

**9<sup>th</sup> California Unified Program**  
**Annual Training Conference**

# CalARP Seismic Assessment Overview

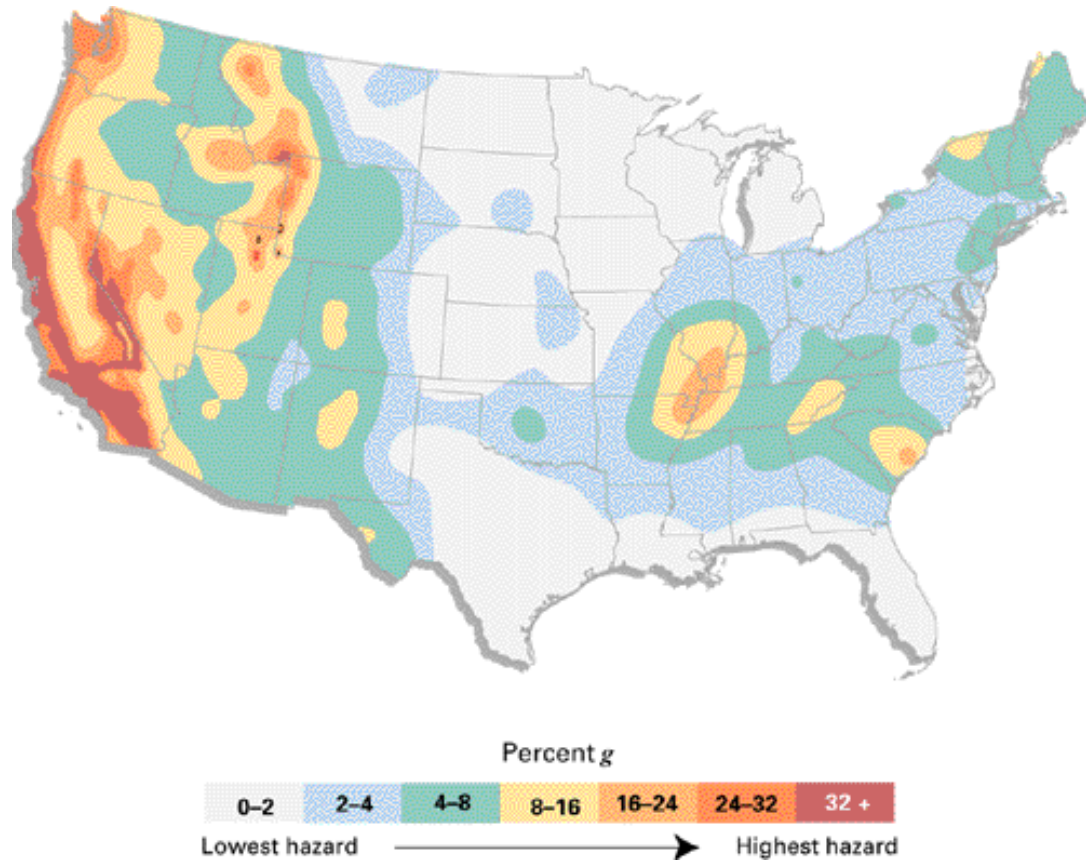
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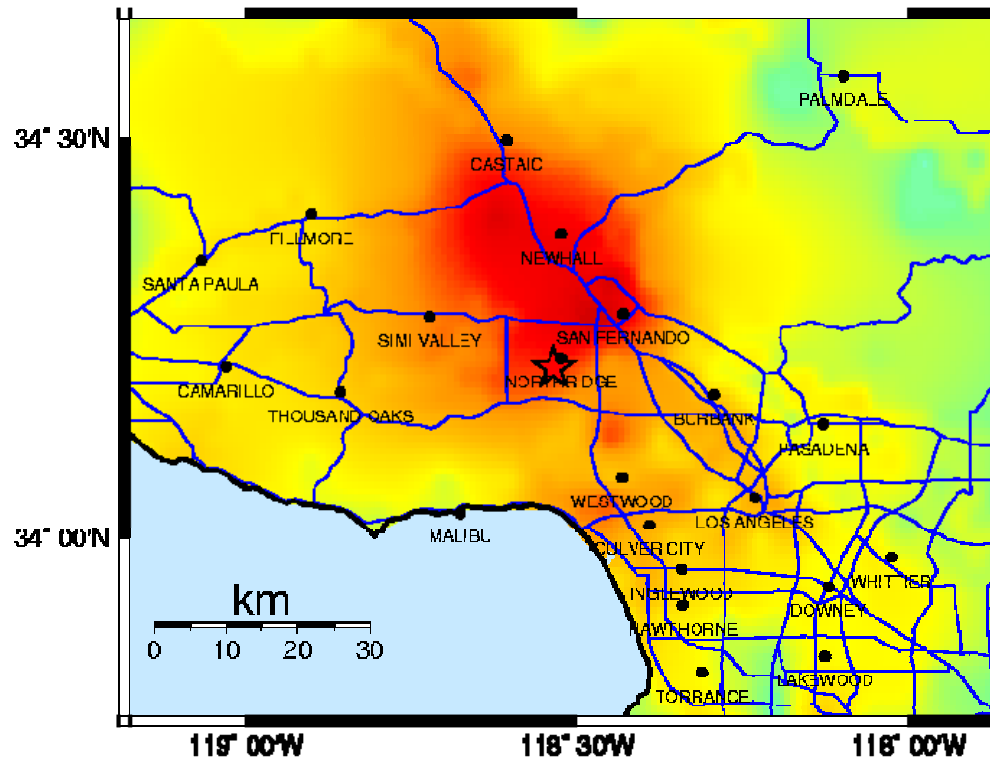
## Seismic Assessments Support a RMP

- Program 2 or 3 Component
- External Events Analysis

RMP Lead Provides Equipment List



## Predicted Seismic Activity



PEAK GROUND SHOULDER	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	None	None	None	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very heavy
PEAK ACC. (g)	<0.17	.17-1.4	1.4-3.8	3.8-6.7	6.7-16	16-34	34-65	65-124	>124
PEAK VEL. (mm/s)	<0.1	0.1-1.1	1.1-3.4	3.4-8.1	8.1-18	18-31	31-65	65-118	>118
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

## 1994 Northridge Earthquake Loads

## Why Perform A Seismic Evaluation Of An Existing System?

- Older Equipment
- Deterioration
- Not Engineered
- Not Maintained

## Seismic Guidance Document

- CalARP Program Seismic Guidance Committee
- Region I Local Emergency Planning Committee (LEPC)
- OES Administering Agency Guidance Resource

# Seismic Guidance Document Development

1990 – Initial Issue

1992 – Revised / Expanded

1998 – Revised / Expanded

2004 – Revised / Expanded

## Seismic Guidance Document

- Latest Issue January 2004
- Three Significant Changes Since 1998 Version
  - Updated Seismic Evaluation Requirements To Be Compatible With Current Design Rules
  - Updated For Five-Year Revalidation Process
  - Added Minimum Report Requirements Section

## Five-Year Revalidation Process

- Review Previous Reports
  - Equipment in Scope
  - Seismic Load
  - Recommendation
- Walkdown Equipment and Systems
  - Equipment in Scope
  - As-Maintained
  - New Nearby Components

## Minimum Report Requirements

- Reason for Study
- List of Equipment
- Soil Profile / Hazard Determination
- Walkdown Summary and Findings
- Recommendations
- Certification

## Walkdown Approach

- Focus on Walkdown Observations / Risk Ranking
- Broad Categories
  - Okay As-Is
  - Not Okay
  - Further Evaluation Required
- Develop Remediation Design Concepts in the Field
- Documentation

Seismic Evaluation  
CalARP Walk Down Review Sheet  
Mechanical Equipment

Component ID:		Date:	
Component Type:		By:	

Evaluation Summary (Circle one)

Adequate      Not Adequate      Further Evaluation Required

Support System (For period estimate)

Rigid Y \_\_\_ N \_\_\_    Semi Rigid Y \_\_\_ N \_\_\_    Soft Y \_\_\_ N \_\_\_

Grade Mounted concrete foundation

\_\_\_\_\_

Other systems (steel/concrete frames, concrete piers, note frame bolting to fdn)

Lateral \_\_\_\_\_

Longitudinal \_\_\_\_\_

Bolting of Equipment to Foundation/Structure

	Y	N		Y	N
Size of bolts OK			Number of bolts OK		
Missing/loose bolts			Bolt spacing/edge distance		
Bolt damage			Bolt corrosion		
Concrete quality			Weld quality		

Notes \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Seismic Evaluation  
CalARP Walk Down Review Sheet  
Piping

Line Number:		Date:	
Drawing Number:		By:	

Evaluation Summary (Circle one)

Adequate      Not Adequate      Further Evaluation Required

Inspection Attributes					
	Yes	No	Inac	Comments	
Piping					
Damaged					
Corrosion					
Flanged/T threaded Joints					
Blind Flans					
Adequate Branch Flexibility					
Rigidly Spans Components					
Supports					
Piping Spans OK					
Missing Hardware					
Corrosion					
Hardware Damage/Loose					
Seismic Interaction					
Adequate Clearance					
Adjacent Comp. Secure					
Clearance at ADVs/MOVs					

# Representative CalARP Seismic Walkdown Forms

## Program Methodology

- **Walkdown** – What is The As-Built And As-Maintained Condition. Bounding Curves / Risk Ranking / Sampling
- **Observation** – “By Inspection” Assessments And “Simple Fix” Approach
- **Calculation** – Bound Hand, Detailed Hand , Computer
- **Remediation** – Minimal Effort To Meet Criteria

## Experience

- Newer Vs. Older Systems
- Engineered Vs. Non-Engineered Systems
- Maintenance Level Variation



## Representative Remediation Issue

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## Representative Further Evaluation Issue

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## Remediated Bracing On Spheres

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## Good Equipment Bracing



## No Anchorage Identified During Walkdown



## Anchorage Remediation

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## Anchorage Deterioration



## No Anchorage Identified During Walkdown



## Anchorage Remediation

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## No Anchorage Identified During Walkdown



## Anchorage Remediation

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## Additional Anchorage Required



## Additional Anchorage Required



## Maintenance Issue

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## Piping Remediation Issue - Flexibility



## Piping Remediation Issue – Seismic Interaction

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## Piping Remediation Issue – Loss of Support



## Remediated Piping – Good Lateral Restraint