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SUBJECT: Forwards response to 830927 request for addl info re 820930 license amend request re source range monitor count rate. Info describes unloading & loading pattern & discusses shutdown margin.

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November 4, 1983

Director
Office of Nuclear Reactor Regulation
U S Nuclear Regulatory Commission
Washington, DC 20555

MONTICELLO NUCLEAR GENERATING PLANT
Docket No. 50-263 License No. DPR-22

Response to Request for Additional Information
on the License Amendment Requests dated
September 30, 1982 - SRM Count Rate

Attached are the responses to your request for additional information dated September 27, 1983. These responses supplement our license amendment request dated September 30, 1982.

If additional information is needed please call us.

David Musolf
Manager - Nuclear Support Services

DMM/TMP/dab

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NRR Project Manager, NRC
NRC Resident Inspector
MPCA
Attn: J W Ferman
G Charnoff

Attachment

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MONTICELLO NUCLEAR GENERATING PLANT

Response to Request for Additional Information
on the License Amendment Requests dated
September 30, 1982 - SRM Count Rate

Question 1 Please state and describe the unloading and loading pattern(s) which you intend to use for full core discharge. The justification for the proposed change seems to be based on spiral unloading and loading but the method of unloading and loading to be used by the licensee has not been indicated.

Response: Cell Unloading Procedure

The procedure to unload a fuel cell at Monticello is to first remove two fuel bundles opposite one another. For example, remove bundles A and C on Figure 1. Then insert a blade guide (Figure 2) into the space vacated by fuel bundles at A and C. Remove fuel bundles B and D. Remove the control rod and then the blade guide. This procedure would be used any time a cell is to be unloaded, except for the last eight cells adjacent to source detector. In these cells one bundle will be left next to the source range detector with the control blade inserted.

Core Unloading Procedure

The first step would be to unload those cells where control rod drive maintenance or other specific tasks are to be performed. For example, see Figure 3 where seven cells have been unloaded. Select a source range detector which the unloading will be centered around. Remove fuel farthest from this source range detector. While leaving two fully loaded cells adjacent to each source range detector, continue to remove the fuel farthest from the selected source range detector (Figures 3 through 8). Now 8 cells remain loaded with fuel. Remove 3 fuel bundles in each cell as shown in Figure 9. Up to this point the source range monitors will provide greater than 3 cps. Removing the last 8 bundles will drop the count rate to zero.

This is a typical procedure. Specific activities planned for each core offload may necessitate deviations from this procedure. One deviation from this procedure that is being currently considered is to unload the edge cells first to reduce the exposure of the personnel working near the vessel.

Cell Loading Procedure

The first eight cells loaded would be loaded slightly differently from the rest of the cells. A blade guide would be inserted and then the control rod. One bundle would be added next to the source range detector, which would provide the three counts per second on the source range monitor. A half blade guide would be added opposite the fuel assembly. When all eight cells are loaded in this manner, the half blade guide would be removed and a fuel bundle added. The full blade guide would then be removed and two bundles added.

All other cells would be reloaded by adding a blade guide (in locations A and C for example), inserting the control rod in the cell, adding bundles in locations B and D, removing the blade guide, and finally loading bundles in locations A and C.

Core Loading Procedure

The core loading procedure will begin with no source range counts. Eight bundles around the source range monitors would be inserted as allowed by the proposed license amendment (see Figure 9). Three counts will appear on the source range monitors. The loading of the eight cells near the source range monitor (see Figure 8)is then completed. One detector would be selected to center the reloading as shown in Figure 7. Continue reloading as shown in Figures 3 through 6 (in reverse order) leaving empty cells if control rod drive maintenance is being done.

Question 2 During full core discharge, will the control blades remain in the core supported by guide blades or will the control blades be removed also? Please describe and fully justify either course of action.

Response: The control rods will be removed or withdrawn as fuel is removed from the associated cells as described in detail in the response to Question 1. During certain in-vessel maintenance activities (such as the planned 1984 recirculation system safe end and piping replacement) selected interior control rods may then be partially re-inserted after all fuel has been removed to provide shielding to the work area. Two potential concerns exist with removing the control rod from the core.

The first potential concern is the removal of the control rod adds some amount of positive reactivity. This concern will be addressed in the response to Question 3.

The second potential concern is that the fuel could be re-inserted before the rod is re-inserted. Procedural steps present this from happening. When control rods are removed and inserted, signoffs are required on the refueling checklist (the procedure used by the operations crews to perform the fuel shuffle). All control rod withdrawals and insertions require independent verification (also included on the refueling checklist). Prior to loading fuel in an unfueled cell, the refueling checklist requires verification that a control rod is fully inserted into that cell. This procedure assures that no fuel is loaded into an unrodded cell.

Question 3 Please provide justification as to how the Technical Specification requirement on shutdown margin will be met during full core unloading and loading.

Response: As cells are emptied (fuel bundles and control rods) the reactivity of the core is reduced. Therefore, the core is less reactive during fuel unloading and loading than it is fully loaded. As the fuel is removed negative reactivity is added. Removal of the control rods adds positive reactivity. The net reactivity change is zero or negative. The bases of the Technical Specification (page 210) that allows this states:

"These operations are performed with the mode switch in the "Refuel" position to provide the refueling interlocks normally available during refueling as explained in Part A of these Bases. In order to withdraw more than one control rod, it is necessary to bypass the refueling interlock on each withdrawn control rod. The requirement that the fuel assemblies in the cell controlled by the control rod be removed from the reactor core before the interlock can be bypassed insures that withdrawal of another control rod does not result in inadvertent criticality. Each control rod essentially provides reactivity control for the fuel assemblies in the cell associated with the control rod. Thus, removal of an entire cell (fuel assemblies plus control rod) results in a lower reactivity potential of the core."

General Electric has analyzed the above situation for another BWR using currently approved methods. The results and conclusions of the General Electric analysis are stated below.

The results of this analysis are summarized in Table 1. The analysis was performed for a specific pattern of unloading, so the first cell removed was not necessarily the most (or least) reactive cell. The results clearly demonstrate a trend of decreasing reactivity as cells are removed from the core. This is as expected since the reactivity of the moderator is less than the reactivity of the fuel it replaces. Because the mean free path of thermal (fission-inducing) neutrons is much less than the width of the empty cell, the additional moderator actually acts like a neutron absorber.

The conclusions of this analysis are applicable to Monticello, and to the statement on Page 210 of the plant technical specifications.

TABLE 1

EFFECT OF EMPTY FUEL CELL

	Description	Core K-effective
Base Case	No cells removed	0.95767
Case 1	One cell (including control rod) removed	0.95545
Case 2	Case 1, plus one additional cell removed	0.95508
Case 3	Case 2, plus five additional cells removed	0.95391

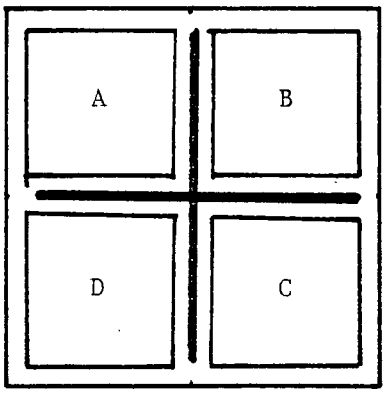

Figure 1

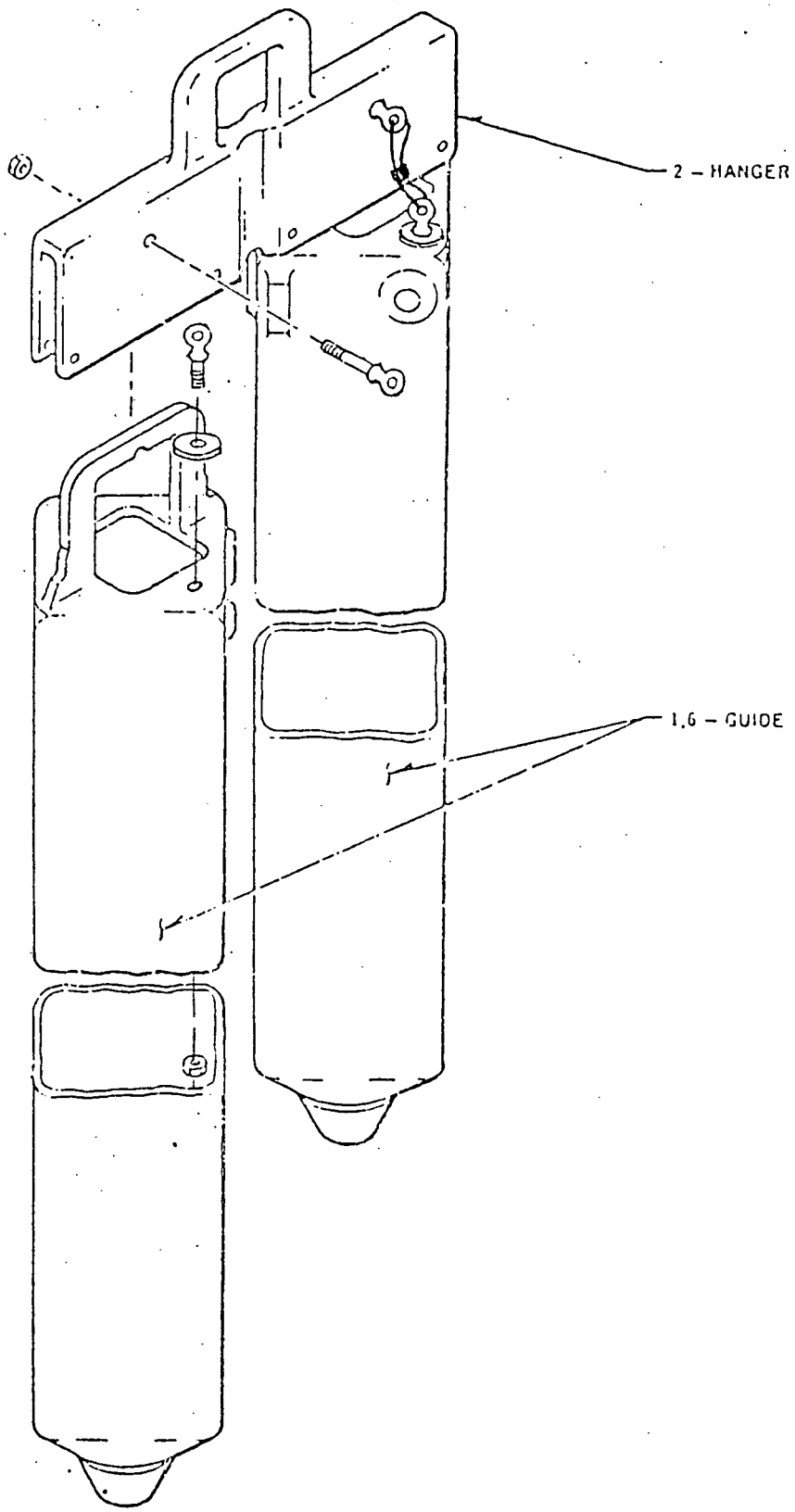

Figure 2. BLADE GUIDE - Stainless Steel assembly containing no fuel

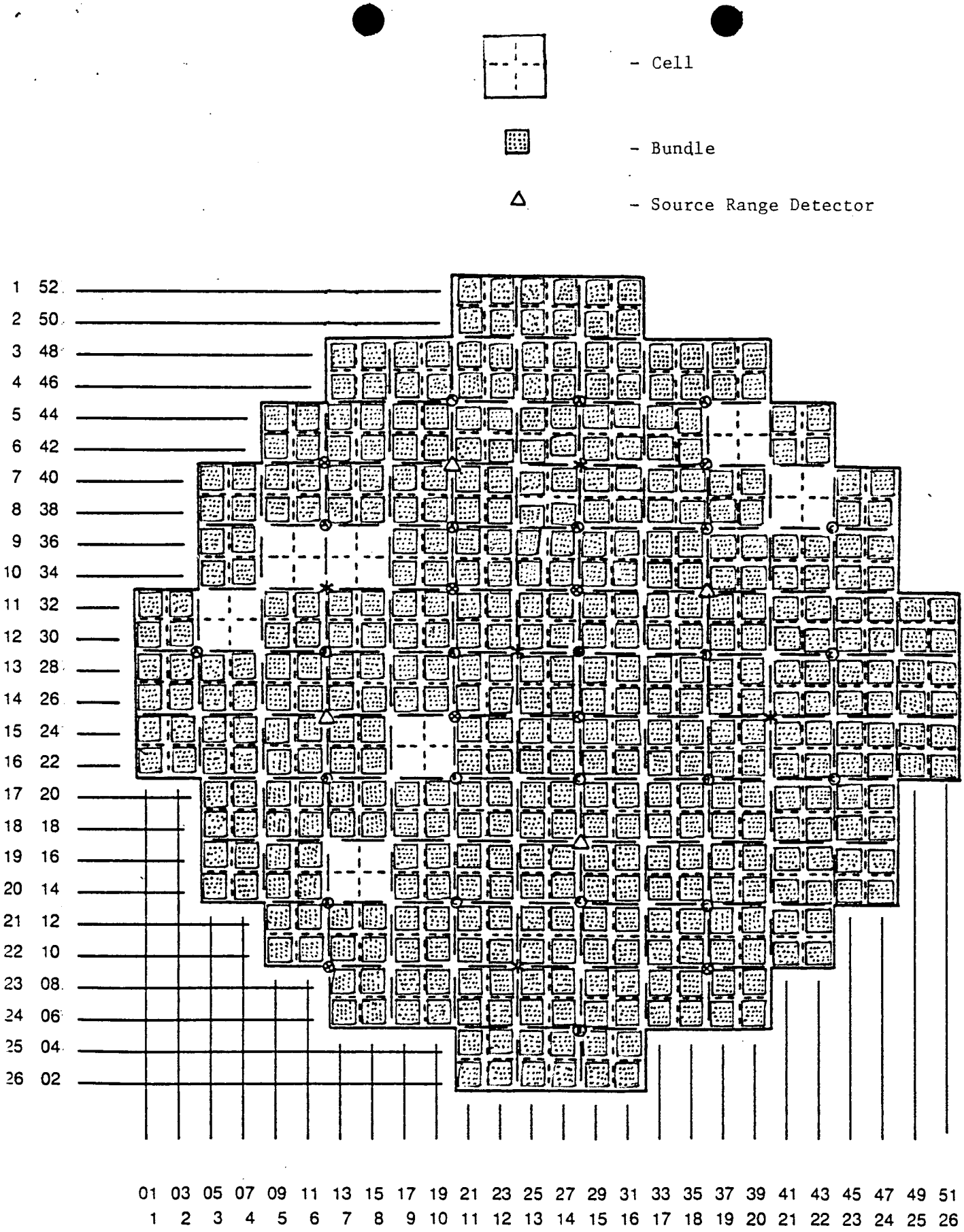
- Cell
- Bundle
- Source Range Detector
1 52
2 50
3 48
4 46
5 44
6 42
7 40
8 38
9 36
10 34
11 32
12 30
13 28
14 26
15 24
16 22
17 20
18 18
19 16
20 14
21 12
22 10
23 08
24 06
25 04
26 02
01 03 05 07 09 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26

Figure 3

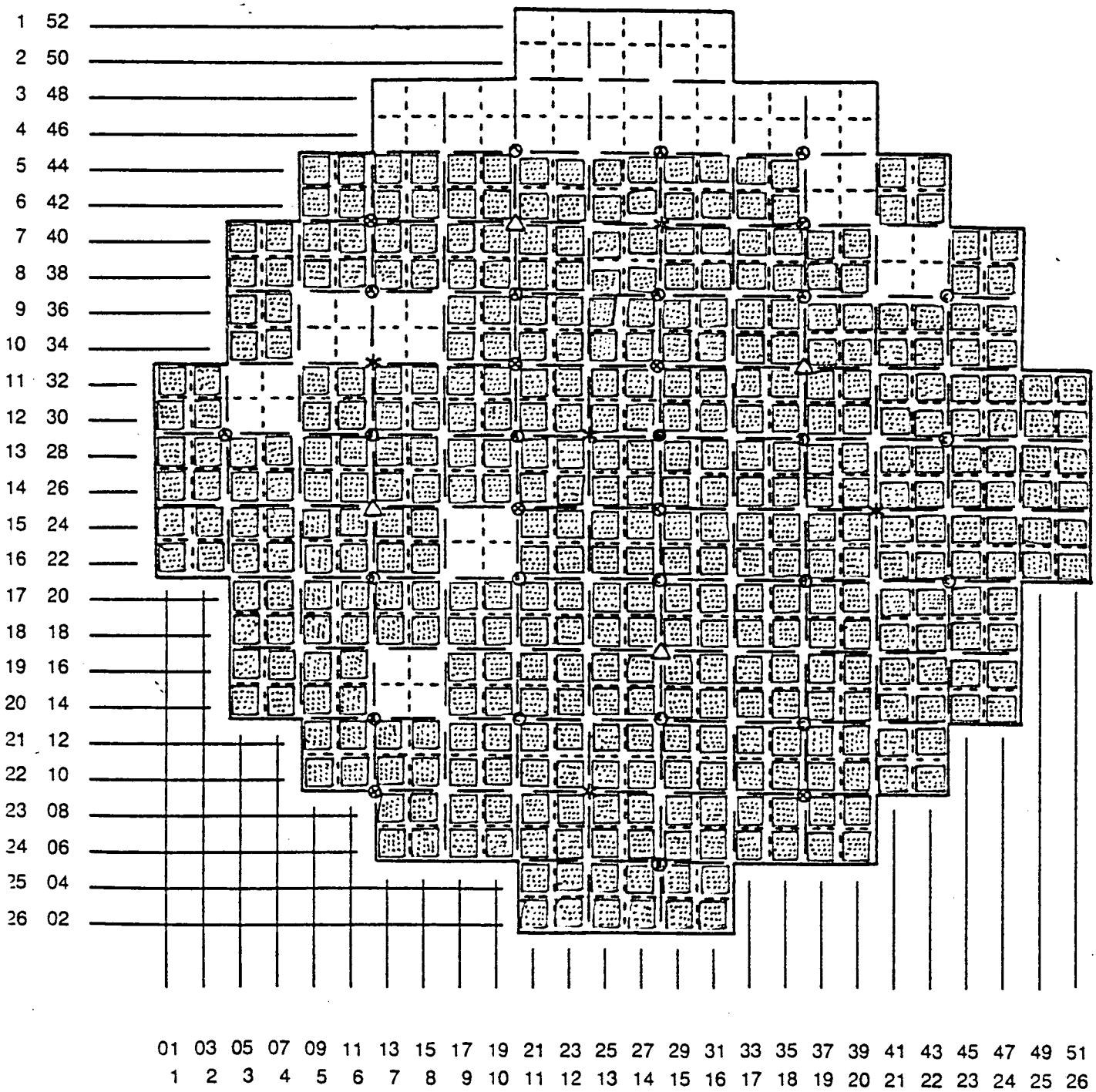
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Figure 4

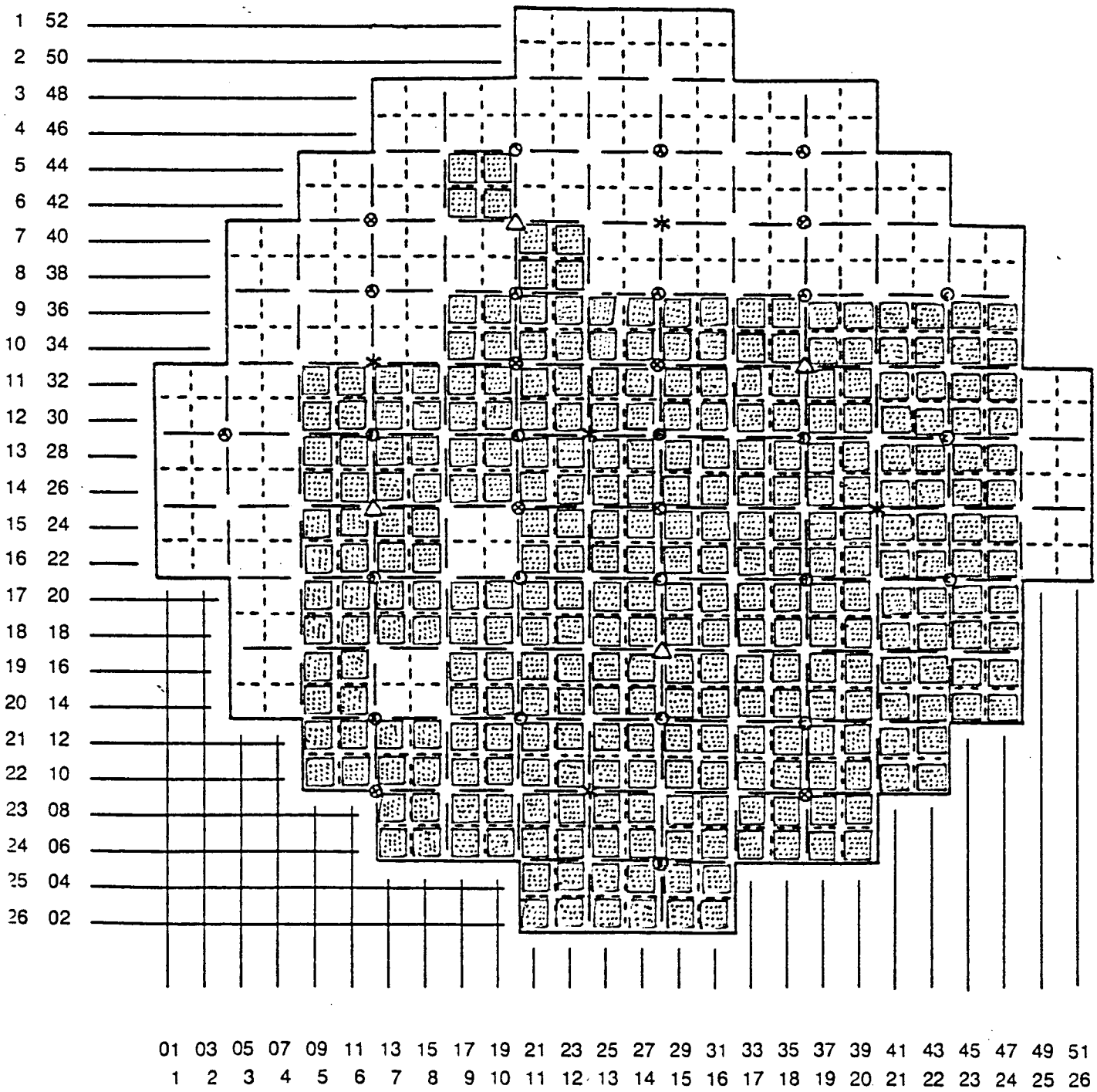
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Figure 5

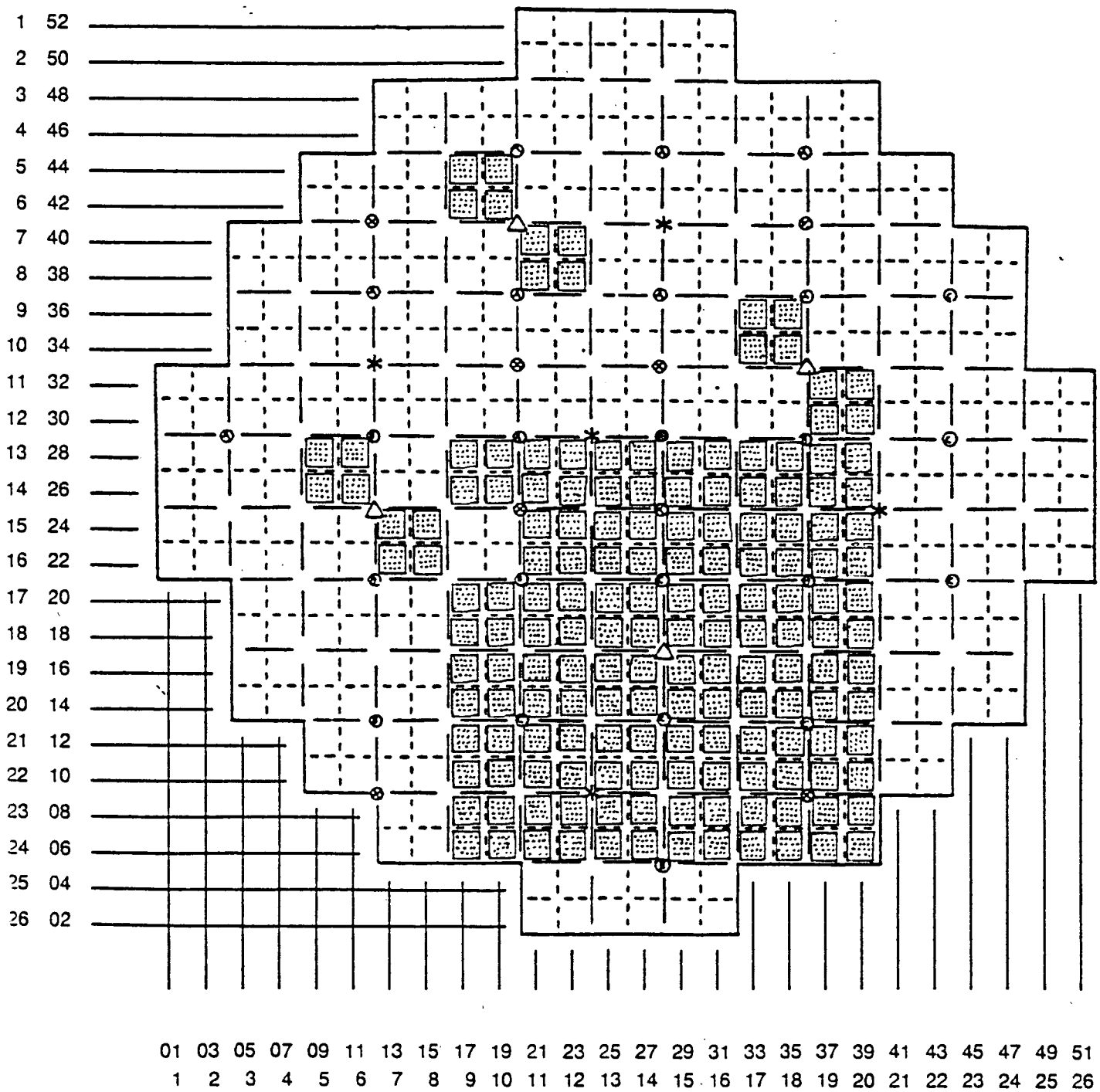
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Figure 6

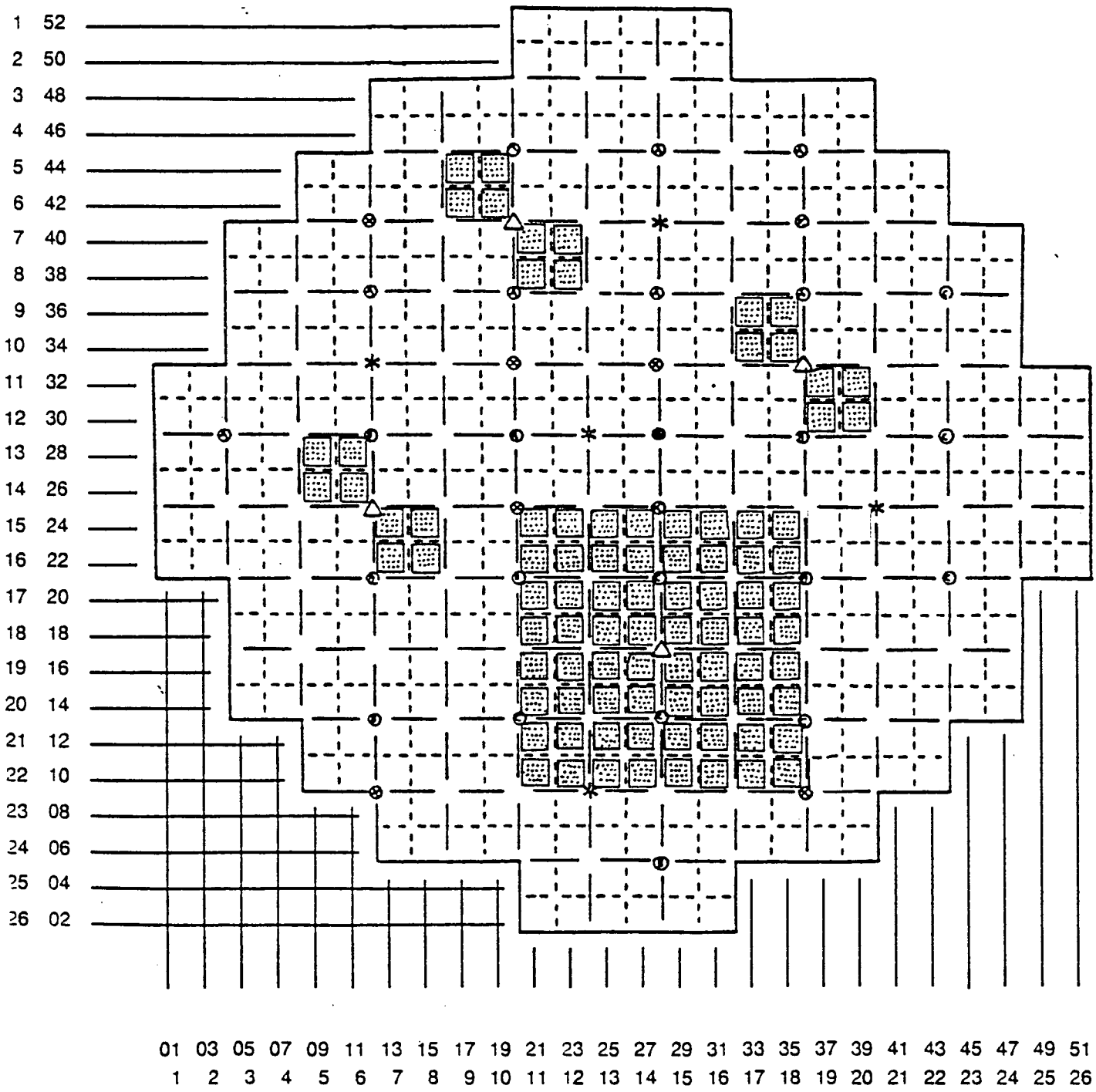
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Figure 7

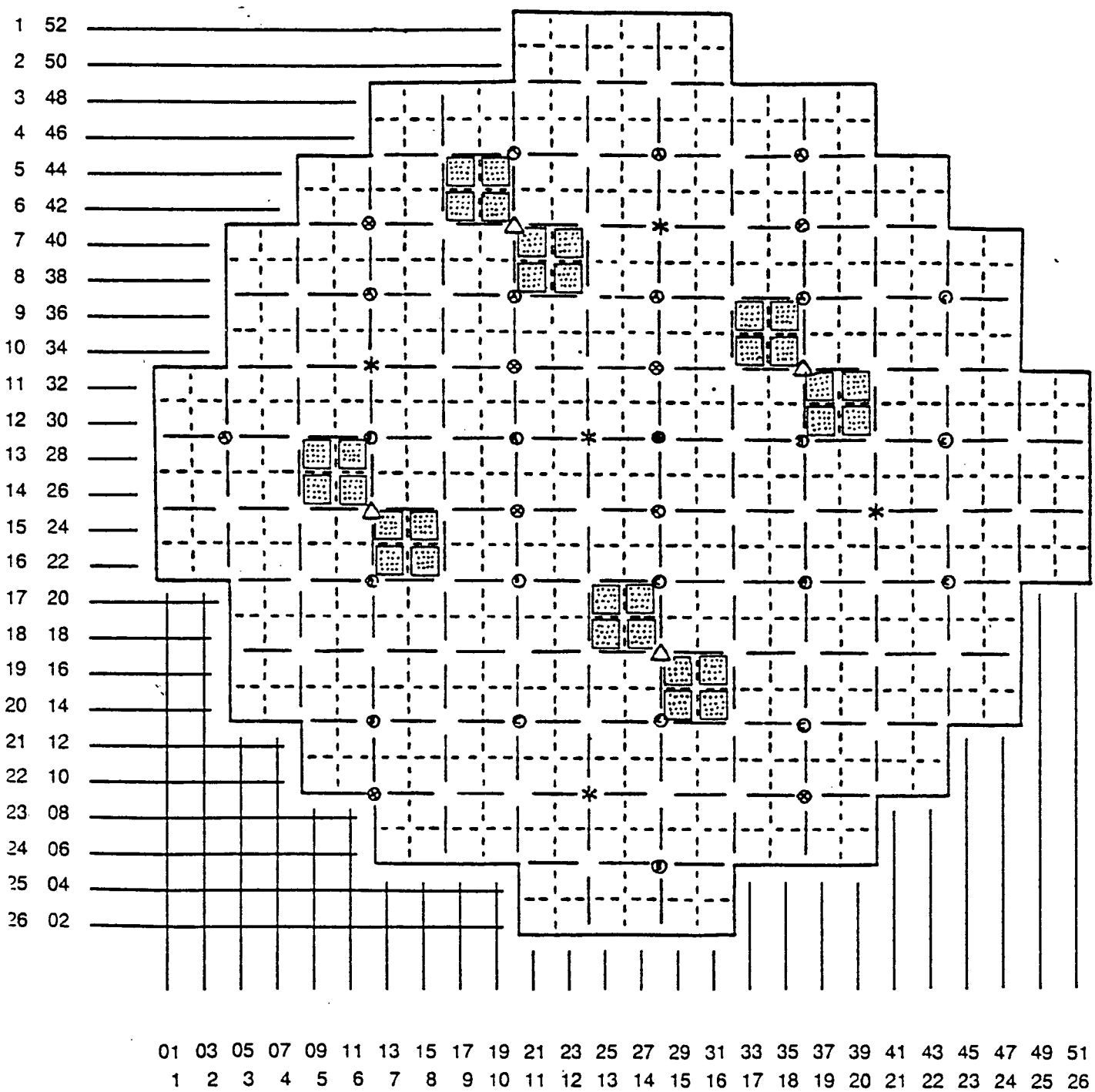
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Figure 8

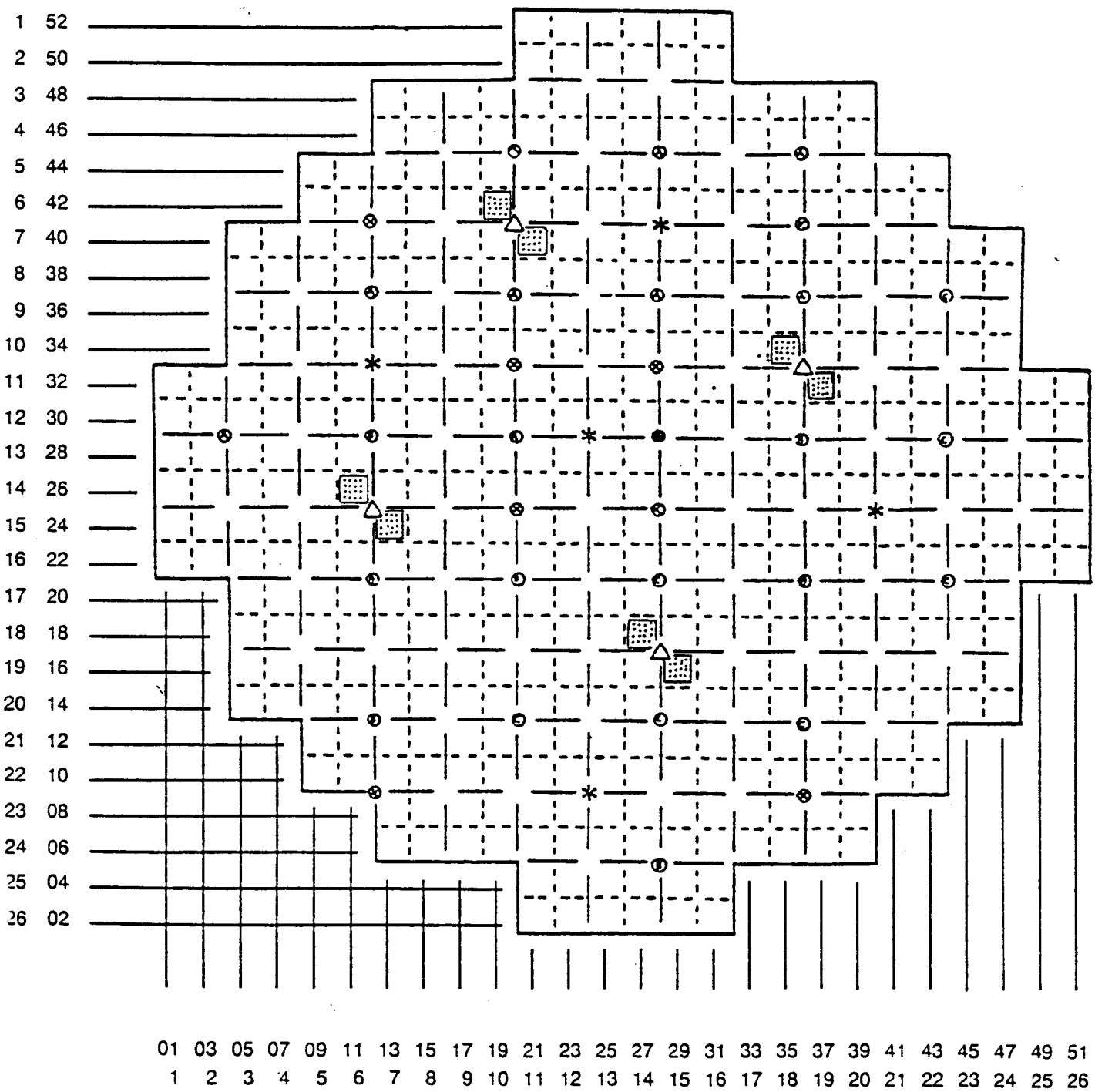
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Figure 9