2018 年测量技术国际竞赛技术标准

Guidebook for 2018' International Competition of Surveying Skills for Polytechnic Schools & Colleges

Rules & Regulations

Ⅰ Aim

This competition is

1. to establish a platform for exchanging achievements and experiences of surveying technology teaching between polytechnic shcools and colleges, to broaden their horizons, and to understand their educational level in the field of surveying and mapping.

2. to test the students' practical ability and basic knowledge, and to develop the students' practical ability in surveying and mapping data collection and data processing.

Ⅱ Content & Time

1. This competition is composed of "2" Degree Leveling" and "Total Station Lofting", including both field observing and indoor calculating. Grading is executed on the basis of time used and result. For more details please refer to Table 1.

Content		Time (Min)	Percentage
2" Degree Leveling	Time	40	40
	Result		60
Total Station Lofting	Time	60	40
	Result		60

*Reminder: Teams shall be stopped working in case of exceeding maximum time limit.

Table 1 Content, Time & Percentage of Scores

Ⅲ Methods

1. The assessment shall take the form of operational assessment. Teams shall complete their assigned task within the time given and submit their results.

2. This event is a team competition. Each country will send one team to participate in the competition. Each team will be made up of two contestants.

3. During the competition, the routes, venues, test questions and the known data will be determined by random drawing of lots, the details of which are as follows:

(1)The competition route of the Degree 2 level surveing is composed of the known points and the waiting points obtained by the teams drawing lots on the spot.

(2)Total station lofting item test questions and test sites are determined by teams drawing lots on the spot, and the common orientation points and inspection points are provided in the competition field.

Ⅳ Test Paper

1. Questions and Requirements for Degree 2 Level Surveying

As is shown in Fig. 1, the closed leveling path consists of 2 segments , one known point and one unfixed point. Teams draw lots on the spot to form a leveling line, and each team completes a test section when observing.

The elevation of point A is 21.836m. Please survey the elevation difference of two sections and calculate the elevation of point B.

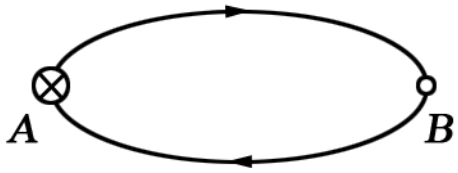

Figure 1

A. Observation and calculation requirements

(1).The contestants use the equipment specified by the competition committee. Sight length of the station, the difference of the visual distance between the front and the back and its accumulative total, the elevation of the line of sight and the number of repeated surveys of the digital level are specified in Table 2.

Distance of sight /m	**Front sight - back sight** distance difference /m	Cumulative difference of front and back sight distance /m	**Height of sighting line** /m	**Difference in height between 2 readings /mm**	**closing error /mm**
⩾3 and 50	**⩽1.5**	**⩽6.0**	**⩾0.55 And 1.85**	**⩽0.6**	**⩽4mm**

Table 2 Requirements for 2" Degree Leveling (Leveling Rod 2 m)

(2).Team information should only be provided in the position specified on the cover of the contest results, and no information unrelated to the contest survey data can be filled in any position within the results.

(3).The contestants use 3kg rod pads. Not using Poles is permitted.

(4).During the competition, contestants shall not run with equipment or rods.

(5).The competition records and calculations shall be in accordance with the Degree 2 Leveling Records and Calculation Results provided by the executive committee. All records and calculations are completed in pencil. Examples of record formats are shown in table 3.

surveying station No.	back sight distance / distance of sight	front sight distance / Cumulative difference of front and back sight distance	direction and rod No.	rod reading: first reading	rod reading: second reading	difference btween two readings	remark
1	31.5	31.6	back A1	15397	15396	+1	
			front	13927	13926	+1	
	-0.1	-0.1	back -front	+1470	+1470	0	
			h	+0.1470			
2	36.9	37.2	back	137 40	13741 ~~13735~~	-1	mitake
			front	114	11440	+1	
	-0.3	-0.4	back -front	+22	+2301	-2	
			h	+0.2300			
3	41.5	41.4	back	113	14391	+1	
			front	109	13926	+1	
	+0.1	-0.3	back -front	+	+ 465	0	
			h	+0.0465			
4	~~23.5~~	24.4	Back B1	135	13532	-1	ultralimit
			front	134	13451	+11	
	-0.9	-1.2	back -front	+	+ 81	-12	
			h				
4	23.4	24.5	back B1	138	13832	-1	resurvey
			front	137	13761	+1	

	-1.1	-1.4	back -front	+69	+ 71	-2	
			h	+0.0070			

Table 3 An Example of Degree 2 Leveling Surveying Manual

Recording requirements: the figures and texts recorded during the observation shall be clear, neat and in the order of surveying records. Do not leave empty column; Do not copy the results; Do not alter on the word; Do not use an eraser.

(6).The order of observing leveling rod for odd stations is: back-front-front-back; for even-numbered stations the order is: front-back-back-front.

(7).There is no limit on the difference between two readings of the same rod, but the difference of the elevation difference surveyed by the two readings shall meet the requirements of Table 2.

(8).The wrong numbers and characters recorded during the observation shall be marked with a single horizontal line in the middle, with the correct numbers and characters written on the top of them. The reasons such as "Remeasuring Error" or "Recording Error" shall be indicated in the preparation column. The reason of calculation error need not be indicated.

(9).If the observation error is beyond the limit, contestants can resurvey immediately on condition that the height of the instrument must be changed for the resurveying. If the error is found after the station has been relocated, contestants should return to the starting point for resurveying. The results of "exceeding the limits" shall be marked with a single horizontal line in the middle in the preparation column, with "exceeding the limits" and "resurveying" respectively indicated in the preparation column.

(10).When the scale pads are moved or flipped for whatever reasons, contestants should go back to the starting point to survey again.

(11).During the course of moving apparatus to the next spot, observers must hold the level with their hands instead of putting it on the shoulder.

Observation records and calculations must be done independently by the observer without the use of calculators.

(12).The recording and calculation of one spot must be completed before competitors move to the next spot.

(13).Calculation of tolerance allocation of elevation must be done on the spot.

(14).When the competition ends and competing teams submit their results, the

scaffold shall be put in place to end the timing.

(15).Starting from when the apparatus is taken, the qualification to compete is lost in the case of the apparatus or scales being dropped to the ground.

(16).The calculation of elevation follows the trade-off principle of surveying. The measurement of lengths is 0.1m; that of height differences and adjustments is 0.0001m; that of elevations is 0.001m. The format of calculation is Table 5. In the form, error of closure and its allowable values must be listed.

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B. End Results Submitted

After finishing the out-house observation, each team shall fulfill on the spot the calculation of tolerance allocation of elevation and complete the form of achievements of elevations. The material to be submitted is: archives of achievements in secondary level surveying competition.

<table>
<tr><th>Points</th><th>Distance of Route (m)</th><th>Height Difference Surveyed (m)</th><th>Readings Adjusted (m)</th><th>Height Difference Adjusted (m)</th><th>Elevation (m)</th></tr>
<tr><td>A</td><td rowspan="2">82.1</td><td rowspan="2">0.1246</td><td rowspan="2">+0.0003</td><td rowspan="2">0.1249</td><td>21.836</td></tr>
<tr><td rowspan="2">B</td><td rowspan="3">21.961</td></tr>
<tr><td rowspan="2">82.4</td><td rowspan="2">-0.1252</td><td rowspan="2">+0.0003</td><td rowspan="2">-0.1249</td></tr>
<tr><td>A</td><td>21.836</td></tr>
<tr><td>∑</td><td>162.5</td><td>-0.0006</td><td>+0.0006</td><td></td><td></td></tr>
</table>

W=-0.6mm $W_{允}$ =±4mm

Table 4 Tolerance Allocation of Elevation

*Reminder: In the Chart of Calculation of Elevations, figures and words must be clear and tidy; the use of rubber is allowed, but clarity and tidiness, without visible alterations, must be maintained.

2. Test Papers and requirements for Lofting by Electronic Total Station

Coordinates of surveying station O, back surveying spot A and examination spot B

are provided, contestants are required to give coordinates of layout points for K1 and K2. Points are laid out according to Figure 2.

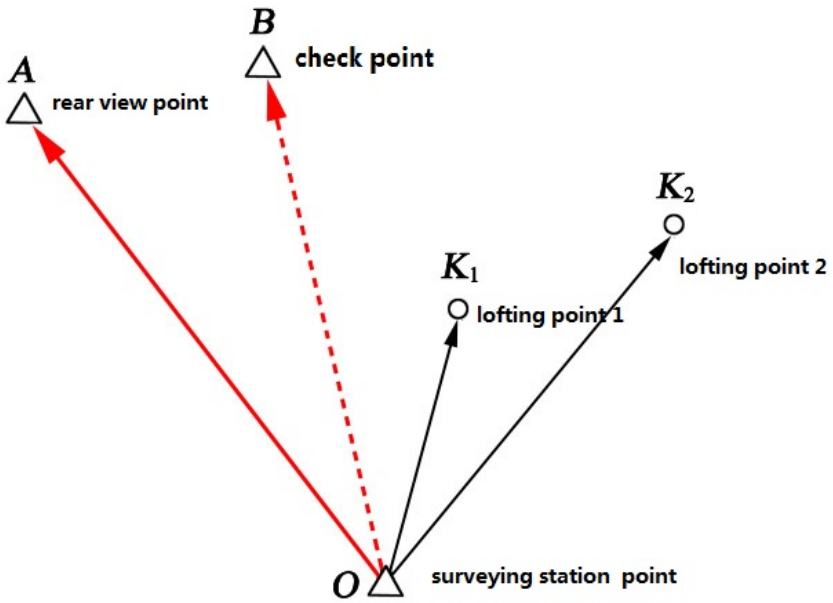

Figure 2

(1). Pre-competition Preparation

The competition committee provides multiple sets of data for the participating teams to draw lots on the spot. Each team is provided with 1 coordinate of survey station and 2 lofting coordinates. 2 known points are shared by all teams to make directional points and checkpoints.

According to the result of the drawing of lots, the shared directional points and the checkpoints, each team is required to complete the task within 60 minutes by using 2 designated lofting points set by total station.

① 2 contestants complete the same lofting job without taking turn.

② Each team is only allowed to use the tripod (including a base) and a centering rod provided by the Competition Committee to conduct lofting assisted by the total survey station.

(2) Steps of Procedure:

① Place a total station at the survey station, select lofting to set up the survey station. Focus on the back point to determine the direction of the coordinates. Focus on the checkup point to check the coordinates.

② Enter the coordinates of K1 and K2, loft the positions of K1 and K2 on the spot, and mark them on the ground.

③ Each team signals the referees to check the results and terminate the timing after the operation is completed.

④ Each team is allowed to place a small prism on the point to be checked on the ground and is held responsible for the errors caused by waiting for inspection.

⑤ The teams retrieve the tripods after the referees finish their inspection and the competition ends.

Ⅴ Competition Rules

1. Contestants shall present their registration pass before the competition.

2. Teams shall arrive at the checkup point 30 minutes before the checkup. Draw lots at the contest venue. Any one who fails to do this is denied from the competition.

3. Contestants will be guided by the staff and get familiar with the venue within the stipulated time. Get prepared for the competition in the meantime.

4. Contestants will not be allowed to use any communication device during the competition.

5. Equipment shall be packed before the competition. The tripods shall be collected and put on the ground.

6. Along with the announcement of start-off by the referee, the timing of the competition shall begin. The timing is accurate to the second.

7. During the competition, in case of any malfunctioning of the equipment, the team can request an examination by engineers of the equipment manufacturers. Once confirmed, and the equipment can be replaced for resurveying with the approval of the head judge in charge. If the equipment proves normal, the time used shall be included into the competition.

If no request is raised for any malfunctioning of the equipment during the competition, no resurveying shall be allowed. Any resurveying due to non-equipment failure shall not be counted into the retiming.

8. At the end of the competition, upon fulfillment their tasks, each team shall get the equipment packed, the tripods collected and the outcome submitted. Timing is then finished.

9. The outcome, once submitted, shall not be requested for revision or resurveying.

10. During the competition, contestants shall abide strictly by the rules of operation, ensure personal safety and that of the equipment, and moreover follow the supervision and warning of the referees.

In case of any damage to the equipment caused by the contestants that leads to any discontinuance of the competition, the team involved shall be stopped and pay for the damage incurred.

11. Contestants shall respect the referees and obey the instructions of the judges. Teams who have objections to referee(s) can lodge an arbitration with the arbitration team of the organizing committee within the time required.

Ⅵ Technical Platform

1. Equipment Used

All the equipment and their spare parts shall be provided by the organizing committee.

(1) Equipment for 2" Degree Leveling

DL-2007 electronic leveling instrument： including 1 wooden tripod, a pair of 2m digital rods, 2 support racks and 2 rod bases (3kg).

(2) Equipment for Lofting Measurement by Electronic Total Station

2″degree total station (South NTS-342R6A) and 2 auxiliary large lenses (including base), 1 central rod, 1 small lens, 3 tripods and 1 2m steel rod.

2. Technical Standard

(1) "National Regulations for 1″, 2″ Degree Leveling", PR China GB/T12897—2006.

(2) Any content not in conformity with the above standards shall abide by the technical regulations of the competition.

Ⅶ Outcome Assessment

1. Scoring Time Consumption

The speed S_i is scored according to the formula below:

$$S_i = (1 - \frac{T_i - T_1}{T_n - T_1} \times 40\%) \times 40$$

Wherein： T_1 refers to the minimum time consumed for the competition.

T_n refers to the maximum time consumed by teams not exceeding the longest time prescribed.

T_i refers to time actually consumed.

2. Scoring Outcome Quality

(1) Outcome quality assessment of 2” Degree Leveling

Outcome quality can be classified in terms of quality observed and outcome accuracy as Qualified Outcome and 2nd Rate Outcome.

① 2nd Rate Outcome

2nd Rate Outcome includes any of the following: eraser wiping in the original records of observation, non-even number of survey station in any survey segment, limit exceeded in terms of the length or elevation of sight, or the difference between back sight and foresight distance and their accumulative difference, or the difference between two readings of elevation difference, as well as consecutive alteration of original records. Any outcome with one of the defects mentioned above shall be classified as 2nd rate. Fifteen points shall be deducted for each 2nd rate outcome.

② Scoring observation and recording

***a*. Surveying process (30 points)**

Evaluation items	Evaluation standards	Points deducted
Running with instrument or surveying rod	One point shall be deducted for each running step when warning does not work.	
Inappropriate transit of instrument when moving to another survey station	One point shall be deducted for each violation of rules.	
Calculator is not allowed for calculating at survey station.	Two points shall be deducted for each violation, and disqualified for multiple violations.	
Survey of elevation difference	Five points shall be deducted for each missed reading of back sight or foresight elevation difference.	
Survey of sight distance	Two points shall be deducted for each missed or intentional wrong reading.	
Moving to another survey station before calculation is finished.	Two points shall be deducted for each violation.	
The stipulated survey route is not followed.	Five points shall be deducted for each deviation of instrument or surveying rod from the stipulated route.	
Transcribing of records	Two points shall be deducted for each violation.	
Using communication tools as phone and walkie-talkie	Two points shall be deducted for each violation.	
Deliberately interfering with the work of other participants	Ten points shall be deducted if resurveying is needed.	
Instrument	Leveling rod falls to the ground.	In accordance with the scoring of 2nd rate outcome.
Total points deducted		

Other violation records		

*Note: violation records include the use of eraser and other violations that are not listed in the table.

***b*. Outcome Assessment**

Items		Criteria	Deduction
Observation and Calculation 40points	Only even number survey stations in each section to be observed	For odd number survey stations	Second type
	Tolerance of station	Overrun in sight length, sight height, front and back sight distance difference and its accumulated result, height difference, etc	Second type
	Observation recording	Serial alteration	Second type
	Handbook recording	Words or symbols unrelated to the observation data, or rubber erasures of the observation data in the handbook	Second type
	Manual record blanks	2 points off for each blank	
	Manual calculation	1 point off for each omission or mistake	
	Recording standards	1 point off for illegible handwriting or .each word change	
	Non-Single-line alterations in manual records	1 point off for each error, until the last point available.	
	More than one alteration on a single datum	1 point off for each error, until the last point available.	
	No remarks for manual alterations	0.5 point off for each error, until the last point available.	
	Alteration percentage for a whole survey station	5 points off when alterations exceeding 1/3 of the total valid records.	
	Readjusting transformable instrument height	3 points off for each violation.	
Outcome calculation 30 points	Calculating location	1 point off for each violation, until the last point available.	
	Closing errors	Over tolerance	Second type
	Checking target elevation points	standard tolerance being ±4mm, 2 points off for each exceeding ±1mm	
	Table neatness	0.5 point off for each unnormal stain.	

Total deductions		**Total score**	

(2) Outcome assessment standard in total station instrument lofting

Two instruments are set exclusively to check the lofting accuracy for each team over competition. Their coordinates of measurement lofting take the median, namely the lofting results of all teams. The coordinates of measurement lofting against the standard values create different scores:

①Full score(60 points) for errors within1cm between two lofting spots .

② For errors between 1cm and 3 cm, 1 point off for each exceeding 2cm.

③ For errors between 3cm and 5cm, 1 point off for each exceeding 1cm.

④30 points is the maximum of deduction.

⑤ 30 points off for disobeying the judge for lofting check-up.

Deduction Sheet of Outcome Assessment in Total Station Instrument Lofting

enrolling	errors	Score deduction			total
		1～3cm	3～5cm	>5cm	
K1					
K2					
total					

Deduction Sheet of Outcome Quality Assessment with Electronic Total Station

3. Method of Scoring

(1) The competition uses a percentage grading system. Scores shall be calculated with respect to the speed of work and the quality of the outcome. The full mark for the quality shall be up to 60 points, based on the scoring criteria; the full mark for the speed shall be 40 points, based on the time consumed. The winning teams will be determined by the sum of the points they score in all two individual aspects.

(2) The total score for the team shall be added and summed up according to the two sub-competitions, in which the values for “2" Degree Leveling Surveying” and “Lofting by Electronic Total Station” shall be respectively 0.4 and 0.6, i.e.

Group Total Score= Score for 2" Degree Leveling Surveying×0.4 + Score for Lofting by Electronic Total Station×0.6

VIII Award

1. Proportion of Awards

The First, Second and Third prizes for team events and two awards for individual events will be given out during this competition. The participating teams will be awarded by the team without individual awards. The proportion of the First, Second and Third prizes is 20%, 30%, and 50% respectively of the number of each team participating in individual events.

2. Excellent Guide Teacher Award

The guiding teachers in the participating team who won the first prize in each individual event will be awarded as Excellent Guide Teacher. The executive committee will report to the competition committee to issue the certificates.

IX Complaints and Arbitration

In the course of this competition, if there is any injustice or misconduct of relevant personnel, the leader of each team may lodge an appeal to the arbitration team within 2 hours after the competition. The arbitration working group shall organize a review within 2 hours after receiving the appeal, and send a timely feedback. The rulings by the arbitration committee shall be final and binding.

The Organizing Committee of 2018' International Competition of
Surveying Skills for Vocational Schools & Colleges
Guangdong Polytechnic College of Industry and Commerce
July 28, 2018

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Undertaken by: Guangdong Polytechnic College of Industry and Commerce

Co-organized by: China Non-ferrous Metal Mining (Group) Co., Ltd, Non-ferrous Metals Industry Vocational Skill Appraisal Guidance Center，National Non-ferrous Metals Industry Profession Education Teaching Steering Committe