





# Alberta/British Columbia Interprovincial Monument Guide

## Monument Styles, Abbreviations, and Symbols

Monument Style	Abbreviation	Symbol
Brass Bolt	B.B.	
Brass Cap	B.C.	
Cairn	&C.	
Capped Post	C.P.	
Concrete Monolith (Monument)	C.M.	
In Concrete	inC.	
In Rock	inR.	
Reference Post	Ref.P.	
Steal Sheath	S.S.	
Witness	Wit.	

## Examples:

### Concrete Monolith C.M.

Square concrete base with concrete monolith in middle. The monolith is clad in heavy zinc with brass name plates, secured to the monolith by threaded brass bolts. Red Metal caps placed as part of the restoration to protect the concrete monolith.



(Before and after Restoration)

## Brass Bolt & Cairn, B.B. &C.

Rock Cairn built around a Brass Bolt



(Outside photo of Cairn)



(Brass Bolt within Cairn)

## Brass Bolt in Concrete, B.B. inC.

Brass Bolt placed in a concrete tower and concrete base



(Unstable Brass Bolt in Concrete, monument was destroyed and replaced with Brass cap at ground level)



(Brass Bolt in concrete on restored Concrete Base)

## Brass Cap in Concrete, B.C. inC.

Brass Cap survey monument placed in center of concrete base



(Brass cap placed in center of restored Concrete Base)



(Brass Cap monument in concrete base)

## Brass Cap in Rock, B.C. inR.

Brass Cap monument set in a rock base



(Brass Cap set in rock)



(View of Rock base)



### Capped Post, C.P.

A survey cap monument placed on a segment of rebar or a post)



(Capped Post)



(Capped Post placed within concrete for added stability, NOT A C.M.)

### Reference Post

A sign placed to help locate and protect the monument.



(Two different reference post styles)

### Steel Sheath, S.S.

Steel Sheath placed around a  
Concrete Monolith



(Restored Steel Sheath of a C.M. monument)

## Historical Diagrams

### Concrete Monuments or Monuments (Concrete)

- This monument type is now described as a Concrete Monolith (C.M.)
- A sketch and description of this monument type is provided on pages 17-19 of *Report of the Commission Appointed to Delimit the Boundary between the Provinces of Alberta and British Columbia Part I From 1913 to 1916*. See Appendix A.

### Brass Bolt

- This monument type is now described as a Brass Bolt (B.B.)
- A sketch and description of this monument type is provided on pages 23-25 of *Report of the Commission Appointed to Delimit the Boundary between the Provinces of Alberta and British Columbia Part I From 1913 to 1916*. See Appendix B.

### Monuments (Special)

- This monument type is now described as a Brass Cap (B.C.)
- A sketch and description of this monument type is provided on pages 94-97 of *Report of the Commission Appointed to Delimit the Boundary between the Provinces of Alberta and British Columbia Parts III-A and III-B 1918 to 1924 From Yellowhead Pass Northerly; Township 72-85* - pages 146 to 161. See Appendix C.

### 1950's Monuments (Special)

- This monument type is now described as a Brass Cap (B.C.)

- A sketch and description of this monument type is provided on pages 19-20 of *Report of the Commission Appointed to Delimit the Boundary between the Provinces of Alberta and British Columbia Part IV 1950 to 1953 Latitude 57°26'40".25 Northerly*. See Appendix D.

## Appendix A: Concrete Monuments



latitude and longitude of the monument used as an observation station in each pass has been computed from the tables issued by the Surveyor General's office.

From the surveys of the Boundary, thus established, used as bases, the secondary triangulation system carried over the entire length of the Boundary by Mr. Wheeler has been expanded and checked at each succeeding pass.

Independent checks on his system of triangulation have been made by Mr. Wheeler by azimuth readings taken upon, or from, the various primary triangulation stations of the Railway Belt Survey, made by J. J. McArthur, D.L.S. and W. S. Drewry, D.L.S., as early as 1887.

In that part of the Boundary Survey dealt with in this first part of the Commission's report, namely from the International Boundary to the Kicking Horse Pass, the computations of elevation above sea-level of all monuments and of the mountains between passes that have been occupied as stations by Mr. Wheeler are primarily based on the track elevations obtained by the Canadian Pacific Railway Company in the Kicking Horse and Crowsnest Passes as corrected up to date. In the Akamina Pass the elevation assigned by the International Boundary Commission to their monument No. 272 was adopted as correct. It is interesting to note that the gross apparent error found by Mr. Wheeler when tying on to monument No. 272 in 1915, after having carried his trigonometric levelling survey from Crowsnest Pass—a distance of approximately fifty-three miles in an air line—was one foot.

#### BOUNDARY MONUMENTS

The concrete monument which is erected in the passes was designed by Mr. Wheeler, and, with certain modifications suggested by Mr. Cautley, has proved to be entirely satisfactory.

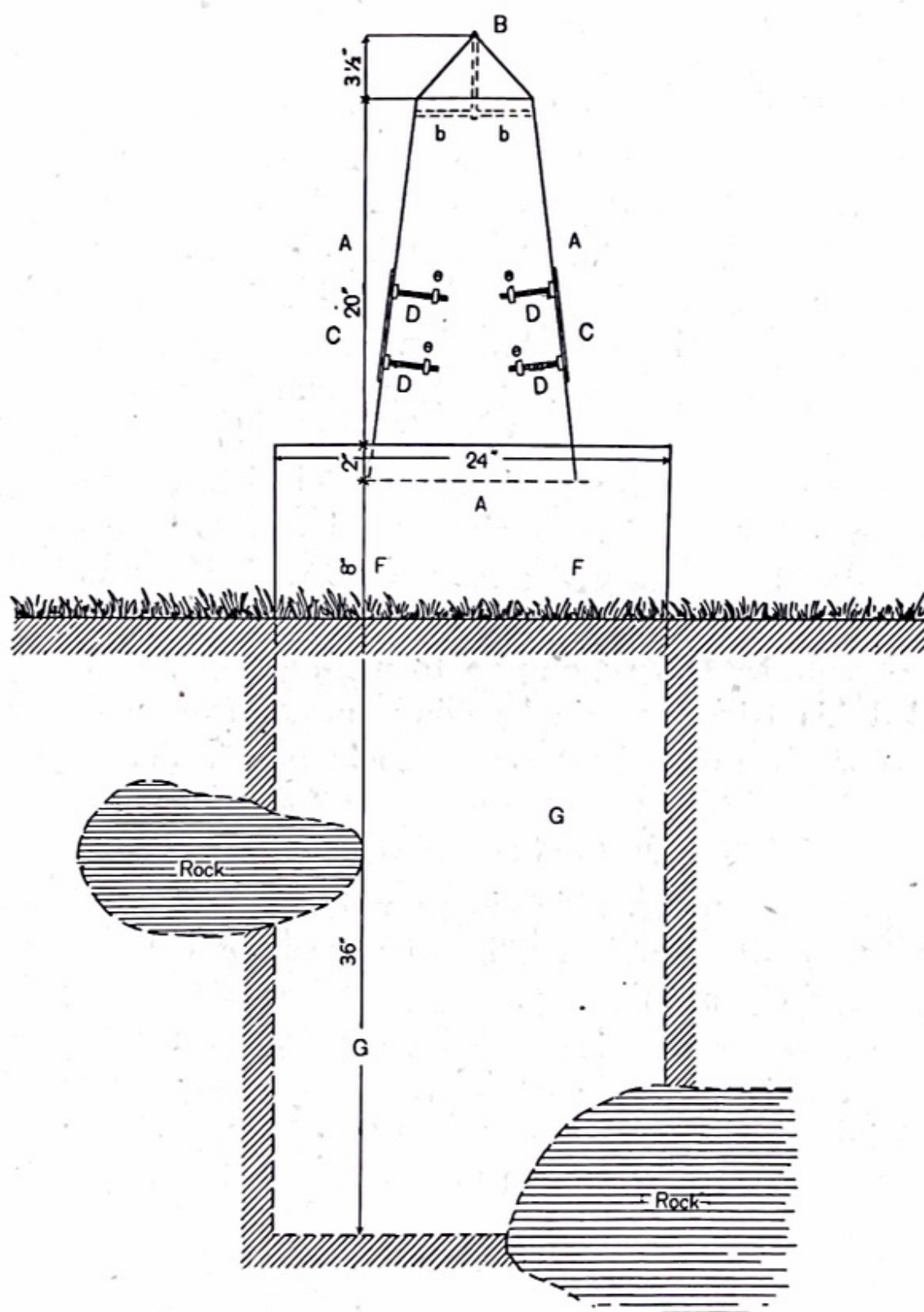
In essence the monument is a concrete monolith, consisting of a truncated pyramid 20 inches high, of which the bottom cross-section is 12 inches square and the top 7 inches square, having a flattish pyramidal top and set on a base 24 inches square which extends 10 inches above the ground and 36 inches into it.

Its parts may be best described by reference to Fig. 1 as follows:—

- A is a form made of heavy zinc which is filled with concrete and is the permanent outer covering of the top part of the monument.
- B is an iron bar protruding through the top of the zinc form and secured in the concrete by the cross-piece (b);
- CC are brass name plates about 1-8th inch thick, each of which is secured to the monument by four threaded brass bolts—DDDD— $\frac{1}{4}$  inch in diameter and  $3\frac{1}{2}$  inches long. On each bolt there are two nuts, one of which is screwed up so as to hold the brass plate close to the zinc form while the concrete is setting in said form, while the other is left near the end of the bolt—as at eeee—to become embedded in concrete and act as



an anchor. The name plates are deeply etched with the names "ALBERTA" and "BRITISH COLUMBIA," respectively, at the factory, and the number of the monument and characteristic letter of each pass are similarly etched in the field as required.\*



SHOWING CONSTRUCTION OF CONCRETE MONUMENT

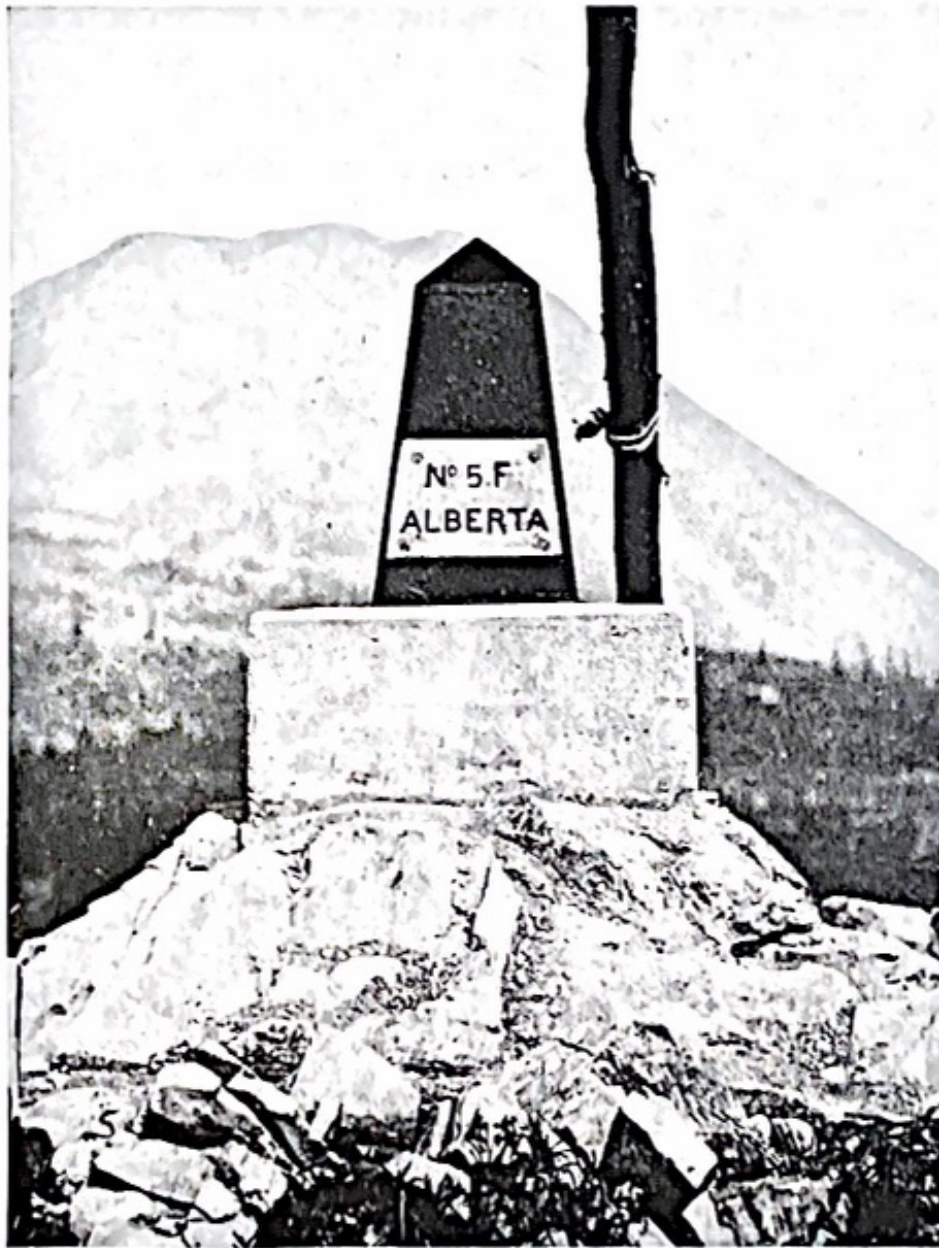
FF is the top of the concrete base which is 24 inches square and extends 10 inches above the surface of the ground.

GG is the extension of the concrete base below surface level. Owing to the difficulty of packing lumber in the mountains and the impossibility of

\*The name plates first designed, and used during the season of 1913 in the Kicking Horse, Vermilion and Simpson Passes, were of thin sheet brass with raised letters and figures which were soldered to the zinc form. After the first season's work your Commissioners felt that these were unsatisfactory, and, on their recommendation, dated the 24th February, 1914, they were authorized to procure and use the heavy brass plates described above.



using an underground form more than once, the collapsible form used for the bases is made to extend only two inches below the surface; below this the hole is dug as carefully as possible and filled full of concrete. Wherever it is possible the holes are dug a full three feet deep; where large boulders are encountered their surfaces are washed so that the concrete may form a properly bonded contact with them. In many cases the monument site is situated on rock in place; in these cases all loose or



MONUMENT 5 F IN CROWSNEST PASS

- partly disintegrated rock is broken away and removed, the interstices are cleaned out and washed and the base is built right on the rock. Fig. 2 illustrates a good example of a monument built in this way; 12 inches of the original surface rock was broken down to secure the foundation for this monument, and its stability is beyond question.

The advantages of this type of monument, as compared with other types which have been used on similar surveys and which have generally taken the form of bronze or cast iron posts, may be stated as follows:—

1. It possesses great solidity and stability, since a monument with a full three foot base weighs about 2700 lbs.

## Appendix B: Brass Bolt



On the basis of charging half the expense of the pack train and half the wages and allowances of the two packers to the monument account, under the head of transportation, and charging as labour of building the actual time of men who are engaged in building monuments, it may be estimated that the actual construction of each monument costs from \$30.00 to \$40.00, as follows:—

To material for one monument.....	\$11.50	\$11.50
“ labour of building.....	4.50	4.50
“ transportation of material by rail and horse.....	14.00 or	24.00
		<hr/>
Total cost of each monument.....	\$30.00 or	\$40.00

#### BOLT AND CAIRN MONUMENTS

From the commencement of the survey until the end of the season of 1915 the bolt form of monument used by the Commission consisted of a solid brass bolt with a shank 4 inches long, of the form and dimensions shown in Fig 3.

It was stamped by means of steel dies with the words “ALBERTA” and “BRITISH COLUMBIA” on the longer sides, and with the number and characteristic letter of the pass on the shorter sides, or ends. A “+” was stamped in the centre of the upper face, or top.

The bolt is set in cement in a hole drilled for that purpose in the solid rock. In some few cases, however, solid rock was not to be had and the bolt has been set in the largest available loose boulder.

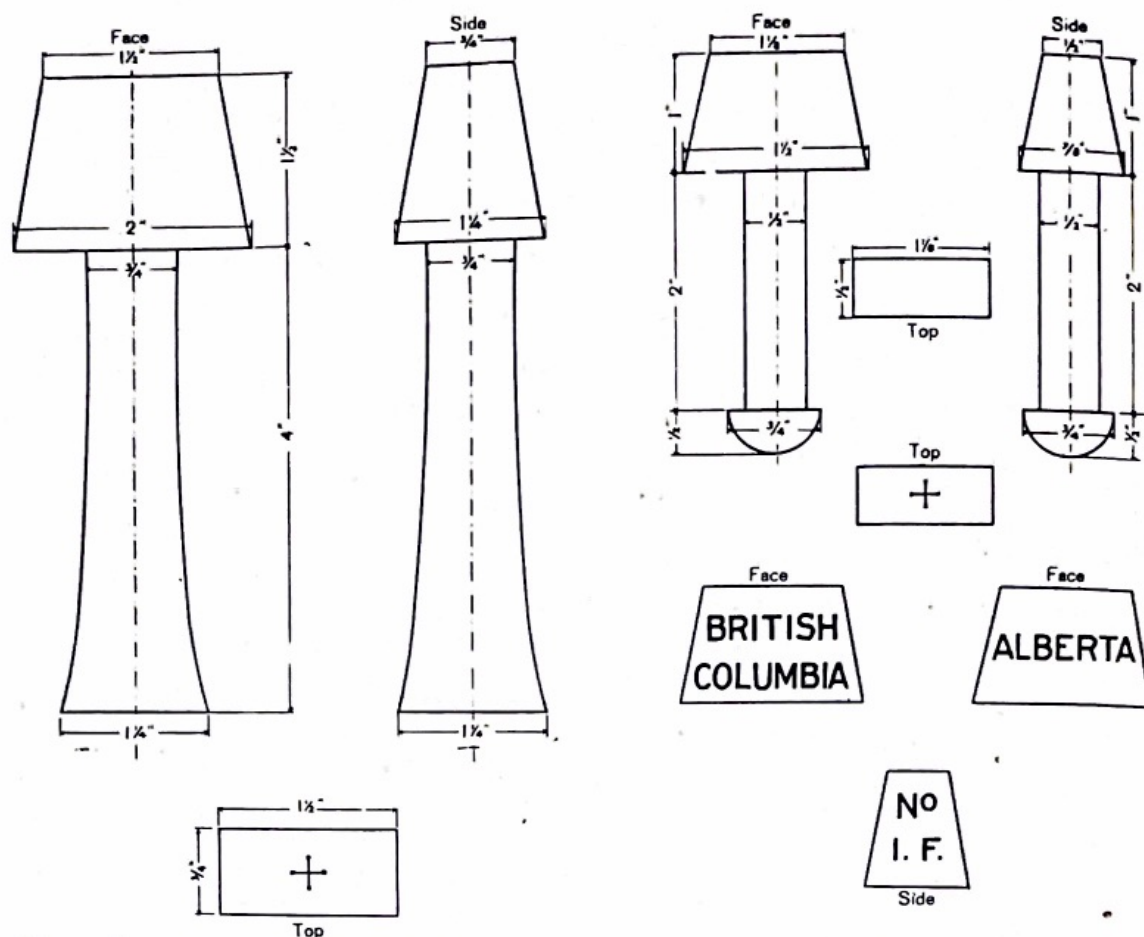
The position of the bolt is marked by the erection over it of a rock cairn with five-foot base and from five to seven feet high, depending upon the amount of material at hand. A photograph or photographs of the cairn and description of its location serve to identify the spot where the bolt has been placed.

The bolt weighs 2 lbs. and it requires a 1½ inch drill and 5 lb. sledge to make the hole in which it is cemented.

In many cases the rock is of a rotten, friable character and the making of a hole with so large a drill frequently results in splitting and chipping. The weight also of the sledge, drill, bolt and cement, together with the surveying instruments has proved highly detrimental when making difficult climbs to selected points.

For the above reasons it has been decided to reduce the dimensions of the bolt to those shown in Fig. 4.





BRASS BOLT USED DURING THE SEASONS OF  
1913, 1914 AND 1915

BRASS BOLT USED SINCE 1915

### THE USE OF BOLT AND CAIRN MONUMENTS

Bolts and cairns are used as monuments of the Boundary Survey in three ways, as follows:—

1. It may be necessary to use a bolt to mark the intersection of two straight line courses of the Boundary. Bolt 4 B in Vermilion Pass may be cited as an example of this case. This Bolt is considerably below timber line, and its location is quite suitable for the erection of a concrete monument, but a precipitous rock bluff, about 700 feet high and extending right across the line for a considerable distance on either side of it, made the transport of monument material impracticable.
2. Usually the last straight line course on either side of a pass is terminated by a bolt and cairn, because the terminal point selected by the Commission is generally inaccessible to horses. This is due to the feeling of the Commission that the straight line boundary should be carried beyond timber line to some prominent terminal point whence the position of the natural boundary, or watershed, is clearly defined, in all cases where such a line can be found which fairly conforms to the watershed.

3. Beyond the last course of the straight line boundary Mr. Wheeler uses bolts to mark dominating points of the watershed in the immediate vicinity of the passes. These bolts are used by him as triangulation stations, and are closely connected with all other monuments of the survey.

Bolts set under this heading are always set on the actual watershed, but the Boundary between such bolts, and the continuation thereof beyond the last bolt set, is the natural watershed as established by photographic delineation.

The cairns built over bolts are all photographed, and the photographs are included in Appendix I of this report.

Since the position of bolts and cairns is accurately determined by the Commission, in relation to the other monuments of the Boundary survey, and to the points of the Dominion Lands System connected therewith, and the cairns are generally visible for miles on either side of a pass, it is possible for a surveyor employed to make land surveys within a reasonable distance of a pass to tie on to the Boundary survey by methods of triangulation, without going to the great labour involved in running a traverse up to the Boundary. In view of the facts (a) that it is of the greatest importance that all isolated surveys should be connected with some survey of which the relative position to the general survey system of the country has been established, and (b) that almost all the concrete monuments of the Boundary survey are situated in thick woods, and that it is difficult to tie on to them by the employment of trigonometric methods for that reason, it is considered probable that these outlying bolts of the pass surveys will be found very useful, and will be extensively used in the years to come.



## Appendix C: Monuments (Special)

remain clear for perhaps fifty years, whereas the lines cut through heavy bush will grow up much more quickly. This is due to the extraordinarily slow growth of timber in muskeg.

Wherever concrete monuments were built the ground was cleared for a space having a twenty-foot radius from the monument, partly to make the monument conspicuous but more particularly in order to afford it protection from bush fire.

#### MAGNETIC DECLINATION

Observations to determine the magnetic declination of the compass needle were taken at various points along the 120th meridian.

#### CONNECTIONS WITH PREVIOUS SURVEYS

Wherever possible carefully surveyed connection was made with all pre-existing surveys, particularly with those Base Lines which form the framework of the Dominion Lands System of surveys. Owing to their importance as governing lines, Base Lines are very carefully surveyed. But Base Lines are not only lines of survey projected far beyond the limits of settlement and civilization as a base for the surveys of the future; they have a greater value and a more romantic interest as lines of exploration. Base Lines have an unexpected trick of running into rivers, that would be called "big" anywhere else than in Canada, miles away from where such river is shown on the latest previous map. They are the sources of information from which the heads of survey departments decide on future policies, and which enables them to avoid waste of public money on subdivision surveys of areas unsuitable for settlement. They generally afford the only reliable data of elevations and surface conditions that are immediately available to those who are considering the probable route of a possible railway.

No less than nine Base Lines, from the 16th to the 24th inclusive, were tied in by surveyed connection to the Boundary survey.

#### BOUNDARY MONUMENTS

Two types of monuments have been used to mark the survey of the Inter-provincial Boundary along the 120th meridian; the first is the concrete monument so fully described in Part I, Chapter II, pages 17 and 18 of this report, and the second consists of a standard Dominion Lands Survey post with a specially designed bronze cap, and a mound and trench or a stone mound.

Diagram I shows the standard Dominion Lands Survey post with the special bronze cap designed for the Boundary monuments.

Diagram II shows the position of the post with respect to the mound and trench, the dimensions of the two latter, and the rock post.

An alternative form of the above secondary Boundary monument consists of the special bronze cap fitted with a short shank—four inches long—which is cemented into rock when it is necessary to establish a monument of rock.

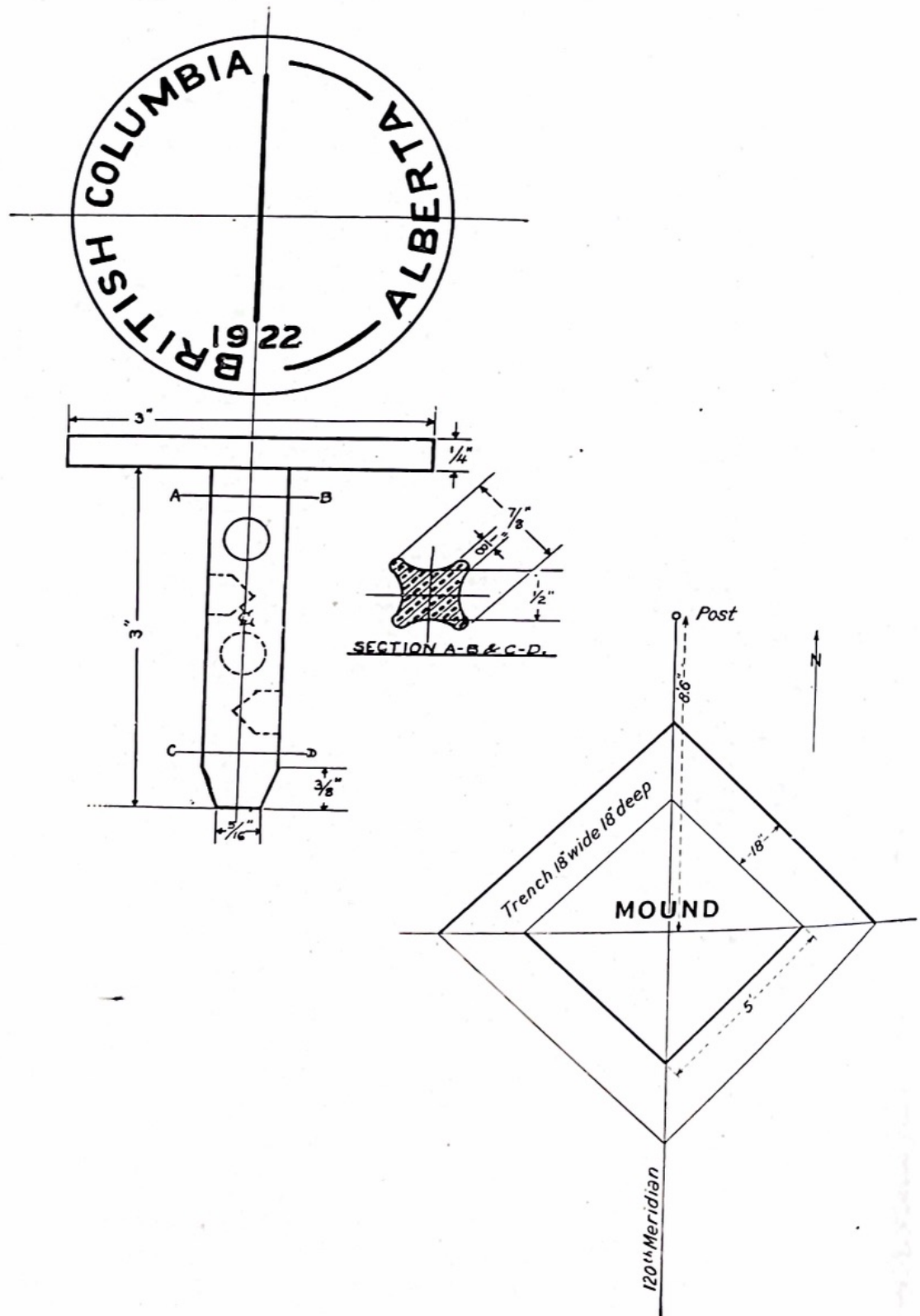


ALBERTA-BRITISH COLUMBIA  
SURVEY POST



ROCK SURVEY  
POST

DIAGRAM II



There is no comparison between the relative merits of the concrete monument and the secondary type of monument. On the other hand, the secondary monument is of a very permanent type, and was designed and authorized by the 1921 Conference in order to avoid the immense cost of transporting monument material to parts of the Boundary far removed from railway, steamboat or wagon facilities of transportation. Apart from the cost of transporting cement, forms, etc., by packtrain, for distances in some cases over 100 miles over rough survey trails, much of the 120th meridian passes through country where it was impossible to secure gravel within reasonable distance of the monuments to be built.

*Concrete and Secondary Type Monuments.*—From Monument 56-0, at the intersection of the 120th Meridian with the summit of the Rocky Mountains, to concrete Monument 62-3, just north of Narraway River, a distance of 38.3 miles, all monuments are of the secondary type.

From Monument 62-3, the most southerly concrete monument built, to concrete Monument 66-4, on the south bank of Wapiti River, a distance of 26.7 miles, a concrete monument was built at intervals of about six miles and all intervening monuments are of the secondary type.

From Monument 66-4 to concrete Monument 84-5, twelve miles north of Peace River, a distance of 109.7 miles, all monuments are of the concrete type with the single exception of Monument 67-6, which occurs on a low ridge in the middle of a big muskeg and is of the secondary type.

From Monument 84-5 to Monument 97-5, being the final northerly monument erected by the Commission, a distance of 77.7 miles, all monuments are of the secondary type.

*Marking of Monuments.*—All Boundary monuments have the words "ALBERTA" and "BRITISH COLUMBIA" plainly marked on those sides of the monument which faces towards the respective Provinces.

In addition it was necessary to mark each individual monument with some distinctive mark of identification.

In the case of Boundary monuments on the 120th meridian it was decided to mark each monument with the number of the township of the Dominion Lands System in which it occurs, followed by its number in order from the south boundary of such township. Thus the first monument built north of the south boundary of township 78 is marked "No. 78-1," and the next monument to the north "No. 78-2" etc. One merit of the above method of numbering lies in the fact that it affords a universally applicable system of marking monuments on the 120th meridian for any part of the line, irrespective of whether it was surveyed north or south from the initial point established.

Brass name-plates of concrete monuments are marked in the field as previously described in Part I of this Report.

Bronze caps of the secondary type of monument are marked with steel dies.

## Appendix D: 1950's Monuments (Special)



Following instructions, the starting point for this season's survey, that is, Monument 97-5 established by Mr. Cautley in 1923, was verified beyond doubt by retracing the sections of the boundary lying between Monuments 97-3, 97-4 and 97-5.

To begin with, the old cutting in this vicinity was quite clear and unmistakable. Although the surface was overgrown with willow and alder, the larger timber had encroached but little and the skyline was quite open.

Monuments 97-3, 97-4 and 97-5 were found in good condition, with posts intact. The mounds and trenches were grown over with grass and small brush. However, except for a general rounding-off of their angularities, they were in good condition.

Bench marks 72 and 73 were found. Number 72, however, was destroyed—the tree having died and fallen. Levels were run between Monuments 97-3, 97-4 and 97-5, and 97-5 was connected to bench mark 73.

#### *Boundary Monuments*

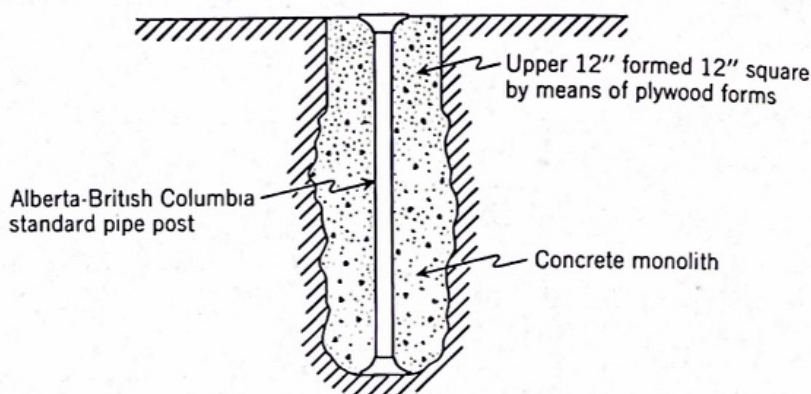
Sixty-four monuments were placed on the boundary during the season, spaced at an average distance of 81 chains. These monuments were all of the secondary type described on pages 94 to 97, Chapter II of Part III-B of the Boundary Commission's Report, and they conform to the specifications there set out. There is a minor difference in the engraving on the cap of the posts used in 1950, in that a crown appears at the top of the cap and the digits 195— at the bottom, as is shown in the diagram below, as well as a statement of protective penalty.



One or more bearing trees were made at each monument where suitable trees existed. These further perpetuate the monuments.



In order to increase the permanency of the monumenting, certain of the posts, at intervals of about 6 miles, were imbedded in concrete. The following diagram shows the general form of this added protection.



Gravel was not available at certain of the sites chosen for concreting. In these cases the standard iron post was imbedded in a mass of neat, wetted Portland cement (1 bag) and the squared top was omitted. The upper 10 inches, approximately, of the hole dug to receive the post and cement mass was back-filled with dirt. This alternative method of enhancing the permanency of the monument should be quite effective despite the lack of gravel.

Each of the posts set was stamped with the corresponding number, according to the system of numbering used on the 120th meridian previously. That is to say, each post was marked (by means of steel dies) with the number of the township in which it lies, followed by its number in order from the south boundary of the township. That is, the first, second and third monuments in township 98 were stamped 98-1, 98-2 and 98-3, and so on, throughout the length of the boundary.

### *Photography*

Photography was used extensively throughout the operations of the survey party. Vertical air photographs taken by the Royal Canadian Air Force as a part of the normal mapping program covering Canada were used to good advantage. A strip of mapping photographs which covers the projected boundary was selected and carried in the field. Inspection of these photographs before the commencement of field operations yielded invaluable information about the terrain and conditions which were later to be encountered and assisted materially in the planning of the project. The actual field operations benefitted by their use in planning and controlling the day-to-day work. Selection of the most suitable camp-sites became a relatively simple matter and the optimum movements of the camp could be intelligently planned without the need of laborious reconnaissance in the field. Furthermore, the strip of country traversed by the boundary can be fairly accurately mapped in some detail by the use of these photographs and a process of analogy based upon the conditions and