

YUCCA MOUNTAIN

April 1, 2004, Field Trip Report to Alcove 8 – Niche 3 Areas

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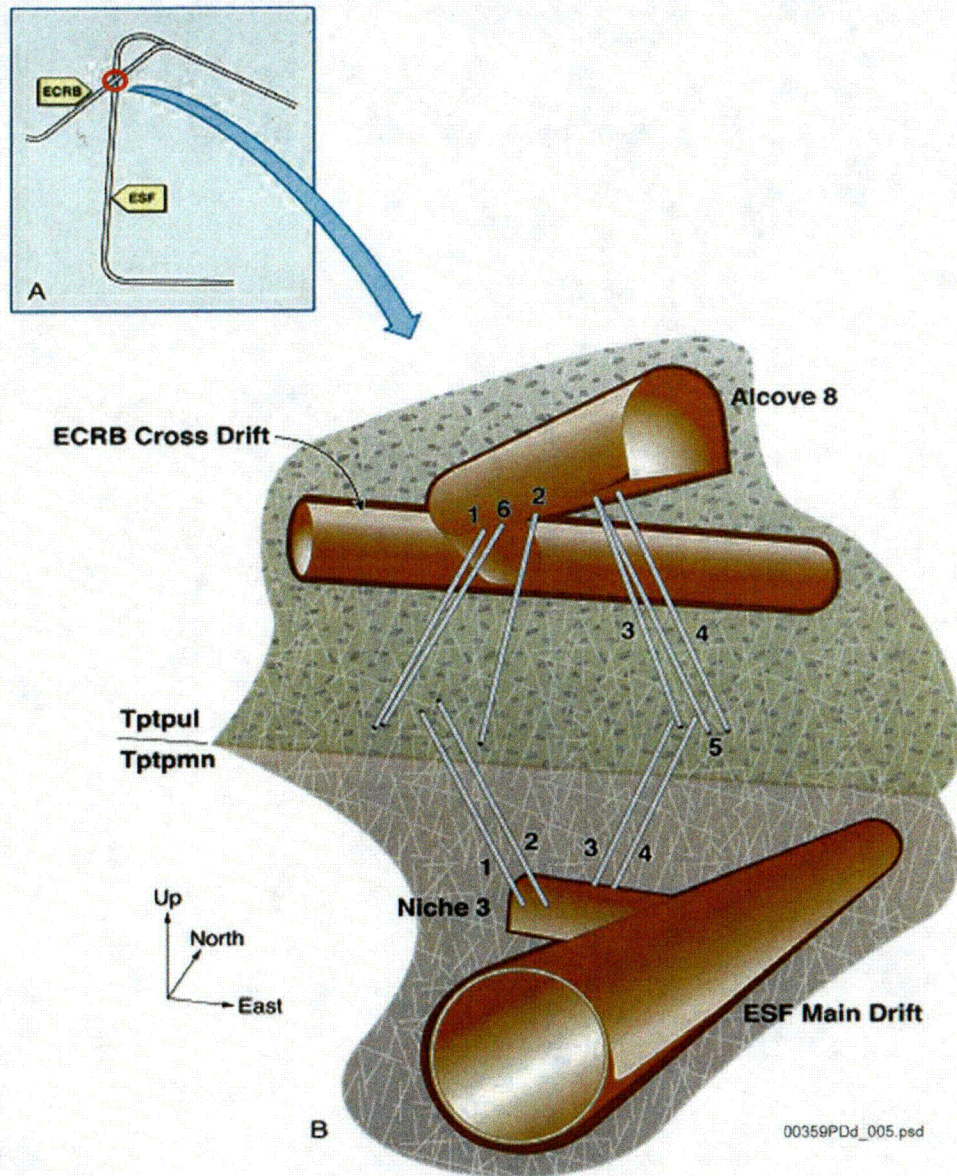
U. S. Nuclear Regulatory Commission
Washington, DC

REPORT

- **YUCCA MOUNTAIN PROJECT**
- **April 1, 2004, Field Trip Report to Alcove 8 - Niche 3 Areas**
- A field trip into Alcove 8 and Niche 3 was conducted by the DOE and the USGS staff on April 1, 2004. Entry was delayed by one hour due to higher radon levels caused by lower atmospheric pressure. The purpose of the field trip was to observe the Alcove 8-Niche 3 testing areas where infiltration and tracer tests are conducted in order to quantify large-scale infiltration and seepage processes in the potential repository horizon, estimate fault and fracture properties and fracture-matrix interface area by analysis and modeling of tracer test results, and evaluate the importance of matrix diffusion in the unsaturated zone transport processes. Data is collected on the hydrologic and hydraulic properties of the geologic matrix, fractures and fault, in addition to solute transport properties, seepage and drainage characteristics, evaporation, lithology, and other information. Alcove 8 is located in the Enhanced Characterization of the Repository Block (ECRB), approximately 200 m below the top of Yucca Mountain. Niche 3 is located in the Exploratory Studies Facility (ESF), about 22 m directly below Alcove 8. Water infiltrates from the ponded water in Alcove 8 in the ECRB and seeps into Niche 3 in the ESF.

REPORT

- Attached photographs show different views taken during the trip and the captions briefly describe the views.
- There are 12 square (1m x 1m) seepage ponds in Alcove 8, covering a rectangular area of 3 m by 4 m. The amount of water infiltrating by gravity through the seepage ponds is about 18 to 20 liters per day. The current average infiltration rate is determined to be about 0.5 cm per day compared to a previous (2002), value of 0.63 cm per day from a similar seepage/infiltration test. The infiltration gallery (12 plots) in Alcove 8 is covered to reduce evaporation, and evaporation and relative humidity values are being measured. The evaporation rate is currently measured to be about 0.8 mm per day. Normally, the humidity in Alcove 8 is about 93% to 94% while Niche 3 is closed off with a bulkhead in order maintain ambient conditions inside. It takes about 7 days for the water to seep through the fractures and a minor fault from Alcove 8 to Niche 3. Seepage is collected in 20 tubes and about 10% of the applied water in Alcove 8 is collected in Niche 3. The balance of the applied infiltrating water may be partially utilized for increase in the moisture content and saturation of the geologic matrix, evaporation in the ESF, and flow diversion around Niche 3. Water diverting around Niche 3 area will be estimated by a mass balance approach for the entire system. Some of the attached photographs illustrate the wetting fronts of the Niche 3 wall and roof surfaces. On the roof/ceilings of Niche 3, stains appear showing the drying pattern. The cause for the difference between drips vs seeps is not clear. No predictable airflow pattern could be observed when the bulkhead is closed.
- During the meeting with the staff conducting the tests, we suggested that the hydrologic and hydraulic parameters, and other data generated from the seepage/infiltration tests should be compatible to and consistent with applicable parameters used in the Unsaturated Zone Flow Model.
- Note: Some of the following pictures were taken by Engelbrecht von Tiesenhausen, Clark County, Nevada.



Source: BSC 2003a, Figure 6.12.1-2.

NOTE: ECRB = Enhanced Characterization of the Repository Block.

Figure E-1. Schematic Illustration of the Test Bed for the Alcove 8-Niche 3 Tests

Area in Front of Alcove 8 Test Area (4_5_04 018.jpg)



Entrance to Alcove 8, ECRB (P4010011.jpg)



View into Alcove 8 Test Area (4_5_04 019.jpg)



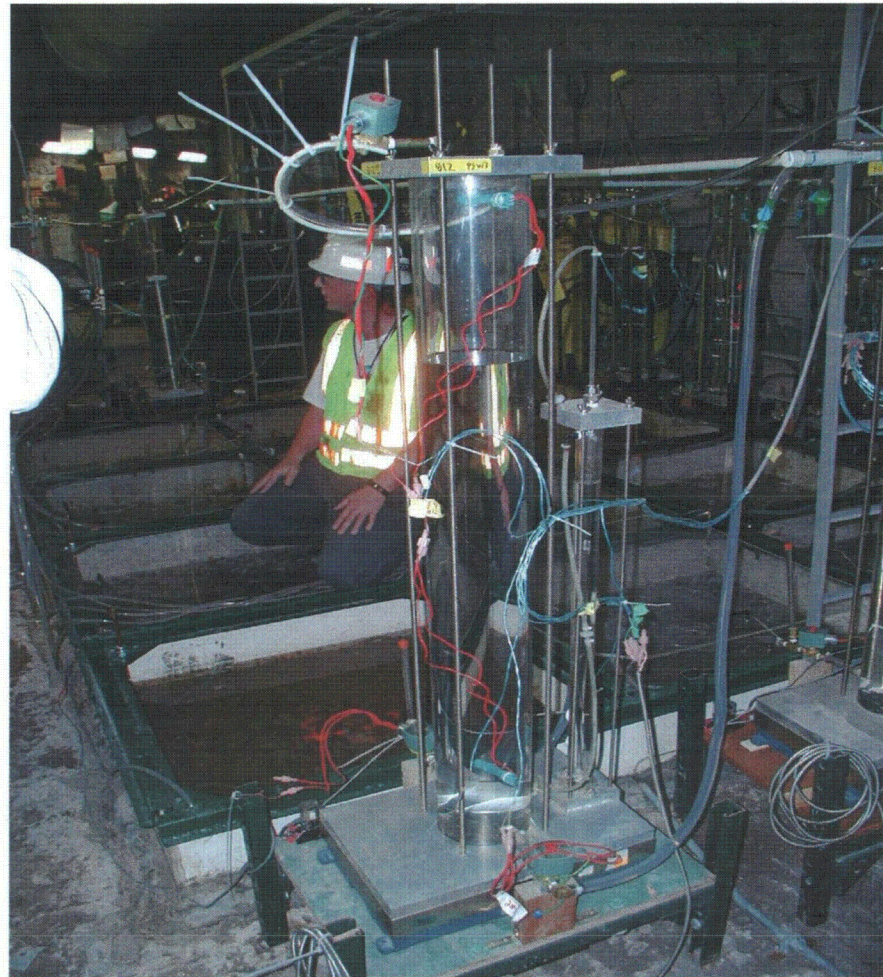
View into Alcove 8 Test Area (4_5_04 020.jpg)



Seepage Plot in Alcove 8, Dave Hudson, USGS (P4010012.jpg)



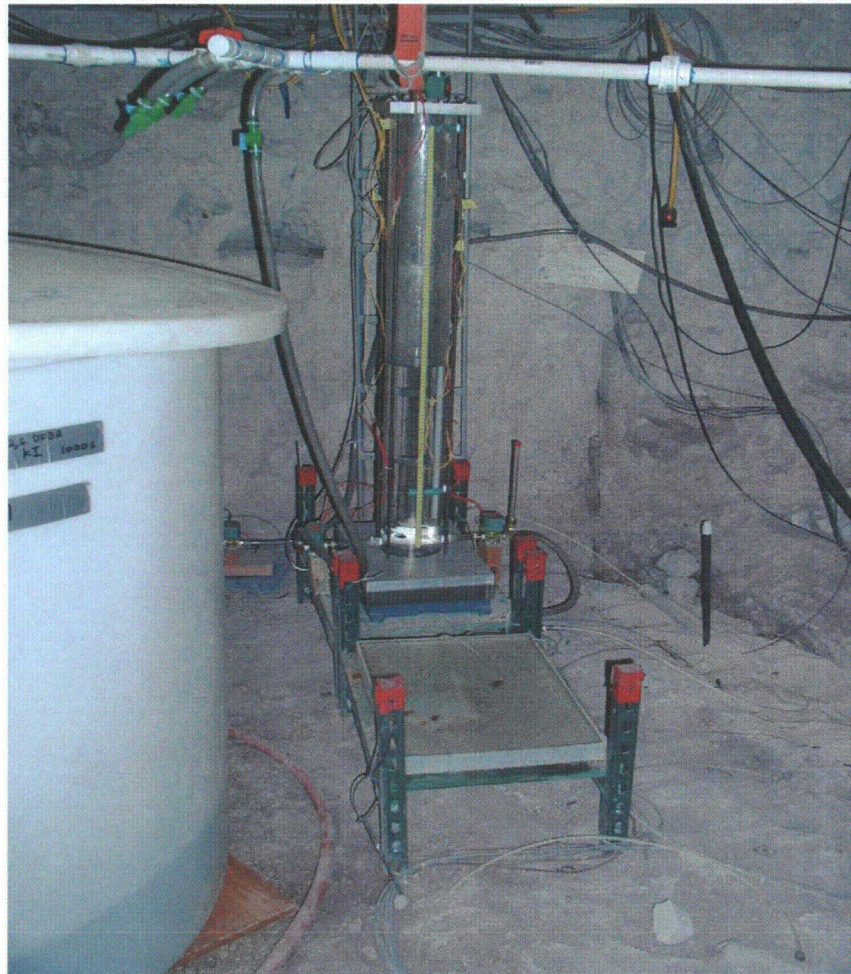
Infiltration Water Apparatus in Alcove 8, Dave Hudson, USGS (P4010013.jpg)



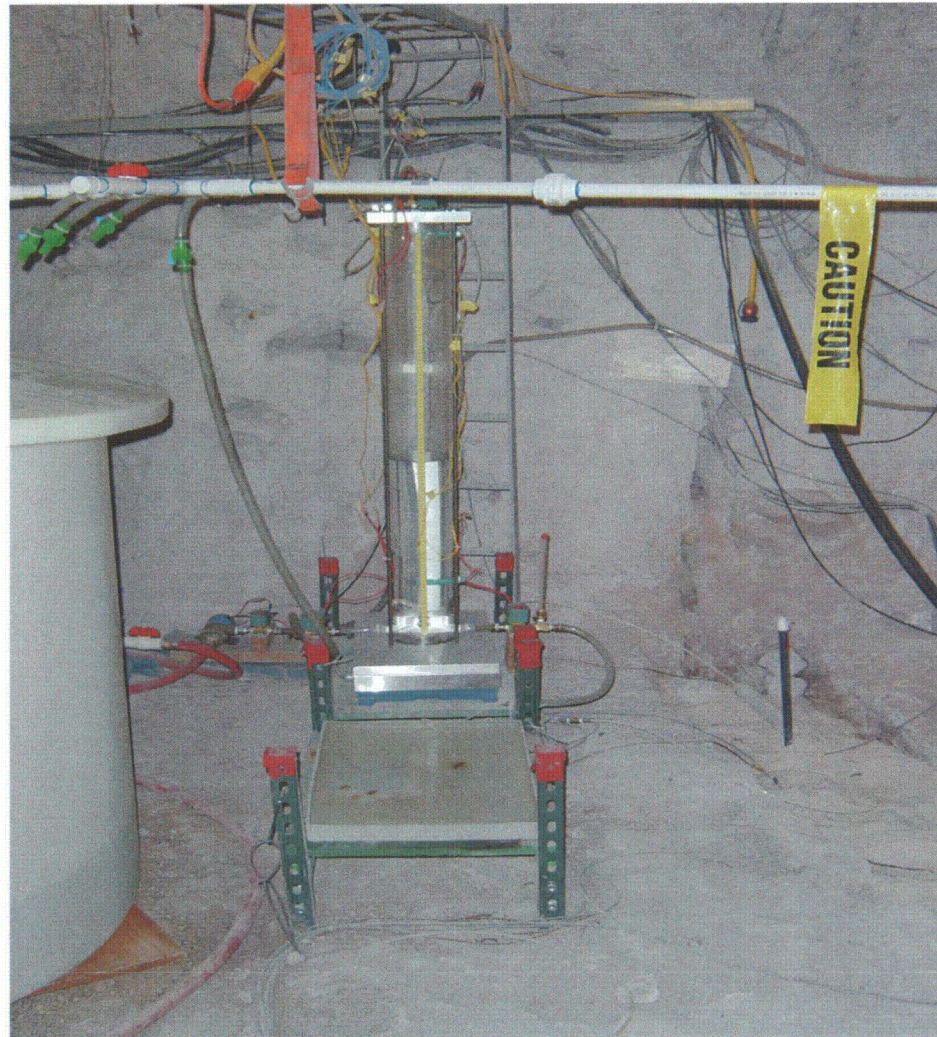
Dave Hudson on Top of Seepage Plots in Alcove 8 (4_5_04 022.jpg)



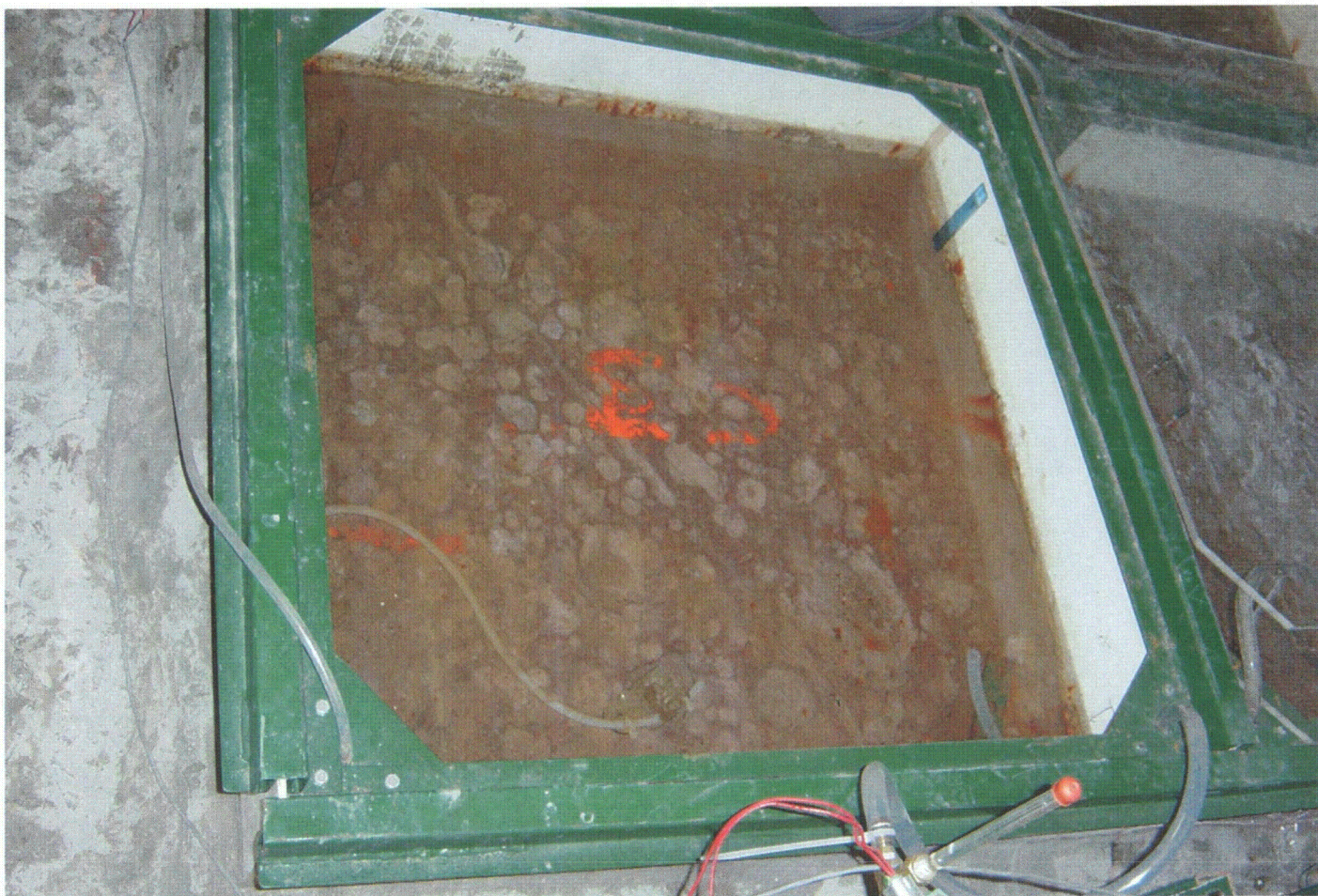
Evaporation Measurement Apparatus in Alcove 8 (P4010014.jpg)



Evaporation Monitoring System in Alcove 8 (4_5_04 023.jpg)



View of One Seepage Plot in Alcove 8 (4_5_04 021.jpg)



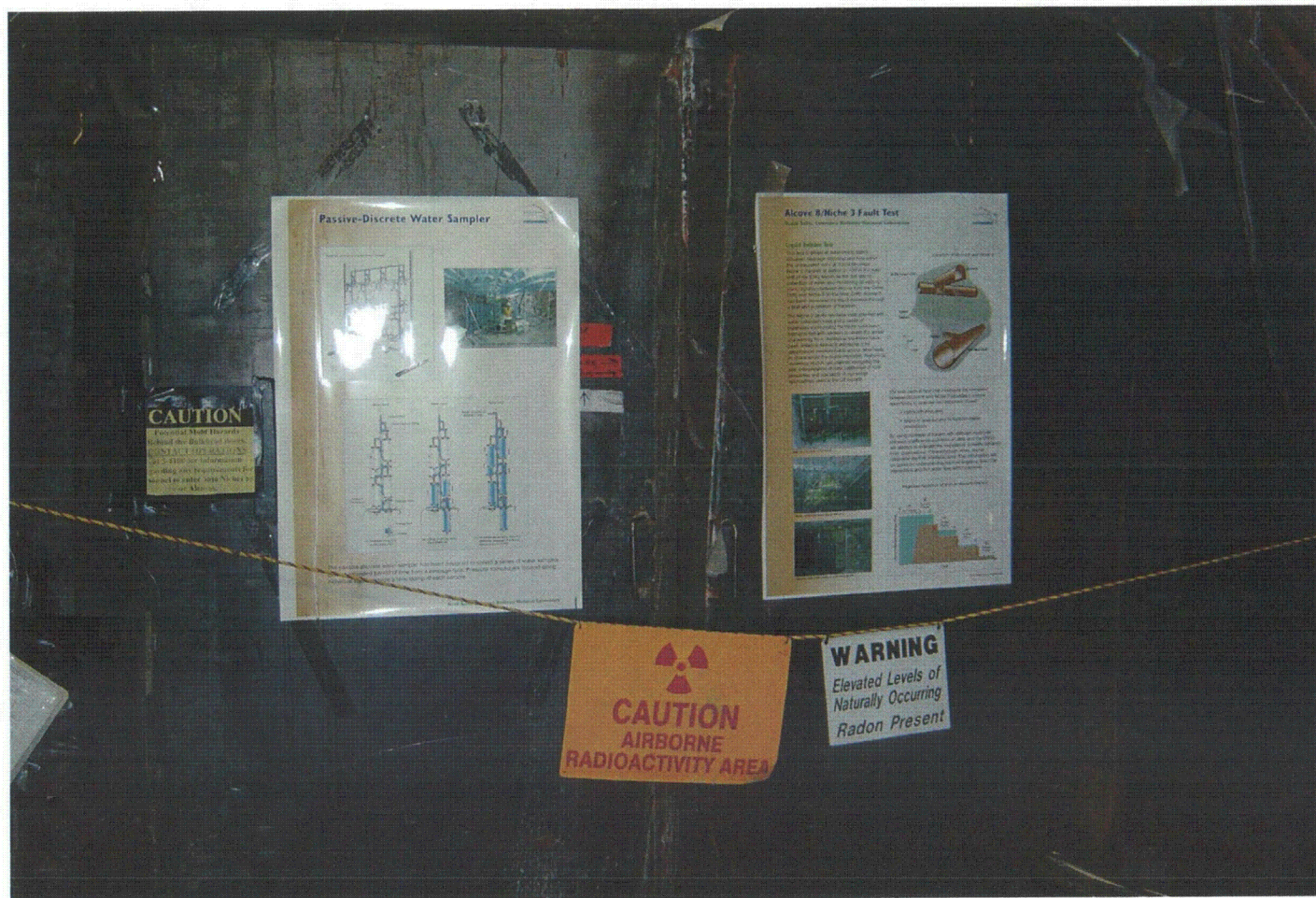
Seepage Plot Area and Equipment in Alcove 8 (4_5_04 024.jpg)



Niche 3 Location (4_5_04 031.jpg)



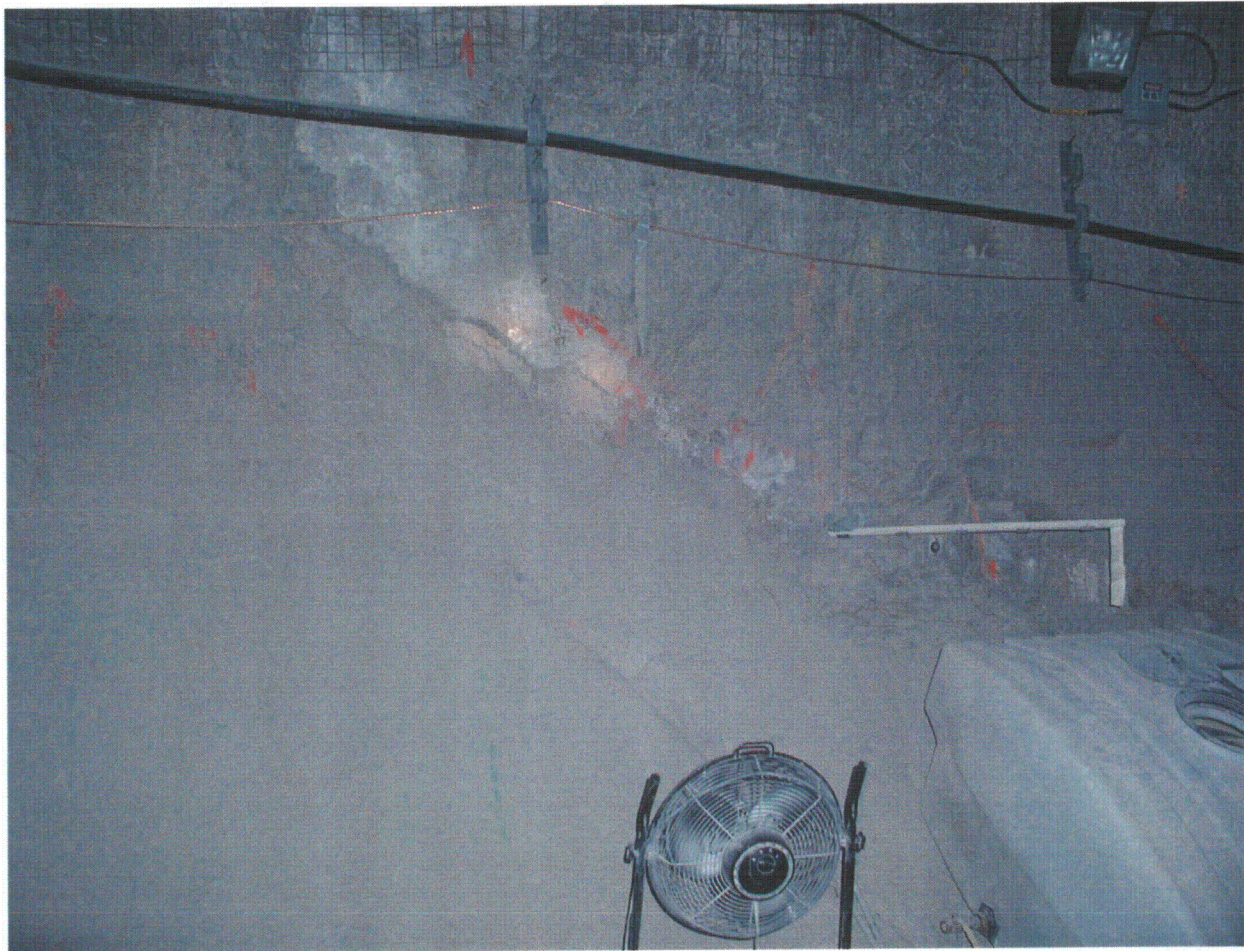
Niche 3 Doorway (4_5_04 025.jpg)



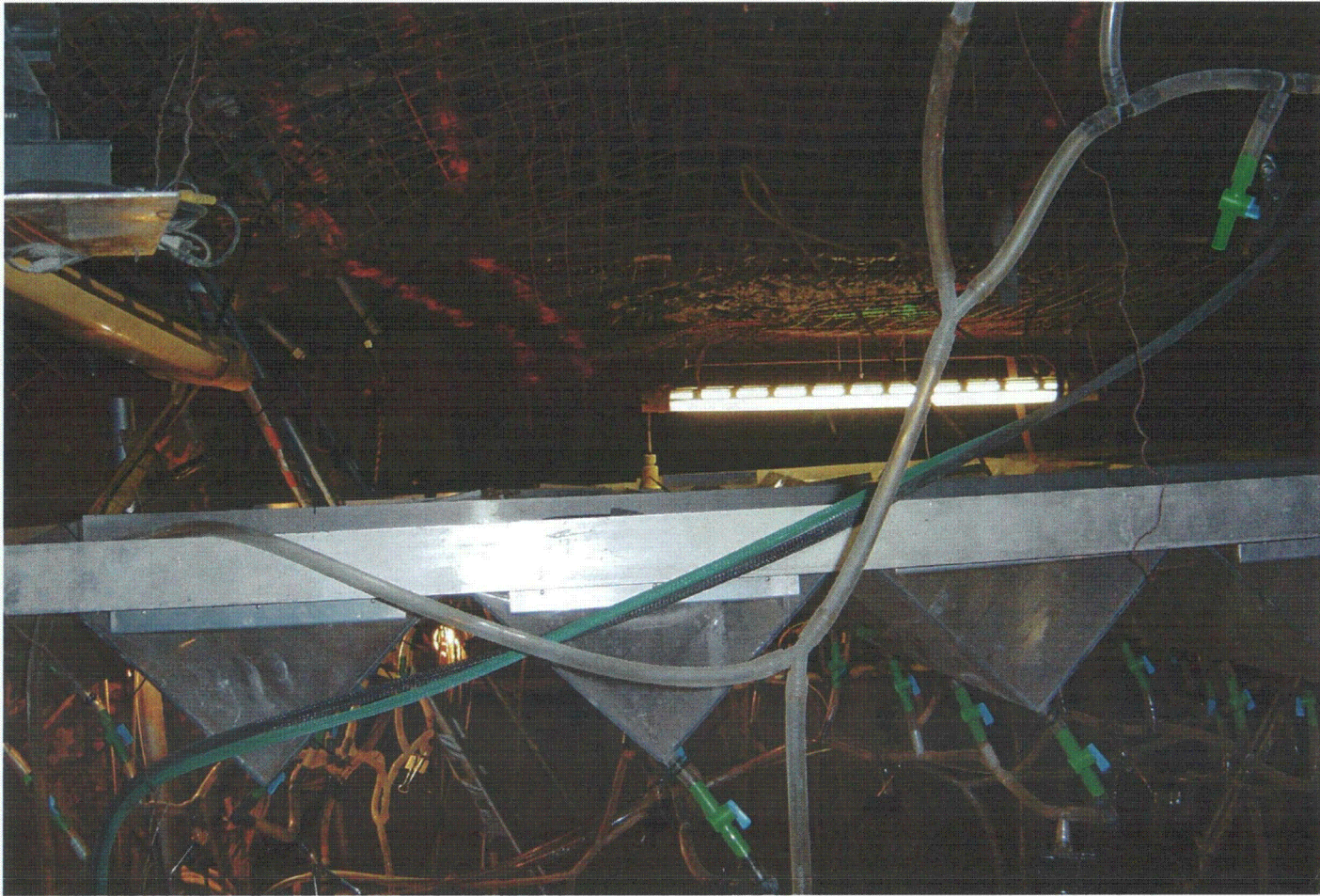
Entrance to Niche 3 ESF, Radon Measurements being Taken (P4010016.jpg)



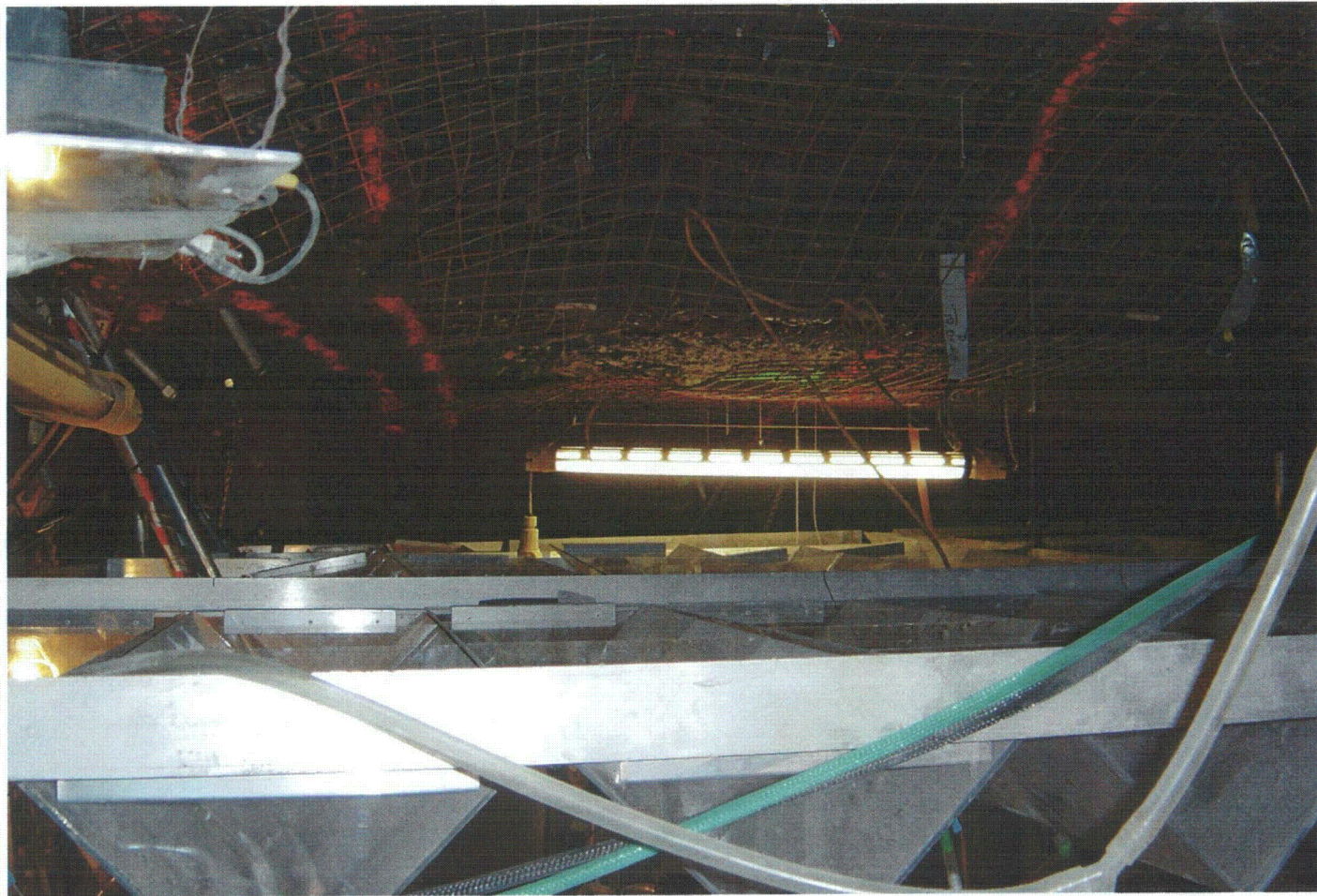
Fault Outside of Niche 3 in the ESF (P4010017.jpg)



Roof of Niche 3 and Seepage Collection Trays (4_5_04 027.jpg)



Roof of Niche 3 (4_5_04 030.jpg)



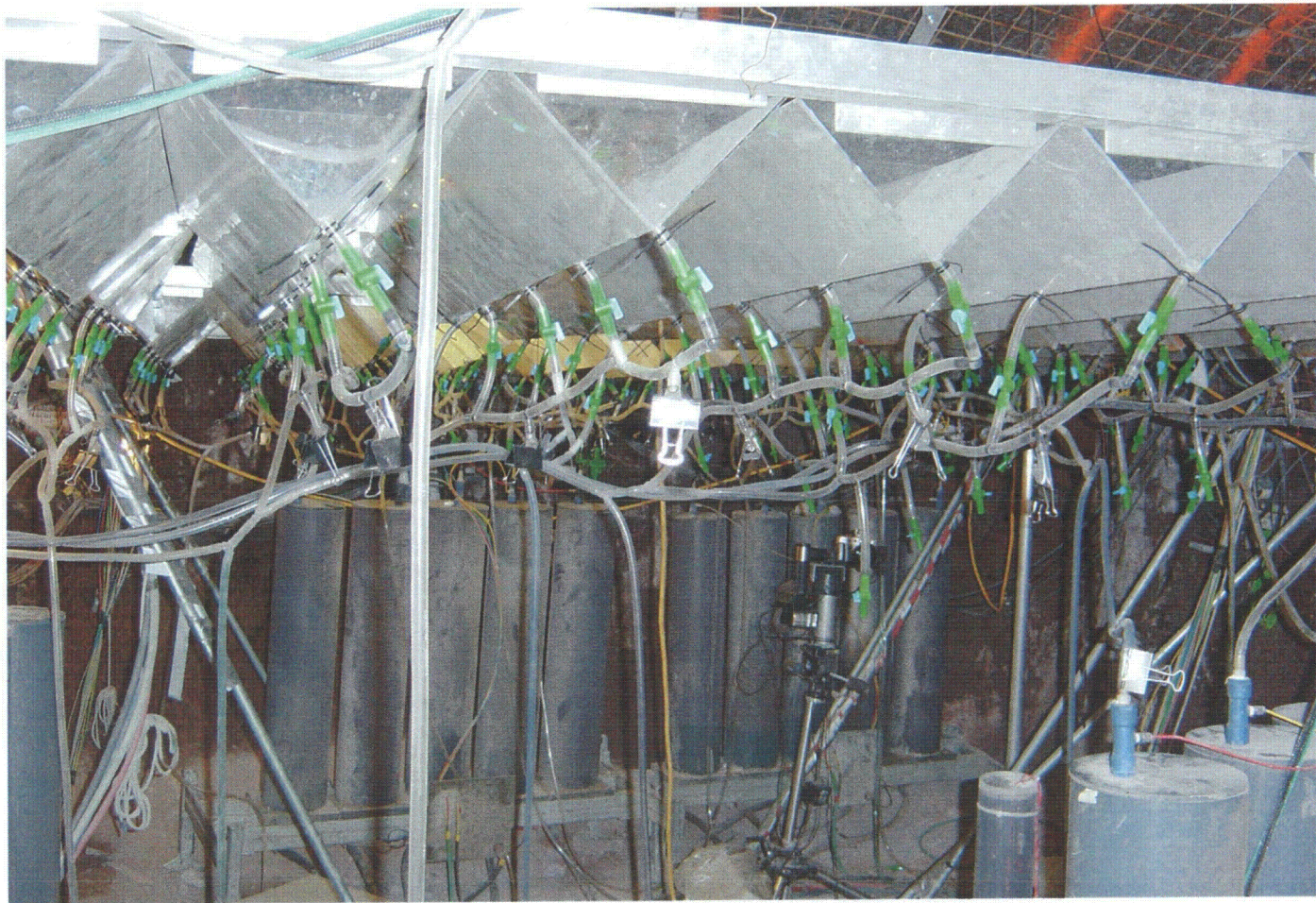
Roof of Niche 3 (4_5_04 032.jpg)



Evaporation Measuring Device in Niche 3 (4_5_04 029.jpg)



Seepage Collection Trays and Seepage Collection System in Niche3 (4_5_04 028.jpg)



Seepage Collection System in Niche 3 (4_5_04 033.jpg)



Wetting Pattern on the Wall of Niche 3 to Left of Door Opening (P4010018.jpg)



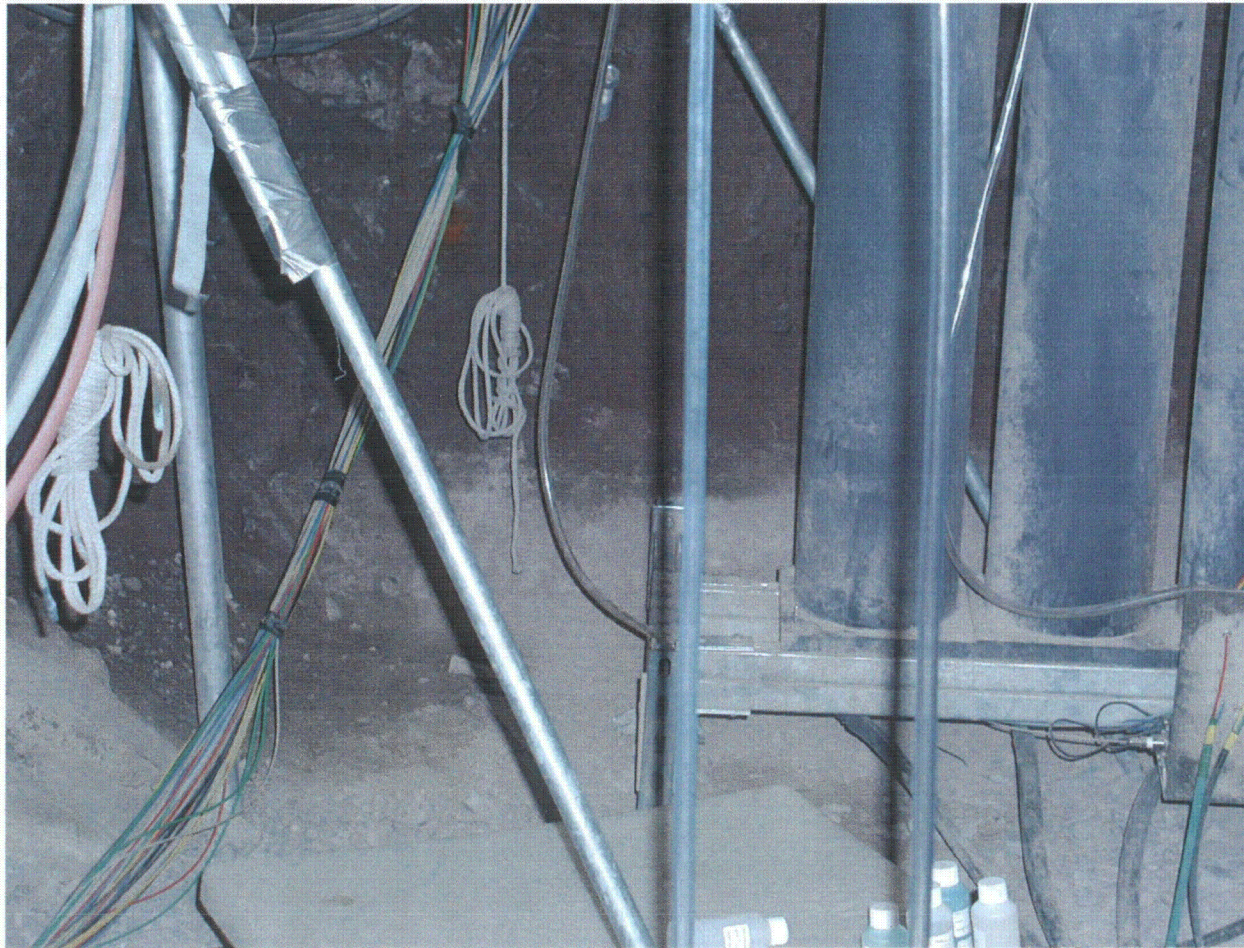
Seepage Collection Apparatus in Niche 3 (P4010019)



Seepage Collection Apparatus in Niche 3 (P4010020.jpg)



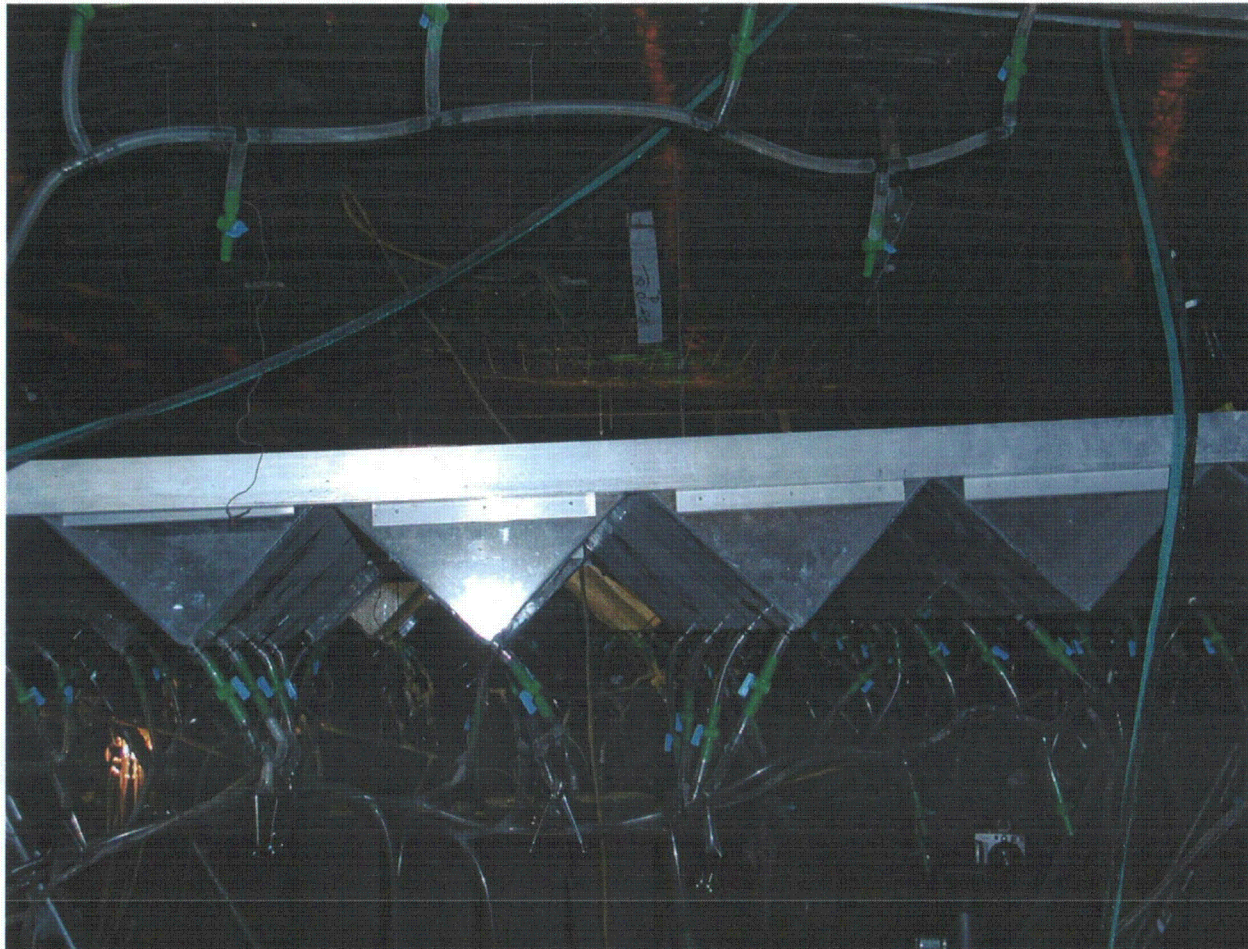
Seepage Collection Apparatus and Seepage Down the Wall in Niche 3 (P4010021.jpg)



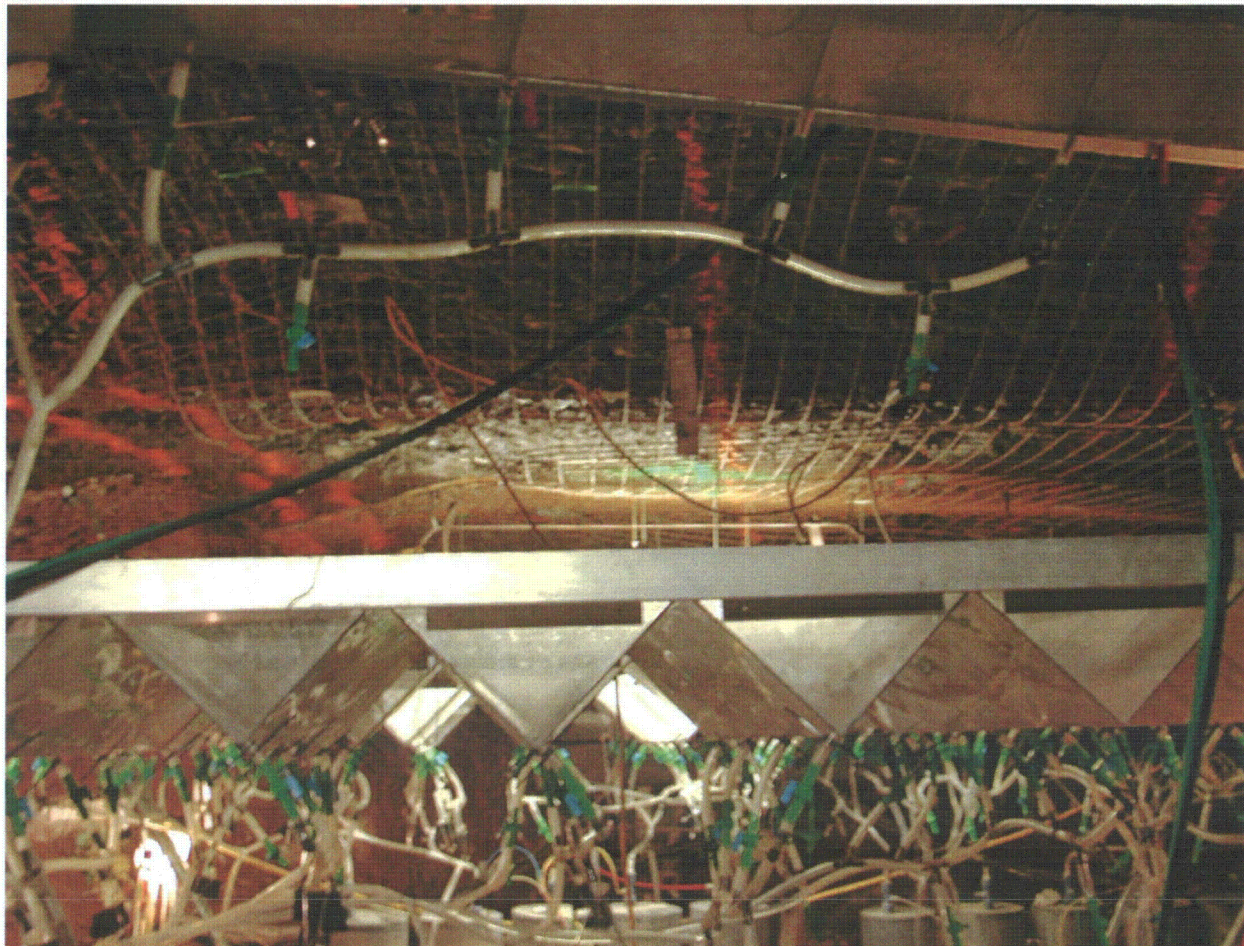
Seepage Pattern in the Wall of Niche 3 (P4010022.jpg)



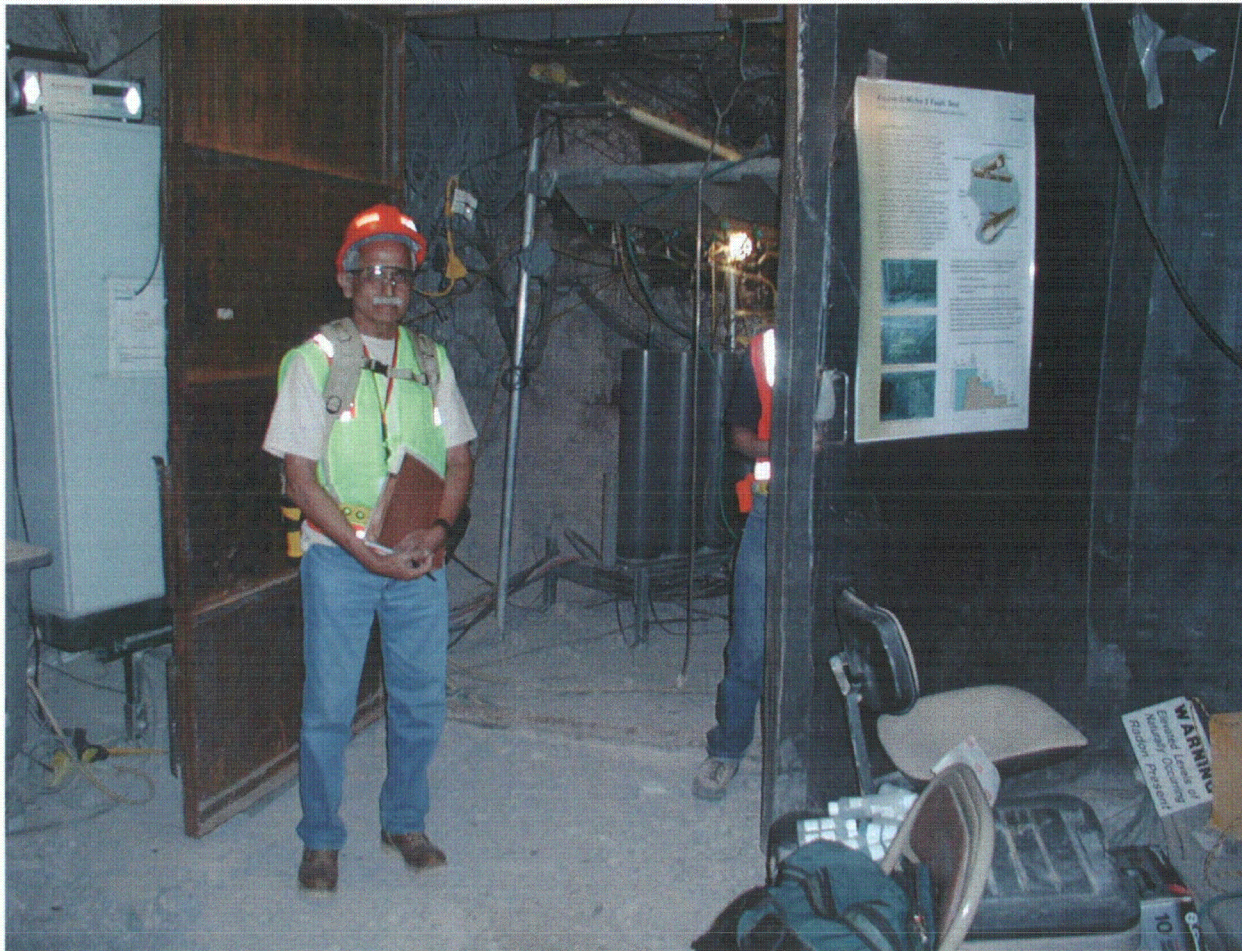
Seepage Collection Devices in Niche 3 (P4010023.jpg)



Seepage Collection Devices and Roof of Niche 3 (P4010024.jpg)



Sam Nalluswami at Door of Niche 3 (P4010025)



Technician Checking Seepage Collection System, Niche 3 (P4010026)



From Left, Data Collection Instruments, Evaporation Measurement System and Door to Niche 3 (P4010027.jpg)

