

CONVENTIONAL DISTRIBUTING FRAME FRAME REHABILITATION GUIDE

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1. GENERAL

1.01 This section provides information to be used as a guide in the development of a plan to rehabilitate a congested conventional main distributing frame (MDF) that is congested due to the presence of a significant amount of dead cross-connection wires (jumpers). The information contained herein is general enough for wide application and sufficient enough for use in any MDF environment.

1.02 Whenever this section is reissued, the reason for reissue will be listed in this paragraph.

1.03 An MDF is in need of rehabilitation when cross-connection wire (jumpers) buildup seriously affects production, service, and the ability to provide growth. The jumper buildup is generally associated with the following factors:

- MDF length
- Terminal block density
- Average jumper length
- Lack of dead jumper removal
- MDF configuration (such as bends)

1.04 In particular, the MDF rehabilitation plan is primarily concerned with the removal of dead jumpers from the MDF. (See Fig. 1.)

1.05 The task of dead jumper removal will require the dedicated effort of a full-time crew devoted specifically to this job. Even through the estimated costs for a dead jumper removal plan may seem very large, they are small in comparison to that of introducing a new MDF. The dead jumper removal plan will also provide long term benefits for future MDF functions and growth.

1.06 When a decision is made to undergo a rehabilitation project, appropriate levels of management must understand and expect that productivity results will suffer. This understanding is a requirement. It must also be understood that a degree of service interruptions will occur due to broken jumpers. Once the decision is made, the project must proceed on a continuing basis to its conclusion to assure success.

2. REHABILITATION PLAN DEVELOPMENT

2.01 When determining the need for MDF rehabilitation, the condition of the MDF must be taken into consideration. Review the

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MDF for the presence of one or more of the following trouble indications:

- (a) Jumper pile-up blocking access to the distributing rings at the rear of the horizontal shelf.
- (b) Jumper pile-up blocking access to the fanning strip holes of the horizontal terminal.
- (c) Less than three and a half inch clearance exists between the top of the jumper pile and the bottom rings of the next higher shelf.
- (d) Forces developed by wire friction and kinks are great enough to prevent the complete removal of disconnected jumpers.
- (e) Jumpers are cascading off the horizontal shelves and are obscuring the terminal blocks.
- (f) Jumpers are crossing between shelves instead of being run on the proper shelf.
- (g) Evidence of a large number of dead jumpers on the shelves. This is recognized as jumper wire ends that have been turned-back at the fanning strips.

2.02 An MDF is considered only moderately congested when there is still some room over the top of the shelf pile-ups so that a jumper can be conveniently run on the horizontal shelves, and slipped through the vertical distribution rings to the vertical side of the MDF. If the MDF is considered to be moderately congested, the dead jumper removal procedures in Part 4, A, B, and D should be used.

2.03 An MDF is considered severely congested when the combination of working and dead jumpers make it very difficult to work. This means that the jumper pile-up on some or all of the shelves prevents the convenient running of a new jumper and would inhibit the mining of dead jumpers per Part 4, B. In some cases, congestion is so severe that jumpers may protrude beyond the edge of the shelves and over the terminal blocks. If the MDF is considered to be severely congested, the dead jumper removal procedures in Part 4, A, C, and D should be used.

2.04 Other items to be taken into consideration for the MDF rehabilitation plan are as follows:

- (a) The implementation of a short jumper concept by the use of preferential assignment, on the MDF. (Information on manual preferential assignment can be found in Section 680-830-010. COSMOS or equivalent provides automatic preferential assignment.)
- (b) The retermination of certain equipment on the MDF which can increase effectiveness of preferential assignment.
- (c) Implementing the use of small slick DT-type (IPVC) distributing frame wire.
- (d) The refurbishment of deteriorated terminal blocks and fanning strips.
- (e) A complete inventory of all MDF working jumper terminations by the use of manual verification, or if available, by computer record printouts (i.e. COSMOS or equivalent).
- (f) The implementation of the Frame Administration Plan to insure that the MDF will not return to a congested state.

3. PRELIMINARY PROCEDURES

3.01 The estimation of work effort for the dead jumper removal program is developed by the following:

- (a) Estimating the amount of dead jumpers on the MDF.
- (b) Evaluating the type of dead jumpers.
- (c) Estimating the required work effort hours.

A. Estimate of Dead Jumper Procedures

Count Procedure

3.02 An estimate of the number of dead jumpers on the MDF can be made during the preparation stage of dead jumper removal as described in 4.02.

3.03 The count procedure should include the following:

- Floater jumpers disconnected at both ends that cannot be removed at that time.
- Tested dead jumpers that are still terminated at one end.

Sampling Procedure

3.04 Perform the preparation stage for dead jumper removal as described in 4.02.

3.05 After completion of the preparation stage, make a sample of ten terminal blocks on each shelf at the horizontal MDF (HMDF) as follows:

- (a) Count the number of turned-back jumper ends on the vicinity of each sample block.
- (b) Determine the average number of turned-back ends per shelf-vertical. (A shelf-vertical is a segment of a horizontal shelf that is 8 inches long with a width of one vertical bay.)
- (c) Multiply this average by the length of the frame (number of verticals) and the number of shelves sampled, to determine the number of dead jumpers visible at HMDF.

3.06 Make a sample of twenty vertical bays at the vertical side of the MDF (VMDF) as follows:

- (a) Count the number of turned-back jumper ends within each sample vertical bay.
- (b) Determine the average number of turned-back jumper ends per vertical bay.
- (c) Multiply this average by the length of the frame (number of verticals), to determine the number of dead jumpers visible at the VMDF.

3.07 As part of the sample counts, the number of identified floaters and nonfloaters in the sampled areas of the HMDF and VMDF should be recorded. This identification is accomplished with the 1A fault locator or equivalent per 4.02(b).

3.08 The sum of the dead jumpers visible at the HMDF and VMDF, as calculated in 3.05 and

3.06, are taken as the estimate of the total number of dead jumpers on the MDF.

B. Evaluating the Type of Dead Jumpers

3.09 Calculate the percentage of dead jumpers that are floaters and those jumpers that are still terminated at one end. (See Fig. 2 for calculation method.)

3.10 The percentage of dead jumpers that are floaters is an indication of the type of dead jumpers on the MDF. The ideal situation would be that a majority of the dead jumpers are floaters. These jumpers could be readily identified at any point along their path by means of the 1A fault locator, or equivalent, test set. A more difficult situation would exist if a considerable amount of dead jumpers are still terminated at one end, since these jumpers will not be identifiable with the 1A fault locator, or equivalent, test set.

3.11 If the majority of remaining dead jumpers are floaters, the recommended rehabilitation procedure would be to remove these dead jumpers by a procedure called *mining*. The mining procedure is a technique of pulling out dead jumpers on a shelf-by-shelf basis from several discrete points along the length of the MDF for which the 1A Fault locator, or equivalent, test set is used to identify the dead jumpers.

3.12 If a considerable amount of the remaining dead jumpers are terminated at one end, which would reduce the effectiveness of the preceding mining procedure, a preliminary record/frame purification process is necessary. This procedure is consistent with the type of data purification required for the introduction of COSMOS, or its equivalent, and can result in the direct removal of these dead jumpers, or at least will create floater jumpers able to be removed by the mining operation.

C. Estimating Required Work Effort

3.13 The amount of work effort for a full-scale jumper removal program will vary with each MDF depending on degree of congestion, and the motivation of the work force carrying out the program. However, the following will provide

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generalized information to aid in estimating the work effort required:

- During the mining stage, a full-time work force should be able to remove approximately 5 pounds of dead jumpers for each man-hour of effort expended.
- One pound of jumpers (U22P) is equal to 180 pair-feet.
- Average length of a jumper is one-third the length of the MDF.

3.14 The amount of work effort that will be required to rehabilitate one horizontal shelf or the MDF can be determined by the development of the following information: (See Fig. 3 for example of estimating work effort.)

- (a) Determine the length (in feet) of the MDF. (Each MDF vertical corresponds to 8-inches, or 2/3 feet.)
- (b) Calculate one-third (1/3) of the MDF length.
- (c) Determine the number of dead jumpers on each horizontal shelf or entire MDF by dead jumper estimate procedure in Part 3A.
- (d) Multiply number of dead jumpers and average length of dead jumper as determined in (b).
- (e) Determine the amount of dead jumper weight to be removed by dividing amount of dead jumper footage determined in (d) by 180-pair feet. (Do not use any weight of wire removed as part of the record/frame purification process per 3.13.)
- (f) Determine the amount of work effort (man-hours) needed by dividing amount of dead jumper weight determined in (e) by 5 pounds per man-hour.

3.15 This method of estimating work effort accounts for the mining effort only. It does not include the preparation procedure (4.02) or an allowance for the record/frame purification process, if required. In particular, the purification task is time consuming and will have a major impact on the amount of work needed and the expense involved. Of course, such a process is a prerequisite for the introduction of COSMOS, or its equivalent, and

therefore serves a dual purpose. All these factors should be taken into consideration when developing the work effort estimates and anticipated expenditures.

4. DEAD JUMPER REMOVAL PROCEDURES

4.01 The dead jumper removal procedure is a tedious, unenjoyable task which may display little progress for a considerable amount of time. Thus, it is recommended that a single horizontal shelf be selected as the initial starting point to provide confidence and motivation to the work force. In addition, a highly visible display showing work progress and pounds of wire removed will greatly add to the sense of progress being made.

A. Preparation

4.02 The first step in a dead-jumper removal program is to perform the following.

- (a) Prepare the horizontal and vertical sides of the MDF by untangling or straightening all the turned-back ends of dead jumpers that are bent around the fanning strips. (Cut off bare jumper ends where they exist.) These turned-back jumpers must be distinguished from newly run jumpers that may be tied and knotted around fanning strip holes in preparation for new installs or cable transfer activity.
- (b) Use the 1A fault locator, or equivalent, test set, (See Section 100-150-301) on the turned-back jumper (tip or ring wire, but not both wires together) to determine whether the jumper is a floater. At this time, if jumper tests as a floater, attempt to remove it from the MDF.
- (c) Whenever possible, dead jumpers should be pulled back through the fanning strip holes, making sure the jumper ends are still accessible in order to facilitate their removal.
- (d) At the vertical side of the MDF, prior to attempting to remove identified floaters, attempt to pass the jumper through the distributing ring to the horizontal side, so when the jumper is pulled, it will not abrade the insulation of adjacent working jumpers. If these dead jumpers cannot be handled in this manner, cut the jumper (one conductor at a time, in order to avoid potential service reaction in case the jumper is bridged onto a working circuit) in the vicinity of the distributing ring. The cut jumper ends

should be placed to provide access for later testing or tracing operations.

(e) If it is extremely difficult to clear the dead jumper ends through the horizontal fanning strip holes, and as a consequence, the floater jumper cannot be removed, on the horizontal side of the MDF, use the 1A fault locator, or equivalent, to test the jumpers at the rear of the terminal strip where the jumper passes through the fanning strip hole. Test either ring or tip wire lead individually or a service interruption might be caused. (See Section 100-150-301 for use of 1A fault locator test set.) An attempt should be made to remove the identified floater jumper by pulling from that point.

B. Mining Procedure (Moderately Congested MDF)

4.03 The mining procedure requires several frame persons equipped with a 1A fault locator and AT-6491 needle point test pick (or if desired, AT-6869B cable transfer clip), or equivalent, to work simultaneously approximately 25 feet apart along the front of a horizontal shelf as follows:

- (a) Test every jumper that crosses the assigned work location by probing either the tip or ring wire lead individually. Start as close to the rear of the shelf as possible. (See Section 100-150-301 for 1A fault locator test set procedures.)
- (b) Those jumpers that have been identified as floaters should be moderately pulled from both directions in an attempt to remove at least one side of the dead jumper. If the dead jumper can be pulled out from only one side, the jumper should be cut at the point of test and that portion removed.
- (c) If the floater cannot readily be pulled out from at least one side, it should be cut to facilitate its removal by the other testers along the shelf. (If the frame is a toll IDF, or has a significant number of toll-type circuits on the shelf being mined, this step should be deleted because the whistle indication may not always represent a dead jumper.)
- (d) The preceding procedures (a) to (c) should be continued until all horizontal shelves have been cleared of dead floater jumpers. The precise spacing of the work locations will depend on particularly convenient locations, as well as

the need to maintain sufficiently small intervals to maintain moderately low pulling forces to prevent excessive service reaction.

C. Mining Procedure (Severely Congested MDF)

4.04 Depending on the physical layout of the MDF to be mined and the particular characteristics of the shelf-jumper pileup, the general mining procedures outlined in 4.03 can be applied from various areas on the MDF other than the front of the shelf which may be sufficiently blocked by wire so as to prevent access for mining. These areas are depicted in Fig. 4 and are explained in the following paragraphs.

Mining At Front Of Shelf

4.05 In general, mining from the front of the shelf will probably remove only small amounts of dead jumpers, since most of these jumpers are relatively new and represent working lines. If some sort of straps or ties have been used to keep the jumper pileup from falling off the shelf, they must be temporarily cut to provide access to the jumpers for testing and removal of dead ones.

Mining At Bottom of Shelf

4.06 In many cases, the majority of dead jumpers can be expected to be at the bottom of the shelf. If there is sufficient clearance between the floor and the first shelf, working from beneath the first shelf becomes feasible. If enough dead jumpers can be removed from the first shelf, then the second shelf can be mined from beneath. In this manner successively higher shelves can be mined. This approach, however, may be very strenuous.

Mining At Top of Shelf

4.07 On some MDFs, the jumper congestion is concentrated toward the front shelf, with the rear relatively loosely packed. By spreading apart the jumpers on the shelf above the one to be mined, an access hole is created through which the jumper pile on the shelf below can be reached for testing.

Mining At Rear Of Shelf

4.08 The jumper pile can be directly accessed from the rear of the shelf by reaching in

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from the vertical side of the frame. This method of access makes it difficult to use the 1A fault locator, or equivalent, for identifying floaters unless there are no connector blocks mounted at some portions of the VMDF. (See 4.12.)

4.09 There are several points along the MDF where the jumpers are particularly accessible for mining. By starting at these points, the removal of dead jumpers may reduce congestion sufficiently to provide access at other points along the shelf. These points are described in the following paragraphs.

Mining At Bends In Shelf

4.10 A bend at some point along the length of a MDF provides an ideal place to mine the shelf. In general, the bend itself does not have terminal blocks on either the horizontal or the vertical side, thus facilitating access to the jumpers from both the front and rear of the shelf. Mining at a bend may significantly reduce local congestion so that access to jumpers at working points some distance from the bend may become more convenient.

Mining At Ends Of Shelf

4.11 The degree of jumper pileup along a shelf is not uniform. Usually it reaches its peak at the middle of the shelf and decreases toward the ends where there is generally sufficient working room to reach the jumpers. Mining at the ends of the MDF may reduce local congestion, thus creating enough working room to permit mining at points closer to the middle of the MDF.

Mining At Vacant Locations

4.12 If there are isolated locations along the horizontal or vertical side of the MDF where there are no terminal blocks mounted, these would be particularly convenient locations to permit access to mine jumpers.

D. Additional Procedures

4.13 During the mining procedure, attempts should be made to push the jumper pileup toward the rear of the shelf without blocking access to the distributing rings. As the mining procedure proceeds, this will become more feasible as dead jumpers are removed and the pile loosens.

4.14 As soon as a shelf has been mined, jumper wire retainers such as ED-97754-70, Group 55, should be installed to keep jumpers dressed back behind the fanning strips. These retainers can be installed on every other transverse arm about two and a half inches behind each terminal strip and also at any bend in the MDF. Jumpers that already are on the shelf can be gradually worked behind the retainers as the pileup is reduced and loosened. The installation of retainers will help keep the MDF neat and facilitate the removal of disconnected jumpers in the future.

4.15 When the MDF has been completely mined for dead floater jumpers, and a determination has been made that further relief in the jumper pileup is needed due to the removal of any remaining nonfloater dead jumpers removed by jumper tracing procedures described in 5.01. If required, these procedures are generally time consuming and will result in additional work effort.

5. JUMPER TRACING PROCEDURES

5.01 Dead jumpers still terminated at one end (nonfloater dead jumpers) can be traced from the turned-back wire ends by one or more of the following procedures:

- (a) By pulling each jumper by hand to locate the terminated end.
- (b) By the use of a commercially available electronic jumper trace to locate the terminated end
- (c) By an inventory of tie pairs that multiple to and from the various frames.

6. RECORD-KEEPING

6.01 In order to maintain an orderly rehabilitation program, suitable bookkeeping records should be developed and maintained. These records should be developed to fit the needs of the particular environment. It is recommended that they include the shelves and positions mined and the techniques used. Some examples of these records are as follows:

- Horizontal and Vertical MDF Progress Charts
- Daily Results Summary

- Job Progress Charts
- Monthly Summary

- Upper Management Summary
- A visual display showing the progress of the program.

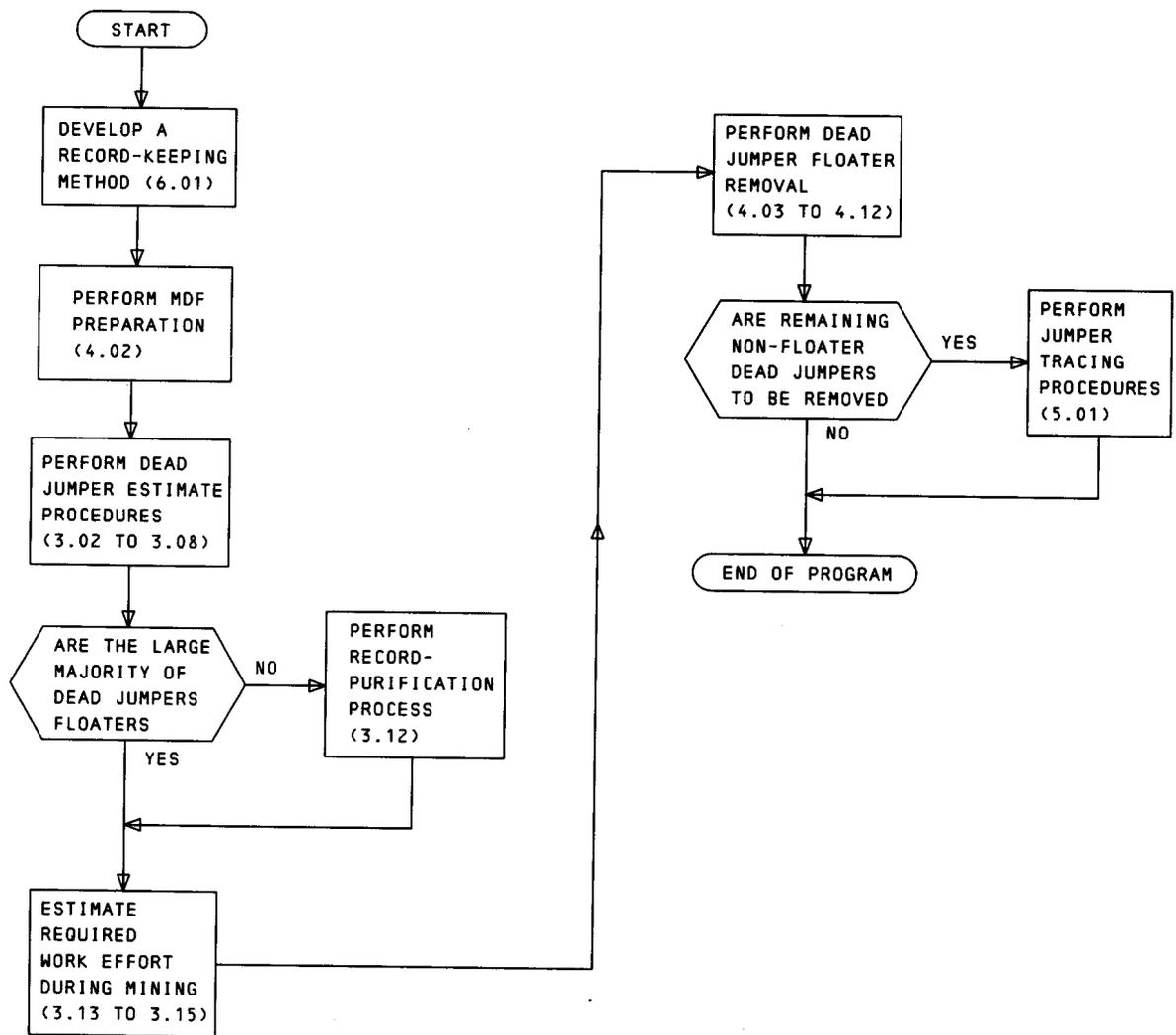


Fig. 1—Dead Jumper Removal Procedure

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Step 1 — Calculate $H = \frac{A}{B}$

A = Number of visible dead jumpers that are tested to be floaters on the horizontal side at the MDF (HMDF).

B = Total number of visible dead jumpers tested at HMDF. (Floaters plus nonfloaters.)

H = Fraction of dead jumpers visible at the HMDF that are floaters.

Step 2 — Calculate $V = \frac{C}{D}$

C = Number of visible dead jumpers that are tested to be floaters on the vertical side of the MDF (VMDF).

D = Total number of visible dead jumpers tested at VMDF. (Floaters plus nonfloaters.)

V = Fraction of dead jumpers visible at the VMDF that are floaters.

Step 3 — Calculate $F = H$ (Step 1) $\times V$ (Step 2) $\times 100$

F = Percent of dead jumpers that are floaters on MDF.

Step 4 — Calculate $T = 100 - F$ (Step 3)

T = Percent of dead jumpers that are still terminated at one end (nonfloaters).

Example — **Step 1:** $H = \frac{380}{400} = 95$

Step 2: $V = \frac{216}{240} = .9$

Step 3: $F = .95 \times .9 \times 100 = 86\%$

Step 4: $T = 100 - 86 = 14\%$

Result: 86% of dead jumpers are floaters; 14% of dead jumpers are terminated at one end.

Fig. 2—Sampling Procedure Calculation Method

Step 1 — MDF is 300 verticals long which equals 200 feet

Step 2 — Calculate that 1/3 of 200 feet = 66.7 feet

Step 3 — Determined that one horizontal shelf contains 8000 dead jumpers

Step 4 — Calculate amount of dead jumper footage by 8000 dead jumpers \times 66.7 pair feet = 533,333 pair feet

Step 5 — Calculate amount of weight of dead jumpers by 533,333 pair-feet \div 180 pair-feet per pound = 2963 pounds of dead wire

Step 6 — Calculate estimated man-hours of work effort needed to mine shelf of 8000 dead floater jumpers:

2963 pounds \div 5 pounds per man-hour = 600 man-hours of work effort

Fig. 3—Example of Estimating Required Work Effort Hours

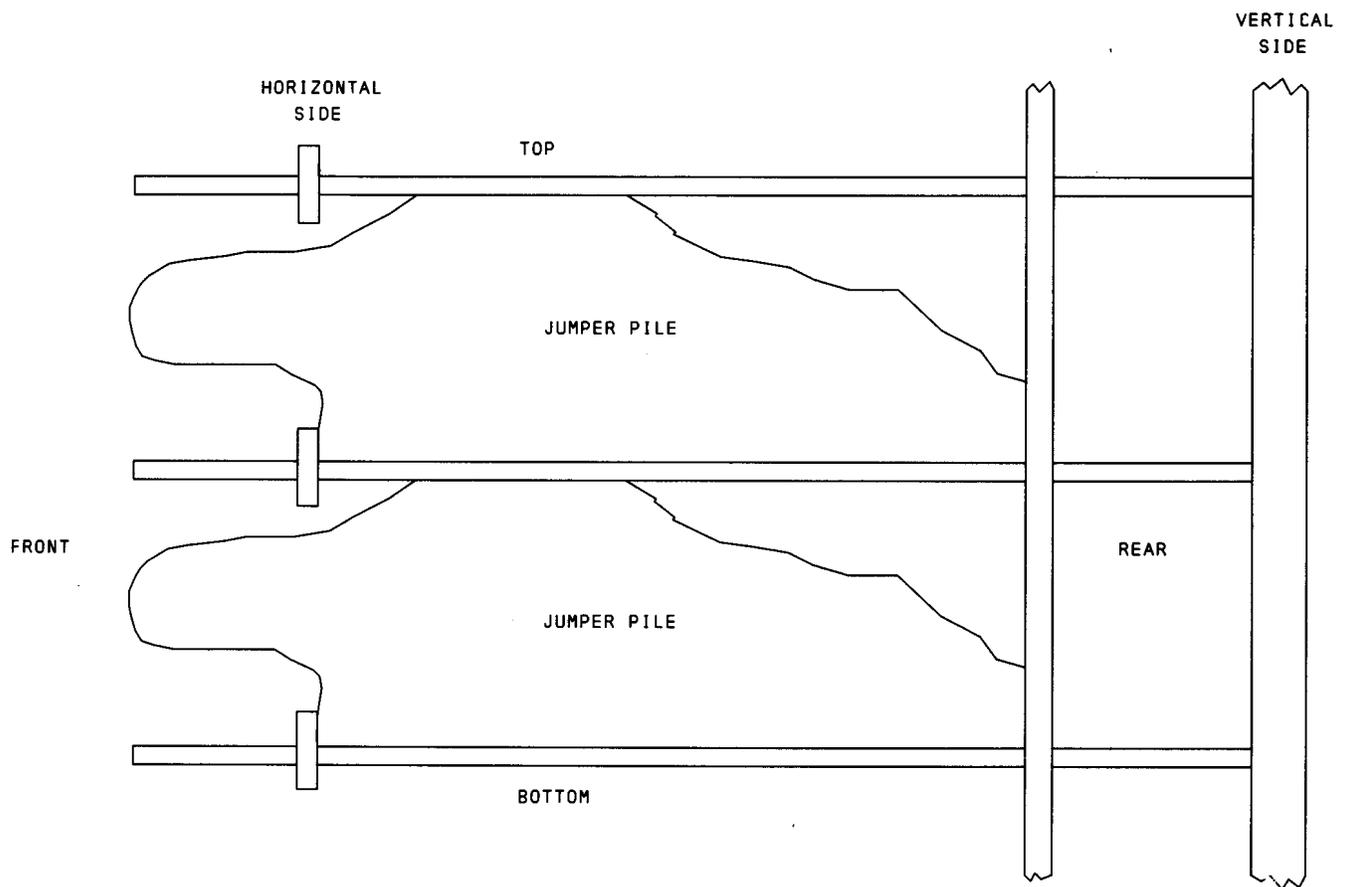


Fig. 4—Areas For Applying Mining Procedure