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1988/18. Field manual for the operation of the neutron tool.

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INTRODUCTION

This manual has been prepared to assist in the safe operation the use of the RADIATION tools. Before using such tools it is advisable that the user consult the Radiation Safety Officer for handling guidelines as set out by the Radiation Safety Council. If at any time the user is unsure of a practice or procedure, he should consult the Radiation Safety Officer. If an accident or incident occurs with the radiation source, the safety officer and the Department of Health **MUST** be informed at once. No action is to be taken until these people are consulted .

An internal Departmental report on the use of radiation sources and the safety requirements is available. The user of the radiation source should read this and discuss with the Radiation Safety Officer before commencing field operations. At all times, if commonsense is used and the radiation sources are treated with respect, then no serious problems should occur.

NEUTRON TOOL

NOTE: At all times the Neutron radiation badge should be worn when near the source. This includes loading and unloading into the vehicle, driving the vehicle and while logging.

Set up logger and tripod in operating positions as described in operations manual. Make certain all interconnecting cables are in place. Ascertain the estimated condition and approximate total depth of the hole from the driller or other informed person(s) before commencing logging. Verify hole depth and condition with dummy tool before using neutron tool.

It must be ascertained prior to neutron logging that the risk of losing the neutron source downhole is acceptably low. Consult with the driller or others familiar with the hole, inspect the condition of the hole visually, consider the type of strata penetrated and the time elapsed since drilling ceased. Always lower the dummy tool before using the neutron tool to ascertain that the hole is not prone to collapse or snag a tool. Only when you are fully satisfied should logging commence. Under no circumstance should you be forced to log a hole when you consider it unsafe.

MAKE CERTAIN THAT THE WINCH BRAKE IS ON

- Prepare connecting threads at bottom end of neutron tool spacer. Put small amount of silicone grease on threads and 'O' rings.

- Slip decentraliser (bow spring) over winch cable.

- Place the neutron source storage container in a HORIZONTAL position near the borehole.

- Remove the lock from the neutron source storage container. Open the door. Tip the source storage container forward until the white stopper can be removed.

NOTE: THE SOURCE STORAGE CONTAINER IS NOW DANGEROUS. REMAIN AS FAR AS POSSIBLE FROM IT AT ALL TIMES. DO NOT LOOK INTO THE OPENING.

- The neutron tool is located in the centre of the container so there is **NO NEED** to look inside the container. A small amount of patience is all that is required to thread the probe on.

CAUTION SHOULD BE TAKEN FROM NOW ON.

- Screw the neutron tool and spacer tightly into the source holder, in the source storage container.

- You will note that pulling the tool does not release it from the source storage container. You will notice that turning to the left or to the right will maintain it in a locked position, and only in the central position can the tool be extracted.

- Prepare cable head. Put a small amount of silicone grease on the threads and 'O' rings.

- Pull the tool out about 30 mm from the lock position. In this position connect the neutron tool to the cable head. This allows the cable head to be held still and the tool to turn.

- **RE-INSERT THE NEUTRON TOOL TO THE LOCK POSITION.**

- Install the decentraliser over the neutron tool and lock it to the probe body by using the two screws. Do not lock both ends of the decentraliser or jamming may occur in the hole.

- Prepare the neutron pen so that ink flows smoothly onto the chart as the paper drive mechanism is advanced.

- Turn Recorder Unit power switch to ON.

- Turn Ratemeter Module TC switch to desired position. This would normally be set for 5 for neutron logging.

- Turn the Ratemeter Module CPS switch to desired range.

- With the Ratemeter Module function switch in ZERO position adjust the control module zero control to zero the neutron pen on the left side of the chart.

- Turn Ratemeter Module function switch to LINE.

- Measure the CPS reading. It should be 715 CPS. This is the calibrated neutron and is equivalent to 100 API units.

- Calmly but quickly remove the neutron tool from the source storage container and insert it into the hole.

- Locate the neutron tool in the hole at zero depth. For calibration and data processing purposes, the zero point is taken as the junction of the tool and the cablehead.

- Set the depth counter to ZERO. Quickly lower the neutron tool a couple of metres below ground level.

- Lower the tool down the hole, carefully observing the pen movements on the chart. Adjust the range switches to make best use of the chart width without having peaks going off scale.

- Hold at bottom of hole for ten minutes to allow decay of neutron captivation by fast decay aluminium and aluminium oxide materials that may be in the formation. This is not necessary if it is known that these materials do not exist in the area.

- Wind the cable up at a rate of six metres per minute. This speed is critical and must be controlled carefully in order to get a consistent and accurate log. Other time constants and speeds can be used to meet special requirements.

- Continue to wind to the top of the hole. Mark ZERO depth on the chart.

- Turn ratemeter function switch to OFF.

- Turn Recorder Unit power switch to OFF.

- Calmly but quickly remove the NEUTRON tool from the hole and insert it into the source storage container. **PUT IT INTO A LOCK POSITION.**

- Remove the decentraliser.

- Release the tool from the lock position and remove the cable head. Re-insert the tool in the lock position, unscrew the tool from the source.

- Remove the tool from the source storage container.

- Insert the white stopper into the source storage container, close the door and install the lock.

- Wipe the threads to remove dirt and water on the neutron tool and 'O' rings. Replace protective caps.

NOTE:

- With the neutron log the count rate goes down with increase in porosity.

- The detector to source spacing determines the depth of investigation and resolution. The 130 mm spacing (considered short) decreases the depth of investigation but gives more detail for thin beds.

RADIATION SAFETY

- Stay as far away from the neutron source as possible at all times.

- Store the source storage container a minimum of seven metres from any working area.

- The radioactive AM BE source used in the neutron tool is a comparatively high strength source in terms of human safety. Proper safety precautions must be strictly followed to prevent any health hazards. If the basic radiation safety rules are followed, however, it is not much more hazardous than working with electricity. One of the chief distinctions is, that unlike electricity, radiation passes through the body without any immediate sensation. Herein lies the greatest potential hazard, as lack of discomfort could cause the unwary person to tend to forget the possible danger and fail to observe reasonable precautions.

FOR FURTHER INFORMATION ON RADIATION SAFETY AND PROCEDURES FOLLOWED PLEASE GET IN CONTACT WITH THE RADIATION SAFETY OFFICER.

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