



# Federal Energy Regulatory Commission Division of Dam Safety and Inspections



## Revised DSSMP/DSSMR – Appendices J and K

*What's new and why....*



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# And, there is a Quiz....

Occasionally, you'll see a picture

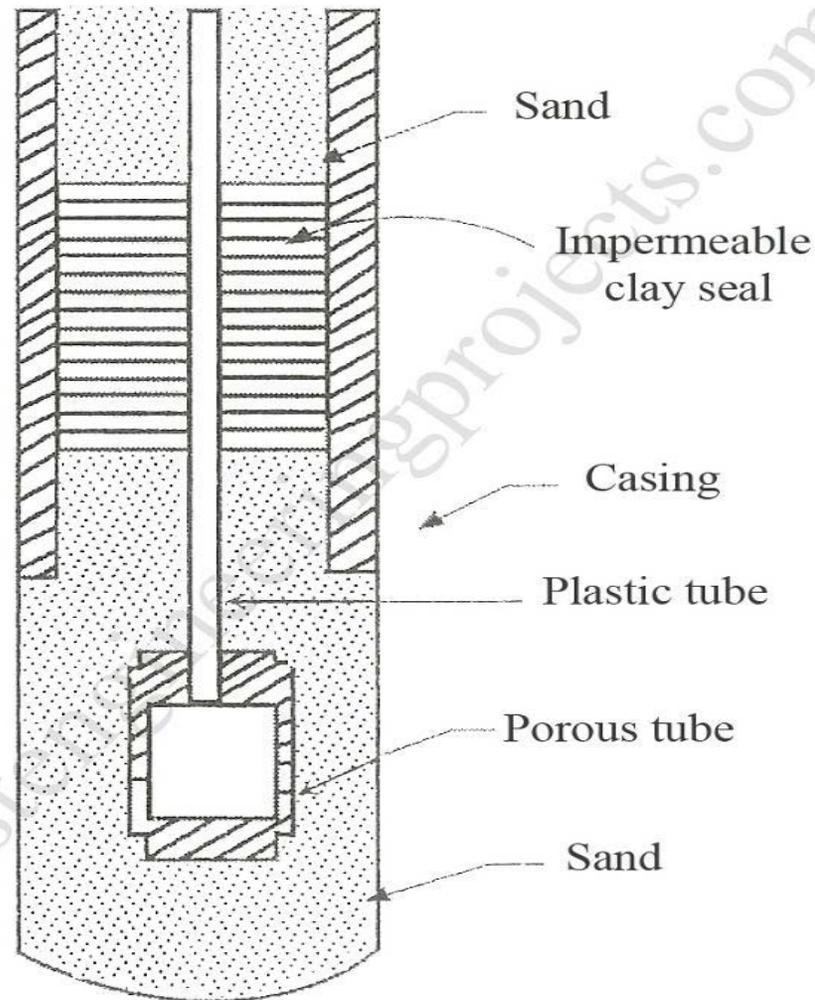
It may flash in and out or across

Note it, and at the end –

What type of instrument? What does it measure?



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# The What....

Commission Letter to all licensees and exemptees of high and significant hazard dams – August 2014 – Two items in future DSSMR's

1. Annual statement from Chief Dam Safety Engineer (CDSE)  
CDSE Certifies “dam safe for continued operation”  
If can't certify, provide next steps to remediate to safe condition for operation
2. Group and identify instruments with respective PFM's  
Identify instruments without a PFM  
Identify PFM's without an assigned instrument  
(visual observation is an “instrument”)



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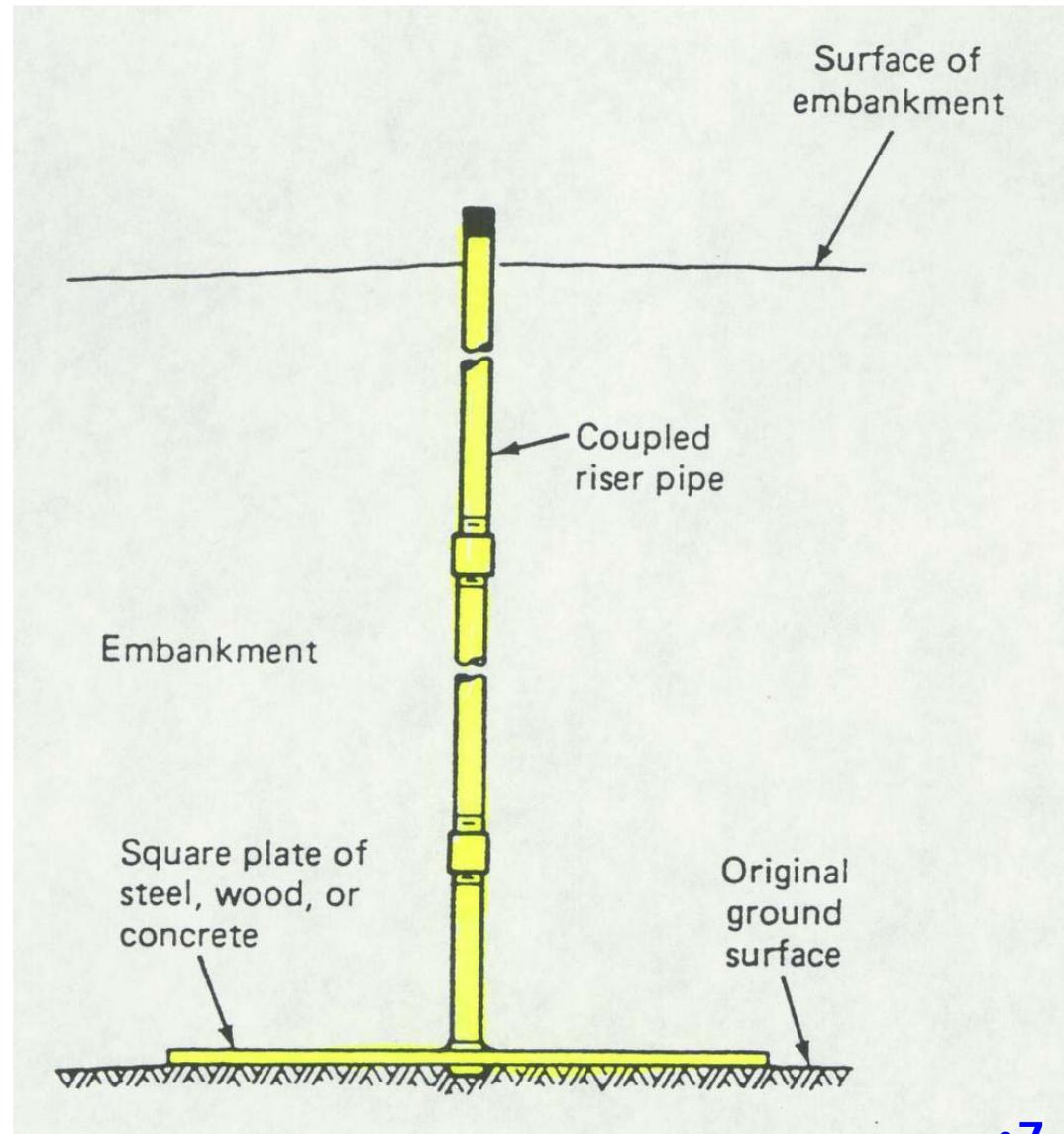


# The Why....

- Licensees\Exemptees and their CDSE “Own” the safety of their project
- Annual statement demonstrates that the CDSE has evaluated the last years’ instrumentation, studies, and inspections, and understands the condition of each dam under their responsibility
- Annual statement provides a vehicle for the owners to self-identify dams not safe for operation, and clarify Risk Reduction Measures and Remediations required.
- Increase awareness & understanding of each instrument’s purpose, relationship to PFM’s
- Provide a method to annually reevaluate the sufficiency of the dam’s monitoring program in regards to newly identified, and existing PFM’s.



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# New Intro...

- Page 14-J-2 – Setting a Philosophy

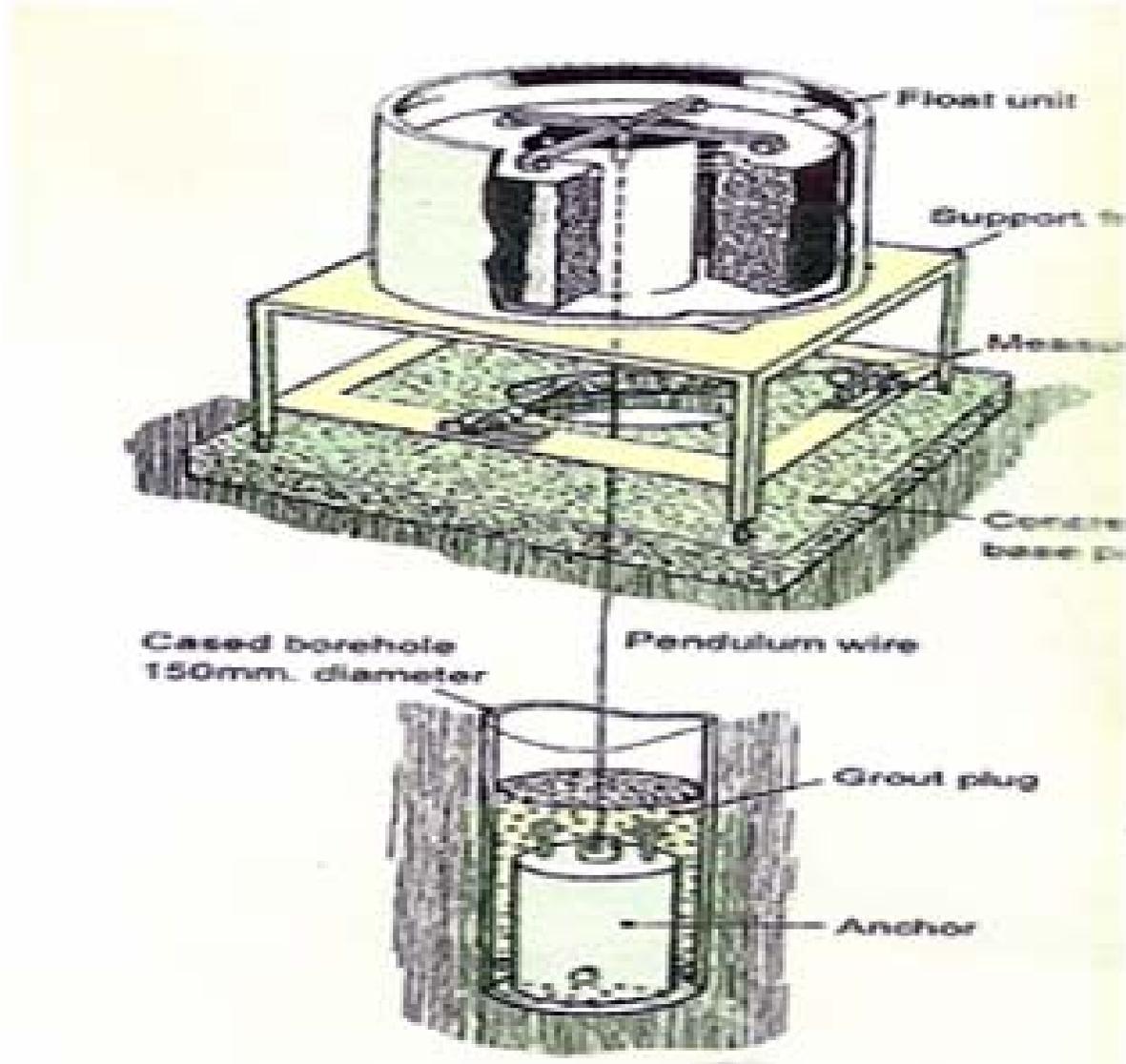
Dr. Ralph Peck, 2000. “Monitoring of every dam is mandatory because dams change with age and may develop defects. There is no substitute for systematic and intelligent surveillance”.

Dr. John Dunncliff states concerning data interpretation “Monitoring programs have failed, because the data generated were never used. If there is a clear sense of purpose for a monitoring program, the method of data interpretation will be guided by that sense of purpose. Without purpose there can be not interpretation.”

Good design, operation, and maintenance does not guarantee freedom from unexpected events that adversely affect the safety of a dam.



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# Instruments and Failure Modes....

- Page 14-J-5 Emphasis on Instrument relative to Failure modes

The purpose/intent of the instrument or visual monitoring program should be documented relative to potential failure modes. If the instrument or visual monitoring program does not apply to a specific potential failure mode, discuss its use to monitor the general health of the dam, or to monitor for the development of undocumented potential failure modes.



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# Review of DSSMP and DSSMR....

- Page 14-J-9 Approach to Review DSSMP and DSSMR

The key to a good instrumentation system ..... a complete understanding of the design intent, installation details and proper maintenance procedures for the instruments. Instrumentation and surveillance programs ..... good monitoring program ..... designed with a clear understanding of PFMs .... early warning signs of failure might be detected ....

References:

John Dunnicliff's book titled "Geotechnical Instrumentation for Monitoring Field Performance"

Center for Energy Advancement through Technological Innovation (CEATI) titled "Dam Safety Performance Monitoring and Data Management-Best Practices"

Steps to a Good Instrumentation System



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## Group \ Evaluate Instruments . . . .

- Page 14-K-2

Lead Paragraph added on the purpose of DSSMR, linking monitoring to PFM's

- Page 14-K-5

### Group and Evaluate Instrumentation to PFM's

Example Tables evaluating the relationship between instrumentation and PFM's, and the general health of the dam.

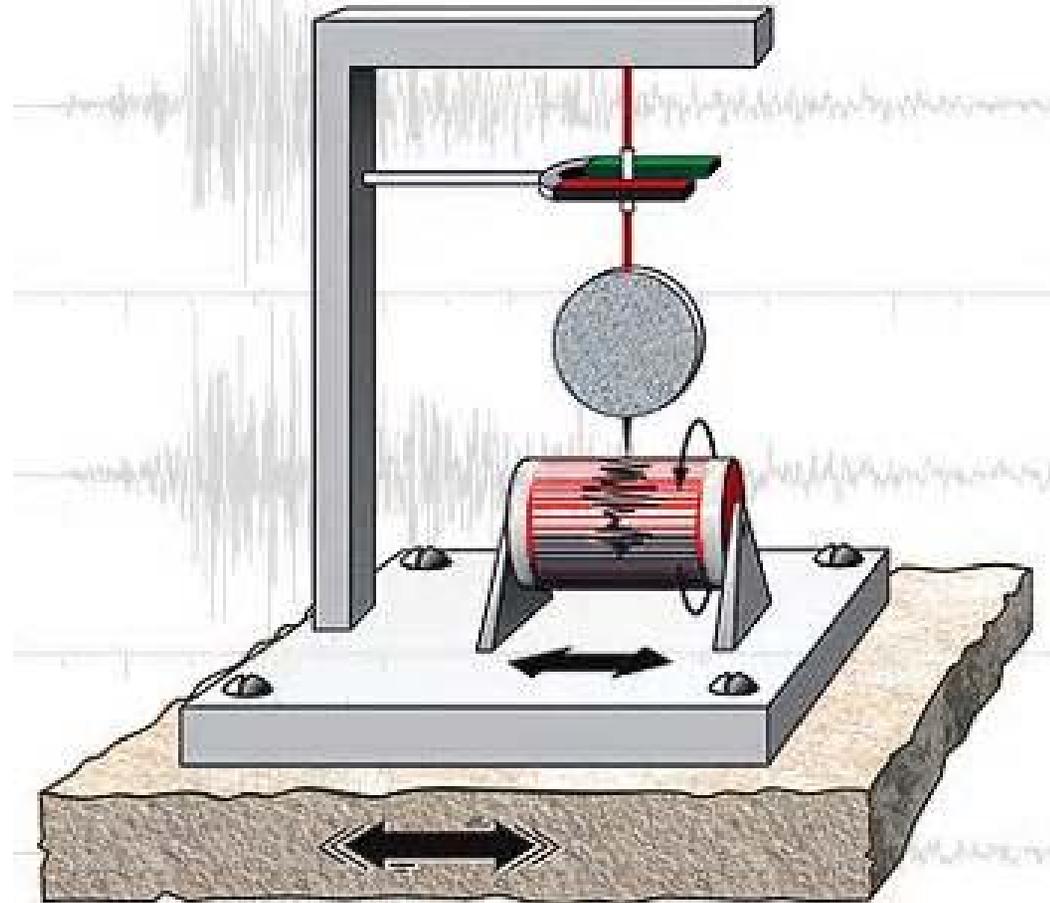
Visual monitoring is also an instrument, and should be included in this evaluation

Instrumentation shall be organized into the four groups.

1. Instrumentation associated with a PFM. (Identify the instrument and PFM)
2. A PFM that has been identified, but not associated with an Instrument
3. Instrumentation not associated with a PFM
4. PFM not previously identified but discovered when reviewing STID, historical data and evaluation of instrumentation readings.



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## • Example Tables – to be included with DSSMR submittal

### EXISTING PFM<sub>s</sub> WITH INSTRUMENTATION:

PFM – Number/Title(s)	Monitoring Effort	Result
PFM 1 - Sliding failure of the spillway during the PMF (Category I – Highlighted PFM)	PZ-1 (uplift piezometer)	No adverse trends, no thresholds exceeded
	PZ-2 (uplift piezometer)	Rising trend but below thresholds, flushed and readings returned to historic range
	PZ-3 (uplift piezometer)	No adverse trends, no thresholds exceeded
	Deformation Surveys	Adverse trend detected for BM-3 through BM-7, see evaluation on page 16
	Annual dive inspection	No adverse findings related to PFM 1
	Daily operator inspections	No adverse findings related to PFM 1
	Monthly supervisor inspection	No adverse findings related to PFM 1
	Annual engineer inspection	No adverse findings related to PFM 1
PFM 2 - Operational gate failure (Category II – Considered not Highlighted PFM)	Annual dive inspection	No adverse findings related to PFM 2
	Daily operator inspections	No adverse findings related to PFM 2
	Monthly supervisor inspection	No adverse findings related to PFM 2
	Annual engineer inspection	No adverse findings related to PFM 2
	Annual gate testing	Current readings in normal range
	10-year detailed gate inspection	All maintenance actions complete

### EXISTING PFM<sub>s</sub> WITHOUT INSTRUMENTATION:

PFM – Number/Title(s)	Monitoring Effort	Comment
PFM 3 - Failure of low level outlet during normal loading conditions (Category II – Considered not Highlighted PFM)	None identified	Low level outlet is submerged and silted in - could not locate during last dive inspection

Note: Some instruments may be used to monitor development of multiple PFM<sub>s</sub> and should be listed with each associated failure mode. All instrumentation, including visual monitoring, should be used to monitor the overall condition of the dam and help identify new PFM<sub>s</sub>.



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Example Tables to be Included with Annual DSSMR Submittal

**NEWLY IDENTIFIED PFMs (Follow Procedure in Chapter 14, Section 14.3.6 for Updating PFM's)**

PFM – Number/Title(s)	Monitoring Effort	Result
Sliding of the non-overflow under normal loading conditions (candidate PFM identified during evaluation of deformation survey results)	Deformation Surveys	Differential movement detected and further evaluation of stability is needed
	Daily operator inspections	New cracks found on 9/18
	Monthly supervisor inspection	No adverse findings
	Annual engineer inspection	No adverse findings
Failure of Penstock No. 1 due to corrosion under normal loading (candidate PFM identified during review of STID)	Daily operator inspections	No visual changes to corrosion or leakage detected
	Monthly supervisor inspection	No visual changes to corrosion or leakage detected
	Annual engineer inspection	No visual changes to corrosion or leakage detected
	Ultrasonic thickness measurements	Section loss detected, see evaluation on page 19

**INSTRUMENTATION NOT ASSOCIATED WITH A PFM:  
(General Health of Dam)**

Monitoring Effort	Result
PZ-5	No adverse trends, no thresholds exceeded
Surveillance Camera	No visual changes or seepage with soil fines
Deformation Surveys	No adverse trends, no thresholds exceeded
Daily operator inspections	No adverse findings
Monthly supervisor inspection	No adverse findings
Annual engineer inspection	No adverse findings



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# CDSE Annual Statement on Safety....

- Page 14-K-5, 6 per the August 2014 letter to all licensees

## Chief Dam Safety Engineer Annual Statement for Continued Operation

### For high and significant hazard dams

“Based on my personal knowledge and meetings and discussions with my engineering staff and/or consultant(s), along with review of the DSSMR, Part 12 Inspection Report, Dam Safety Inspection(s), and Dam Safety Studies, I conclude, that the dam(s) is safe for continued operation.

Or

“Based on my personal knowledge and meetings and discussions with my engineering staff and/or consultant(s), along with review of the DSSMR, Part 12 Inspection Report, Dam Safety Inspection(s), and Dam Safety Studies, I conclude, that the dam(s) is safe for continued operation, with the following issues noted: (*List of outstanding items (instrumentation anomalies, detailed stability analyses, PMP/PMF studies, etc.)*.”



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# If the CDSE can't certify safe for operation....

- Submit a Justification for Continued Operation Plan  
Schedule to evaluate and remediate dam  
Interim measures to reduce risk



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# Your actions...

- Review and understand changes to Appendices J & K
- Examine new DSSMR's in light of the changes
  1. Is the dam considered safe by the CDSE?
  2. If not, do they present a cogent remediation and evaluation plan, and risk reduction measures to justify continued operations?
  3. Is the purpose of the dams' instruments in relation to PFM's or health of the dam clearly understood?



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# Quiz Results....

- Self – Grade, Honor Rules
- Ten points – Perfect – Expert Level (ask for a raise)