CHAPTER VII

ENGINEERING SURVEYS

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CHAPTER VIII

ENGINEERING SURVEYS

ORGANIZATION

7.1 The District Senior Superintendent of Surveys has to prepare send his proposals for Engineering survey under the following headings and send to the Additional surveyor General(field) through Provincial Surveyor General with copy to relevant sections.

(i) **Horizontal survey** – Proposals should be prepared, if new horizontal control network to need be establish using GPS. Copy of which should sent to D.S.G. (Geodetic Surveys)

(ii) **Bench marking and leveling** - If secondary tertiary leveling is to be undertaken, as in (i) above Proposals should be prepared and copy of which should sent to D.S.G. (Geodetic Surveys)

(iii) **Advance work**. - Manum Sahayakas must be profitably employed in clearing and picketing of traverse routes, clearing and benchmarking of level lines and Kilometer and 1/2 km grids.

A careful estimate of the staff requirements for completion of the advance work should be prepared considering all relevant facts.

(iv) District Senior Superintendent of Surveys should identify required information, all type of resources and supports which are need to be obtained from client institution. Thereafter, action should be taken to get those by working close coordination with those institutions and their local heads.

(v) Listing of human and other resource requirement.

7.2 When the District Senior Superintendent of Survey's suggestions are approved, he has to prepare following documents with the help of SS (HQ). Thereafter work has to be entrusted to the Superintendent of Surveys with instructions.

(i) Traverse and level diagrams on the 1:50,000 map.

(ii) A diagram on the 1:50,000 scale showing all major surveys already executed and abutting on work taken up. Numbers of abutting engineering survey sheets should be given together with their year of survey.

(iii) Latest Arial Photographs of the relevant area.

(iv) Key diagram (layout of engineering survey) showing 1/2 km grid in 1:50,000 map for work assignment.

(v) Specification for survey.

7.3 Setting out and clearing of the kilometer ½ km grids and laying of Benchmark/Geodetic Survey Control Station should be done as soon as possible. Immediately after that D.S.G. (Geodetic Surveys) should informed to establish horizontal control network to by GPS observations. In parallel to that leveling of Benchmark also should be done. Superintendent of Surveys should employ his whole staff for this task with systematic plan.

7.4 On enablement of this vertical and horizontal control network, Superintendent of Surveys should send the 1:50,000 map showing control station and their co-ordinate, bench mark position and values, grid lines to the District senior Superintendent Surveys.

7.5 Superintendent of Surveys on receipt of the documents referred to in para 7.2 will plan a system of detailed traverse and level line which will be done along the boundaries of blocks assigned to be different surveyors.

7.6 Thereafter each surveyor should be assigned blocks. Surveyor should study the block by physical inspection and using Arial photograph and should plan traverses for the survey of internal details and boundary information. Similarly he should plan for establishment of level line inside the block and along the boundary. Before start the work his programme/plan should get approved by Superintendent of Surveys.

7.7 As far as possible each surveyor should be assigned blocks corresponding to the sheets that are taken up. If it becomes necessary to assign work to two surveyors in the same block leveling should be assigned to one surveyor and detailed surveys to the other, so that the delays resulting from more than one surveyor sharing the same sheet may be avoided.

FIELD WORK

Traverses (See Chapter II)

7.8 In the case of control traverses surveyed along grid lines, greater care should be devoted as any error is reflected as a corresponding error in the latitude or departure.

7.9 Field books be maintained as per DSR chapter XI and annexes 1 to 10 of DSR Chapter XXII.

7.10 Co-ordinate sheets of all traverses should be pasted in field book. The Sporadic Surveys can find the necessary information by referring to engineering survey field books.

7.11 As far as possible field books relating to any one sheet should bear consecutive numbers.

7.12 Details of Survey along the boundaries of grid sheets should be done by only one surveyor as practice East and South boundaries are taken for particular block.

Clearing

7.13 The Supervising Officer on his first inspection of the Surveyor should indicate to him the directions of spot height lines that are to be cleared after studying his work plan . This will be decided after study of the photo diagram.

7.14 Spot height lines will be set out by the Surveyor as indicated by the Supervising Officer, at intervals of 100m/50m, from both end if it extends to more than 1km in any one block, and from one end if less than 1km. On the day setting out, 50m/20m from each and of the spot height lines will be cleared. This interval may vary on client requirements at it is indicated in specification of survey'

7.15 Clearing will be done from both ends and checked at every intervening ½ km grid. If an error of more than 5m is observed, within a ½ km section, this should be re-cleared.

7.16 Spot height lines should be extended to 50m or an additional spot height line cleared beyond the perimeter of the area taken up for survey in a particular year, if the abutting area had not been surveyed earlier. This is necessary to ensure the correctness of contours at the perimeter.

7.17 The efficiency of a Survey engaged on engineering surveys depends largely on his capability to organize his Manum Sahayaka to produce the maximum clearing. To ensure this Surveyor should scrutinize the daily progress in clearing and, if necessary, verify in the field to satisfy himself that any low clearing output reported is actually due to the nature of the clearing involved.

7.18 Manum Sahayakas should clear in groups of 3 or 4.

7.19 A clearing progress diagram on the scale of 1:50,000 should be maintained showing the clearing done every day of the week in different colors. The head Manum Sahayaka should maintain the clearing progress diagram on the scale of 1:10,000 and submit it at the end of each day to the Surveyor who will initial it after transferring the particulars to his diagram. This survey clearing progress diagram should be sent to the Supervising Officer at the end of every week together with his journal.

The cleared lines will be indicated in position in relation to the block.

The colors to be used are: -

1st day of the week	– Red
2nd day of the week	– Blue
3rd day of the week	– Yellow
4th day of the week	– Brown
5th day of the week	– Green
6th day of the week	– Black
7th day of the week	– Brown

Bench Marking

7.20 Type "E" bench marks without brass bolts and type "F" bench marks (See Annex VI in Chapter II) will be constructed at the inter-sections of 1 km and ½ km grids respectively, at safe places. Bench mark numbers will be inscribed on the bench marks when the concrete is still wet. Letter and numbers should be in script direction of West to East.

7.21 Temporary bench marks (stout wooden pegs tapered at the top) will be buried at the terminals of spot height lines in any block assigned to a Surveyor. These will be numbered in terms of appendix 25 to the Technical Instructions. When level line running for assign heights for these Temporary bench marks, those should be used as turning point and not as intermediate point or detail point.

Detail Surveys – See Chapter IX

7.22 Detail surveys should be done before the detail leveling of spot heights is started. All topographical features such as railways, roads, paths, streams, bunds, rocks, and important buildings should be surveyed or transferred.

7.23 If recent surveys of streams, roads, paths, and revenue boundaries of the E.S area exist, those may use in productive manner without resurveying

7.24 Boundaries between different cultivations and state, private ownership will be surveyed and shown in block.

7.25 Approximate boundaries of high jungle, low jungle and Damana within State lands should be sketched and shown in dotted lines on large scale contour plans. Their extents should be computed to the nearest hectare and entered on a sheet, which may be forwarded with the report.

7.26 All village boundaries should either be surveyed or re-plotted direct from old field books, where such surveys are available, or sketched from cutting taken on grid lines. Boundaries thus, sketched will be shown on field sheet in conventional signs for village or revenue boundaries.

7.27 The information regarding the number of houses and families in each village together with the approximate population should be obtained by the Surveyor in the field in consultation with the Grama Niladari and entered on a schedule which will be forwarded with the report.

7.28 The outer boundary of lands given out under the Land Development Ordinance but which have not been developed should be shown in dotted line of the field sheet and described.

7.29 It is important survey all constructions and features which indicate the form of the country, which may be of use to the Engineer.. e.g. streams, dry streams and channels and bunds, excavations and embankments, rock areas and boundaries.

Advance Leveling – Vide DSRs. 7.4 to 7.7

7.30 A tracing on the 1:50,000 scale should be prepared with details of newly established level lines(minor and higher), including the route of the level lines, type of bench marks established, their numbers and values and the field book and level book numbers, and sent along with the benchmark sketches(Annex V) to the District S. O. or to D.S.G. Geodetic as the case may be. Benchmark sketches will also appear in the last pages of the level book and the index page should be endorsed accordingly.

7.31 **Detail leveling** – Detail leveling is leveling done to obtain spot heights in systematic manner and heights on or along natural or artificial features covering the respective area.

7.32 The height of any TBM used for commencing or closing a line should be established by using it as a turning point of a level line.

7.33 Special care should be taken to obtain heights on or along features, which run parallel to spot height lines.

7.34 Sufficient heights should be taken on rocks to enable Engineers to estimate their size and approximate shape. The height of the highest point should be observed. In obtaining the height of the highest point if ordinary leveling is not feasible, theodolite heightens may be used, and the method of stepping using a linen tape can also be adopted.

7.35 If spot height lines are so placed in relation to sections of watercourses and if heights at an average of 100 m apart along the streams are not obtainable, such sections must be leveled to provide adequate heights.

7.36 If the bed height cannot be obtained due to depth of water, heights as far inside the stream as possible should be obtained and shown in position on plan.

7.37 If discernible, the high flood level should be given at least at 4 points in every ½ km. The Irrigation Department requires these values to build colonists' cottages in areas, which will not be submerged in the event of floods. The Surveyors should pay special attention to obtaining such heights.

7.38 Additional heights should be observed where necessary after 1m contours have been approximately sketched.When two or more self contours having the same value adjoin, sufficient heights should be observed to determine whether these would form a single self-contour.

7.39 Diagrammatic index of the contents of each page of a level book will be maintained by the surveyor. This will be pasted on the cover of the level book.

7.40 Level books should be reduced daily and the 'close' should be worked out.

7.41 Errors need not be distributed for spot height leveling but should always be distributed for leveling to establish bench marks.

Bench Marks

7.42 The values of benchmarks, when finalized, will be entered in a form (see specimen at the end of the chapter) called the benchmark list. The values thus entered will be checked with the level book and E.S. Sheet by the Supervising Officer and initialed.

7.43 The Supervising Officer will maintain benchmark lists for the whole area on the lines indicated in the specimen annexed. He will compile the benchmark list after reference to the Surveyor's benchmark lists. The values thus entered will be final and will be used in the key diagrams.

7.44 The Surveyor should not change the benchmark values without intimating such changes to the Supervising Officer after his benchmark list has been initialed.

7.45 All level books used for detail leveling will be destroyed by the District S.O., when engineering survey plans have been printed, passed and security copies digital data/maps have been sent to the branch Document management and Professional Standard at Head office.

Field Checks

7.46 The Supervising Officer should check the rate of clearing of each gang during the beginning of the field season. He should be present during clearing for at least 2 hours to be able to estimate fairly the average output of clearing. The District Superintendent will set a norm for clearing.

7.47 The Supervising Officer must check a sufficient portion of the leveling in his party, and must sign a certificate to this effect on every engineering survey plan. The certificate will contain reference to level books containing his checks. The checks must consist of re-leveling lines already completed or independent lines of leveling. The Supervising Officer is responsible for all leveling done under his charge being closed within the error allowed.

7.48 The form of the ground indicated by contours should be checked by the Supervising Officer by inspection on the spot, by leveling additional lines to cut across the form of contours or by tracing contours in all cases, which appear doubtful. In addition to this he should make the check in the more open and undulating areas and elsewhere, if necessary on every sheet.

7.49 The Supervising Officer must check a sufficient portion of traverse and detail survey and must sign a certificate to this effect on every engineering survey plan. The certificate will contain reference to the field books in which the field checks appear. He may employ any of the methods prescribed in the Technical Instructions, chapter 4, and is responsible for all surveys carried out under his charge, being of the required accuracy prescribed in DSR 2.11. At least 10% of the work should be checked.

Plan work

7.50 Plans work should be done by the software provided by the Survey Department.

7.51 Plan should be produced as per client specifications suitable scale and applying suitable colors. In General detailed information will be plotted in black and contours in brown and will be drawn on A3 size field sheets of the scale of 1:5000.

7.52 Complete set of printed ES sheet should be print for filed at document room of District Survey Office in addition to the client copy.

7.53 Two addition copies of digital map produced for client should prepared and one should be kept at document room of District survey Office and other one should sent to branch Document management and Professional Standard at Head office.

7.54 All the edges of each sheet should be compared with the edges of adjoining sheets by means of boundary comparison tracings. The descriptions of lots on either side should also be compared.

Sheets

7.55 The abbreviations shown in annex 10 of DSR Chapter XXII should be used in both plans and field books of engineering surveys to describe all detail survey information of boundaries.

7.56 Every engineering survey field book shall have reference to these abbreviations pasted on the back of the index page facing the first page of the field book. This should be done in district offices on all field books issued for engineering surveys.

Old work

7.57 Each Surveyor should obtain all the old field sheets in his block after referring to the relative 16 chain RDs / Key sheets and show all private lands in position on plan by suitable fixation technique.

7.58 Encroachments will be surveyed in block.

7.59 It should be borne in mind that engineering survey plans are not revenue plans but are used by the Irrigation Department to block out lands for alienation and design a network of channels. Therefore it is essential that all private lands should be separately shown to avoid their being included is State land for alienation.

It would be sufficient if Photostat reductions are used for incorporation of old work in Engineering Survey Plans.

Contours

7.60 **C**ontours should be interpolated using software provided by the Survey Department. It has to be ensure continuity of contours and has to determine whether additional heights are required. Contours should be interpolated accurately and should be checked by the Supervising Officer before the print.

7.61 The line thickness of index contours and datum contours should be 0.8m and 0.3m respectively on the 1/2000 scale.

7.62 Contours will be broken at detail to enable further differentiation between contours and details.

7.63 Important and necessary spot heights should be printed on the E S Sheet. Additional heights referred to in D. S. RR. 7.33,7.34,7.36 and 7.38 should also be printed on E.S. Sheet.

7.64 The point where a bench-mark has been established should be shown by a square of side 1.5mm and the geodetic height should be entered in three decimal places thus: **51.517**

7.65 Values of the 5m contours will be printed with the numbers reading uphill.

7.66 Grid numbers will be printed along the Southern and Eastern boundaries clear of any detail.

7.67 An index of adjoining sheets will be shown and will appear centrally in the Southern printing margin of the E.S. Sheet (this index will be similar to the one provided in 1:50000 topographical sheets and will be useful to Surveyors and Officers of the Irrigation Department when they have to find out numbers of adjoining sheets without reference to the key diagram). It will be drawn on the scale of 1:50,000.

Numbering of the engineering survey sheets

7.68 Each sheet will be known by the number of the 4x2.5 km sheet whose north-east corner falls on it or is nearest to the center of the sheet.

7.69 When two sheets have to be allotted the same number, the first sheet will be distinguished by the letter A after the number and the second sheet by the letter B after the number.

Printing on engineering survey plans

7.70 The names of streams & all details should be printed in black by hand or by using computers.

7.71 Description of details and claimants should be printed in black.

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Reports

7.72 The Surveyor should make individual reports on their work on the standard forms. As the whole area under surveys has, as a rule, one scheme each Supervising Officer should make a comprehensive report on the whole area.

7.73 **A Key diagram** (Annex VI) should be prepared by the Superintendent of Surveys with the help of his surveyors and should show: -

(i) All bench marks in correct position with their values (vide specimen);
(ii) Boundaries of sheets taken up, with their numbers.
(iii) Kilometer grid numbers outside the perimeter.
(iv) One or more natural features, which will help in orientation of the diagram on the 1:50000 topographical sheets.
(v) Administrative boundaries with the their names.
(vi) Reference to abutting irrigation schemes with their year of survey. The relevant old key diagram should be obtained and abutting boundaries indicted after reference to them.
(vii) The name of the engineering survey scheme, year of survey and the scale will be given preferably on the top in the north-west corner within the printing margin outside the body of the diagram.

7.74 The scale of the key diagram will be 1:10000 or smaller scale in case of need, irrespective of the extent of survey.

7.75 If two or more parties are engaged in the survey of a particular scheme, as far as possible a composite key diagram (Annex IV) should be drawn. The composite key diagram will be one, which will cover the area of survey by more than one party.

7.76 If it is not possible to prepare a single key diagram for the entire area of survey in any one year/project, separate diagrams will be differentiated by the suffix A, B, etc., (e.g. Kawdulla Engineering Surveys, 1965- A).

Returns

7.77 The following returns should be sent by the Surveyor to his Superintendent of Surveys :-

(i) Traverse and level progress diagrams and a field progress diagram on the form L 403 to reach him by the 2nd of the month. The Surveyor should maintain the diagrams on the traverse of form L 403on the scale of 1:50000.
(ii) Clearing progress diagrams along with the journal every week.

7.78 Superintendent of Surveys should send the following returns to the District Senior Superintendent: -

(i) Clearing progress diagrams every fortnight.
(ii) Traverse and level progress diagrams and the field progress diagrams to reach the District S.O. by 5th of the month. Supervising Officers should maintain with them for their own information and for the information of inspecting officers a copy of the Field Progress Return (Annex I).

7.79 **Records for future references** –Superintendent of Surveys should forward the following to their District Superintendents on completion of E.S.: -

(i) 1:50000 tracing of the area surveyed.
(ii) Tracing of the scale of 1:250000.
(iii) Tracing showing the level lines and bench-marks, their values and the field book and level book numbers and pages.

7.80 District Superintendents will maintain 1/250,000 diagrams mounted on rollers showing all engineering and village tank surveys within the district. The areas under survey will have a broken band in green and the schemes completed will have a continuous band with the name of the scheme written within.

7.81 The District Superintendent will also maintain an album of 1/50000 topographical sheets relating to the district wherein every engineering scheme will be shown in position. The numbers of sheets falling on the perimeter of the area taken up each year with grid number, values, major traverses and level lines which will help to forward his proposals for survey of the adjoining areas, without reference to any other documents, will be shown.

CHANNEL TRACE SURVEYS

7.82 Contours and heights indicated on the 1/5000 contour prints are inadequate to decide the exact course of the channels for an accurate estimate of earthwork involved in the construction of the channels. Therefore it has to be provide a strip survey of land on either side of the proposed channel.

7.83 Generally the construction of channels is done by contractors employed by the Irrigation Department and since section are often given to different contractors for the convenience of design and handling units, each kilometer of the channel is treated as a separate unit.

7.84 In most major irrigation schemes, there will be two main channel referred to as the right bank main channel and the left bank main channel, a number of branch and distribution channels branching off the main channels or the main distribution channels and numerous field channels off the distribution channels.

7.85 The entire area under paddy in a particular scheme is normally divided into a number of tracts by the Irrigation Department and referred to a tract No. 1,2,3, etc. The distribution and field channels in a particular tract are numbered from unity and referred to as distribution or field channel No. 1,2,3, etc. in tract 1,2,3, etc.

7.86 Channels are traced on engineering survey sheets obtain prints of each kilometer of the proposed channel by the Irrigation Department. incorporating a few natural features and grids with their numbers and other information which would help the Surveyor to orient these prints on the engineering survey sheets. The contours are usually not shown on these prints.

7.87 Once Channel trace prints and specifications for survey are received by the District Senior Superintendent of Surveys, it will send to the field with requisition for surveys.

7.88 The Supervising Officer in charge of the party employed on channel tracing should obtain beforehand the engineering survey sheets, key diagrams and bench mark sketches relating to the scheme so that delays in obtaining all documents subsequently may be avoided.

7.89 On receipt of the channel trace prints the Surveyor will make tracings of each print and transfer the centerline of the channel on to the corresponding engineering survey sheet. The data given on each print should suffice to give a good fixation. Whenever possible, action should be taken to get down digital copy of the channel trace form the respective engineer and it will be make survey work much comfortable.

7.90 When transferring centerlines, it should be ensured that no gap exits between the end point of a kilometer and the starting point of the subsequent kilometer.

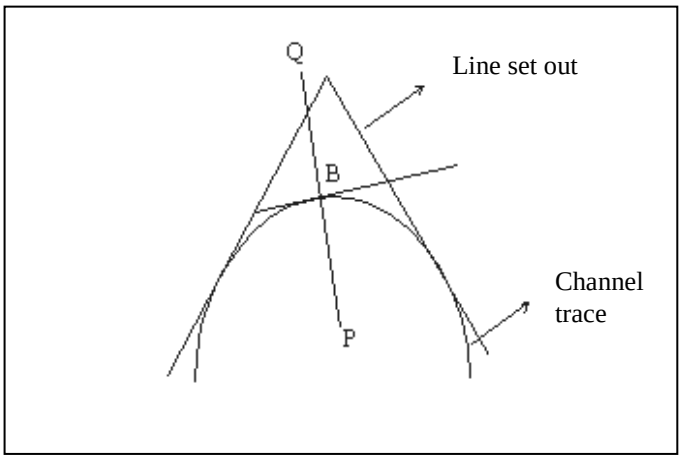
7.91 Bearings will be compiled, commencing and closing on old pickets, and the center line set out in the field with a Theodolite/ Total Station, but not more than 3 km of the trace will be set out without closing on old pickets.

7.92 On completion of the setting out of the center line, it will be surveyed to detail accuracy and plotted on the engineering survey sheet chain lines will not be inked.

7.93 Setting out of cross sections may be entrusted to the head manum sahayaka except at points where they have to be at right angles to the curve.

7.94 In setting out center lines of the proposed channels, it is not necessary to set out the curves shown on the channel prints unless specially requested.

7.95 The channel trace as indicated on the prints is not the final trace but the proposed trace and survey is under to determine the exact trace. Cross sections have to be set out at right angles to the trace and the following procedure will be employed.



Referring to the diagram above- if the cross section has to be set out through B, a tangent through B is drawn and then a line QBP at right angles using a parallel ruler and off-set scale. The bearing of the line QP can be obtained from the plan. The point Q can be fixed in the field by scaling the distance from the previous cross section on plan.

The cross section can now be set out.

7.96 **Leveling**. The centerline will be leveled to detail line accuracy, starting and closing on previously established benchmarks. Not more than three kilometers will be leveled without closing on benchmarks. All bench marks and pegs buried along the center lines at the intersections of cross sections will be used as turning points.

7.97 Cross sections will be leveled by starting and closing on pegs. They will be at the cross sections on the centerlines. If the time interval between leveling of the longitudinal section and the cross sections is appreciable or, there is reason to suspect movement of the cross section pegs, then the leveling of the cross sections should be commenced on the previous peg and closed on the peg subsequent to the one under consideration.

7.98 **Plan work.** Plans work should be done by the software provided by the Survey Department. Printing will be done on tracing paper for reproduction on the scale of 1/5000 unless otherwise stated and digital files of maps should be systematically

named and save in hard disc and compact disc. Additional copy should be send to the District Senior Superintendent of Surveys for his records

7.99 The trace will be oriented so as to have it horizontal as far as possible. A North line will be drawn in black on the North-East corner of the tracing and will be 4 cm long.

7.100 All detail surveys appearing on the engineering survey sheets within the strip will be shown on the tracing.

All spot heights will be entered in black. Concrete pegs will be shown as black dots-0.8 mm, with their appropriate numbers.

Benchmarks will be shown as in the case of engineering survey plans.

7.101 Blue grids of the A3 field sheets will be traced and shown away from the main body to the plan in the four corners with values.

7.102 Cross sections or longitudinal sections will not be drawn except when asked for, but sufficient space will be left below every plan for drawing of the longitudinal section.

7.103 When channel trace surveys of existing and abandoned channels are done, cross sections will also be drawn by the Surveyor. Each cross section will be plotted separately and the plotting will be graph-height against distance, on the scale indicated by the Irrigation Department (usually 1:100 / 10 feet to 1 inch).

7.104 On completion of the plan it will be examined and passed by the Superintendent of Surveys and forwarded to the Irrigation Department through District Senior Superintendent of Surveys. The cancelled requisitions will be sent through the normal channels to the District S O.

7.105 All newly establish type "E" and type "F" bench marks will be indicated in position in the corresponding engineering survey key diagram in red and certified. A certified benchmark list will be sent along with the key diagram.

7.106 Returns. Each Surveyor will maintain the following apart from the usual returns: -

(i) Clearing progress diagram on the scale of 1/5000, and forward it to the Supervising Officer along with the journal weekly

(ii) Field progress return of Form L 403

(iii) 1/50,000 tracing of the channel showing progress.

The Supervising Officer will maintain

(i) a register of requisitions for the party grouping different categories of channels.

(ii) A Field progress return for the entire party(Annexes 2 & 3) .

This will be forwarded to the District Superintendent to reach him by the 5th of the following month .The Field progress return will be sent to the Provincial Survey Office to reach him by the 10th of the month.

VILLAGE TANK SURVEYS

7.107 These are similar to the 1/5000 contour surveys except for the fact that spot height lines are at right angles to a base line, which is pre-determined.

7.108 The flat survey will be confined to the area shown in the sketch forwarded with the requisition. Private and State lands and topographical features should be surveyed.

7.109 A suitable base line will be laid down and leveled to the accuracy of a minor line.

If the extent exceeds 400 hectares, the line should be treated as a tertiary line.

Spot height lines will be set out at right angles to the base line at intervals of 100 m and spot heights taken 50 m apart.

7.110 All streams should be surveyed and height of banks near pickets or at closer intervals recorded, where necessary.

Rock out-crops should be surveyed separately and a few random heights to include the highest point obtained.

7.111 Two permanents benchmarks should be established on or near the bund.

7.112 Plans work should be done by the software provided by the Survey Department. The plan will printed on the A3 field sheets. All details, benchmarks, base lines and grid lines any, contours and significant spot heights will show in black ink. These Village tank Sheet should be passed by the Superintendent of Surveys and District Senior Superintendent of Surveys.

DAM AXIS SUVEYS

7.113 Perennial sources of water like streams or rivers cannot be effectively utilized for irrigation purposes without artificial measures like the construction of reservoirs. Reservoirs are constructed in this case by constructing a dam across the river.

7.114 A dam is designed to be constructed at a suitable point along the river giving due consideration to the volume of water carried by the river, lay of the land, in and around the dam site and the extent of the irrigable area.

7.115 The Irrigation Department will be able to locate the approximate position of the dam if engineering survey plans of the area are available.

If these are not available the Survey Department is requested to make a dam site survey which will generally be on the same specification as the 1/5000 close contour surveys, unless otherwise stated. The extent involved will depend on the nature of the plans available for location of the dame site area.

7. 116 When the approximate position of the dam is decided on by the Irrigation Department the centerline is fixed. This is called the ‘Dam axis’. As in channel trace surveys, this

dam axis will be only a tentative one and the final axis has to be decided on after a strip survey on either side of the proposed axis.

7.117 The Survey procedure followed for a dam axis survey will be as for channel traces, except that beacons are constructed at each end of the dam axis and at point of change of direction of the axis. Other special requirements will be indicated in the specification for the survey.

7.118 It is very necessary to provide flood heights and to show the flood escapes, for this data is invaluable in the designing of the dam.

7.119 Plan work should be done according to the Specifications using software provided by the Survey Department.

SPECIMEN REFERRED TO IN D.S.R. 7.42

SCHEME: - Engg. Sheet: -

LIST OF BENCHMARKS

N/S Location of B.M.	E/W Location of B.M.	M.S.L. Value	Level Number	Book Page	Checked		Remarks

The above Bench Mark values have been checked against level book and against plan and are correct.

……...
Supervising Officer

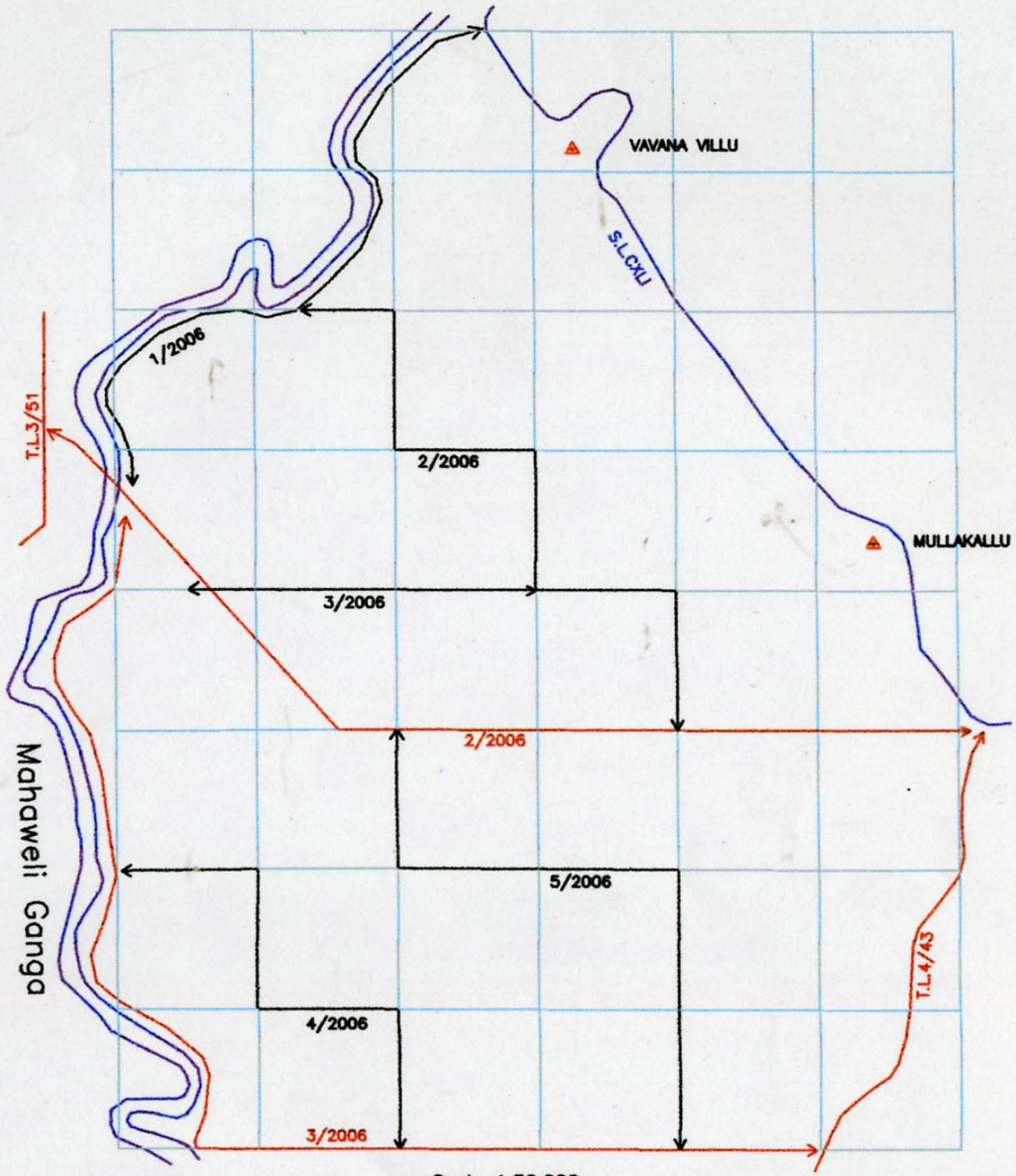
Annex 1

Annex 2
Chapteer VIII

LEVELLING PROGRESS DIAGRAM

ALLAI ENGINEERING SURVEY AREA 2006

Mr.....Party



Scale 1:50,000

	Proposed	Copmleted
Primary Line		
Secondary Line		
Tertiary Line		
Minor Line		

Staff	Arrived
Mr.E.Y.Dias, Grade i	2006.02.10
Mr.P.R.De.Mel, Grade ii	2006.02.20
Mr.S.N.Perera, Grade ii	2006.02.13

T.L.	Length	Sur. innitial	Error	Error Allowed	M.L.	Length	Sur. innitial	Error	Error Allowed

PROGRESS(in Kms)											
2006	T.L			M.L							
Month	Cleared	Benchmarked	Levelled	Cleared	Benchmarked	Levelled	Sup.Officer	S.S	D.S.G(Pro)	D.S.G(Snr)	S.G

37

Annex 2

ENGINEERING SURVEYS, 20___

PARTY

……..Asst. S.S/O.C.P.

……Surveyor (see over)

Estimated Date for Completion……. Acres……

Revised do do ……

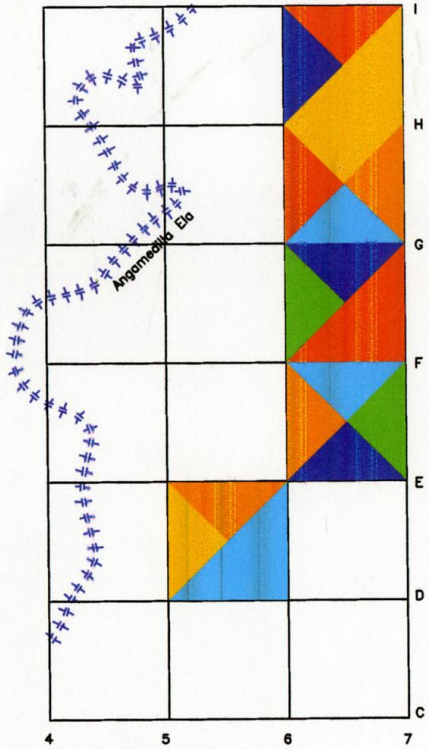
Revised do do ……

FIELD PROGRESS RETURN

Month	Miles Cleared	Miles Surveyed	Miles Leveled	Miles to Clear	Miles to Survey	Miles to Travel	Remarks	O.C.P.	S.S.	A.S.G.	D.S.G.	S.G.
January 20….												
February												
March												
April												
May												
June												
July												
August												
September												
October												
November												
December												

Annex 3(Contd)
Chapter VIII

Surveyors	Grade	Date of arrival
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		



Proposed Grid Lines

Detail Survey Complete

Spot Height Lines Complete

Spot Heights Observed

Pencil Plotting(Surveying & Levelling) Complete

Note:–

1. This diagram is not necessary in the return forwarded to Head Office
2. Indicate with the surveyor's initials the area or sheet allotted to him

Scale 1:50000

Colour Scheme

- January
- February
- March
- April
- May
- June
- July
- August
- September
- October
- November
- December

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Annex 3

CHANNEL TRACING, 20

PARTY

……..Asst. S.S/O.C.P.

……Surveyor (see over)

Estimated Date for Completion ……. Acres ……

Revised do do ……

Revised do do ……

FIELD PROGRESS RETURN

Month	Miles Cleared	Miles Surveyed	Miles Leveled	Miles to Clear	Miles to Survey	Miles to Travel	Remarks	O.C.P.	S.S.	A.S.G.	D.S.G.	S.G.
January 20….												
February												
March												
April												
May												
June												
July												
August												
September												
October												
November												
December												

Annex 4(Contd)
Chapter VIII

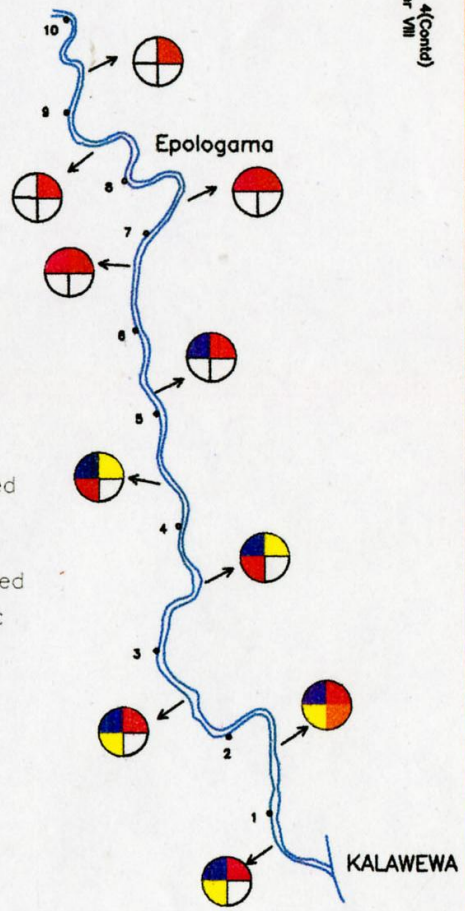
	Surveyors	Grade	Date of arrival
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

Reference

Circle represents Km taken up (1 2 / 3 4)

Quadrant 1 Coloured = horizontal survey completed
Quadrant 2 Coloured = centre line surveyed & normal set out & cleared
Quadrant 3 Coloured = longitudinal section surveyed
Quadrant 4 Coloured = cross sections surveyed & Km completed

Note
1. Colour scheme as in Annex 3
2. Indicate with the surveyor's initials the Km allootted to him



Scale 1:50000

Annex 4

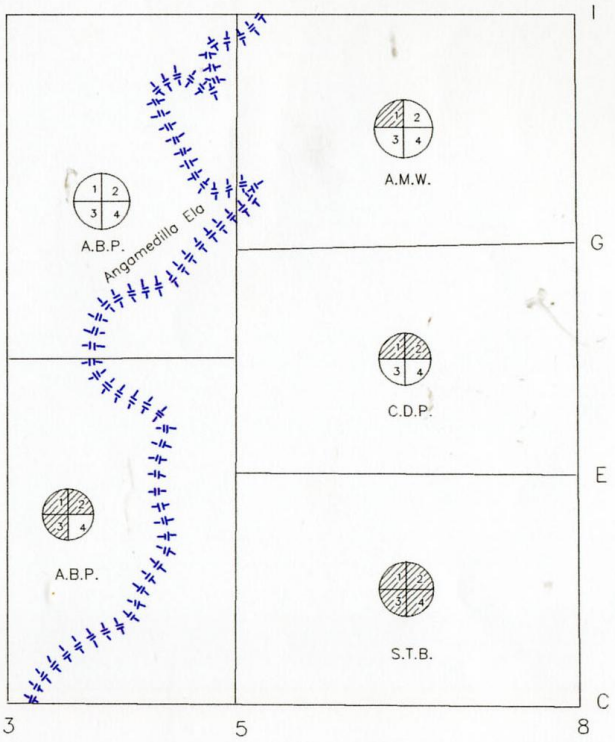
RECESS PROGRESS DIAGRAM

AMBANGANGA TOPAWEWA ENGINEERNG SURVEYS, N.C.P

Mr.....Party

Estimated date of Completion.....

Scale 1:50000



Surveyors

Mr.A.M.White
Mr.A.B.Pieris
Mr.C.D.Perera
Mr.S.T.Block

Circle represents Sheet taken up

Quadrant	1	hachured	=	detail plotting complete
Quadrant	2	hachured	=	interpolation of contours complete
Quadrant	3	hachured	=	inking of flat plan complete
Quadrant	4	hachured	=	inking of contours complete

	Intials of				
Month	Sup. Officer	S. S.	D.S.G(Pro)	D. S. G.(Snr)	S. G.
November					
December					
January					

Annex 4

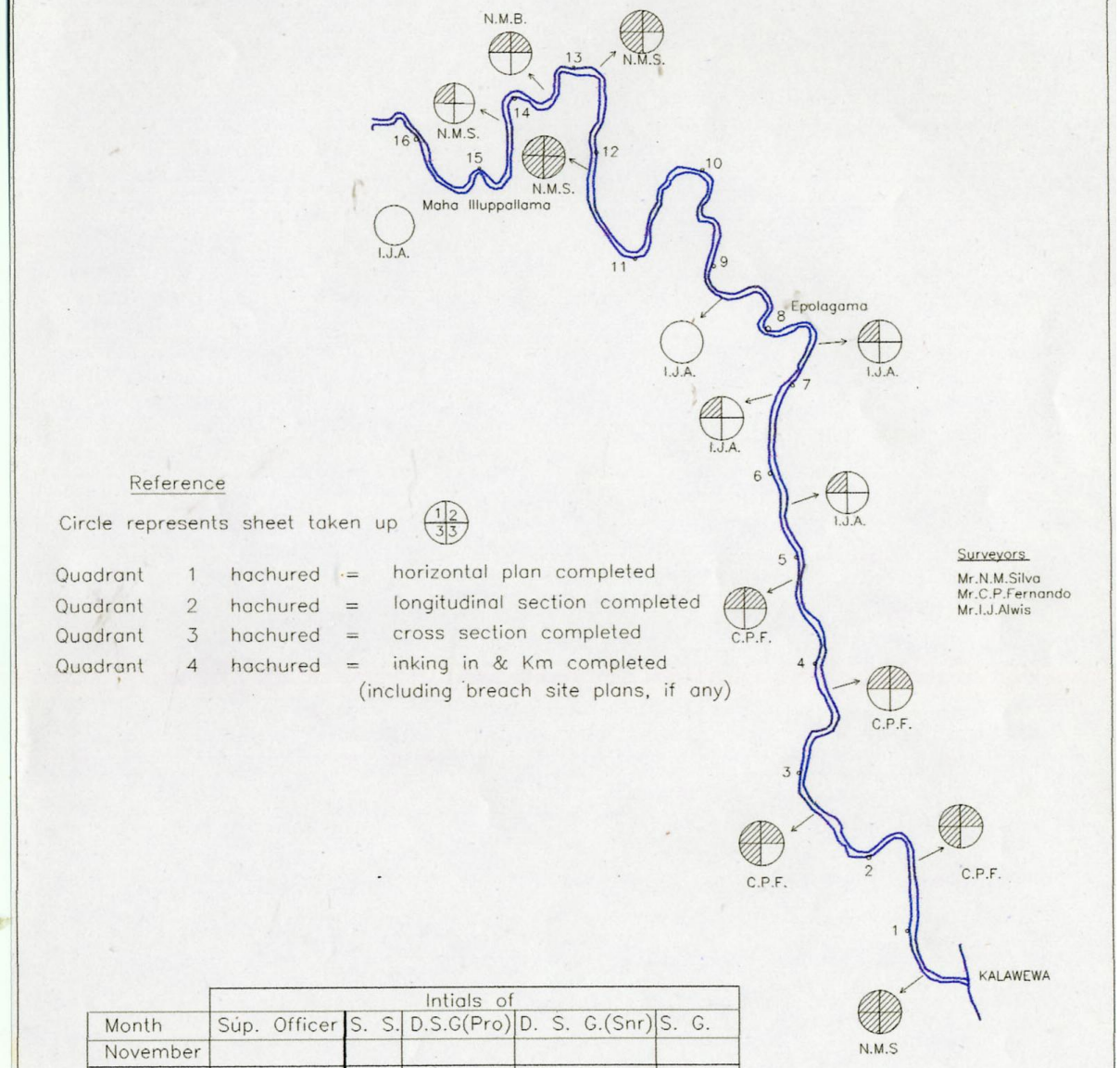
RECESS PROGRESS DIAGRAM

KALAWEWA YODI ELA ENGINEERING SURVEYS, N.C.P

Mr.....Party

Estimated date of Completion.....

Scale 1:50000



Reference

Circle represents sheet taken up

Quadrant 1 hachured = horizontal plan completed

Quadrant 2 hachured = longitudinal section completed

Quadrant 3 hachured = cross section completed

Quadrant 4 hachured = inking in & Km completed

(including breach site plans, if any)

Surveyors

Mr.N.M.Silva

Mr.C.P.Fernando

Mr.I.J.Alwis

	Intials of				
Month	Sup. Officer	S. S.	D.S.G(Pro)	D. S. G.(Snr)	S. G.
November					
December					
January					

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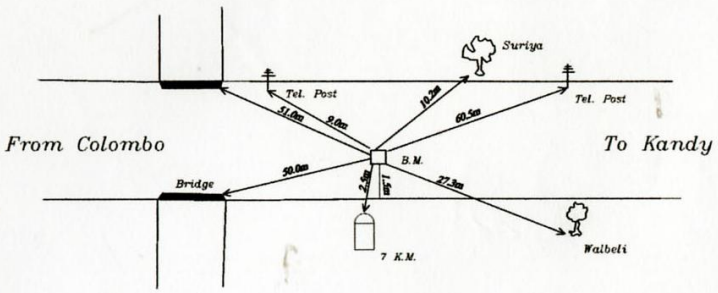
Annex 5

Chapter VIII

SPECIMEN OF A DESCRIPTIVE SKETCH OF A BENCHMARK



Type " D ": Depth 70cm : Near 7 km.s

Annex 6

Chapter VIII

CONVENTIONAL SIGNS TO BE USED ON ENGINEERING KEY DIAGRAMS

73	*Primary Benchmark*
25	*Secondary & Tertiary Benchmark*
□	*Minor Levelling Benchmark*
	Detail Levelling Benchmark

Note

1. *The signs will be shown in black*
2. *The sizes may be varied in proportion to the scale adopted for the key Diagram The sizes shown are a diagram on scale of 1:10000*

Annex 7

LIST SHOWING TYPES OF BENCHMARKS IN USE PRIOR TO THE ISSUE OF THESE REGULATIONS.

No. Type 1	Short Term 2	Size in inches 3	Brass Bolt 4	F or + Or – Inches 5	Letters SD. 6	H or V 7	P.SP or T 8	Type of LC 9	Description 10
1	C.B.	18 x 18x 20	L.B.B.	+4"	SD	H	P	S	Big concrete block, made in situ bevelled from ground level, with 12" square top.
2	C.S	12 x 12 x15	L.B.B.	+3"	SD	H	P	T	Small concrete block, made in situ, bevelled from ground level, with 9" square top.
3	R.B	9 x 9.	L.B.B.	-	SD	H	P	S & T	Live Rock B.M. cut and dressed 9 inches square, with L.B.B. let in and cemented.
4	R.S	6 x 6	S.B.B.	-	SD	H	P	T & M	Live Rock B.M. cut and dressed, with S.B.B. let in and cemented.
5	R.D	4 x4	-	-	SD	H or V	SP	D	Live Rock B.M. cut but not dressed with out B.B.
6	L.B.C	4 ½ x 4 ½ x 18 in 3" concrete	L.B.B.	+3	SD on cement bevel	H	P	S & T	Stone L.M. picket buried in concrete all round bevelled from ground level with 4½ top, and with long brass bolt let in and cemented.
7	L.B	4 ½ x 4 ½ x 18	S.B.B.	- 2 as BM. +3 as LBM	-	H	P	T & M	Stone L.M. Picket without concrete, but with S.B.B.
8	B.P	4 ½ x 4 ½ x 18	-.	F as BM + 3 as LBM	-	H	P	D	Stone L.M.P. used as a B.M. for Minor and Detail work as well as Traverse Picket without concrete or brass bolt.
9	S.B	9 x 9	L.B.B	-	SD	H	SP	S & T	B.M. on a masonry structure cut and dressed 9 inches square with L.B.B.

10	S.M	6 x 6	S.B.B	-	SD	H	SP	T & M	B.M. on a masonry stone or masonry structure cut and dressed 6 inches square, with S.B.B.
11	S.D.L	4 x 4	-		SD	H	SP	D	B.M. on a masonry structure cut and dressed 4 inches square, without B.B.
12	B.C.P	9 x 3	-	F	-	H	T	M & D	Big cement peg. Pegs to be made in Depots and not in situ.
13	S.C.P	4 ½ x1 ½	-	F	-	H	T	D	Small cement peg. Pegs to be made in Depots and not in situ.
14	S.S	4 ½ x4 ½ or greater	-	F	-	H	T	D	Sunk stone used, where necessary instead of a cement peg with centre mark and B.M sign cut thereon.

Annex 8

Type Sheet for Engineering Survey Sheets and Ethulons

Words / Figures to be typed	Description	To be typed in	
		Detail Ethulon	Contour Ethulon
Redi Bendi Ela Engineering Surveys N.W.P	Heading	Top Margin, Left	Top Margin, Left
4 264	Scale (in chairs and feet)	top Margin	-
2	Contour interval	Centre -	Top margin Centre
I 2/53	Sheet No.	top margin right	Top margin right
I, J, K	E-W. grid letters	-	Outside rect. squares
17, 18, 19, 20	N-S grid Numbers	- -	-do- Centre
Diwullewa Village F.V.P 2411	Village name and F.V.P. No.		
Bund, Tank	-	In Square J.K. 17 - 18	-
P	Cultivation and claim	Four places in Sq. I.J. 17.19	-
F	Cultivation and claim	Four Places in Sq. I.J. 17.19 once near B.M. J/19	-
72950/17	F.B. showing Supervising Officer.'s checks	Bottom margin left	-
3359/22	L.B. showing Supervising Officer's checks	-	Bottom margin Left
66287, 67360, 72950	F.Bs showing work on plan	Bottom margin centre	-
1902, 2002, 3359	L.Bs showing work on Ethulon	-	Bottom margin centre

CORRECTION SLIPS

CORRECTION SLIPS