

TETON DAM FAILURE **LESSONS LEARNED**



***TETON BASIN PROJECT,
IDAHO***





Looking Downstream



Welded Tuff Exposures

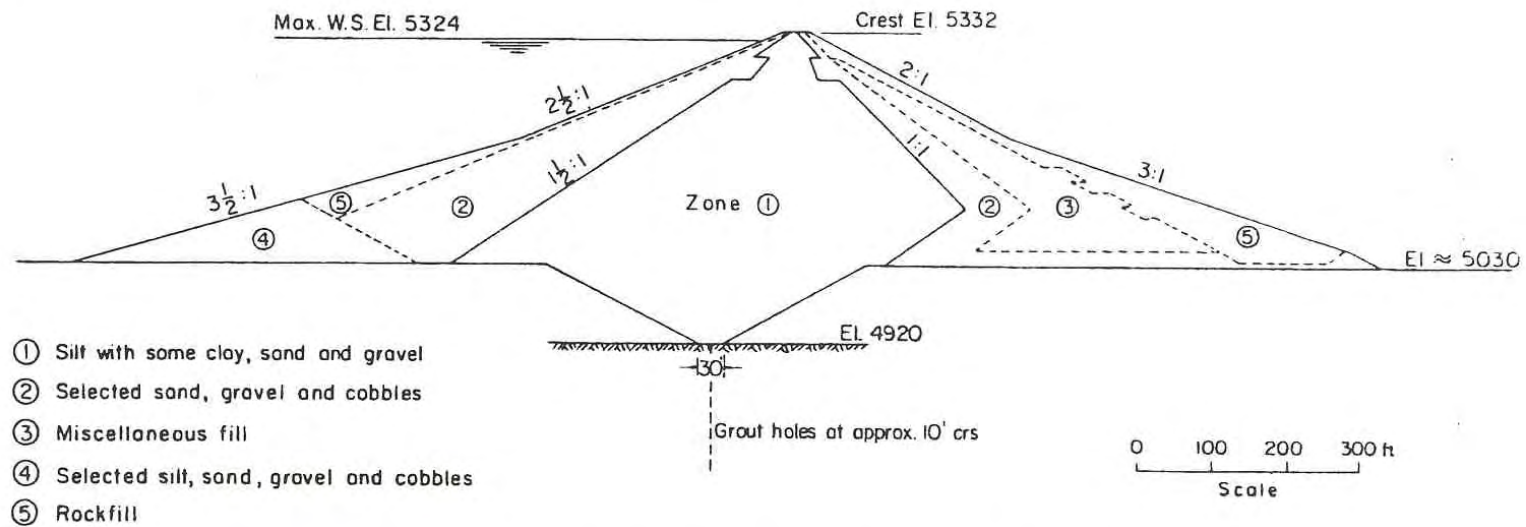


Fig.2. Cross-section through center portion of embankment founded on alluvium.

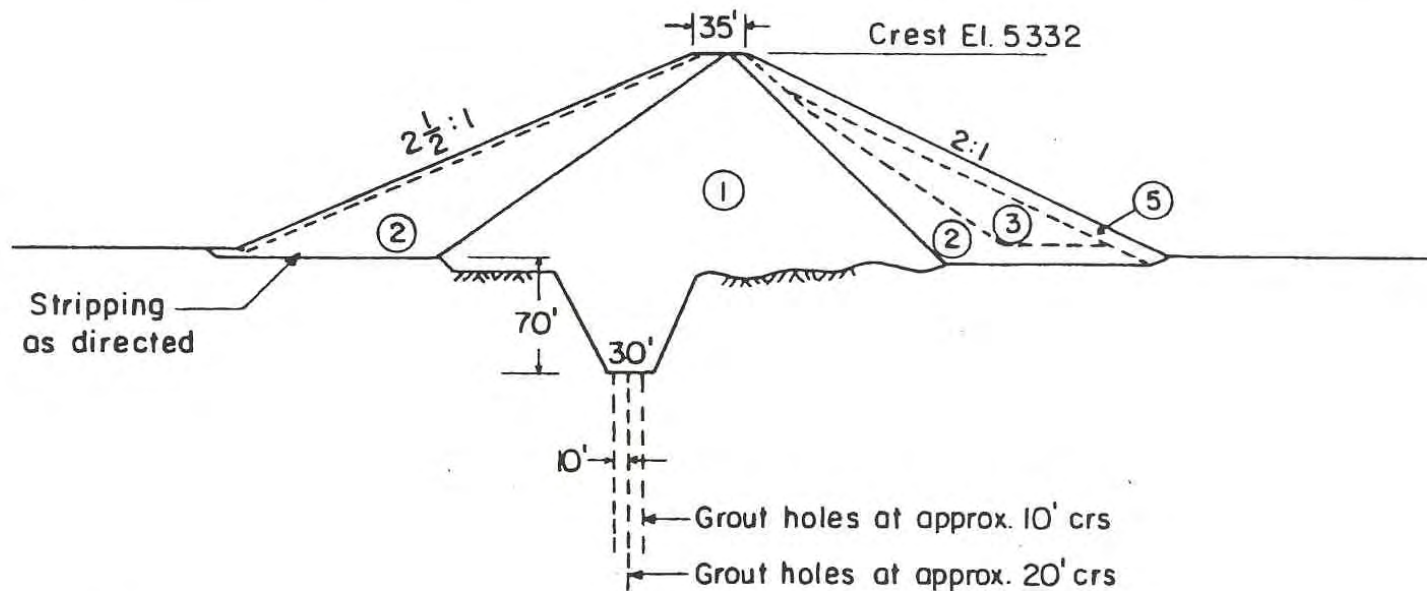


Fig.3. Typical cross-section over abutment sections founded on jointed rhyolite.



Drilling Overhangs



Fissure in D/S Right Abutment



View of D/S Rock in Right Abutment Key Trench

*Fissure
Interior*



*Fissure With
Light Bulb*





High Slump Concrete Placement

DOWNSTREAM

UPSTREAM

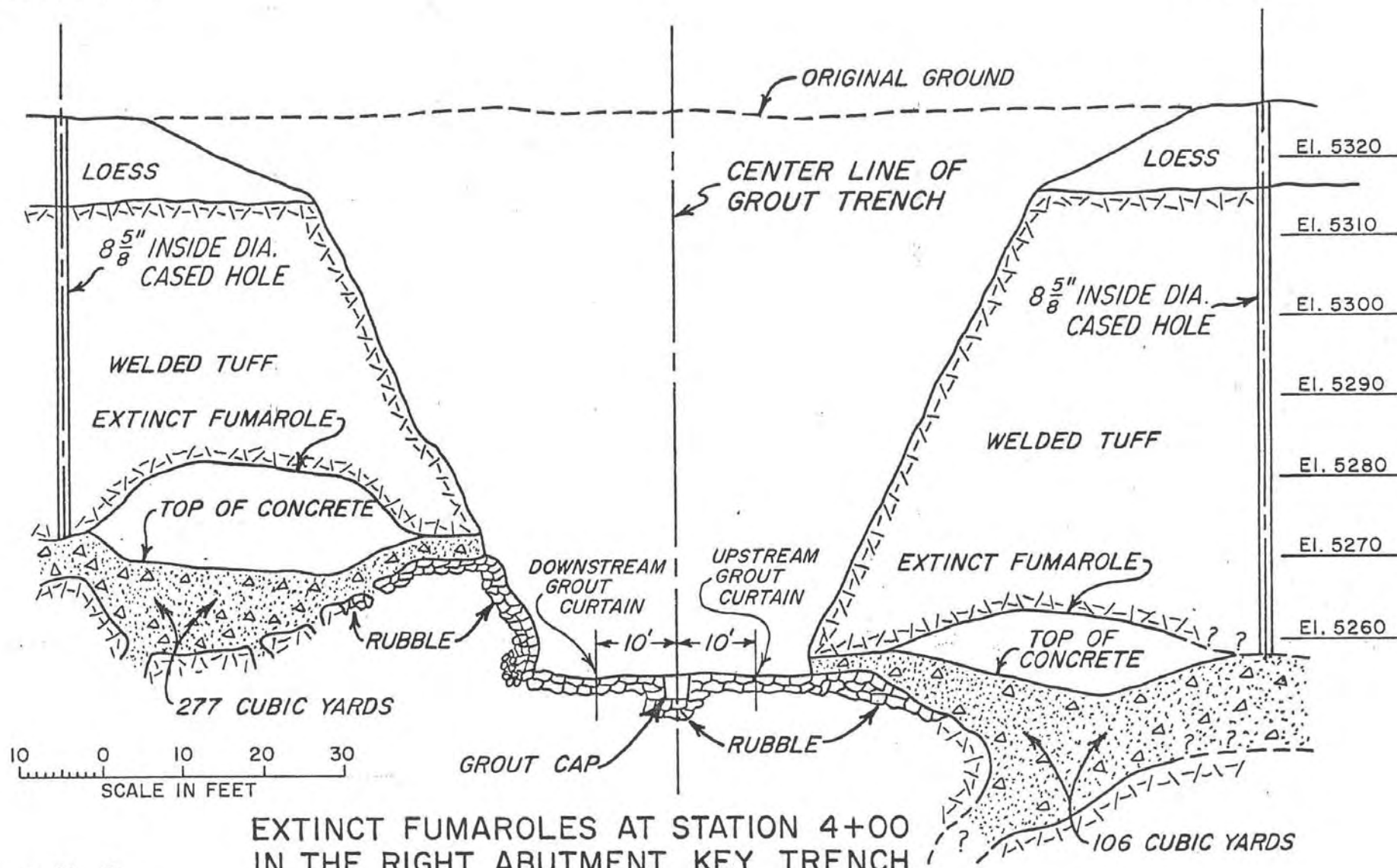
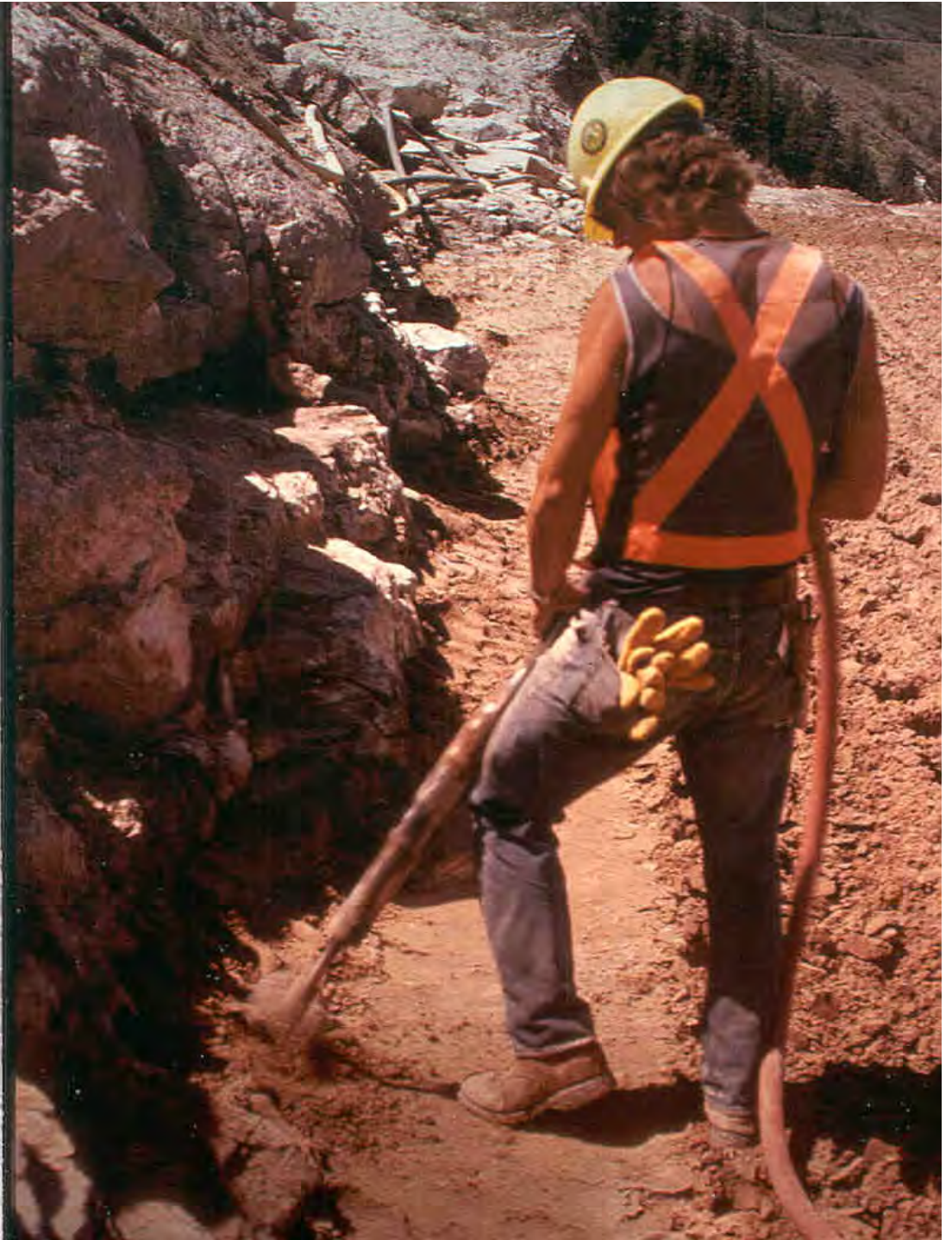
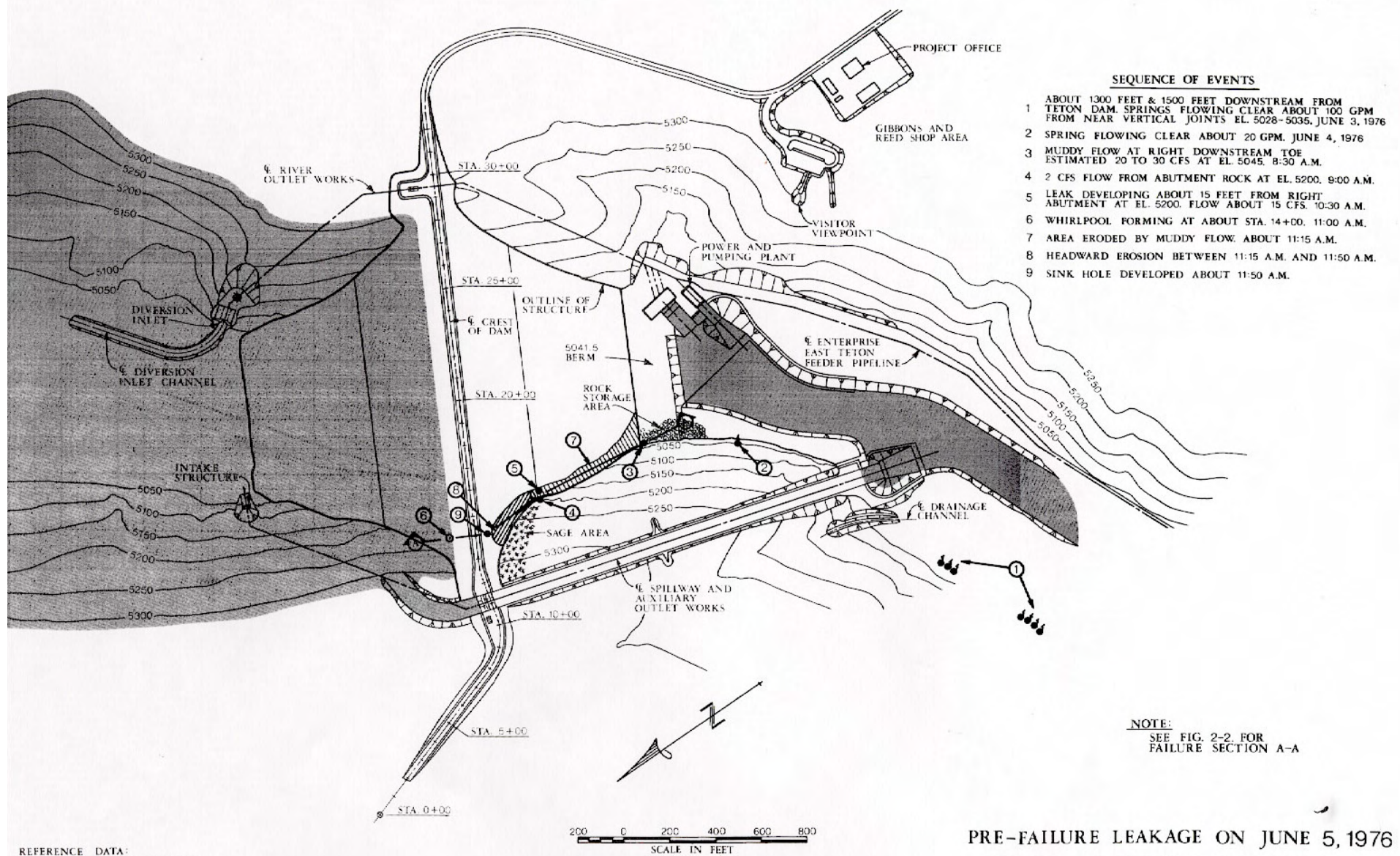


Figure No. 9

Fissure Backfill Method

*Special Compaction
Adjacent to Rock*





Pre-Failure Seepage



Increased Flows



Early Afternoon, June 5, 1976



Rexburg, Idaho



Sad View

***POSSIBLE TRIGGER
MECHANISMS OF
FAILURE***

POSSIBLE TRIGGER MECHANISMS OF FAILURE

- *Seepage under grout cap.*
- *Piping through cracks caused from hydraulic fracturing or differential settlement.*
- *Hydraulic separation between key trench fill and base of the trench (open joints).*
- *Seepage through the key trench fill (open joints).*
- *Seepage through soil at base of key trench by sloughing.*
- *Collapse of dry seam in trench fill.*
- *Wet seam (?).*

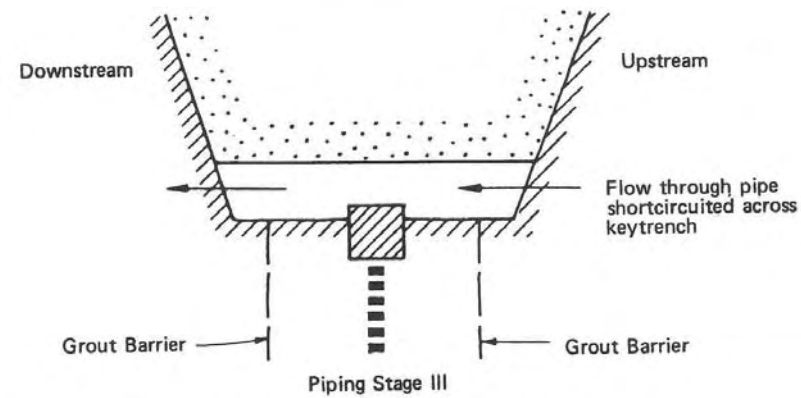
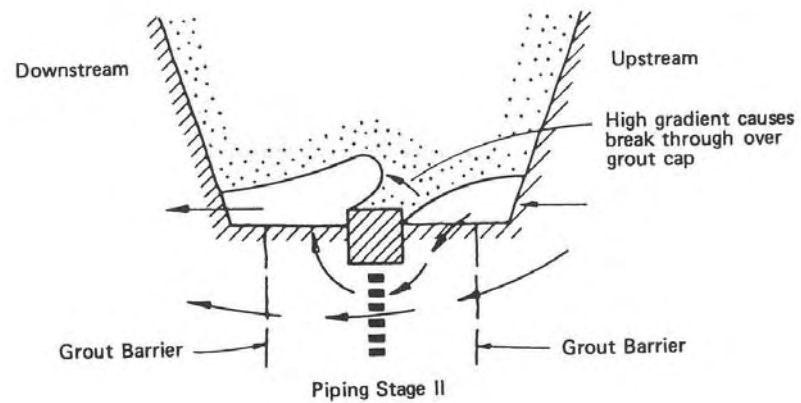
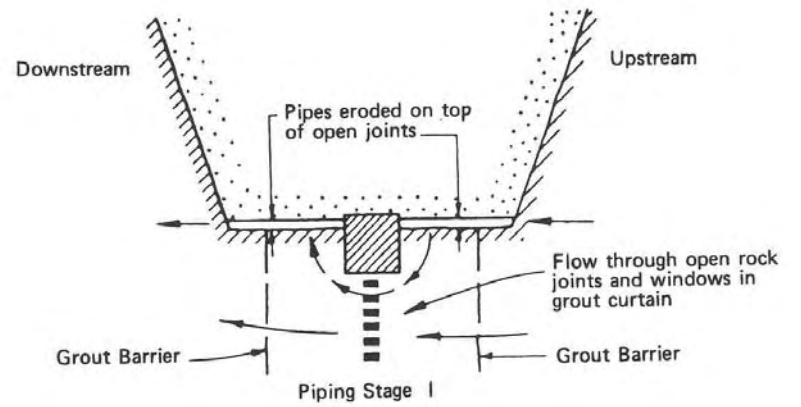


Fig.6. Conceptual mechanism of failure due to seepage under grout cap.

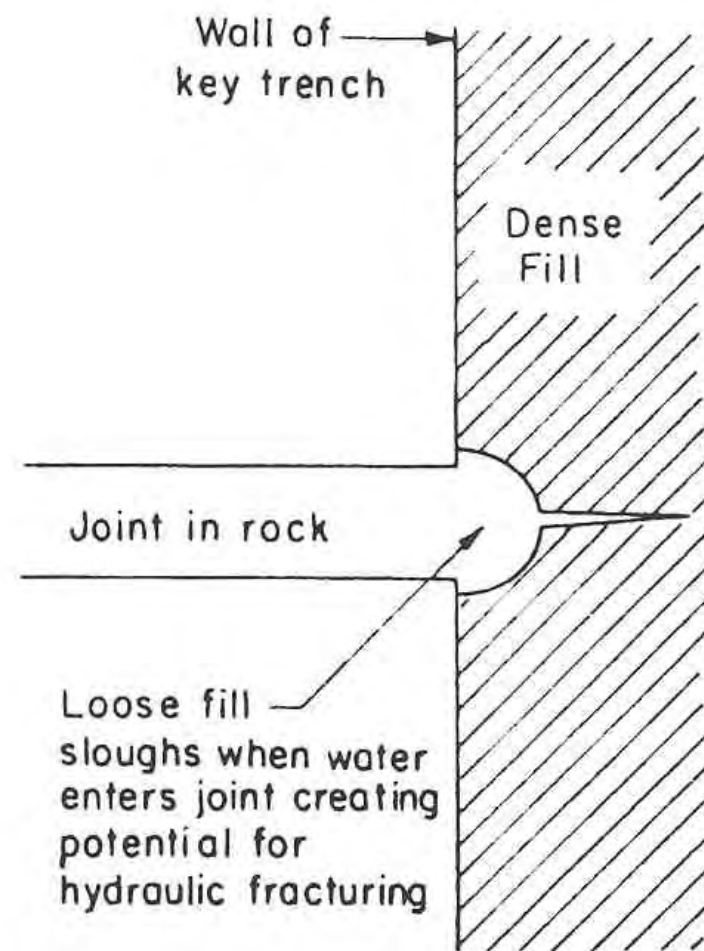
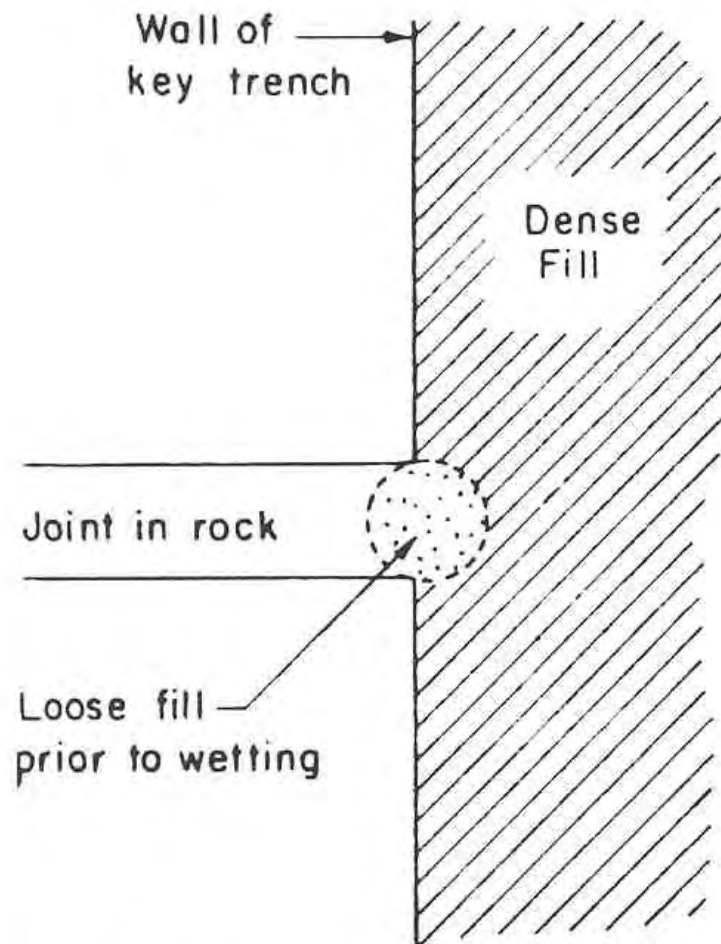


Fig.18. Conceptual mechanism of hydraulic fracturing in key trench fill.



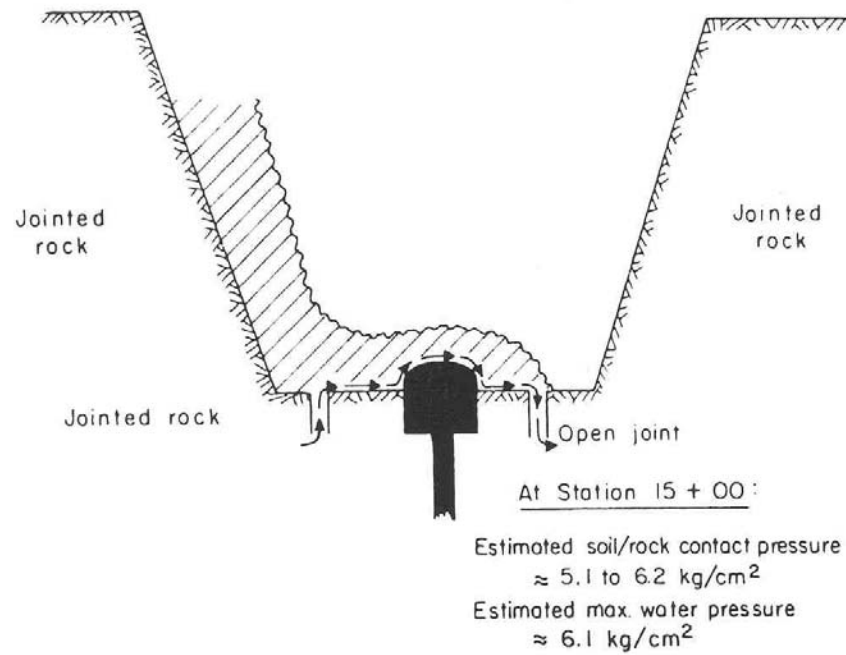


Fig.19. Hydraulic separation at base of key trench.

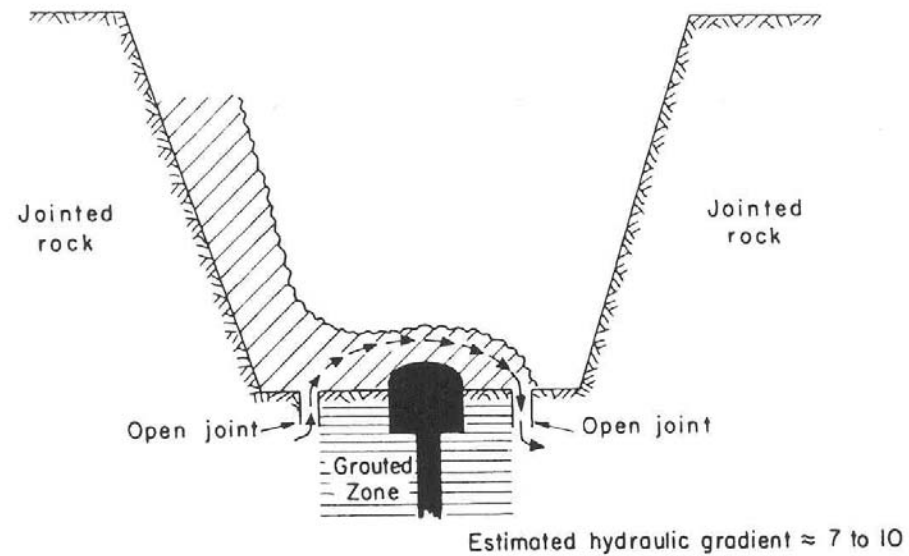


Fig.20. Piping due to seepage across base of key trench.

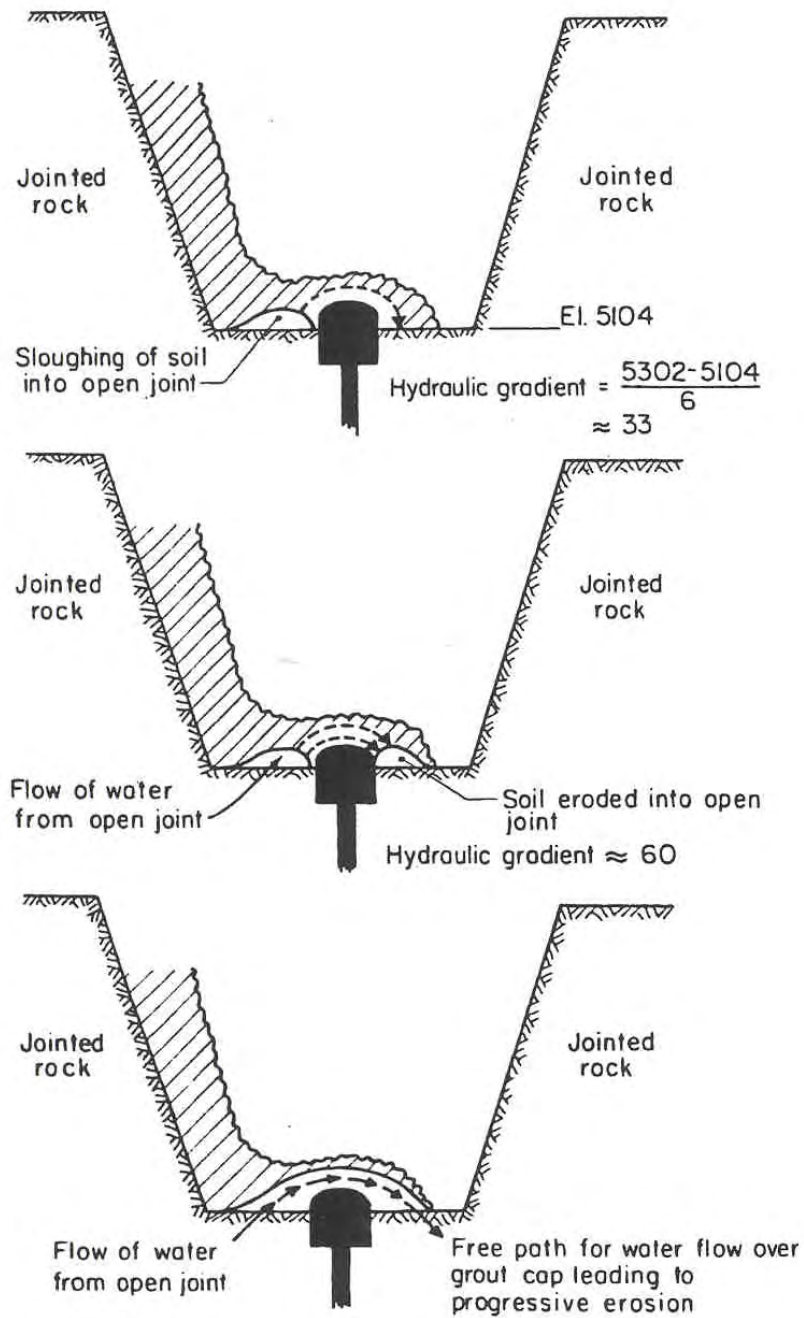


Fig.21. Piping due to seepage and sloughing over base of key trench.

LESSONS LEARNED - *Institutional*

- *Hubris engineering is detrimental.*
 - *Hubris*
 - Webster: exaggerated pride or self-confidence often resulting in retribution
- *Bring in appropriate consultants for technical reviews and field reviews.*
- *Investigators, designers, and consultants work closely together, with timely onsite field trips.*
- *Internal Reviews*
- *Independent Dam Safety Office*
- *Monitor dam closely*

LESSONS LEARNED – *Institutional*

- *Use of Principal Designers and Responsible Geologists (put both on same level)*
- *Improved documentation*
 - *Technical memos*
 - *Foundation approval memos*
 - *Geotechnical considerations in specs*
- *Establish Emergency Preparedness plans*

LESSONS LEARNED -

Geotechnical

- *Flaws can occur in man-made structures.*
- *Use more than one line of defense against seepage.*
- *Foundation treatment is important (slush grouting, dental concrete, abutment shaping)*
- *Use filters and drainage downstream of core*
- *Slow first filling of reservoir.*