



Republic of the Philippines
Department of Environment and Natural Resources

LAMP

GPS GUIDELINES

&

RECEIVER OPERATION

MANUAL

REPORT C2



Land Administration & Management Project
Prototype Implementation Office I
Province of Leyte

DOCUMENT VERIFICATION & APPROVAL

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1. INTRODUCTION

These instructions have been prepared as a guide to assist in the operation of the Leica SR520 GPS Receivers. They were developed by Andrew Dyson, Survey Control Adviser, under the Philippine – Australia Land Administration & Management Project Technical Assistance Program.

Most of the general instructions are applicable to any GPS survey. The receiver operating instructions are specific to the Leica SR520 GPS Receivers. At the end of the document are some general guidelines to assist in the planning of GPS surveys.

Refer also to the Leica Instruction Manuals provided with the receivers.

Samples of the GPS Field Sheets to be used on LAMP GPS surveys are included at the end of this document.

These instructions should be reviewed regularly and updated as required.

2. GENERAL INSTRUCTIONS

2.1 Preparation

Ensure that batteries are fully charged before starting the day's observations.

Advise local officials and property owners of activities.

Teams should set watches to the local time on their GPS receiver (when tracking satellites) to ensure that all teams are operating at the correct time.

Differential GPS observations must be carried out simultaneously at all stations. Therefore each GPS Team must ensure that they observe at the scheduled times.

To ensure that observations start by the scheduled time, start setting up the equipment at least 30 minutes before the scheduled start time.

The receiver should be switched on at least 10 minutes before the scheduled time - for new operators allow at least 15 minutes for the start up procedure.

For static control observations the observations should be started as soon as possible.

When travelling, equipment must be carefully packed to avoid damage.

2.2 Equipment Setup

If possible, clear all obstructions above 15 degrees elevation

The antenna should usually be set as high as possible to minimise obstructions and away from the vehicle.

Ensure that the antenna setup is stable, take particular care on hard and slippery surfaces and when windy. It may be necessary to use sandbags with a tripod and/or to chip holes in concrete or take other steps to secure the tripod/bipod legs.

The antenna must be carefully set exactly over the station mark.

For second and higher order observations, the antenna should be oriented to magnetic north.

When using the range pole and bipod, always use sandbags to prevent the bipod from moving.

Use the appropriate length antenna cable for the situation.

Connect antenna cable to the receiver & antenna (unroll cable completely).

Protect the receiver, particularly the screen and keyboard from direct sun, place in shade if possible or use an umbrella.

Ensure that batteries are inserted into Battery Module and the heavy duty battery connected if possible.

Always use at least two batteries and monitor their status during the observations.

Ensure that the PC-card is properly inserted into the GPS receiver. It should be inserted with the side displaying the Leica logo facing up.

People (especially children), animals and vehicles should be kept well away from the antenna, cables and receiver.

The equipment must not be left unattended especially when observing.

The antenna must not be disturbed during the observations and GPS signals must not be obstructed.

2.3 Observation Times

Refer to the General Guidelines at the end of this document for the suggested observation times for different GPS operations.

For rapid static observations, the suggested times are the minimum period of unbroken data. If in doubt record more data.

If observations are being conducted in a remote area where the baselines cannot be processed and validated before the field teams leave the area consider using longer observation times.

2.4 Observation Guidelines

GDOP should be less than 8 and preferably less than 5 particularly for shorter observations such as Rapid Static. Try to avoid periods of high GDOP when planning observations.

Satellites should be above 20 degrees if possible.

Antenna heights are critical and must be carefully measured and independently checked at the start and finish of the observations.

The person checking the antenna height should initial the relevant entry on the field sheet.

Ensure that each team is using a compatible *Configuration Set* for the observation. In particular the observation rates must be identical. For most observations it will be 15 seconds as defined in the *LAMP Configuration Sets*.

Always check that correct Pt ID and Antenna Ht have been entered into the receiver.

During the session, regularly monitor satellite health, position, satellites tracked and battery condition. Record details of anything unusual on the field sheet.

Note details of any obstructions, large structures, power lines, radio transmitters and any other comments on the back of the field sheet.

Ensure that the GPS Field Sheet is correctly and completely filled in with a black pen.

Do not stop observations before the scheduled stop time, unless instructed to do so by the Team Leader.

The PC-card should only be removed when the receiver is switched off or when the PC-card Status Icon at the top of the display has an arrow pointing down the screen, indicating that it is safe to remove the PC-card.

2.5 Packing Up Instructions

Replace all caps and covers.

The yellow plastic cover must be placed securely on top of the tripod immediately after the tribrach is removed.

Cables should be carefully rolled up.

All equipment to be clean and dry and returned to box or bags before transporting.

3. LEICA SR520 RECEIVER OPERATING INSTRUCTIONS

3.1 Starting the Observation

PANEL	ACTION/DISPLAY	KEY
	Switch on	ON
MAIN \	Check available memory on PC-card before commencing observations by pressing F10 or using the STATUS key:	STATUS
STATUS \ Menu	Select: General	CONT/F1
STATUS \ General	Select: Memory / Battery.	CONT/F1
STATUS \ Memory / Battery	Displays: Amount of memory remaining on PC-card. Note on Field Sheet	CONT/F1
MAIN \	Select: Job	CONT/F1
JOB \ PC-Card	Lists available Jobs. To create a new Job	NEW/F2
JOB \ New Job	Enter: Name: up to 15 characters, suggest format Ddddy-n (ddd= day of year; yy=year; n=session) Description: (suggest project name) Creator: (your name) Device: PC-Card (Check this entry)	Enter CONT/F1
JOB \ PC-Card	Lists available Jobs	CONT/F1
MAIN \	Select: Survey	CONT/F1
Go to the appropriate instructions for a STATIC or RAPID STATIC survey:		
For a STATIC Survey (used for 2nd Order Control and Reference Stations)		

PANEL	ACTION/DISPLAY	KEY
SURVEY \ Begin	Select: Config Set: STATIC Job: Select the new Job, created above Coord Sys: WGS84 Antenna: Should display appropriate type, if not, change	CONT/F1
SURVEY \ Job	Enter: Point Id: (15 characters) Ant Height: (measured height)	Enter OCUPY/F1
SURVEY \ Job	Displays: Point Id Ant Height Time at Pt <%> GDOP Check Point ID and Ant Height are correct. Can stay in this screen during the observation or use STATUS key to check on status of receiver and survey. (See DURING OBSERVATIONS instructions below). It is suggested that the keyboard should be locked when not in use to prevent accidental activation of the keys. To lock/unlock the keyboard, press Alt L Observe until the scheduled end time.	
At end of Observation:		
SURVEY \ Job	Before finishing the observation: Remeasure antenna height and enter on field sheet. Check that the correct Point ID and Ant. Height are displayed on the receiver. Then:	STOP/F1
Data will be recorded automatically		
If another point is to be observed, move to the next point. If the point is near by, lock the keyboard and move without switching off the receiver, if more distant, switch off before moving. Set up at the next point and repeat the following:		
SURVEY \ Job	Enter: Point Id: (15 characters) Ant Height: (measured height)	Enter OCUPY/F1

PANEL	ACTION/DISPLAY	KEY
<p>Repeat the procedures above for each point to be occupied After completing observations at the last point:</p>		
	To end observation session:	SHIFT QUIT/F6
<p>For a RAPID STATIC Survey (used for 3rd Order Control by Rover Receivers)</p>		
SURVEY \ Begin	<p>Select:</p> <p>Config Set: ROVER_5 or ROVER_10 (depending upon distance from the Reference up to 5km or 10km –as advised by team leader)</p> <p>Job: Select the new Job, created above</p> <p>Coord Sys: WGS84</p> <p>Antenna: Should display appropriate type, if not change. Note on Field Sheet</p>	CONT/F1
SURVEY \ Job	<p>Enter:</p> <p>Point Id: (max 15 characters)</p> <p>Ant Height: (measured height usually 2.000 with the fixed length range pole)</p>	OCUPY/F1
SURVEY \ Job	<p>Displays:</p> <p>Point Id: Ant Height: Time at Pt GDOP:</p> <p>Check Pt ID and Antenna Ht are correct.</p> <p>Can stay in this screen during the observation or use STATUS key to check on status of receiver and survey. (See below)</p> <p>When the required amount of data has been collected the Time at point will indicate 100% or more. The time should agree with the times used in the Configuration Set.</p> <p>Use the STOP & GO Indicator as detailed below to assist in monitoring the progress of the observations.</p>	
<p>At end of Observation:</p>		
	<p>Check Pt ID and Ant Height are correct on the display.</p> <p>To finish the observation at that point:</p>	STOP/F1
	<p>Data will be recorded automatically</p>	
	<p>If another point is to be observed, move to the next point. If the point is near by, lock the keyboard and move without switching off the receiver, if more distant, switch off before moving.</p>	

PANEL	ACTION/DISPLAY	KEY
	Set up at the next point	
SURVEY \ Job	Enter: Point Id: (max 15 characters) Ant Ht: (measured height)	OCUPY/F1
Repeat the above procedures for each point to be occupied		
After completing observations at the last point:		
	To end observation session:	SHIFT QUIT/F6

3.2 During Observations

During the observations the status of the receiver and survey should be checked using the following features: Note that some of these displays can be activated directly by pressing the function keys F7 to F10. (F7 – Status/satellites; F8 – Status/Stop & Go; F9 – Status/position; F10 – Memory/battery)

PANEL	ACTION/DISPLAY	KEY
Check the status of the receiver and survey as follows:		
SURVEY \ Job	Check the icons at the top of the screen. See the User Manual for full details of all icons. In particular check: Number of visible satellites Number of satellites used on L1 & L2 Observation Log Status	
	Most information of interest can be checked by pressing the dedicated STATUS key:	STATUS
STATUS \ Menu	The available Status screens are shown and can be selected as required. Of most interest is the Survey screen and the items available from this screen. Select Survey	CONT/F1
STATUS \ Survey	Select STOP & GO Indicator Displays important information about the current observation: Completed % Time to go Time at point Cycle Slips L1 & L2 GDOP Obs Rec Rate Static Obs For STATIC surveys do not finish the observation when	CONT/F1

PANEL	ACTION/DISPLAY	KEY
	<p>the display indicates 100% completed and 0 time to go, continue until the scheduled stop time</p> <p>To return to the previous screen:</p> <p>To return to the SURVEY \ Job screen</p>	<p>ESC</p> <p>CONT/F1</p>
STATUS \ Survey	<p>Select Position</p> <p>Displays Time, Position, HDOP & VDOP</p> <p>To return to the previous screen:</p> <p>To return to the SURVEY \ Job screen</p>	<p>CONT/F1</p> <p>ESC</p> <p>CONT/F1</p>
STATUS \ Survey	<p>Select Satellites</p> <p>Displays status of each satellite, elevation, azimuth, signal to noise ratios (SN) and quality indicators (QI).</p> <p>SNs should be between 32 & 51. High elevation SVs should have SNs between 45 & 51. Elevations below 20 degrees, SNs between 32 & 40.</p> <p>QIs should be between 80 & 99. Lower values indicate disturbed signal reception.</p> <p>If there are more than 6 satellites, scroll down to display information for the remaining SVs.</p> <p>To determine satellite health. Scroll down to display all of the screen.</p> <p>To obtain a skyplot. Various options are available for this screen</p> <p>To return to the previous screen:</p> <p>To return to the SURVEY \ Job screen</p>	<p>CONT/F1</p> <p>HEALTH/F4</p> <p>ESC</p> <p>SKY/F5</p> <p>ESC</p> <p>ESC</p> <p>CONT/F1</p>
STATUS \ Survey	<p>Select:</p> <p>General</p>	<p>CONT/F1</p>
STATUS \ General	<p>Select:</p> <p>Memory / Battery.</p> <p>Displays memory and battery information.</p> <p>To return to the previous screen:</p> <p>To return to the SURVEY \ Job screen</p>	<p>CONT/F1</p> <p>ESC</p> <p>CONT/F1</p>

3.3 Receiver Configuration

The receiver has numerous parameters and functions which can be configured by the user. Different Configuration Sets are used for different measuring techniques. Several default Configuration Sets are pre-programmed into the receiver. These default files cannot be deleted.

You may define your own Configuration Sets by selecting Configure from the Main Menu. Configuration parameters are entered in sequence and saved in a Configuration Set for subsequent use.

When Configure is selected from the Main Menu there are two configuration levels available, Standard and Advanced. Standard is recommended for most users. Advanced enables definition of parameters required for specialized applications.

Three Configuration Sets have been defined for LAMP control activities. These are as follows:

STATIC For static control such as Second Order Control and for Reference Station Operation. Antenna always set on tripod, height to be measured using the height hook.

ROVER_5 For Rapid Static operation of a Rover receiver for distances up to 5 km from the Reference Receiver. Antenna usually set on a fixed 2m range pole.

ROVER_10 For Rapid Static operation of a Rover receiver for distances up to 10 km from the Reference Receiver. Antenna usually set on a fixed 2m range pole.

The STATIC Configuration Set was defined in the Standard Operation Mode, the two ROVER Configuration sets were defined in Advanced Operation Mode as this enables the setting of new default times for the number of satellites observed.

To start defining a Configuration Set:

PANEL	ACTION/DISPLAY	KEY
MAIN \	Select: Configure	CONT/F1
CONFIG SET \	Select: PP_STAT (The default static configuration)	NEW/F2
CONFIGURE \ New Configuration Set	Enter: Name: (up to 8 characters, eg. STATIC) Description: (eg. Static/Reference) Creator: (your name)	CONT/F1
CONFIG SET \	To edit this new configuration set	EDIT/F3
CONFIG \ Operation Mode	Select: Standard or Advanced	CONT/F1
	Follow through the panels in sequence, entering the appropriate parameters for your new Configuration Set.	

3.4 LAMP Configuration Sets

The parameters used in the three LAMP Configuration Sets are as follows:

3.4.1 STATIC Configuration Set

PANEL	ACTION/DISPLAY	KEY
CONFIG \ Operation Mode	Select: Standard	CONT/F1
CONFIGURE \ Antenna	Ant Name: AT502 Tripod Vert Offset: 0.360 Deflt Hgt: 0.000 Meas Type: Vertical	CONT/F1
CONFIGURE \ Position	Update Rate: 1.0 sec Coord. Sys: WGS 84	CONT/F1
CONFIGURE \ Format	Only the last line should need editing as follows: OCUPY Counter: Time	CONT/F1
CONFIGURE \ Coding	Coding Type: None	CONT/F1
CONFIGURE \ Real Time	R-Time Data: None	CONT/F1
CONFIGURE \ Logging	Log Static Obs: YES Obs. Rate: 15 sec Log Moving Obs: No Log Auto Position: No	CONT/F1
CONFIG \ Occupation Settings	OCUPY Mode: Normal Auto Store: Yes	CONT/F1
CONFIG \ ID Templates	OCUPY Pts: No Template Used Auto Log Position: Time & Date	CONT/F1

3.4.2 ROVER_5 Configuration Set

For distances up to five kilometres from the reference station, the minimum observation times for the number of satellites are as follows:

6 or more satellites	10 mins
5 satellites	15 mins
4 satellites	20 mins

The parameters used in the ROVER_5 Configuration Set are as follows:

PANEL	ACTION/DISPLAY	KEY
CONFIG \ Operation Mode	Mode: Advanced	CONT/F1
CONFIGURE \ Antenna	Ant Name: AT502 Pole Vert Offset: 0.000 Deflt Hgt: 2.000 Meas Type: Vertical	CONT/F1
CONFIGURE \ Position	Update Rate: 1.0 sec Coord. System: WGS 84 Transform: ----- Ellipsoid: WGS 84 Projection: ----- Geoid Model: -----	CONT/F1
CONFIGURE \ Format	Only the last line should need editing as follows: OCUPY Counter: Time	CONT/F1
CONFIGURE \ Coding	Coding Type: None	CONT/F1
CONFIGURE \ Real Time	R-Time Data: None	CONT/F1
CONFIGURE \ Logging	Log Static Obs: YES Obs. Rate: 15 sec Log Moving Obs: No Observables Normal Log Auto Position: No	CONT/F1
CONFIG \ Occupation Settings	OCUPY Mode: Normal Auto OCUPY: No Auto Stop: No STOP P-PRC # of Sats Auto Store: Yes End Survey: Manual	P-PRC/F5
CONFIG \ Post Proc Auto STOP	STOP Point Occupation when: 8+: 10 7: 10 6: 10 5: 15 4: 20	CONT/F1
CONFIG \ Occupation Settings	OCUPY Mode: Normal Auto OCUPY: No Auto Stop: No STOP P-PRC # of Sats	

PANEL	ACTION/DISPLAY	KEY
	Auto Store: Yes End Survey: Manual	CONT/F1
CONFIG \ ID Templates	OCUPY Pts: No Template Used Auto Log Pos: Time & Date Auxil Pts: No Template Used	CONT/F1

3.4.3 ROVER_10 Configuration Set

For distances up to ten kilometres from the reference station, the minimum observation times for the number of satellites are as follows:

6 or more satellites	20 mins
5 satellites	25 mins
4 satellites	35 mins

The parameters used in the ROVER_10 Configuration Set are as for the ROVER_5 Configuration Set except for the observation times as indicated above. The relevant panel is shown below:

PANEL	ACTION/DISPLAY	KEY
CONFIG \ Post Proc Auto STOP	STOP Point Occupation when: 8+: 20 7: 20 6: 20 5: 25 4: 30	CONT/F1

4. GPS PLANNING GUIDELINES

The following guidelines are to be used for planning GPS surveys for geodetic control purposes:

4.1 GPS Receivers

For GPS control surveys to third order and higher specifications it is essential that survey receivers are used. Survey receivers are able to record both code and phase data. Receivers that can only record code data are only suitable for small scale mapping and GIS work.

Determination of the suitability of GPS receivers for control surveys should be determined by checking the manufacturer's specifications. Regardless of how well a "code only" receiver might determine a position or measure a baseline on a particular occasion, it is not suitable for control surveys.

Single frequency code & phase receivers are adequate for control surveys over shorter distances, generally less than twenty kilometres, however in the interests of efficiency it is suggested that dual frequency code & phase receivers should be used wherever possible. Only dual frequency receivers can be used for rapid (or fast) static observations.

It is suggested that single frequency receivers should not be mixed with dual frequency receivers for any particular observation session.

In selecting the number of receivers to be employed on a project, consider the size of the project, the number of staff, amount of support equipment and the logistical details. As a general rule three or four receivers provide for a good level of efficiency. The use of two receivers is generally inefficient, except for very small projects. Three receivers doubles the productivity that can be achieved with two receivers.

GPS receivers must be equipped with an appropriate user interface to enable full operator control of the observation, and the entry of point IDs and antenna heights in the field. In addition they must have a display which will provide the operator with the information necessary to determine the receiver's performance, the observation status, and when sufficient data has been collected at each point.

4.2 Observation Times

The following times are suggested as the minimum session lengths:

4.2.1 Static Dual Frequency

10 km - 20km	20 km - 30 km	30 km - 50 km	50 km - 150 km	over 150 km
1 hour	2 hours	3 hours	4 hours	6 hours

4.2.2 Rapid Static (Dual Frequency P-code)

	Up to 5 km	5 km to 10 km
6 or more satellites	10 mins	20 mins
5 satellites	15 mins	25 mins
4 satellites	20 mins	35 mins

For rapid static observations, the above times are the minimum period of unbroken data. If in doubt record more data.

If observations are being conducted in a remote area where the baselines cannot be processed and validated before the field teams leave the area consider using longer observation times.

PDOP should be less than 8 and preferably less than 5 particularly for shorter observations such as Rapid Static. Try to avoid periods of high PDOP when planning observations.

Satellites should be above 20 degrees if possible.

4.3 Connection to Existing Control

Connections must be made to control of the same order or higher. The recommendations for connecting to existing control to achieve the appropriate level of accuracy are:

To Achieve	PRIMARY	SECONDARY	TERTIARY
Minimum	3	2	2
Recommended	4 or more	3 or more	2

4.4 Independent Observations

Each point must have a minimum of two independent observations to ensure true redundancy. To achieve higher than third order results, more independent observations are required as follows. Each independent observation must be a different setup with different antenna heights, unless using a fixed height range pole or similar device. When using Rapid Static Reference/Rover observation techniques, only one reference station should be occupied at any one time. Occupying two reference stations at the same time does not provide an independent observation and this practice must not be used. Independent observations may be on the same day, but should be at quite different times to ensure different satellite geometry.

To Achieve	PRIMARY	SECONDARY	TERTIARY
Minimum	3	2	2
Recommended	4 or more	3 or more	2

4.5 Network Observation Techniques

4.5.1 Second Order

For second order observations it is recommended that the network is observed such that, depending upon the number of receivers available, a series of interconnecting triangles or quadrilaterals is created. All adjacent points should be directly connected. It is suggested that consideration be given to observing some baselines more than once to increase the level of redundancy.

Second order observations will be by rapid static or static techniques depending upon the baseline length. It is generally suggested that second order observations should be a minimum of 30 minutes.

4.5.2 Third Order

For third order GPS control the recommended observing technique is the Rapid Static Reference/Rover method. The reference stations should be second order control points. Using this technique, the required accuracies can be achieved with the minimum observation times.

One of the advantages of this technique is that many third order control points will have less than optimal satellite visibility. Provided that the second order stations that are to be used as reference stations are completely clear of obstructions quite acceptable results can be achieved. In this way the operators at the rover station can be confident that all the data they collect will be common with data from the reference station and can make a well informed judgement as to when they have sufficient data.

If observing between two stations with different obstructions it is very difficult to determine when enough data has been collected, even with good communications between parties. The result will often be that the baseline between two such stations cannot be satisfactorily reduced.

4.6 General

Ensure that each team is using a compatible Configuration Set for the observation. In particular the Observation Rates must be identical. For most observations it will be 15 sec as defined in the LAMP Configuration Sets.

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GPS Field Sheet – Reference & Static Control

Province:		Leica SR 520 Receiver S/N:	
Municipality:		Leica AT502 Antenna S/N:	
Operator:		Antenna Setup: Tripod	
Date:	Day No:	PC-card:	
Job:	Config Set:	Free Memory:	

	OBSERVATION 1	OBSERVATION 2	OBSERVATION 3
Point Number			
Scheduled Start Time			
Scheduled Stop Time			
Actual Start Time			
Actual Stop Time			
Antenna Ht. Start	Checked:	Checked:	Checked:
Antenna Ht. Stop	Checked:	Checked:	Checked:

	OBSERVATION 4	OBSERVATION 5	OBSERVATION 6
Point Number			
Scheduled Start Time			
Scheduled Stop Time			
Actual Start Time			
Actual Stop Time			
Antenna Ht. Start	Checked:	Checked:	Checked:
Antenna Ht. Stop	Checked:	Checked:	Checked:

Antenna heights are to be independently checked at the start and end of the observation at each setup.
 If occupying the same point in consecutive observations, reset antenna at a different height.
 Detail obstructions, large structures, power lines, radio transmitters and any problems overleaf.
 Note any periods of high GDOP.

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GPS Field Sheet – Rapid Static Rover

Province:		Leica SR 520 Receiver S/N:	
Municipality:		Leica AT502 Antenna S/N:	
Operator:		Antenna Setup:	Range Pole / Tripod **
Date:	Day No:	PC-card:	Free Memory:
Job:	Config Set:		Ref. Stn.:

Pt ID	Ant. Ht.	Start	Stop	Comments (No of SVs, GDOP, obstructions, breaks)
1b				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				

** Delete as appropriate. For Rapid Static Roving a Range Pole and bipod will usually be used.

Add comments and sketches overleaf.

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GPS Equipment

GPS Receiver, antenna and ancillary equipment in box

Tripod & bag

Plumbing pole, bipod & bag

Spare batteries

Spare cables (antenna & power)

Target carrier

GPS backpack

Two way radio

Bolo

First Aid Kit

Hammer (large)

Shovel

Traffic Cones (6)

Sand bags (2)

Temporary Marks

Paint

Brushes

Tarpaulin

Umbrella (surveyor's)

Equipment Box with the following items;

 Magnetic Compass (surveyor's)

 Clinometer

 Flashlight

 Chisel

 30m Tape Measure

 5m Tape Measure

 Plumb bob

 Pliers

 Screwdriver Philips Head large

 Screwdriver Philips Head small

 Screwdriver large

 Screwdriver small

 Wire ties

 Electrical Tape

 Plastic marking tape

Personal protective clothing (each person to have)

 Safety jacket

 Rubber boots

 Raincoat

 Skull guard

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Team Leader's Field Bag

Each team leader to be equipped with a strong water proof bag with the following items:

Folder or clipboard

Waterproof Pens (black & red

Pencils

Ruler

Drawing template

Paper

Note book

Field sheets

Envelopes

Fluorescent pens (for GPS teams) (various colours)