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CHAPTER TWENTY-TWO

GENERAL SURVEY PROCEDURES

The intent of Part III is to follow the rules and procedures concerning a route survey as defined in 865 IAC. If INDOT rules and procedures are determined to be less stringent than those shown in 865 IAC, 865 IAC will govern.

22-1.0 ENGINEER'S REPORT

The Engineer's Report provides a project number, a designation number, and, if for a bridge project, a new structure number. The report will be for one of the types of projects such as follows:

1. bridge replacement;
2. bridge rehabilitation and repair;
3. small structure replacement;
4. intersection improvement;
5. road rehabilitation and repair;
6. added travel lanes; or
7. a new-centerline route.

The Engineer's Report also establishes the project's survey limits and incorporates incidental construction and right of way, temporary or otherwise, that is required.

Once the Engineer's Report is received by the Production Management Division's Survey Team, a survey then may be initiated. A major objective of the survey is to establish a baseline that complements the survey limits documented in the Engineer's Report. If right of way is required, section corners must be located during the survey.

22-2.0 PRELIMINARY RESEARCH

22-2.01 Research Requirements

The items to be researched by the Production Management Division's Location Survey Team, , or a consultant, and furnished to the field-survey party prior to initiating the survey is as follows:

1. USGS quadrangle maps which encompass the project, ensuring that adjoining maps are obtained where drainage basins extend beyond the primary maps' edge;

2. benchmark locations, elevations, and base datum (NGS 1988 NAVD required if within 5 km of the project limits);

3. existing road and intersection survey books;

4. existing road plans;

5. bridge survey books of existing structures;

6. layout and general plans of existing structures;

7. railroad plans within the limits of the project;

8. Engineer's Report for the proposed project;

9. painted cross references;

10. available section-corner references;

11. project designation number;

12. project number including the parenthesized character;

13. structure number, if for a bridge project; and

14. line designation letters.

These items should be packaged so that an item which was researched but not found is readily identified by the party chief.

22-2.02 Sources of Information

The sources that should be contacted during the research phase of the survey include public offices, private surveyors, or utility companies. The information obtained from these sources will be of value during the development of the survey. Key sources of information are discussed below.

22-2.02(01) County Surveyor's Office

Contact the office for section-corner references that may be required. The county surveyor, by virtue of its position, is on the county's Drainage Board and will have relevant information concerning legal drains within its county. Information that is required for legal drains include the following:

1. cause number;
2. flowline profile;
3. side slopes;
4. bottom width;
5. last year dredged;
6. official drainage area and how it was determined; and
7. information pertinent to tying stationing and level equations to the survey baseline.

22-2.02(02) County Auditor's Office

One of the duties of the county auditor's office is to maintain property plat maps. Contact the office to obtain updated records of property owners who may be affected by the planned project survey. A notice of survey will need to be sent to each of the affected property owners. This information will also be required to prepare section plats and topography notes. The preparation of notice of survey and section plats is discussed in Section 22-3.0 and Section 22-4.0, respectively.

22-2.02(03) County Recorder's Office

The county recorder's office maintains all final subdivisions plats, property surveys, Title 865 surveys, deeds, and easement records. If a survey baseline is in the vicinity of a subdivision or platted town, a copy of the official plat and its description must be obtained, without exception. These plats are necessary to locate relevant property lines and section corners. Deeds for all affected property owners within the survey area must be obtained and packaged with the completed survey.

22-2.02(04) Private Surveyors

Private surveyors are familiar with the section corners, property deeds, and peculiarities particular to their locale.

22-2.02(05) Utility Companies

A critical part of the survey is the accurate location of the underground utilities that will be affected by the project. This requires that each local utility company be notified before the project survey is initiated. To facilitate this task, the utility companies have established the two toll-free telephone numbers as follows:

1. 800-382-5544 for calls originating within Indiana, and
2. 800-428-5200 for calls originating outside Indiana.

Do not attempt to contact individual utility companies unless they are not listed by Underground Indiana. A utility company will not respond to a utility location request unless it is placed through one of these numbers, and it is best to give as much advance notice as practical. Once the call is placed, the caller should be prepared to provide the information as follows:

1. county name;
2. civil township;
3. section, congressional township, and range;
4. address or location;
5. type of work;
6. extent of work;
7. name of caller;
8. title of caller;
9. telephone number;
10. best time to call;
11. start date;
12. start time;
13. contractor;
14. surveyor or engineer's telephone number; and
15. contracting engineer's or surveyor's address.

During the conversation, the person contacted will inform the caller of the companies that will be notified. This information should be compiled for placement in the field book. The person contacted will also issue a reference telephone number that should be retained if future discussions are needed or if a problem arises (e.g., schedule conflict, utility company fails to locate lines). The person contacted will ensure that all relevant utility companies are notified of the planned project survey. Each notified company then will schedule its own field crew to locate underground utility lines and appurtenances. Afterward, the locations of all affected utilities should be incorporated into the field survey book.

22-2.02(06) Research and Documents Library Team

Because the survey will most likely involve an existing State-maintained route, the plans and the field books for each affected highway must be obtained. These can be obtained from the Planning Division's Research and Documents Library Team. Department benchmark information can be obtained from the Production Management Division's Location Survey Team. The location of a benchmarks should already be determined from field reconnaissance before contacting the Team for the elevation.

22-2.02(07) National Geodetic Survey

The desired control, both vertical and horizontal, is obtained from NGS. Control that is used should be identified for the datum, e.g., NGVD29, NAVD88, NAD83 (1986). However, the latest datum should be used if possible. The website address is http://www.ngs.noaa.gov.

22-3.0 NOTICE OF SURVEY

22-3.01 Indiana Code Requirements

To comply with Indiana Code IC 8-23-7-26 through 8-23-7-28, it is necessary to mail a survey notice to each affected property owners. Quoted below is Indiana Code 8-23-7-26 through 8-23-7-28 as added by Public Law 18-1990, Sec. 216.

1. Sec. 26. *An authorized employee or representative of the department engaged in a survey or investigation authorized by the commissioner or the commissioner's designee may enter upon, over, or under any land or property within Indiana to conduct the survey or investigation by manual or mechanical means, which include the following: (1) Inspecting, (2) Measuring, (3) Leveling, (4) Boring, (5) Trenching, (6) Sample-taking, (7) Archeological digging, (8) Investigating soil and foundation, (9) Transporting equipment, (10) Any other work necessary to carry out the survey or investigation.*

2. Sec. 27. *Before an authorized employee or representative of the department enters upon, over, or under any land or water under section 26 of this chapter, the occupant of the land or water shall be notified in writing by first class United States mail of the entry not later than five (5) days before the date of entry. The employee or representative of the department shall present written identification or authorization to the occupant of the land or water before entering the land or water.*

3. Sec. 28. *If during an entry under section 26 of this chapter damage occurs to the land or water as a result of the entry or work performed during the entry, the department shall compensate the aggrieved party. If the aggrieved party is not satisfied with the compensation determined by the department, the amount of damages shall be assessed by the*

county agricultural extension educator of the county in which the land or water is located and two (2) disinterested residents of the county, one (1) appointed by the aggrieved party and one (1) appointed by the department. A written report of the assessment of damages shall be mailed to the aggrieved party and the department by first class United States mail. If either the department or the aggrieved party is not satisfied with the assessment of damages, either or both may file a petition, not later than fifteen (15) days after receiving the report, in the circuit or superior court of the county in which the land or water is located.

22-3.02 Preparation of Survey Notice

A notice of survey should be completed as illustrated in Figure 22-3A. An editable version of this form may also be found on the Department's website at www.in.gov/dot/div/contracts/design/dmforms/.

1. Item 1. The name of the person or persons whose name(s) appear on the tax records in the office of assessor or auditor of the county where the project is located. This information should be written near the top-left side of the sheet.

2. Item 2. The Survey Team's telephone number should be located near the top-right side of the sheet. If a consultant is performing the survey, its telephone number should be located here instead of the Survey Team's number. Also, include a fax number as indicated.

3. Item 3. The date of mailing.

4. Item 4. RE: Survey _____. This information must include the project number and a brief project description written in layman's terms.

5. Item 5. The notice should include a complimentary close and the following:

   _____ (name)
   Location Survey Engineer
   or Consultant Project Manager

6. Item 6. The designation number for the project.

The front page of both the white and yellow copies of the form are identical and should be completed with the same information (i.e., a carbon copy). The white copy must be sent by first-class mail to the property owner. The yellow copy is retained for the interviewer.

Prior to entering private property, the occupant first must be interviewed. The back of the form's yellow copy is used to document the interview. The following provides the instructions for

completing the survey interview report as illustrated in Figure 22-3B. An editable version of this form may also be found on the Department's website at www.in.gov/dot/div/contracts/design/dmforms/.

1. Item 1. Enter the designation number.

2. Item 2. Enter the project number.

3. Item 3. Enter the name of the county.

4. Item 4. Enter the route number.

5. Item 5. Enter a brief description of the project location.

6. Item 6. Enter the name of person interviewed, and indicate if this is the property owner, a renter, lessee, or other occupant.

7. Item 7. Enter the date on which the interview took place.

8. Item 8. Enter the name of the survey-party interviewer.

9. Item 9. Indicate if the occupant received the Notice of Survey letter.

10. Item 10. Enter a name or address correction if necessary.

11. Item 11. Enter information relevant to property access and the interviewee (i.e., attitude, special requests, instructions to close gates, beware of dog, future identification).

The yellow copy of the survey notice is retained until the completion of the survey, then filed with the Research and Documents Library Team.

22-3.03 Public Relations

The Survey Team and project consultant can promote public relations for future contacts by representatives of the State. These individuals are among the first representatives to contact people that will be affected by a planned highway improvement. A first impression is a lasting one, and its importance cannot be over-emphasized. To achieve this goal, the survey party should perform a service to the Department by being courteous, presenting a pleasing appearance, conducting themselves properly, and properly identifying themselves to the people that they contact during the performance of their duties.

Survey notices and interview reports, as described above, are the first step in this process for public relations. The survey party should be sensitive to the needs of each property owner. For example, an overgrown fence row may be viewed by a farmer as a nuisance, so the farmer may want to have the survey crew cutting brush as needed for surveying operations. Others may view the same fence row as prime wildlife habitat, or it might contain their favorite persimmon tree or berry patch. The survey party will need to work differently with each property owner or occupant in such a circumstance.

While a survey party has the right to enter on private property to conduct a survey, it does not own or control the property. The survey party should minimize adverse impacts. The party should not leave behind trash or debris. Lath and flagging should be removed, unless a property owner agrees that it can remain in place. For farm animals, plastic flagging or sheeting may pose a health hazard if eaten. The property owner may prefer that it not be used. Due consideration must be given to lath and stakes that extend above ground which can interfere with farm operations or cause damage to farm equipment such as combines if left in place. Walking around a site may be a problem at a time of year when farm crops are susceptible to damage.

A survey control point that must be left in place to facilitate subsequent phases of project development poses other concerns. In a farm field which is plowed, such a point should be buried 300 mm to 450 mm below the ground line to avoid being disturbed by plowing or damage to the plow or other farm equipment. Where possible, it may be desired to locate such a point in a fence row or edge of a field where it is less likely to be disturbed or cause a problem.

A buried survey point may also be needed where a vandal or unhappy property owner willfully removes or disturbs the control monument overnight while the survey is still in progress. Though it is a nuisance for the survey party, such action cannot be stopped since the party does not own the property. A somewhat-visible nearby decoy point can be installed that a vandal can disturb, while the real survey control point is buried to be as inconspicuous as possible.

A property owner or occupant may refuse to allow the survey party onto the property, or may become belligerent or threatening. The party should contact its office for further instructions. A consultant should contact the Survey Team for further instruction. A telephone call or letter from the Survey Team or the Legal Services Division may resolve the problem. A law-enforcement officer may be needed to help preserve the peace. A court order may be needed to enforce INDOT's right to enter upon private property to complete a survey. A survey-party member should argue with a property owner or occupant, should not force his or her way onto a property, and should not take action that can endanger safety.

A property owner or occupant, nearby residents, or the media can all be expected to be curious about the effect of the project on the property and the area. Questions from the media should be directed to the Office of Communications. A property owner deserves explanation once a survey crew enters his or her property. However, most inquiries are best addressed by explaining the general nature of

the project (intersection improvement, bridge replacement, road reconstruction, etc.). It is best to explain that the survey party is there only to gather information necessary for proper design of the project. The survey party is unfamiliar with details of the project except for the scope of the needed survey. Questions about specific design features or impact on specific properties must be referred back to its office, and often cannot be answered until later in project development.

A survey party should be neighborly and should maintain public relations with each property owner or occupant, and the public. These people may have anxiety or concerns about the project and its potential impact on their property, so they may not want the survey party on the property. Understanding and concern for individual needs and concerns will make the survey process easier for both the party and the public.

22-4.0 SECTION PLATS

22-4.01 Section-Plat Requirements

Preprinted section plat form is furnished by the Survey Team to the survey party for use in preparing a section plat. The items to be completed on the form are as follows.

1. Project Number.

2. Transit Book Number. For a bridge project, this is Number 1, as a bridge survey will not likely to be extensive enough to require more than one book. For a road project, multiple books are numbered consecutively.

3. Survey-Line Letters.

4. County.

5. Civil Township.

6. Section.

7. Congressional Township.

8. Range.

9. Designation Number.

10. North Arrow. The north arrow is preprinted on the form.

11. Scale. A scale of 1:12 000 is used to facilitate the use of USGS quadrangle maps at double scale.

12. Date. The date of plat preparation.

13. Survey Party. The person who prepared the plat and the survey-party members.

22-4.02 Preparation of Section Plat

1. Property Information. The plat should identify all of the property included within the quarter sections where the project is located. All contiguous properties which lie within adjoining quarter sections should also be identified. The Office of Real Estate requires this information to assess property damage. The property-owner names should be shown, and may be obtained either from the county auditor or the township assessor. A routine check of the Transfer Books is necessary so that the current owners are identified on the plat.

2. Development Identification. Towns, subdivisions, or additions should be identified as shaded areas. A copy of the official plat that is obtained from the county recorder's office must be submitted with the field book.

3. Survey Baseline. The survey baseline must be shown, and the beginning and ending points must be identified.

4. Color Scheme. The color scheme should be as follows:

   a. blue for stream,
   b. yellow for State-maintained route,
   c. red for survey baseline, and
   d. green for county road.

   This achieves a neat and consistent appearance on the original section plat. Color does not appear on copies of documents.

5. Section Monuments. Section and quarter-section monuments should be shown.

6. Road Names. All road names should be identified.

A copy of the completed section plat should be made and placed in an envelope in the back of the field book. The original section plat is retained by the Research and Documents Library Team. Figure 22-4A provides an example of a completed section-plat sheet.

If a county updates its plat records electronically, its plat books will be located on a computer. A copy should be purchased and manually updated as the county does not update the older plat books. Each property owner will have a code number associated with his or her property holdings. Items on the older plats should appear on the electronic plat (e.g., scale).

22-5.0 SURVEY OPERATIONS

22-5.01 Establishing Alignment Baseline

The first operation of the survey is to establish the baseline. The new baseline is used for the following:

1. determining the present right of way in relation to the baseline;
2. determining additional right-of-way requirements; and
3. staking the new right of way.

In establishing the baseline, permanent points should first be located from the original survey. Iron pins will be in their original position if not disturbed by construction. This approach is best for establishing both alignment and stationing. However, other means may be necessary to establish the baseline. For a concrete road, split the pavement in two locations at either side of a PI, and project the tangents to their point of intersection. The stationing then can be equated at the PI. If a concrete road has been resurfaced with asphalt, a pick or jackhammer should be used to locate the pavement edge. For a road without as-built plans (e.g., a county-road takeover), the baseline can be established by splitting the pavement using the longest possible sights available or by establishing an offset baseline that identifies pavement edges at 20-m intervals.

After the centerline tangents are recreated and intersected to form the PI, the Δ angle is determined from the results of the centerline traverse or by coordinate geometry calculation with verification on the calculations. Since these measurements are likely being done with more-accurate equipment than that used for the original survey, the Δ angle for the curve and the stationing will vary. It is not desired to have a station equation at every monument found, therefore the new more-precise Δ angle should not match the old even-minute Δ angle from the original survey. Horizontal-curve calculations require two elements to geometrically define the curve. Apart from the Δ angle, the desired second element for curve calculation is the plan radius or the degree of curve converted to feet and then to meters. If monuments are found at the PCs or PTs, they should be used for tangent-line determination only because of the discrepancy in the stationing described above. Therefore, the two desired elements for curve determination are the new measured Δ angle and the radius as obtained from the old plans.

22-5.02 Alignment Data

Once the alignment has been established, a closed traverse should be run through the PIs and back on a separate line to the beginning of the traverse. Measured distances should be recorded and a minimum of two pair of angles (i.e., one direct, one reverse) should be turned at each traverse point. The horizon should be closed at the end of the traverse. The misclosure should be calculated, and the traverse should close with a precision of at least 1 in 20 000. The raw field data should be recorded in the field book.

After checking the misclosure, a full adjustment should be performed on the traverse and the adjusted data recorded in the field book for the alignment data. All curve information then should be calculated and the PCs and PTs set from existing monuments at the PIs.

The alignment data is the listing of the permanent points in the field and curve data. Each individual point is to be listed as close to its appropriate position as possible. The listing should reflect the type of point (e.g., PC, PT), its correct stationing (e.g., 10+780.263) and type of monument set. The PI station should present the following:

1. Δ angle;
2. radius of curve;
3. tangent length;
4. length of curve;
5. external distance; and
6. bearing of the foretangent.

Points in the survey baseline should not exceed an interval of 300 m and should be of a material and size that is in accordance with 865 IAC 1-12-24.

Each permanent point must be referenced. The references must be shown in the topography notes next to the point listing. The most common reference is a roofing nail that is driven through a bottle cap into a tree. However, a point on a distinct object may be used as long as the reference is fully described (e.g., northeast corner of headwall, bolt on light standard). A compass-directional description should not be used.

A folded piece of flagging may be used for a reference. As a tree matures, the flagging will remain visible long after the tree has grown over the nail. At least three references should be used for each point. Each reference should be positioned to swing an arc so that they will have a distinct crossing over the point. If a sloped distance is used, it should be identified on the reference.

22-5.03 Obtaining Bearings

The starting bearing must be shown and the source fully described. Methods of obtaining a bearing are as follows:

1. celestial observation, either polar observation or sun shot;
2. using global positioning equipment to fix a bearing;
3. running a bearing traverse from a USC&GS triangulation station; or
4. using a bearing from existing road or bridge plans.

22-5.04 Running Bench Levels

Only the length of survey line described in the transit book should be in the corresponding level book. Benchmark elevations begin on level book page 2 for a road survey.

Bench levels should originate at a bench mark that is on a sea level datum. The permitted types of benchmarks are as follows:

1. National Geodetic Survey (NGS), formerly U.S. Coast and Geodetic Survey (USC&GS);

2. U.S. Geological Survey (USGS);

3. Indiana Flood Control and Water Resources (IFC&WR) of the Indiana Department of Natural resources); and

4. Indiana Department of Transportation.

If available, NGS with NAVD 1988 datum is required within a 5-km radius of the project. The monument should be described in detail including the fully-spelled-out name of the agency, the datum used, the elevation, and a rubbing of the disc. The NGS benchmark elevations that are in the vicinity of the work area are available from NGS at the location shown in Section 22-2.02.

If the starting benchmark is distant from the beginning of the project, a circuit must be run from that benchmark to the first benchmark set for the project and back to the original benchmark to complete the circuit. Each bench circuit should be run to third-order accuracy and specification. The allowable error in the circuit is computed from the formula as follows:

Allowable Error = ± 12 mm / K where: K = length of circuit, km

This provides the survey party with a starting elevation to use as the benchmark elevation for the baseline benchmarks following the double-run benchmark circuit as shown in Figure 22-5A.

In running bench levels, do not make sights more than 90 m long. Keep the backsight and foresight as equidistant as practical with a 10-m maximum difference per setup and a 10-m cumulative maximum per circuit (see Third-Order Leveling Specifications, NGS). The selected point should be marked before giving a sight. If more than one sight is needed, the exact point is lost between sights. The rodperson should use a solid turning point and keep the bottom of the rod shoe free from mud, ice, etc. The same standards and allowable error in the circuit apply for the benchmarks along the baseline. Do not set or check a benchmark as a sideshot on a benchmark. Make a complete turn on every benchmark with a different instrument set-up for a foresight and backsight. Once the circuit has been closed, the benchmarks for the project are set. Starting at the benchmark, set in the circuit at the start of the project, the benchmarks for the project should be set not more than 300 m apart. In a hilly terrain they should be set closer as the number of turns determines the frequency rather than the distance. Benchmarks should not be more than four turns apart. A benchmark should be set far enough from the baseline in a permanent object such that it they will not be disturbed during construction. The most common object is a 6-in boat spike in a tree. The boat spike should be placed as low in the tree as practical so that, if the tree is cut down, the benchmark will remain undisturbed in the stump. A benchmark can be a chiseled cross or square in the concrete base of a sign, etc. The description of each benchmark written on the right-hand page should describe the benchmark followed by its location as a plus and distance out from the baseline. A minimum of three bench marks should be set for each project, with one at each end of the project and outside of the construction limits.

Conventional field-book notes may not be utilized due to recording in an electronic data collector. However, if the software used for processing the data allows for the printout of a level book format report, it should be included with the adjusted elevations in the skeleton survey field book.

If starting a baseline for a new survey, the practice is to number the benchmark at the start of the survey as TBM #1, the next benchmark as TBM #2, etc. Benchmarks retain the number assigned to them on the earliest field survey. Thus, if survey line “A” is completed and it later becomes necessary to run baseline “B” ±1 km from line “A”, benchmark 1 “A” retains its original number and elevation. If line “B” bench levels tie into other line “A” bench levels, the line “B” benchmarks also carry their original numbers 1st TBM 1 “A,” 2nd TBM 1 “B,” 3rd TBM 2 “B,” 4th TBM 5 “A,” etc.

Level equations, with their respective basis of datum, are to be shown in bench levels as illustrated in the example in Figure 22-5A. Each benchmark is tied to the survey baseline by station and offset. Benchmarks can be tied using conventional surveying techniques or an electronic data collector. Show party members’ names, the date, and weather conditions at the time bench levels are run.

After the bench levels have been run and the backsights and foresights have been totaled, the rule that the difference between the totals of the foresights and the backsights is equal to the difference in elevation between the start and end of the bench circuit applies. This is done at the end of each bench circuit and is a check on the mathematics of the circuit. Each level circuit should be adjusted according to standard techniques.

22-5.05 Locating Section Corners

Each section or quarter-section corner in the area should be located and tied in to the survey baseline so that an accurate Location Control Route Survey Plat can be made. If the last deed of record is examined, the monument corners referenced by the instrument should be located. If the monument corners are not found, that should be indicated. The Office of Real Estate uses the information which appears in the Location Control Route Survey Plat to compute right-of-way takings and to write descriptions of such takings. If a reference point cited from a last deed of record cannot be found, the county surveyor's office should be notified of a candidate location which needs to be re-established by that office.

If a section corner is visible from the survey line, a distance and a minimum of two pairs of angles should be measured to the section corner. These measurements should be recorded in the field book or electronic data collector.

If a section corner is not visible from the survey baseline, a closed traverse should be run from the survey line to the section corner with the measured distance recorded and two pairs of angles turned at each traverse point. The horizon will be closed at the end of the traverse. The traverse misclosure should be calculated and the traverse should close with a precision of at least 1 in 20,000. The raw data of the completed traverse should be recorded in the field book or electronic data collector.

Other pertinent information about the monument found at a section corner also should be recorded in the field book. This includes the following:

1. type of monument;
2. size of monument;
3. mass of monument;
4. distance above or below the ground;
5. other existing monument near the subject monument;
6. reasons for using the monument;
7. testimony; and
8. other relevant information.

The above list is not complete, but should provide sufficient guidance to the type of information that is to be recorded in the field book. The references are to be drawn in the book and provided on reference cards as shown on Figure 26-1C.

Whether the county surveyor is the only party who can reset a section or quarter-section corner monument is debatable. The following sections of the Indiana Code clarify the issue.

1. Indiana Code 36-2-12-13, Sec. 13. *A person may, for excavation, mineral extraction, or other purposes related to the person's business, temporarily remove a monument marking a corner. The person must notify in writing the county surveyor at least thirty (30) days before removing the monument. The person must replace the monument within a reasonable time at the person's expense under the supervision of the county surveyor or, if the county surveyor is not registered under IC 25-31, the registered person who is selected under section 11 of this chapter. The surveyor shall file a copy of the notice in the corner record book.*

   Only a county surveyor or a designee may change the location of any monument. A person who wishes to have the location of a monument changed must make a request to the surveyor in writing and furnish written approval of all landowners whose property is affected by the proposed change. The surveyor may approve, reject, or modify the request and shall file a copy of the notice and the landowners' consents in the corner record book.

2. Indiana Code 8-23-9-24. *If in the construction or maintenance of a state highway it is necessary to remove or bury a monument marking or evidencing an established corner, the department shall cause to be set in the pavement or right-of-way at the place where the monument was located a monument capable of activating a metal detection device. The top of the monument must be level with the pavement or the grade of the right-of-way. The department shall cause a memorandum of the monument to be filed in the county surveyor's office of the county.*

To perpetuate the location of a corner before, during, or after construction, the following definitions apply.

1. Established Corner. A corner that the county surveyor has provided references, which was found as referenced and described, and which the county surveyor has recognized as being true and correct.

2. Re-established Corner. A corner that has been reestablished by the field survey party and accepted by the county surveyor as being true and correct.

3. Apparent Corner. A corner location that has been reestablished by the field survey party and has not yet been approved or accepted by the county surveyor.

All three types of corners should be documented in the field survey notes, referenced, and the type identified. For Items 2 and 3 listed above, a pin or rebar should be set on that corner and the type of monument should be identified. The references and an explanation of the procedure used should be provided to the county surveyor so that he or she can add them to the reference book.

22-6.0 FIELD-BOOK FORMAT

22-6.01 Front Flyleaf

An identifying note on the flyleaf should include the project number, designation number, structure number if a bridge survey, and a brief description of the project.

The description of a bridge project as found in the improvement program is taken directly from the bridge-inventory book. If there is a conflict between the improvement program and the bridge-inventory book, the wording of the improvement-program description should be used, as its is the most-common usage. To further clarify this statement, the following example applies.

> *The improvement program states, SR 2, bridge over Wolf Creek, 10.62 km south of US 30. The bridge-inventory book shows Wolf Creek on SR 2 to be 10.63 km south of US 30 and also11.02 km north of US 231.*

The description in this example is expressed to the hundredth of a kilometer.

The description to be used on the flyleaf should read as follows:

> *Structure No. 2-64-1170 over Wolf Creek, 10.62 km south of US 30.*

If the other description, *Structure No. 2-64-1170 over Wolf Creek, 11.02 km north of US 231*, is used, all subsequent correspondence can raise a doubt as to whether that bridge or another was being discussed. A check of the bridge-inventory book is needed for clarification.

For a road project, the description shown in the improvement program should be followed as closely as possible.

An example is a follows:

> *US 6, from the west junction with SR 3 to 0.65 km east of Kendallville.*

See Figure 22-6A for an example of a front flyleaf.

22-6.02 Index Sheet

The index sheet is page 1 of a road or bridge survey's transit book. The list of the information that should appear on the index sheet is as follows.

1. Transit Book Number. The transit book number should be centered on the top line of the left-hand sheet.

2. Project Number. The project number should be in the right margin on the second line.

3. Route Number. The route number should be in the left margin on the second line.

4. County Name. The county names should be centered on the third line.

5. Structure Number. The new structure number of the proposed bridge should be centered on the fourth line.

6. Designation Number. The designation number should be centered on the fifth line.

7. Line Description. The line description should be listed in order of appearance on the actual survey in progressing headline. An example is, *S-16-G – a side-road survey @ Co. Rd. 500S from Station 5+021.789 to Station 5+400.000*.

8. Instrument Data. Instrument data should be shown, including the instrument manufacturer, model, and serial number for total station, or transit and EDM, along with horizontal circle least count and the manufacturer's specified accuracy for the EDM.

9. Registration Seal. The book must be certified by a registered Indiana land surveyor. The land surveyor who certifies the book should place his or her seal on the lower left hand sheet of page 1 under the line description. He or she should place his or her initials and the date adjacent to the seal.

10. Top Line. The top line of the right hand sheet of page 1 should indicate *Indiana Department of Transportation* and *Survey Team* or the consulting firm name.

11. Roster. The roster of the survey party should be shown under the party number.

12. Index. The index for the items shown in the transit book follows the roster for the party numbers.

13. Dates. The last line on the sheet shows the date the book was started and the date the book was finished.

The only difference between a road- or bridge-survey index sheet is the indexed items. The level book and transit book for a bridge survey is one book, so there will be only one index. This also applies to a small intersection improvement or spot-improvement. See Figure 22-6B for an example.

22-6.03 General-Information Sheet

This sheet is page 2 in a bridge survey, but is not included in a road project. However, for a road project it is useful to have this sheet to describe how the baseline was set up and certain specifics about the project.

This sheet is used to point out specifics which are difficult to show graphically, but that the designer must have to develop a logical design.

There can be more than one name for a stream. The Bridge Inventory can have one name; the quadrangle map for the area can have another; and the county records can show a third. If the stream is a legal ditch, the name of the first person to sign the petition is used as the name of the ditch. If there is more than one name, the name which appears in the Bridge Inventory should be used, with the other names shown in brackets, to make it clear that the stream has more than one name. The following is the information to be shown on the general-information sheet as illustrated in Figure 22-6C:

1. Alignment and Stationing. A full explanation of the method of establishing the alignment is necessary. If the old plans are available, they should be used to establish the baseline of the survey. If the old line is re-established, the existing right-of-way location can be determined by the Office of Real Estate. If the baseline is established at random without regard to the existing right of way, the existing right-of-way location is difficult to re-establish. The baseline should be matched to that on the old plans with equations in at least two places. The existing right-of-way location can be determined mathematically.

2. Level Datum. A full explanation of the level datum used is needed. An existing bridge was likely built on an assumed datum. As it is required to survey an INDOT project on a sea-level datum (see Section 22-5.04), there should be a statement concerning the level datum used. Level equations must be shown between the survey for the present structure and the survey for the proposed bridge.

3. Present Structure. There should be a short description of the present structure. This description should state type of structure, number of spans, lengths of spans, and clear-roadway width.

4. Miscellaneous Information. This is the location to make comments such as conversations with local people about the location of section corners, unusual circumstances encountered on the project (e.g., such as not being able to re-establish the baseline without difficulty, etc.). Statements which are neither level notes nor topography notes can be valuable to the designer in the work.

5. Survey Purpose. A statement as to the purpose of the survey (e.g., widening, replacement, repair) should be included. An example is, *The purpose of this survey is to provide data for the repair and widening of the present structure*.

6. Other References. There should be reference to old survey books, plans, or miscellaneous information so that the designer is aware that more information is available.

22-6.04 Stream-Data Information

Stream-data information appears on page 4 of the bridge-survey field book, but is not included in a road-survey field book. Figure 22-6D illustrates an example of stream data. The information needed is similar to drainage data for a small- to medium-sized area. The information can be shown in narrative form and should include discussions of the following:

1. how fast the water level rises and falls;
2. the condition of the channel;
3. siltation;
4. brush;
5. amount and size of drift; and
6. ice flow.

22-6.05 Present-Structure Information

The present-structure information appears on page 5 of the bridge-survey field book, but is not included in a road-survey field book.

If the bridge is to be replaced, whether on its present location or on a slightly different location, the regular plus and distance, as shown in the topography notes, is sufficient to show the existing bridge. If the present bridge was State built and plans are available, the old plans can be used to determine the quantities for removal of the present structure. A statement that the bridge was built according to plans is sufficient.

If the bridge is to be repaired or widened, it is necessary to obtain detailed information on the existing structure so that the new work will match the existing structure once completed. A plan view of the structure needs to be drawn, with the plus and distance out recorded on the drawing to the nearest 5 mm. See Figure 22-6E for an example.

Also, a side view should be drawn so that the elevations can be recorded. The required elevations are as follows:

1. top of opening;

2. profile along the main baseline under the bridge, showing enough ordinates to adequately figure the effective opening;

3. low-water elevation;

4. ordinary high-water elevation;

5. extreme high-water elevation;

6. bridge-seat elevations;

7. top of curb, if present; and

8. top of handrail.

Additional levels on the present structure will be discussed later in this chapter. See Figure 22-6F for an example.

22-6.06 Utility-Ownership Information

The complete name and address of each utility and the reference number should be listed on Page 2 of a road-survey field book, or page 6 of a bridge-survey field book. If more than one company for a single utility is encountered, all names and addresses should be listed. The limits of each utility location should be identified with stationing and left or right offset.

The name of the utility shown refers to the area served by that utility and implies only the company involved. If a company has no utilities in the field, then *None* should be entered next to the name of the utility. See Figure 22-6G for an example.

22-7.0 FIELD-POINT REFERENCE

Information is described below that will assist the surveyor in maintaining uniformity and minimizing ambiguity in reference drawings. Examples are illustrated in Figure 22-7A and Figure 22-7B.

22-7.01 Field-Book Entries

Make each field-book entry neat, but be expedient in entering information. If a question arises about spelling, wording, coordinates, etc., ask and resolve the question before entering the information. Avoid erasing a field-book entry. If an entry cannot be crossed out, then redevelop the field-book page. Entering the information correctly the first time is desirable over having to redevelop a page in a hurried manner.

22-7.02 Orientation

In a new-roadway-location area, or an area accessed via winding roads, disorientation is possible. To minimize mistakes resulting from becoming disoriented, use a compass for each reference ties. Have an assistant check all information. Use the following guidelines for orientation.

1. Reference a survey or base-line point to the ahead line.

2. Reference a section corner, or other point not referenced to the survey line, to North.

3. Label the arrow appropriately (e.g., line name, North) and check the compass reading to verify the direction of the line.

4. In drawing the reference, ensure that it is properly labeled. If, for example, the southwest corner of a post is used, draw the line to the southwest corner of the post.

5. If the point is an equation point of two lines, orient to the current line of the survey. Show the relationship of the other line by drawing a solid line at the appropriate angle and label both lines. In the equation note, list the station of the current alignment first and the intersecting line second. In a reference note, list the S-line page number for the corresponding equation reference in the book.

6. Use a compass and provide an azimuth, from North, to the nearest one degree to each reference point from the point being referenced. Show the azimuth of each line drawn (e.g., angled road, fence, wall).

22-7.03 Drawing Details

If a point is revisited after a considerable length of time, some, if not most, of the references will be missing. Therefore, document sufficient detail to increase the likelihood that something will exist in the field that ensures finding the point. Place the point number and the designation number in the lower left corner of the section-corner card. All points will have coordinates placed in the book after traverse adjustments are made. Have an assistant check the information gathered. Use the following guidelines in developing the drawing.

1. Show all notations and drawings on field-book paper. If the drawing must be redone for clarification, place the original in the back of the book until the final check. Keep the original reference drawing in the field book.

2. Use a straightedge, protractor, and template for drawing a circle, rectangle, tree, etc., and make the drawing as graphically accurate as practical. However, for clarity, an angle or distance may have to be exaggerated graphically to avoid clutter.

3. Measure all distances horizontally. Choose tie points such that the measurement will be as level as practical.

4. Draw and specify fence lines, tree lines, edge of pavement (including road name or number), edge of field, etc.

5. For a PI, draw the deflection of the line in the appropriate direction and specify the Δ angle.

6. If a corner post is used, specify the direction of the fence lines and label which side or corner of the post where the reference nail was set.

7. If a reference is set and measured to, state what device was used (e.g., N&C for nail and bottle cap).

8. If a reference is set and described with a particular height, then for consistency describe each such reference in the same fashion. Measure and document to the nearest 0.1 m.

9. Ensure that everything written is legible, especially the distances.

10. Place each distance parallel to the line, not across it. Illegibility results if a figure is placed over the line.

11. Enter each distance measured in meters to three decimal places. Include the unit of measurement (e.g., 97.452 m). Include the decimals even if they are zero.

12. For a tree size, show the diameter to the nearest mm.

13. For a decimal measurement of less than 1 m, include a zero at the beginning of the documented number (e.g., 0.1 ft post). If the decimal point becomes illegible, the distance will be read as 1 m.

14. Take each reference measurement using a metric tape. If the original measurements must be taken in feet and inches, show the distance in the units used to measure with, then convert

and show the distance in the desired units in parentheses; e.g., 2.203 m (7.23').

15. If references are all in a straight line, then draw it as such (e.g., three fence posts).

16. In referencing to repetitious objects (e.g., fence posts, railroad ties), specify the object by the number of them away from the control point (e.g., 3rd tie, 5th post).

17. The desired number of references is four. Specify three references only if a reasonable fourth tie is not available. If there are fewer than three ties available, then state N.O.R.A. (i.e., No Other Reference Available) or N.R.A. (i.e., No Reference Available).

18. In referencing a section corner, indicate the following:

    1. how the found monument fits original county surveyor's ties;
    2. the physical condition of the monument;
    3. the relationship to the surface of the ground; and
    4. the uncertainty of the found monument.

22-8.0 CONVENTIONAL SURVEY

The old *Indiana Survey Manual* should be referenced for a conventional-survey operation. It has been Department experience that few surveys are now conducted using this method. All INDOT survey crews, open-end surveying firms, and most consulting firms are using electronic surveying techniques. If the standard-book method of surveying is desired, the old *Survey Manual* should provide sufficient guidance. The final survey must be submitted in an electronic format as outlined in Chapter Twenty-six. The information provided herein supersedes that provided in the old *Survey Manual*.

22-8.01 Nomenclature

The survey party is expected to use consistent nomenclature in survey work and notebooks. Figure 22-8A provides a sample illustration of nomenclature use. Figure 22-8B defines the nomenclature terms.

22-8.02 Conventional and Topographic Lines and Symbols

Figure 22-8C provides the conventional and topographic lines and symbols that should be used.

22-8.03 Abbreviations

The abbreviations shown in Figure 22-8D are well-established through common usage and should be used in note keeping in preference to spelling out words to save time and space. The abbreviations shown in Figure 22-8E are not as well-established, but may be used at the option of the individual taking the notes where necessary or convenient to save time and space, provided the manner of usage is such as to make the abbreviation clear. For example, the abbreviation *Loc.* for locust is used in connection with the symbol for a tree, followed by its diameter in inches, for example, *15-in. Loc*. *Rec.*, for recommend, is used in recommending that certain work should done or used in design and construction, for example, *4 + 956, Rec. 375mm pipe*, meaning that a 375 mm pipe is recommended at Station 4 + 956 under the road to be constructed.

INDIANA DEPARTMENT OF TRANSPORTATION
Driving Indiana's Economic Growth

100 North Senate Avenue
Room N758
Indianapolis, Indiana 46204-2216 (317) 232-5533 FAX: (317) 232-0238

Mitchell E. Daniels, Jr., Governor
Michael W. Reed, Commissioner

, 20

NOTICE OF SURVEY

Dear Property Owner:

Our information indicates that you own or occupy property near the subject proposed highway project. Our employees will be performing a survey of the project area in the near future. It may be necessary for them to come onto your property to complete this work. This is permitted by law per Indiana Code IC 8-23-7-26. They will show you their identification, if you are available, before coming onto your property. If you have sold this property, or it is occupied by someone else, please let us know the name and address of the new owner or current occupant so we can contact them about the survey.

At this stage, we generally do not know what effect, if any, our project can eventually have on your property. If we determine later that your property is involved, we will contact you with additional information.

The survey work will include mapping the location of features such as trees, buildings, fences and drives, and obtaining ground elevations. The survey is needed for the proper planning and design of this highway project. Please be assured of our sincere desire to cause you as little inconvenience as possible during this survey. If problems do occur, please contact our field crew or contact me at the telephone number or address shown above.

Sincerely yours,

Project Manager

:

SURVEY INTERVIEW REPORT

Route: _____ Des No.: _____ Project No.: _____

County: _____ Location: _____ _____ of _____

Name of person interviewed:_____ Date: _____

Name of person doing the interview: _____

Has occupant received the "*Notice of Survey*" letter? Yes: ☐ No: ☐ *[Click on one]*

If different from letter, show corrected occupant name and address below:

Name: _____

Address: _____

_____

List any suggestions, special requests, and attitude of individual interviewed:

Click When Done

Clear Data

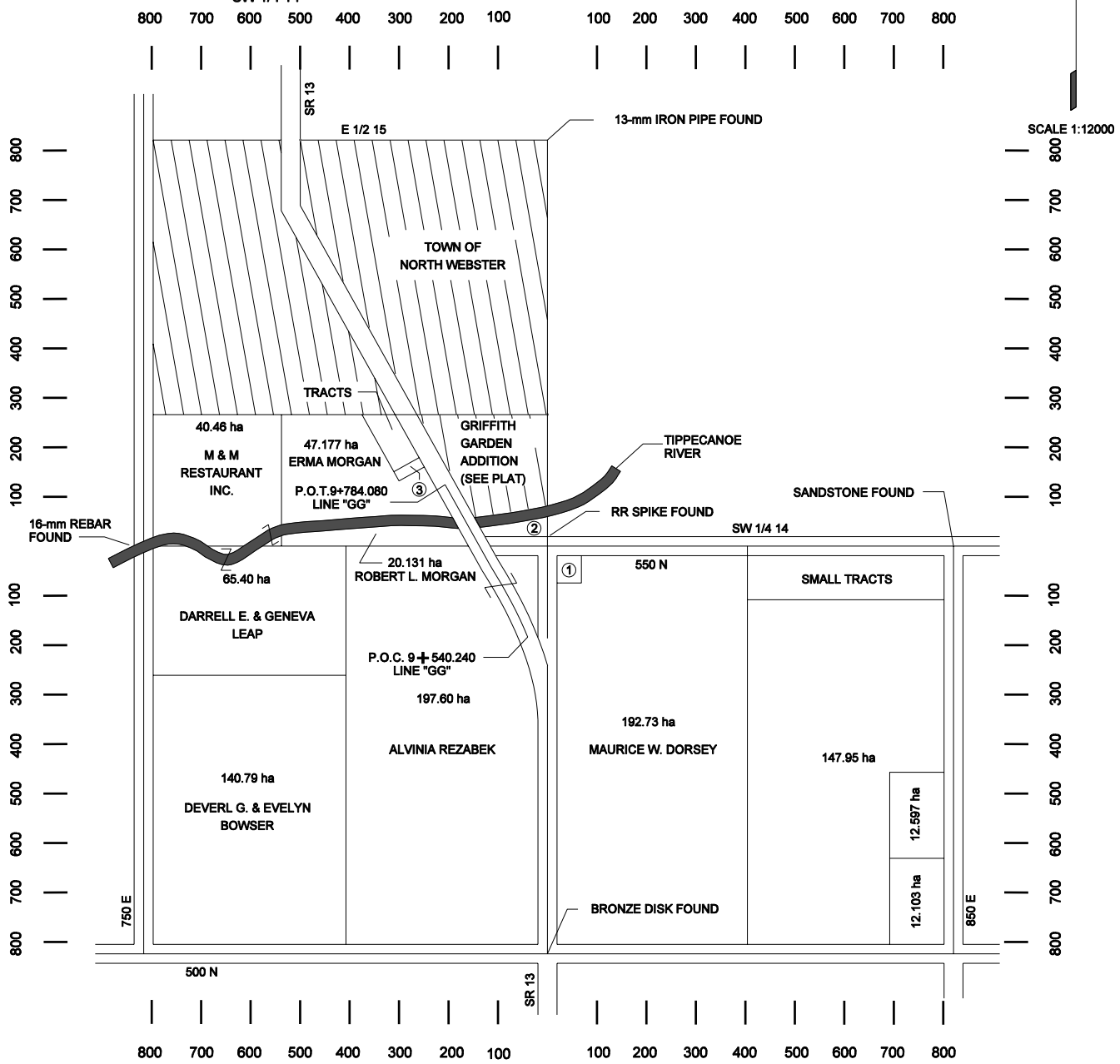
STATE FORM 4712

SECTION PLAT SHEET

PROJ NO. ST-5343(B) TRANSIT BOOK NO. _____ LINE LETTERS "GG"

KOSCIUSKO COUNTY TIPPECANOE TOWNSHIP

SEC. E 1/2 15 SW 1/4 14 TWP. 33 N RANGE 7 E



PROPERTY OWNERS

①	EARL & RUTH STUTZMAN	0.28 ha
②	ESTHER & HELEN GRIFFITH	0.53 ha
③	KATHRYN & LYNN FELLER	0.14 ha (35.052 m FRONTAGE)

DATE: JULY 16, 1979 SURVEY BY: PARTY #1 - JOHN A. DOE

SECTION PLAT SHEET

Figure 22-4A

(Note: This is not to scale.)

PROJ. NO. ST-141-1(C) LINE "A" PG. 10 OF 30

NAVD '88 LEVEL DATUM
START BENCH LEVEL NOTES

POINT	PLUS	H.I.	MINUS	ELEV.	ADJ. ELEV	
E 247	0.862	193.794√		192.932√		U.S.C. & G.S. BENCH MARK DISK SET IN THE SIDEWALK ON THE
	1.298	193.419√	1.673	192.121√		S.E. END OF THE R.C. GIRDER, STEEL BEAM, & STEEL TRUSS
TBM 3 "A"	2.883	193.581√	2.721	190.698√		BRIDGE OVER FLATROCK RIVER, 5.586 m LT. OF STA. 11+301.518 "A"
	1.289	193.490√	1.380	192.201√		BT. SPK. IN PWP. #738-142 AT STA. 11+144.543 "A", 15.044 m LT.
	1.228	193.451√	1.267	192.223√		
TBM 2 "A"	3.288	193.576√	3.163	190.288√		BT. SPK. IN PWP. #738-138 AT STA. 10+928.43 "A", 16.191 m LT.
	1.767	194.539√	0.804	192.722√		
TBM 1 "A"	0.307	194.536√	0.310	194.229√		BT. SPK. IN PWP. 25.277 m LT. OF STA. 10+765.64 "A"
	0.932	193.609√	1.859	192.677√		
TBM 2 "A"	3.139	193.426√	3.322	190.287√	190.288√	
	1.322	193.502√	1.246	192.180√		
	1.225	191.414√	1.313	190.189√		
TBM 3 "A"	2.660	193.356√	2.718	190.696√	190.698√	Thursday, August 11, 1994
	1.600	193.836√	1.120	192.236√		Clear & Hot
E 247			0.905	192.931√	192.932√	Notes & Instrument DWS
	+23.800√		-23.801√			Level Rod BRJ
	192.932√		216.732√			E 247 to TBM#1 & Return
√ by MAS	216.732√		192.931√			
	END	BENCH	LEVEL	NOTES		
						LEVEL EQUATION:
						LINE "A" PROJ. F-170(4) IS 0.042m ABOVE LINE "A" STA. 11+301.518
						LINE "A" = 192.915 PROJ. F-170(4) NGVD '29
						LINE "A" = 192.873 THIS PROJECT NAVD '88
						0.042 DATUM DIFFERENCE

BENCH LEVEL NOTES

Figure 22-5A

Survey Book

For

Structure No. 9-52-6793 over Hawk Creek

5.472 km north of SR 14

Project No. ST-144-1(A)

Des. No. 8315648

If found, please return to, or call

Engineer of Location Surveys
Room N642
Indiana Government Center
100 North Senate Avenue
Indianapolis, Indiana 46204-2217

Phone (317) 232-5309

FRONT FLY LEAF EXAMPLE
Figure 22-6A

PROJ. NO. NH-G200(19) LINE "P" PG. 1 OF 30

BRIDGE SURVEY

TRANSIT & LEVEL BOOK #1

U.S.R. #31 PROJECT NO. NH-G200(19)

COLUMBUS TWP. BARTHOLOMEW CO.

LINE "P" STA. 10+000.000 TO 13+450.850

LINE "S-1-P" STA 5+000.000 TO 5+250.000

LAND SURVEYOR'S STAMP GOES HERE

INITIAL & DATE HERE

INSTRUMENT DATA

SOKKIA SET XL TOTAL STATION NO. 15634 HORIZONTAL CIRCLE LEAST COUNT 1 SECOND EDM MEASUREMENT ACCURACY +/- (5 mm + 5 mm) MEAN SEA ELEVATION.

INDIANA DEPARMTENT OF TRANSPORTATION

LOCATION SURVEY SECTION

CHIEF OF PARTY	E. C. HOFFMAN
INSTRUMENTMAN	R. J. FISH
INSTRUMENTMAN	R. W. McCAIN
TOPOGRAPHER	K. R. BUNSOLD
RODMAN/CHAINMAN	L. M. HIGGENBOTHAM
RODMAN/CHAINMAN	O. A. RANDOM

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SURVEY STARTED 9/28/94 SURVEY COMPLETED 10/31/94

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Figure 22-6B

GENERAL INFORMATION

STR. # 3-40-6560 OVER MUSCATATUCK RIVER
PROJ. F-199-4(2) LINE "A"
VERNON TWP. - JENNINGS CO.

Located in the Northwest Quarter of Section 11, T-6-N, R-8-E, 0.39 km Northwest of the junction of State Road 7 and State Road 3 and 4.81 km south of the junction of State Road 7 and State Road 3.

Alignment and stationing was established by recovering the old road survey (1929) PI at Station 815+31.2 ft and then centering on the present structure at each end. All 3 points were in line. Stationing was established using this PI as a starting point, and should match the original stationing. Alignment should also be the same as the original. See plans for Project 164 (1929), sheets 6, 7, and 8. Also see the old bridge plans for Project 7.

Level datum is IFC and WRC using TBM VFMR 80 for this project elevation = 195.007 m. This same datum was used for Aerial Survey and Kelsplotter, which is being used in conjunction with ground survey for this project.

This survey datum is 99.487 m higher than the old road and bridge project datum. See page 36 of this book for level equation and old road and bridge plans (1929) Projects 164 and 7.

The present structure was State-built in 1930 as a Reinforced Concrete Arch with 5 spans at 24.384 m each with 0°00' skew and 6.706 m clear roadway. The bridge was repaired in 1956. The original structure number was 7-40-957.

The present State Road 7 and 3 is a blacktop over concrete roadway varying in width from 7.2 m to 8.4 m and has shoulders of varying width.

The original charter of Vernon and various maps, show the Corporation Line of Vernon to be on the low water mark at the south edge of the river's channel being at the foot of the hill on the south end of the present structure at that time and, at the present time, at the location of a small running channel. There were at that time, according to local residents, two channels, one at the south end of the structure and one at the north end of the structure. The main channel is now at the north side of the structure and it is shown now on all newer maps that the corporation line is at the low water mark on the north edge of the present main channel.

The purpose of this survey is to show underwater elevations to be used by the Photogrammetry Team to complete the contour maps and also to establish alignment and stationing, to survey property lines, to locate underground utilities, limited topography, stream profile, and other incidentals.

SAMPLE GENERAL-INFORMATION PAGE

Figure 22-6C

STREAM DATA

The drainage area is 507.6 km^2 (50 760 ha). This value was obtained from the drainage book prepared by the U.S. Department of the Interior, Geological Survey, page 124.

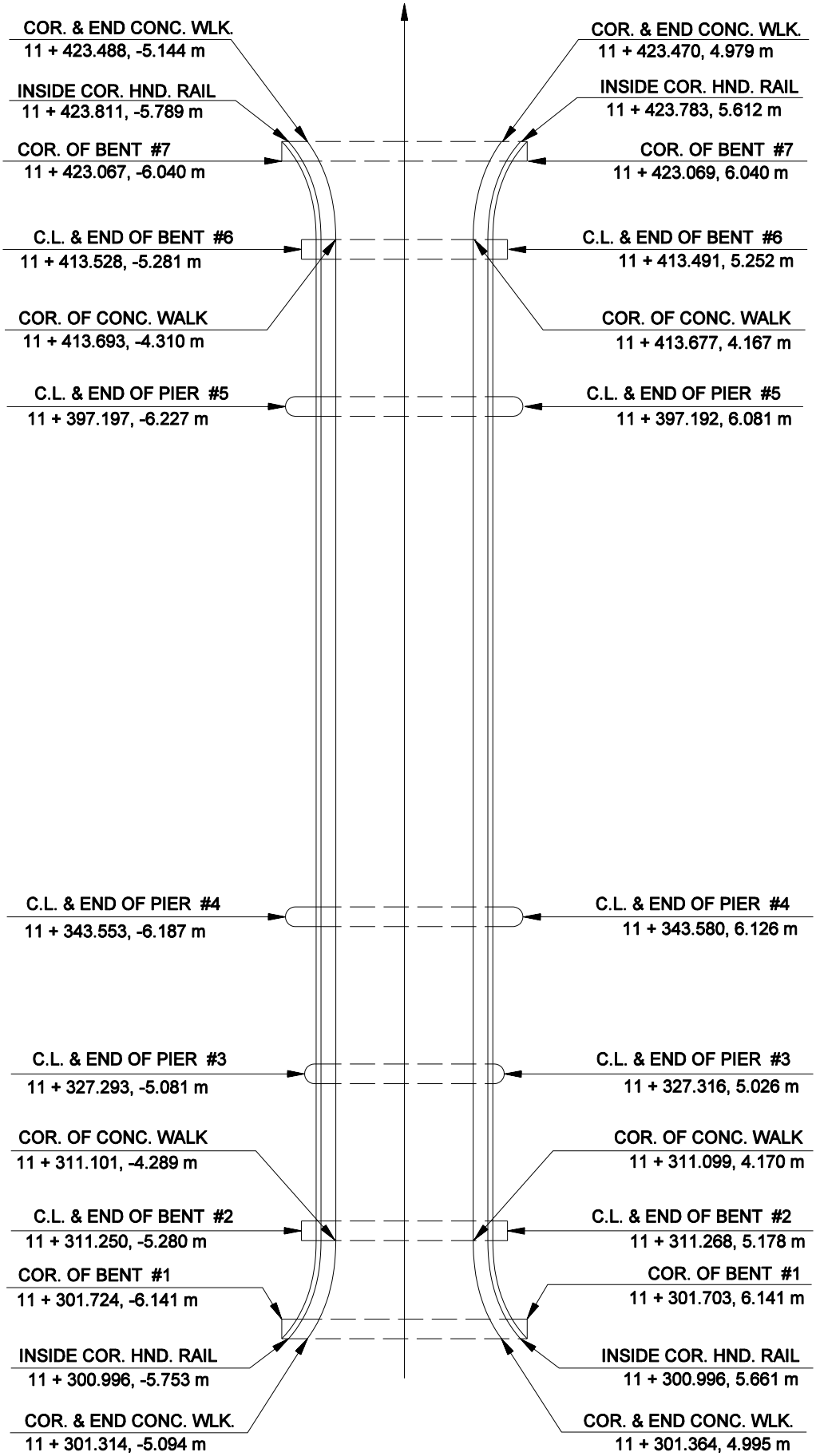
The stream rises slowly and lowers slowly. The main channel is new at the north side of the structure and has been for many years, but another channel was at the south end of the structure before this structure was built. This information was obtained from an old atlas and local residents.

About 70 m of the river bottom is along the centerline and about 150 m up- and downstream is an island built up of mud, sand, and loose rock. This island is vegetated with willows and small sycamores that catch quite a bit of small- to medium-sized drift and probably slow the flow of water during high water period. A set of plans is on hand, dated 1957, which proposed to clear out a similar situation at this location. Whether it was done is not known. If it was, it is probably just as bad or worse now. Such set of plans shows the main channel to be on the south side of the structure.

High-Water Elevation = 193.1 m (1897 and 1961)
Low-Water Elevation = 184.6 m (present water elevation minus 0.15 m)

STREAM-DATA SAMPLE

Figure 22-6D



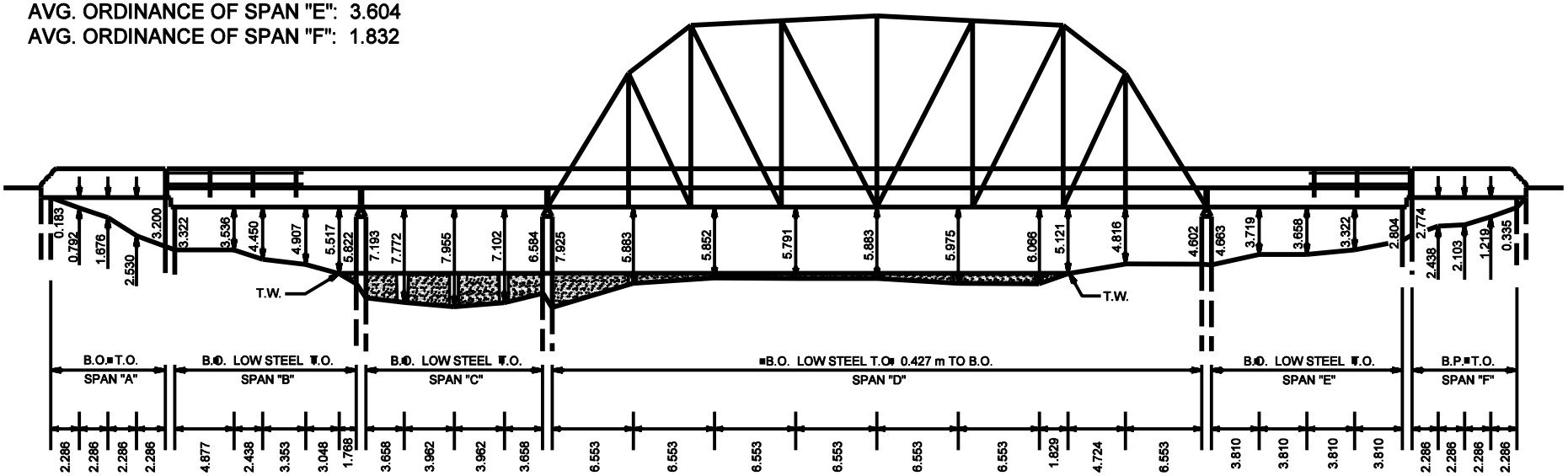
PRESENT STRUCTURE

Figure 22-6E

PRESENT STR. BUILT IN 1941 BY I.S.H.C. AS 6 SPAN STR.

1 - R.C.G. SPAN @ 9.144 m, 2 - S.B. SPAN @ 15.697 m, 1 - S.T.T. SPAN @ 53.34 m,
1 - S.B. SPAN @ 15.697 M, & 1 - R.C.G. SPAN @ 9.144 ON 0 DEG. SK.
C.L. RDWY = 8.534 m VERT. CLR. 4.420 m

AVG. ORDINANCE OF SPAN "A": 2.077
AVG. ORDINANCE OF SPAN "B": 4.600
AVG. ORDINANCE OF SPAN "C": 7.429
AVG. ORDINANCE OF SPAN "D": 5.739
AVG. ORDINANCE OF SPAN "E": 3.604
AVG. ORDINANCE OF SPAN "F": 1.832



PRESENT STRUCTURE PROFILE VIEW

Figure 22-6F

CABLE TELEVISION:

T.C.I. OF INDIANA
1600 WEST THIRD STREET
BLOOMINGTON, IN 47402

ELECTRIC:

PUBLIC SERVICE OF INDIANA
1100 WEST 2ND. STREET
BLOOMINGTON, IN 47402

GAS:

INDIANA GAS COMPANY, INC.
P. O. BOX 966
BLOOMINGTON, IN 47402

SANITARY SEWER:

CITY OF BLOOMINGTON
1969 SOUTH HENDERSON
P. O. BOX 1216
BLOOMINGTON, IN 47402

TELEPHONE:

AMERITECH
4517 EAST INDIANA BELL COURT
BLOOMINGTON, IN 47401

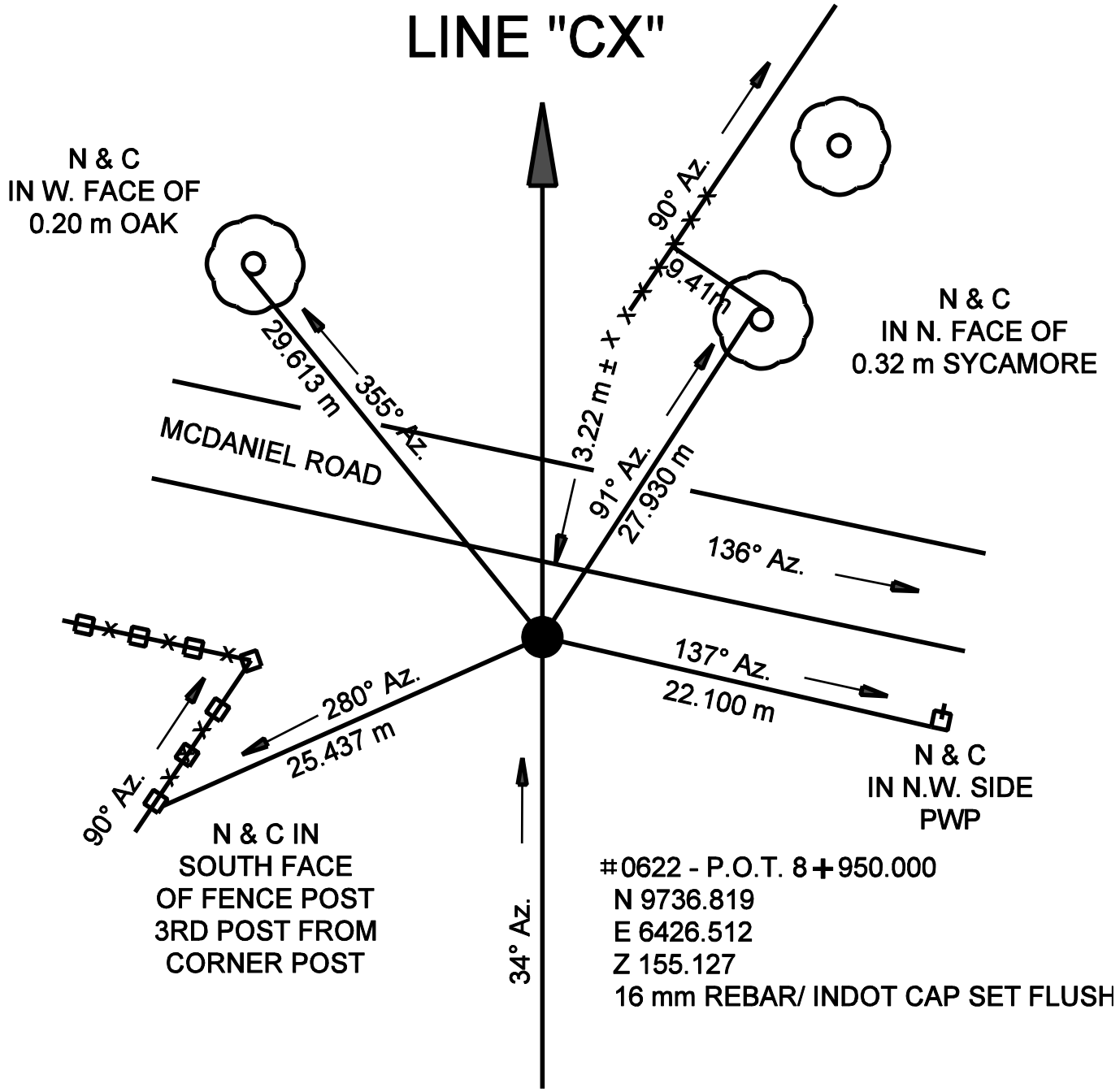
WATER:

CITY OF BLOOMINGTON UTILITIES
1969 SOUTH HENDERSON
P. O. BOX 1216
BLOOMINGTON, IN 47402

Note: There may be other utilities other than these that are listed that were not notified by underground Indiana, and no evidence was discovered as to their identity.

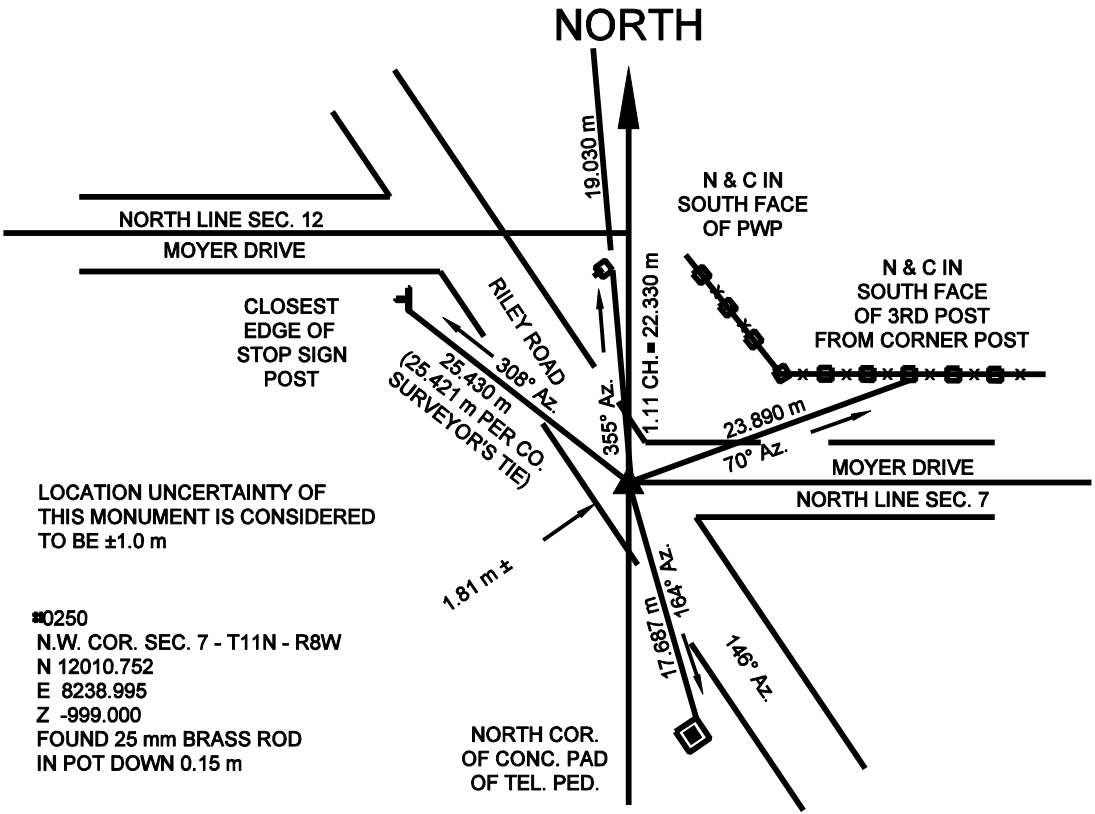
Note: Underground Utilities Contract # 943706042

PUBLIC UTLITIES
Figure 22-6G



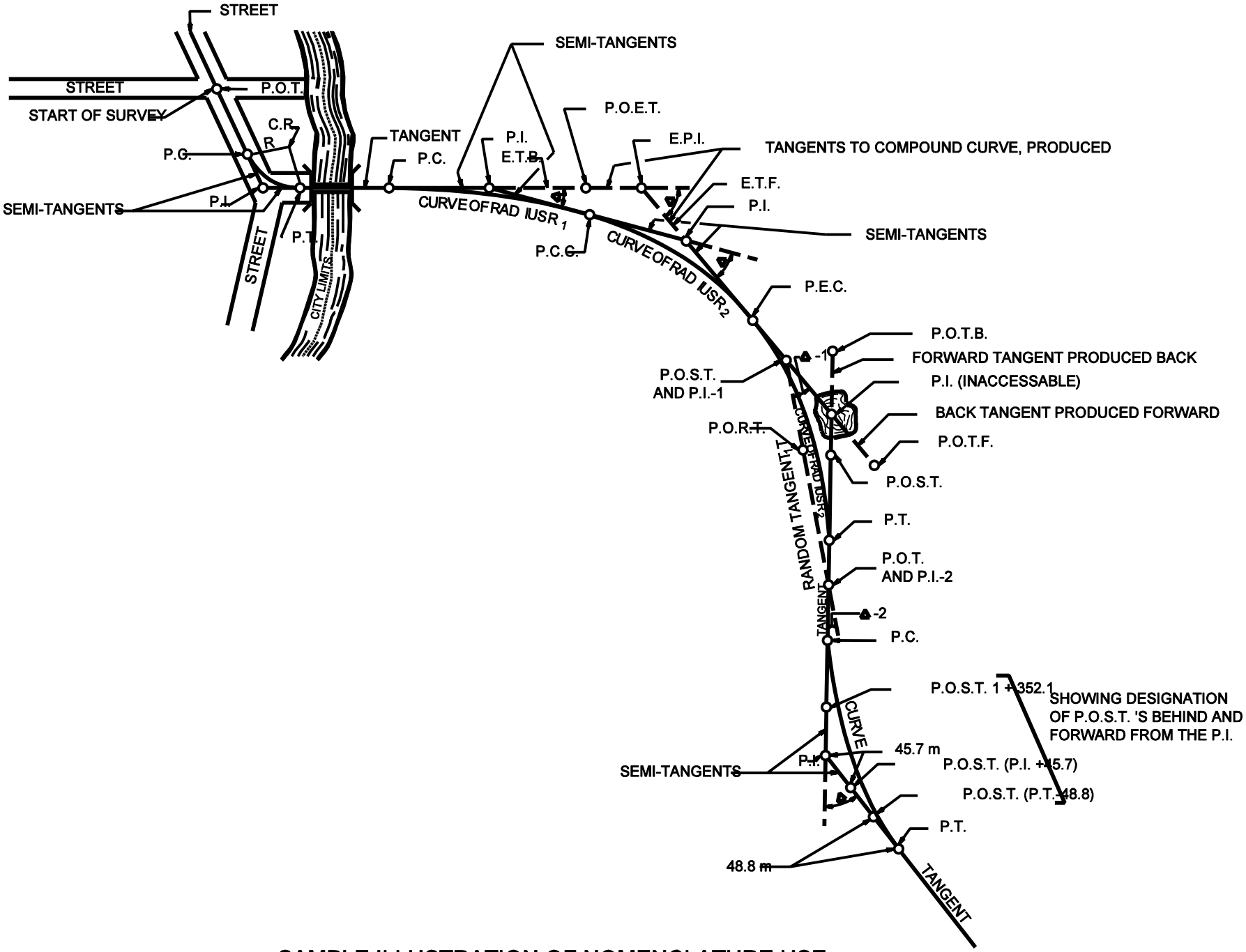
CONTROL REFERENCE POINT

Figure 22-7A



SECTION CORNER REFERENCE POINT

Figure 22-7B



SAMPLE ILLUSTRATION OF NOMENCLATURE USE

Figure 22-8A

P.I.	Point of Intersection, the point where two tangent lines intersect.
P.I.-1, P.I.-2, etc.	Denotes points on the semi-tangents of a curve, or elsewhere, at which angles are turned when the P.I. itself is inaccessible, the algebraic sum of the angles turned at these points being the total deflection that would be turned at the P.I. if it could be set and used.
E.P.I.	External P.I., the intersection point made by two tangents to a compound curve produced to meet outside the regular P.I.'s.
P.C.	Point of Curve, the point where a tangent ends and a curve begins.
P.T.	Point of Tangent, the point where a curve ends and a tangent begins.
P.C.C.	Point of Compound Curve, the common point where a curve of a given radius ends and another curve of a different radius begins.
P.E.C.	Point of Equal Curve, the common point where a curve of a given radius ends and another curve of the same radius begins.
P.O.C.	Point on Curve, any point on the arc of a curve.
P.O.T.	Point on Tangent, any point on tangent line.
P.O.S.T.	Point on Semi-Tangent, any point on the semi-tangents of a curve.
P.O.R.T.	Point on Random Tangent, a P.O.T. on the random line between a P.I.-1, P.I.-2, or P.I.-3, etc.
P.O.T.F.	Point on Tangent (Produced) Forward, any point on the backward semi-tangent of a curve, produced ahead, through and beyond the P.I.
P.O.T.B.	Point on Tangent (Produced) Backward, any point on the forward semi-tangent of a curve, produced back, through and behind the P.I.
C.P.	Center Point, the center of a circle of which an arc used, usually of small radius, is a part. C.P. is often times set when the radius is 30 m or less.
B.S.	Backsight, the point on which the total station is backsighted.
F.S.	Foresight, the point on which the total station is foresighted.
P.O.E.T.	Point on External Tangent (see Figure 22-8A).
E.T.B.	External Tangent Backward (from E.P.I.)
E.T.F.	External Tangent Forward
Δ	Delta, the deflection angle at the P.I. or total angular turn of a curve.
Δ-1, Δ-2, etc.	Angles turned at P.I.-1, P.I.-2, etc., their algebraic sum being Δ.

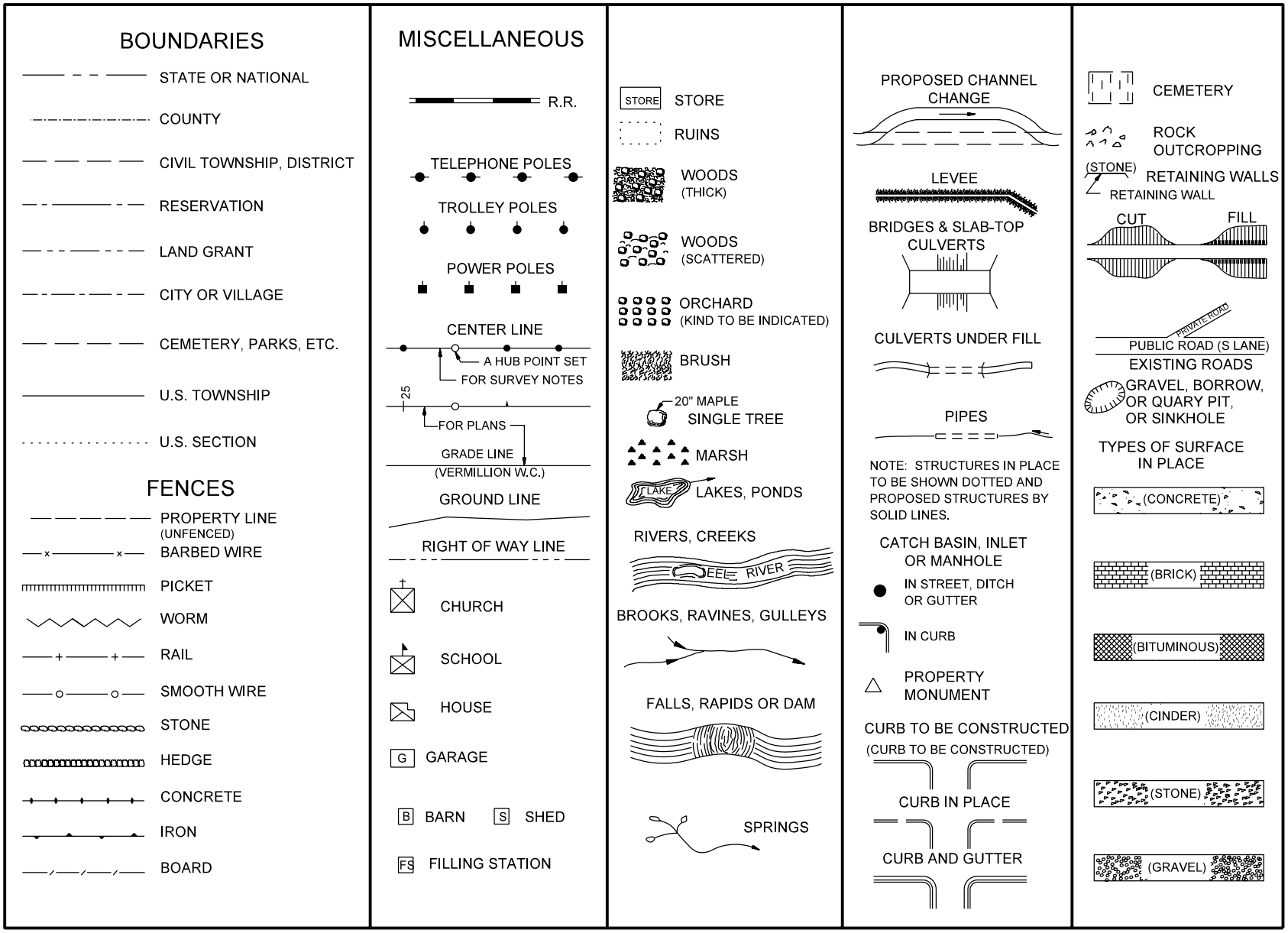
D	Degree of Curve	M.B.	Magnetic Bearing, read from needle, without correction for variation.
E	External of a Curve		
T	Semi-Tangent of a Curve	C.M.B.	Corrected Magnetic Bearing, bearing obtained from needle reading corrected for variation.
L	Length of a Curve		
R	Radius of a Curve		
LC	Long chord of a curve.	O.B.	Observed Bearing, true bearing obtained from observation on Polaris, or the Sun.

T.P.	Turning Point, a temporary point on which the rod is set in making a turn in leveling.
B.M.	Bench Mark, a soli point set or already established, the elevation of which is determined in leveling to provide a permanent elevation reference point.
T.B.M.	Temporary Bench Mark, a bench mark for temporary use but not intended to remain as a permanent B.M.
H.I.	Height of Instrument, in level work the elevation of the instrument line of sight when level is set up.
B.S.	Backsight, the rod reading when backsighting with the level to obtain the H.I.
F.S.	Foresight, the rod reading when foresighting with the level to obtain the elevation of any point.

Note: In establishing the center line of a survey, the original or first line established is designated as Line "A." If an alternate line is established, it becomes Line "B," any succeeding alternates, Line "C," Line "D," etc. In case of a survey crew going out to run a revision of a line run at some time previous, by another survey crew, and the survey crew does not know how many letters have been used for alternates, then start well up in the alphabet with "M" or higher. In establishing preliminary lines, the first one run is "P-1," the next, "P-2," etc. For side road surveys the letter "S" is reserved, the first one being S-1, next S-2, etc. Y-lines should be labeled according to the corner in which they lie, thus a Y in a northeast corner connecting a survey with S.R.100 would be "Y-100-NE"; if the same where alternate line "B" connects, then "YB-100-NE."

NOMENCLATURE FOR USE IN CONVENTIONAL SURVEYS

Figure 22-8B



CONVENTIONAL AND TOPOGRAPHIC LINES AND SURVEYS

Figure 22-8C

Sta.	Station
℄	Centerline
P.L.	Property line
F.L.	Flow line
W.E.	Water's edge
H.W.	High water
Ord. H.W.	Ordinary H.W.
L.W.	Low water
Rd.	Road
Rdwy.	Roadway
Hwy.	Highway
Pub.	Public
Priv.	Private
R.R.	Railroad
Rwy.	Railway
Elec.	Electric
R.	Right
L.	Left
N.	North
E.	East
S.	South
W.	West
p.	Page
pp.	Pages
Sec.	Section
R/W	Right-of-way
Dist.	Distance
c.-c.	Center to center
o.-o.	Out to out
in.-in.	Inside to inside
F.T.	Farm title
V.P.	Vitrified clay pipe
C.I.P.	Cast iron pipe
C.G.M.P.	Corrugated galvanzied metal pipe
B.I.P.	Boiler iron pipe
Conc. P.	Concrete pipe
Wd.B.	Wood box
M.H.	Manhole
Br.	Bridge
Conc.	Concrete
Grav.	Gravel
Bit.	Bituminous
Asph.	Asphalt, asphaltic
Brk.	Brick
Pav.	Paving, pavement
Ft.	Foot, feet
In.	Inch, inches
Yd.	Yard, yards
Mi.	Mile, miles
sq.	Square
cu.	Cubic
Elev.	Elevation
T.P.	Turning point
B.M.	Bench Mark
N&C	Roofing Nail in Bottle Cap

COMMON ABBREVIATIONS FOR NOTE KEEPERS
Figure 22-8D

Off.	Offset
Adj.	Adjusted
Ref.	Reference
Rec.	Recommend
Aver.	Average
Approx.	Approximate
S.R.	State road or route
U.S.R.	U.S. route
C.L.	Corporate limits
C.L.	City limits
Sec. L.	Section line
H.	House
B.	Barn
G.	Garage
S.	Shed
C.C.	Corn crib
W.C.	Water closet
F.S.	Filling station
Gas. P.	Gasoline pump
F.P.	Fence post
Tf.P.	Telephone pole
Tg.P.	Telegraph pole
Pw.P.	Power pole
Lt. P.	Light pole
Br. P.	Brace pole
Gy. P.	Guy pole
F. Hyd.	Fire hydrant
Sdwk.	Sidewalk
Cb.L.	Curb line
Cb. In.	Curb inlet
Gut.	Gutter
M.H.	Manhole
I.P.	Iron pin
W.H.	Wood hub

I.P.F. or W.H.F.	Flush with ground
I.P.L. or W.H.L.	Lightly buried
I.P.B. or W.H.B	Buried below plow
B. Spk	Boat spike
R.R. Spk.	Railroad spike
X-Sec.	Cross-section
T.B.	Top of bank
F.S.	Foot of slope
T.O.	Top opening
T.P.	Top of pipe
Chan. Chg.	Channel change
Hdw.	Headwall
Abut.	Abutment
Wgw.	Wingwall
Br. S.	Bridge seat
T.H.R.	Top of handrail
Wh.	White
Blk.	Black
Yel.	Yellow
O.	Oak
S. Map.	Soft maple
H. Map.	Hard maple
Wal.	Walnut
Hick.	Hickory
Wil.	Willow
Syc.	Sycamore
Chy.	Cherry
W. Chy.	Wild cherry
Apr.	Apricot
Pch.	Peach
Pers.	Persimmon
Pop.	Poplar
Cot.	Cottonwood
Sass.	Sassafras
Loc.	Locust

ADDITIONAL ABBREVIATIONS FOR NOTE KEEPERS
Figure 22-8E