type: none"> <li>• Upon initial assignment</li> <li>• Once each calendar year.</li> </ul>
Emergency Coordinator/Chairman	Procedure review of RMP-04 and RMP-04	<ul style="list-style-type: none"> <li>• Upon initial assignment</li> <li>• Once each calendar year.</li> <li>• As changes are made to the procedure.</li> </ul>
Emergency Committee Members (SUS'ed Water Workers)	RMP-04 and Steering Committee requirements of RMP-04	<ul style="list-style-type: none"> <li>• Once each calendar year at the time of the steering committee meeting.</li> </ul>
Risk Management Engineers	Per RMP-04 Emergency Management Program	<ul style="list-style-type: none"> <li>• Upon initial assignment</li> <li>• Once each calendar year.</li> <li>• As changes are made to the procedure.</li> </ul>

## 8.0 GROUND MOVEMENT THREAT ALGORITHM

**8.1 Gas Transmission:** Ground Movement (GM) algorithm shall be completed per the direction of the GM Steering Committee. The committee has determined that the factors in A through H of this section are significant to estimate the Likelihood of Failure (LOF) of a gas pipeline due to ground movement damage. The GM contribution to LOF shall be the summation of assigned points times the assigned weighting for the following factors:

A) Crossings\* (70% Weighting): Points will be awarded as follows:

Condition	Points	Weight
Major Water Crossing Present**	20	14
Significant Fault Crossings Present***	4	28
No Major Water or Faults Present	0	0

\* Points for each factor are additive.

\*\* A Major Water Crossing is defined as waterway identified by the Office of Pipeline Safety (OPS) as being a thermally navigable waterway.

\*\*\* Significant Fault Crossings as defined in Attachment 1.

A=064\*FR (Prob. of Rupture in Attachment 1; the number, 064, is a non-dimensional multiplier used to appropriately weight fault crossings as agreed by the GM Committee, for example: Highway Fault, PR = 0.1%, A = (064\*0.001) = 0.064 and B = (0.1\*0.064) = 0.0064.



09. Unstable Soil (Susceptibility to either slide instability or liquefaction) (10% Weighting): Points will be awarded as follows:

Criteria	Points	Weight
Known Soil Instability in Vicinity	10	10
Seismic Hazard Study in Vicinity	10	10
Liquefaction	10	10
None	0	0

Liquefaction shall be considered for areas defined as the susceptibility of Liquefaction within CSE and adjacent Disturbed Area to 1997

10. Seismic Area (5% Weighting): Points awarded as follows:

Criteria	Points	Weight
Seismic Hazard Assessment of CSE	10	10
Seismic Design Acceleration 2.0g to 3.0g	10	10
Seismic Design Acceleration 0.2g to 0.4g	0	0

Seismic Area shall be considered only if it is in an area of unstable soil. For the purpose of this section, unstable soil shall be defined as an area of Moderate-High Soil Instability within CSE or areas of Moderate-High or Known Liquefaction within CSE

Seismic Design Acceleration is the peak ground acceleration values for 10% probability of occurrence in 50 years for 475 year return period

11. Erosion Area (60% Weighting): Points awarded as follows:

Criteria	Points	Weight
Area segments within 100 meters of identified erosion area	10	10
Not in erosion area	0	0

Erosion Area shall be defined by the State Transportation Engineer, Project Manager and shall include (with exceptions per Planning Leave Crossings in the Delta) but from the engineering risk management (ERB) study (Attachment C) that are susceptible to falling into adjacent water body on an ongoing basis.



**II) Ground Movement Mitigation (50% Weighting) Points awarded as follows**

Criteria	Points	Criteria
Full Ground Movement Mitigation* of Known Landslide performed	300	18
Partial Ground Movement Mitigation** of Known Landslide performed	200	12
Full Ground Movement Mitigation* of Known Erosion performed	200	12
Partial Ground Movement Mitigation** of Known Erosion performed	100	6
Full Crossing Mitigation***	200	12
None	0	0



\* "Full Ground Movement Mitigation" efforts are projects whose scope substantially removed the ground movement threat of pipeline failure. This information is reported to the RMP on a case-by-case basis by the appropriate Pipeline Engineer and is documented in the RMP file.

\*\* "Partial Ground Movement Mitigation" efforts are projects whose scope removed some, but not all of the ground movement issues related to a threat to the pipeline. This information is reported to the RMP on a case-by-case basis by the appropriate Pipeline Engineer and is documented in the RMP file.

\*\*\* "Full Crossing Mitigation" is pipeline and crossing segment that has been evaluated/inspected per criteria listed for service P-50 (see Attachment 1) and the "Crossing Points" awarded will be removed.

**III) GPR Void Condition (20% Weighting) Points awarded as follows**

Criteria	Points	Criteria
Approved Void Remediation plan w/ ground application & GPR	120	24
Approved Void Remediation plan w/ ground application & GPR	80	16
All Other	0	0