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"Chain of events"

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The Society publishes a wide range of books and booklets on historic OS map series and its journal, *Sheetlines*, is recognised internationally for its specialist articles on Ordnance Survey-related topics.

Chain of events

John Cole [1]

When I joined Ordnance Survey in 1952 a popular perception was that at least part of the work involved endless sunny days perched on top of a Scottish or Welsh mountain peering through the eyepiece of a theodolite. Dragging a chain or tape measure amidst the slag heaps of an unspeakable industrial landscape or along bleak streets of seemingly endless terraced houses did not enter the mind. Nevertheless, apart from a minority who entered triangulation, traverse, levelling or even archaeological survey – or undertook the multitudinous office tasks at Southampton, Chessington or Esher – field survey training meant a stiff dose of chain survey and large-scale map completion.

Joining three months before such a course commenced, I spent the time gaining some insight into the goings on at Bristol Division Office, employed, along with five other lads, on wielding a drawing pen, presumably to see if there were any budding draughtsmen amongst us. I was the least likely to impress in that direction, but in the event all six of us were sent for field survey training.

At that time, chain survey was known as 'detail survey' and, with air survey still in its OS infancy, chaining was the method used for the bulk of town and city work then underway. Training in the method necessitated long suffering Southampton residents being subjected to gangs of (mainly) callow youths plaguing them to 'measure in the garden' or inconveniencing them on the pavement or road whilst chaining operations were in progress.[2]

In the main, two blocks of work were tackled at Southampton – in my case the first at West End, the second at Midanbury. The hope obviously was that, by the time of the second block, trainees would be much more into the swing of things and would have learned from the mistakes which were bound to occur. Many of these came to light when the chain survey work was completed on the actual map – in my own case there was a quite terrible plotting error from the chain survey book.

On completion of training few, if any, actually commenced chain survey work, it being deemed that a good deal of map completion experience was first needed. I was able to testify to the wisdom of this after I had completed National Service and returned to Southampton for a refresher course. Although by then (1956) tachy and air machine plotted surveys were also underway, chain was still very much in vogue and once again two blocks, at Chandlers Ford and Shirley High Street, were to be surveyed. However it soon became clear to the instructor that I and two colleagues (also ex-National Service) knew exactly what was expected as a result of our first block efforts and he left us to our own devices in order to help a hard-pressed fellow instructor with half a dozen brand newcomers.

Posted back to West Bromwich in 1957, I was a little taken aback when the Chief Surveyor asked, "Why don't you want to do some chain survey?" I said that I must have been mis-heard as I was exceptionally keen to experience the method which had fascinated me from the moment I joined. In 1:1250 resurvey sections at that time, the lowest surveying grade, four, was in fact divided. The best and most experienced, apart from completing the most difficult maps, also helped out the section supervisor with the validation of completed

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[1] This account of the author's own experiences of chain survey follows on from the article by G Foster in *Sheetlines 83*.

[2] Up to the 1950s such training had not been concentrated at Southampton. There had been 'schools' at Coventry, Catford (London), Bristol and Dalkeith (near Edinburgh).

work. The next best did the chaining, whilst the third category, including all those fresh from training, carried out examination or map completion. Since this completion depended considerably on the calibre of the chain work framework, the importance of this stage could not be overemphasised.

In the event I was lucky, as the nine chain books I was responsible for turned out to be the last in the Black Country before the method switched to tachy survey. Indeed I had gone on an early experimental course for tachy at Wolverhampton the same year. The remaining area for chaining, to the north of West Bromwich, was quite un-typical of the Black Country in that a large percentage was rural.

A canvas bag contained the equipment for the operation.[3] The accompanying documents were the 'Field Content Book' (OS 023), and one or more 'Revision Point Albums' containing the photos needed to identify RPs. Oh, and perhaps most important of all was the field assistant (or labourer: though the more exact term, as it appeared in the book, was 'chainman'). The disposition and skill of the chainman could do a lot for the efficiency of the operation and unfortunately the best examples were more likely to be found in areas of high unemployment.[4]

The field content book contained an irregularly shaped extract from the latest county series 1:2500 map, the area usually bounded by roads, railways or major geographical features. It would be divided into blocks to enable the chain lines run to be entered diagrammatically onto form OS 245, which eventually was sent to the line plotters at Regional Office. There were two pages at the front of the book for records and index, and another two at the rear for statistics, such as how much work was done each day, and a more sinister and complex page detailing the eventual calibre of the work regarding speed and accuracy. Even so it did not fully expose the value or shortcomings of the survey, which could only be found on the finished plot. Finally at the rear of the book was a 31-item reminder.

Thus armed, the surveyor set forth to identify the RPs he would be using and also to reconnoitre the chain lines which had been recommended by the section supervisor (shown in pencil on the 1:2500 map section). The ideal, and speediest, lines would be those along the face of long straight walls or housing blocks fronting right onto the street, booking the measurement at every property junction. Failing this the line would be as close to detail as possible and various points offset – that is, measurements were taken at right angles to the point of detail from the chain line. The lengths of offsets were limited to eight metres to points of detail but up to twelve to supply a curving feature.

No fewer than 35 pages of the Biscuit Book[5] are devoted to the actual chain survey, so only a few of the more important aspects are mentioned here. Ensuring that the line was indeed straight was of the utmost importance. Otherwise detail surveyed from it would be unreliable and further chain lines run from it might fail to plot. Therefore lines exceeding two hundred metres in length had to be 'traced'. If several vertical objects, e.g. telegraph posts or lampposts, could be lined up so much the better. Failing this, various alignment marks could be made on the ground using the assistant and offset staff. If the surveyor could not see the exact spot where the line would terminate he would look for a good 'forward object' to site onto. Similarly the assistant was expected to site a back object as a further check. Lines that

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[3] This was described by Mr Foster, *Sheetlines 83*, 36.

[4] Eric Weight notes that in the late 1940s, in Catford (where Eric started work), the Chief Surveyor would only recruit chainmen from the ranks of retired police officers from the local station. The fact that they knew the district, as well as much of the local population, very much contributed to the efficiency of the work.

[5] *Instructions for detail survey*, 1948.

exceeded three hundred metres (or of lesser length if broken or undulating ground intervened) had to be traced using a small line-tracing instrument (or a transit theodolite). Should very steep slopes be encountered, an Abney level would be superior to the normal pocket level as the bubble in the former could be tilted up to 60° to the line of sight. And if a straight line was not possible, e.g. in a factory complex, traversing would be resorted to (within limits) and angles measured using a theodolite or even (and more commonly) a simplistic former 'artillery director'. A forward and back reading would be taken at each turn of the traverse and recorded on form OS 05. Angular and distance misclosures would be allowable up to certain limits. Chain lines themselves would run from RP to RP or more normally to and from usually short lines joining pairs of RPs.

The revision points would have been instrumentally slotted onto either the unwieldy forty centimetre enamel coated zinc plates or the anodised (later enamel coated) butt joint plates. These would be in the regional office awaiting the arrival of the OS 245s showing the chain lines and traverses surveyed. The line plotter would accept (again within limits) and plot these, or reject and return to the surveyor with a hint as to the possible cause of error. A large error was usually easy to spot: a small one often quite difficult. Should the line still not be plottable the section supervisor might have to investigate and I can recall a very extreme case (in the last days of chaining) where a tacheometer was eventually used along a very difficult line to try to pinpoint an error.

Reference points or 'pickets' along the chain line – usually acting as jump off points for other chain lines – explain the remaining contents of the canvas bag. A chisel cut in the form of a 10×10×5 centimetre triangle could be used on a road or sidewalk. More popular was a nail driven through a washer (not a nail on its own which could be confused with a traverse station for minor control). Sometimes even a wax crayon triangle was employed, though the crayon's main use was to unobtrusively mark RPs when identified. On soft ground, wooden pegs were driven in, not to show more than half an inch above surface, or a triangle was cut into turf. The main use for the steel tape was to measure between RPs away from main roads, usually house corners inside gardens, where chain use would have been impracticable.

I commenced work with a great deal of enthusiasm: a bit too much as it turned out, resulting in the following curious incident. The first book contained a section of railway line in a cutting, and on the diagram two pencil lines had been drawn across the line, which, I thought, gave me the opportunity right away to use the Abney level. Sadly, on completion, both lines were rejected for small errors, and even more sadly failed a second time. The section supervisor was none too pleased, not so much at my making mistakes but at my slavishly running the lines at all, which he claimed were not necessary! It involved him in an altercation with a person of similar grade to himself who had recommended the lines and who rather sheepishly told me later that I had to use my own judgement in such matters.

The next book of significance was number five, which included a very awkward river. Several pages became covered in mud in the course of surveying this. Also, at a road bridge, I and my assistant were witnesses to an accident involving two cars and a lorry. No one was seriously hurt but we had to help alleviate traffic chaos until police arrived. Perhaps as a result of problems such as this I was later reproached for slow work. Never a fast worker it was the one and only occasion I attracted such a deserved reprimand.

The last two books were in terrain more representative of the area, involving canals (in use and derelict) several small industrial and chemical works, including one where I spoilt a pair of good trousers, and also derelict land that had been the scene of bygone industry. It

was also the first time I had seen canal dredging in process – first out was a dead cat – and I never ceased to wonder at seeing local youths swimming in Midland canals.

I had the same assistant throughout the nine-month stint and he proved reliable and amiable enough, provided he could have his lunchtime beer. He was not the smartest dresser though, as mentioned, good clothes were not always a good idea, but one amusing incident sticks in my mind. I was observing the angles of a traverse and he was at the end of the 'leg' to be measured, looking a bit morose (rarely did he look happy anyway). I then saw a boy scout approach him and engage in conversation. After he had left I found my assistant looking a bit perplexed. Doubtless due to his scruffy overcoat tied with string round the middle, coupled with his expression, the scout had thought he was 'down on his luck' and had offered him a shilling!

It was possible for me to complete one 1:1250 map arising from my own chain survey. The northern edge of this map marked the boundary between chain and later tachy and I completed a small triangle of land including a few houses extending over the map edge. The tachy surveyor later picked up some of this detail and there was a flurry of alarm when a discrepancy of about 0.3 metres between the two forms of survey was noted. Also surveyed was the frontage of one of the houses some distance from the road detail, agreeing exactly with the graphically surveyed position – a fact which I was at a loss to explain as it had been surveyed from the surrounding chain survey! There was further anxiety in that the Regional Officer, who was visiting, wanted to look at the maps of the area but to everyone's relief (especially mine) he said that two forms of survey, especially if one was more sophisticated than the other, would never quite agree and should not really have been merged. He was also highly amused when the 'accurate' house was pointed out.

As far as I can establish, chain survey as a dedicated task came to a conclusion in 1960,[6] but it certainly was not the end of the method. I still have an FCB, now called a 'chain survey book' and numbered OS 274, containing various supplementary surveys at both 1:1250 and 1:2500. The first was at St Austell, where the air machine plotter could only supply a pencil outline in the narrow streets of the old town centre. Simply fitting in under the perceived eaves was not altogether satisfactory in this case and it was simpler to run chain lines (about 300 metres worth) between positively identified points (penned in red) and offset the frontages. Needless to say this was done very early in the day before traffic and pedestrians were about in quantity.

Chain survey totalling 1600 metres was next carried out for a small regularly shaped estate on the continuous revision document for Bodmin. This was at 1:2500 scale, using for control points old detail of reliability proved by an air photograph of some years earlier.

The third exercise was again at 1:1250, at Brixham in Devon, and involved the rural area to the west of the town. In the first sector it had been possible to use 1950s 1:2500 resurvey chain books to survey badly overgrown hedges, but in addition two traverses were run (between RPs and tachy points) to survey detail in a wood. In the other area, in spite of additional tachy, about 80% of a map consisting of field boundaries and streams needed about 15,000 metres of chainage and over 300 offsets.

All of the above was properly booked but a considerable amount of additional chainage, particularly on the 1:2500 map, was simply booked in a notebook. Even on 1:1250 work, today's RTK or GPS-aided surveyor may still occasionally resort to the odd chain line with offsets.

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[6] *Sheetlines 68*, 48.