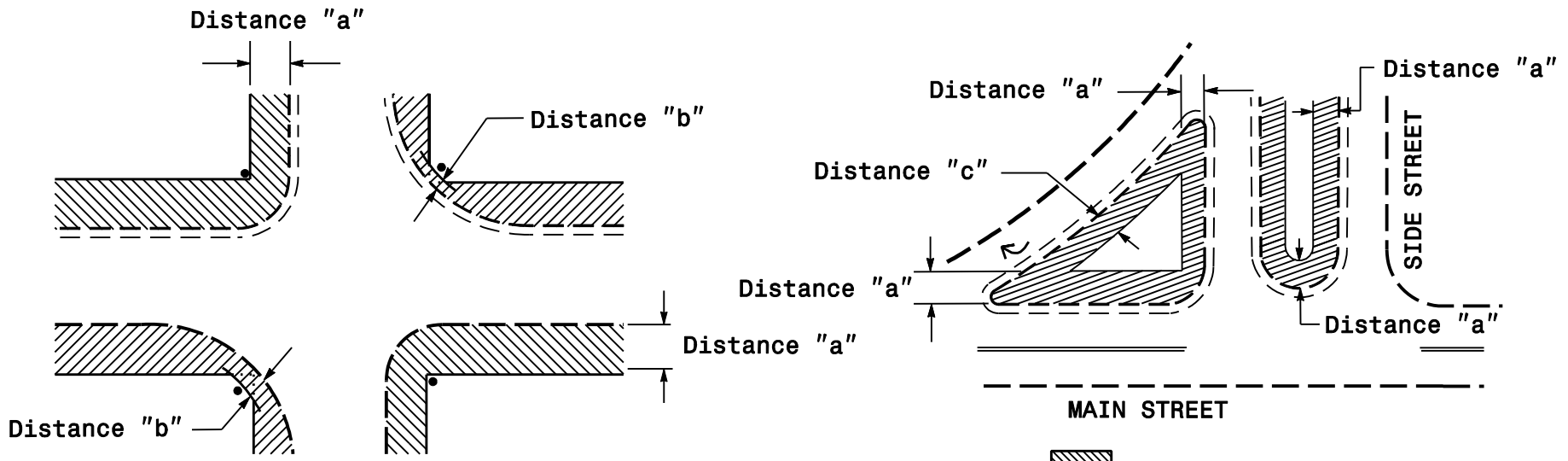
# Clear Zone Distances for Pole Placement




| Design Speed MPH (km/h) | Distance "a" | | Distance "b" | | Distance "c" | | |
|---|---|---|---|---|---|---|---|
| | Distance from Face of Curb ft (m) | Distance from EOP ft (m) | Face of Curb ft (m) | EOP ft (m) | Side St. Speed MPH | Distance from Face of Curb ft (m) | Distance from EOP ft (m) |
| ≤40 (64) | 12 (3.5) | 14 (4.0) | 7 (2.0) | 10 (3.0) | ≤40 | 7 (2.0) | 7 (2.0) |
| | | | | | 45-50 | 7 (2.0) | 7 (2.0) |
| | | | | | ≥55 | 10 (3.0) | 12 (3.0) |
| 45-50 (72-80) | 16 (5.0) | 18 (5.5) | | | ≤40 | 7 (2.0) | 7 (2.0) |
| | | | | | 45-50 | 10 (3.0) | 12 (3.5) |
| | | | | | ≥55 | 12 (4.5) | 14 (4.5) |
| ≥55 (88) | 22 (6.5) | 22 (6.5) | | | ≤40 | 7 (2.0) | 7 (2.0) |
| | | | | | 45-50 | 10 (3.0) | 12 (3.5) |
| | | | | | ≥55 | 12 (3.5) | 14 (4.5) |

Note 1: When traffic signals are installed on high-speed facilities, the signal supports should be placed as far away from the roadway as practical.

Note 2: Painted islands should not be used for pole locations unless a method of protection is provided (such as a guardrail).

Distances are the desired minimum from the face of pole

Reference: "Roadside Design Guide" 2002 AASHTO

# Standard Pole Placement

SIGNALS & GEOMETRICS SECTION
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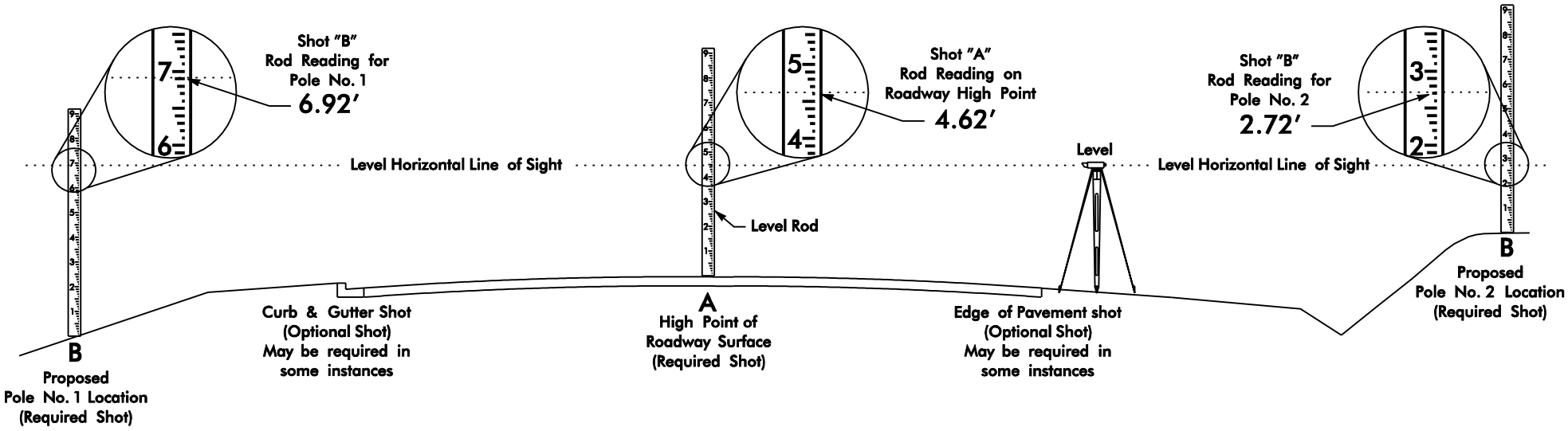
10.0
SHEET 1 OF 1

## Survey Level With Rod Method

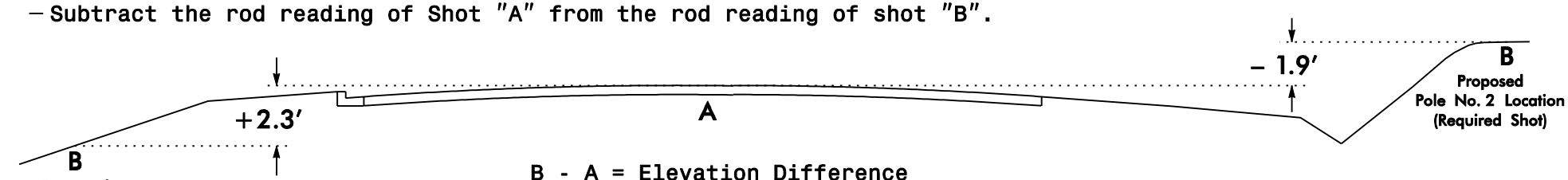
**Step 1:** Using a standard Survey Level and Level Rod:

– Take elevation shots on high point of roadway (shot "A") and at proposed pole foundation centerline (Shot "B").




**Step 2:** Find the elevation difference between the proposed foundation and the high point of the roadway

– Subtract the rod reading of Shot "A" from the rod reading of shot "B".




B - A = Elevation Difference

(Do not round up)

Elevation difference for Pole No. 1: 6.92′-4.62′ = +2.3′

Elevation difference for Pole No. 2: 2.72′-4.62′ = -1.9′

# Determining Elevation Difference for Metal Poles

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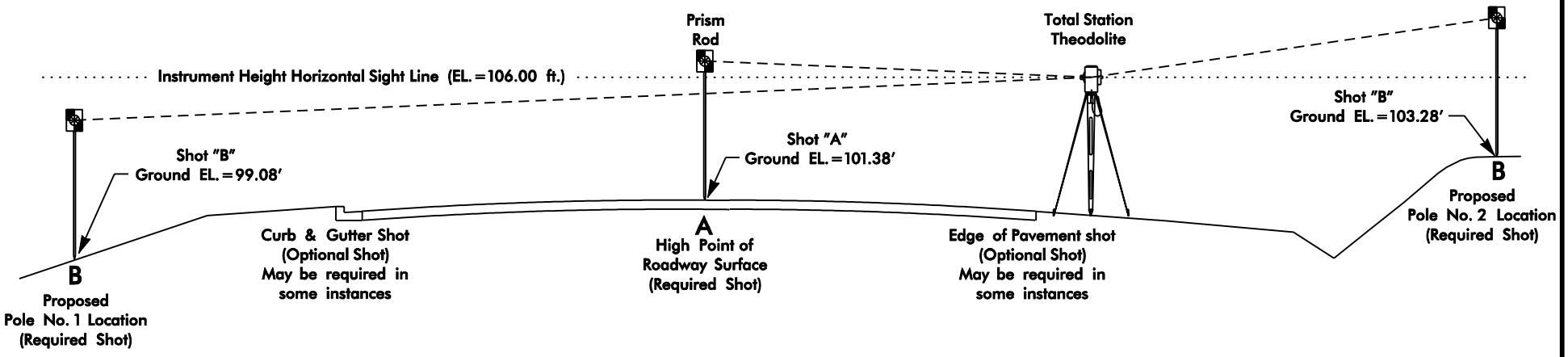
10.1.1
SHEET 1 OF 2

## Total Station And Data Collector With Prism Rod Method

**Step 1:** Using a Total Station and Data collector with Prism Rod:

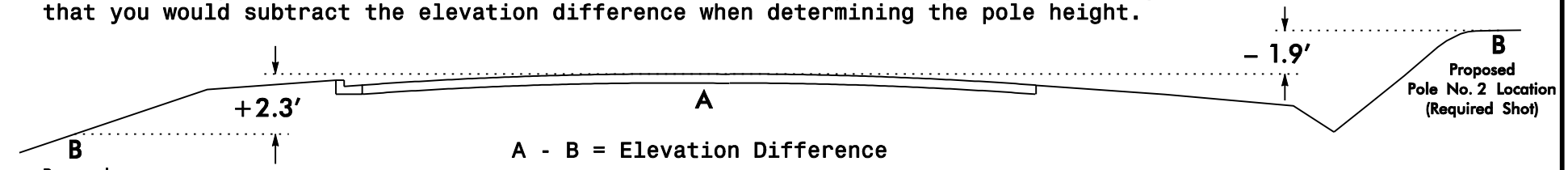
– Take elevation shots on high point of roadway (shot "A") and at proposed pole foundation centerline (Shot "B").




**Step 2:** Find the elevation difference between Shot "A" and Shot "B"

– Subtract the ground elevation of Shot "B" from the roadway elevation of shot "A".

Notice the difference in the equation when different survey methods are used. A positive number should reflect that you would add the elevation difference to the pole height, where a negative number would mean that you would subtract the elevation difference when determining the pole height.




A - B = Elevation Difference

(Do not round up)

{ Elevation difference for Pole No. 1: 101.38'-99.08' = +2.3'
Elevation difference for Pole No. 2: 101.38'-103.28' = -1.9'

# Determining Elevation Difference for Metal Poles

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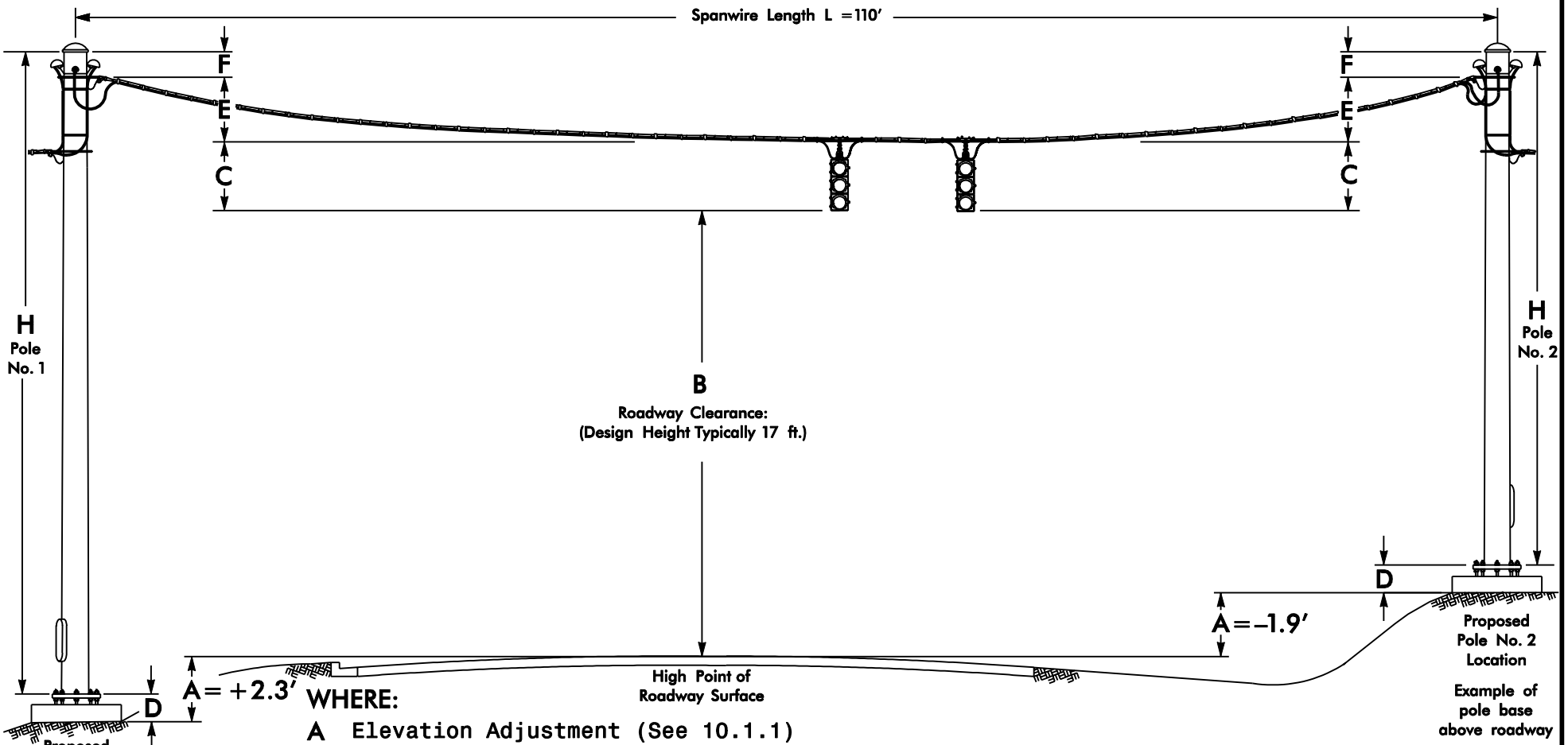
# MINIMUM STRAIN POLE HEIGHT (H) = A + B + C − D + E + F




**WHERE:**

- **A** Elevation Adjustment (See 10.1.1)
- **B** Roadway Clearance Distance (Design Height typically 17′)
- **C** Signal Head Height for Spanwire Mounting (See 10.1.3)
- **D** Top of pole base above ground = 0.75′
- **E** Spanwire Sag = 4% of total Spanwire Length "L"
- **F** Spanwire Attachment Point (Minimum) = 1.5′ Below Top of Pole

**Calculating H** (Round up to .5 ft.)

Pole height for pole No. 1 (H): +2.3′+17′+4.25′-.75′+4.4′+1.5′ = 28.7′ => 29.0 ft.

Pole height for pole No. 2 (H): -1.9′+17′+4.25′-.75′+4.4′+1.5′ = 24.5′ => 24.5 ft.

# Pole Height Determination – Strain Poles

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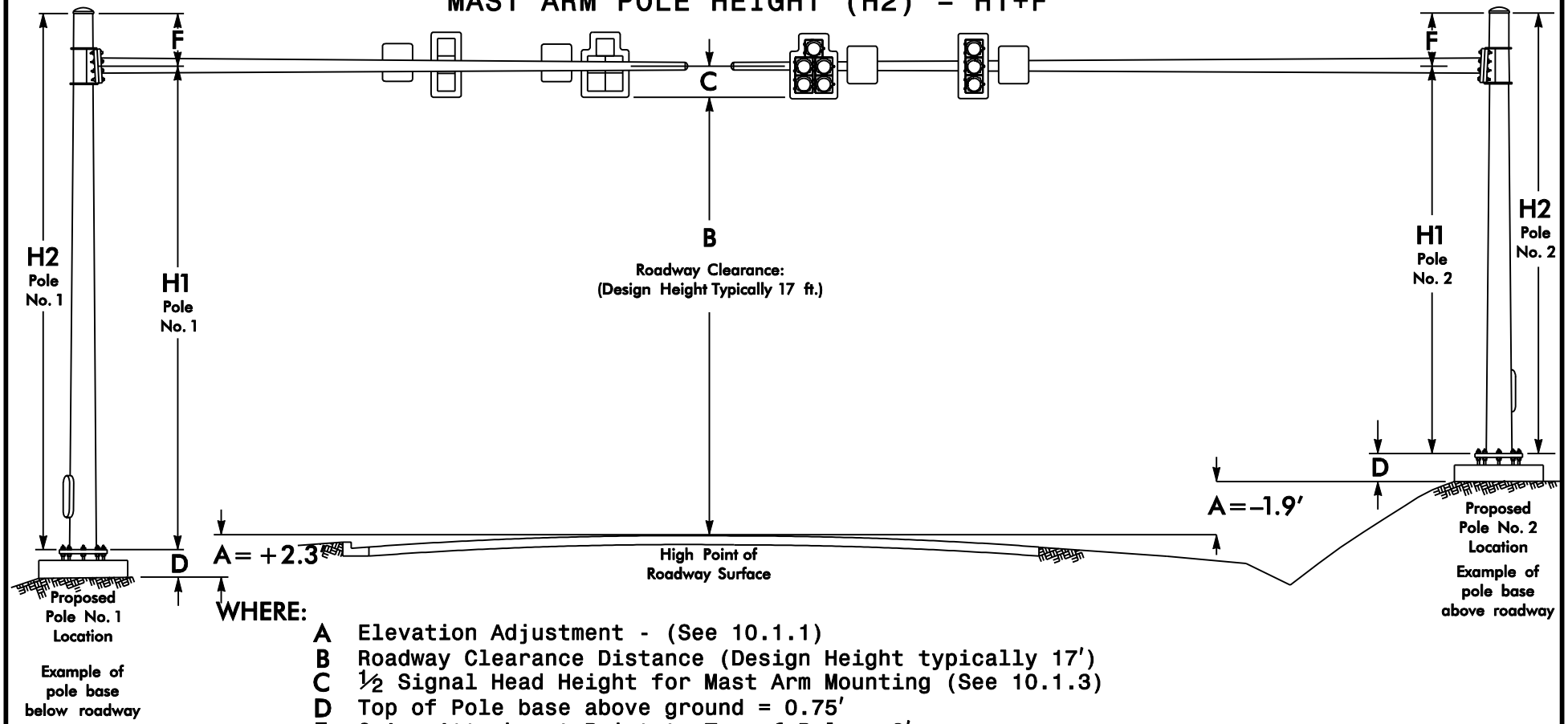
10.1.2
SHEET 1 OF 3

## MAST ARM ATTACHMENT HEIGHT (H1) =A+B+C-D
## MAST ARM POLE HEIGHT (H2) = H1+F




**WHERE:**

- A Elevation Adjustment - (See 10.1.1)
- B Roadway Clearance Distance (Design Height typically 17′)
- C ½ Signal Head Height for Mast Arm Mounting (See 10.1.3)
- D Top of Pole base above ground = 0.75′
- F ℄ Arm Attachment Point to Top of Pole = 2′

**EXAMPLES:**

Calculating H1 (Round up to .1 ft.)
- Mast Arm attachment height for pole No. 1 (H1): +2.3′+17′+(4.67′/2)-.75′ = 20.885′ => 20.9 ft.
- Mast Arm attachment height for pole No. 2 (H1): -1.9′+17′+(4.67′/2)-.75′ = 16.685′ => 16.7 ft.

Calculating H2 (Round up to .5 ft.)
- Pole height for pole No. 1 (H2): 20.9′+2′ = 22.9′ => 23.0 ft.
- Pole height for pole No. 2 (H2): 16.7′+2′ = 18.7′ => 19.0 ft.

# Pole Height Determination – Straight Mast Arms

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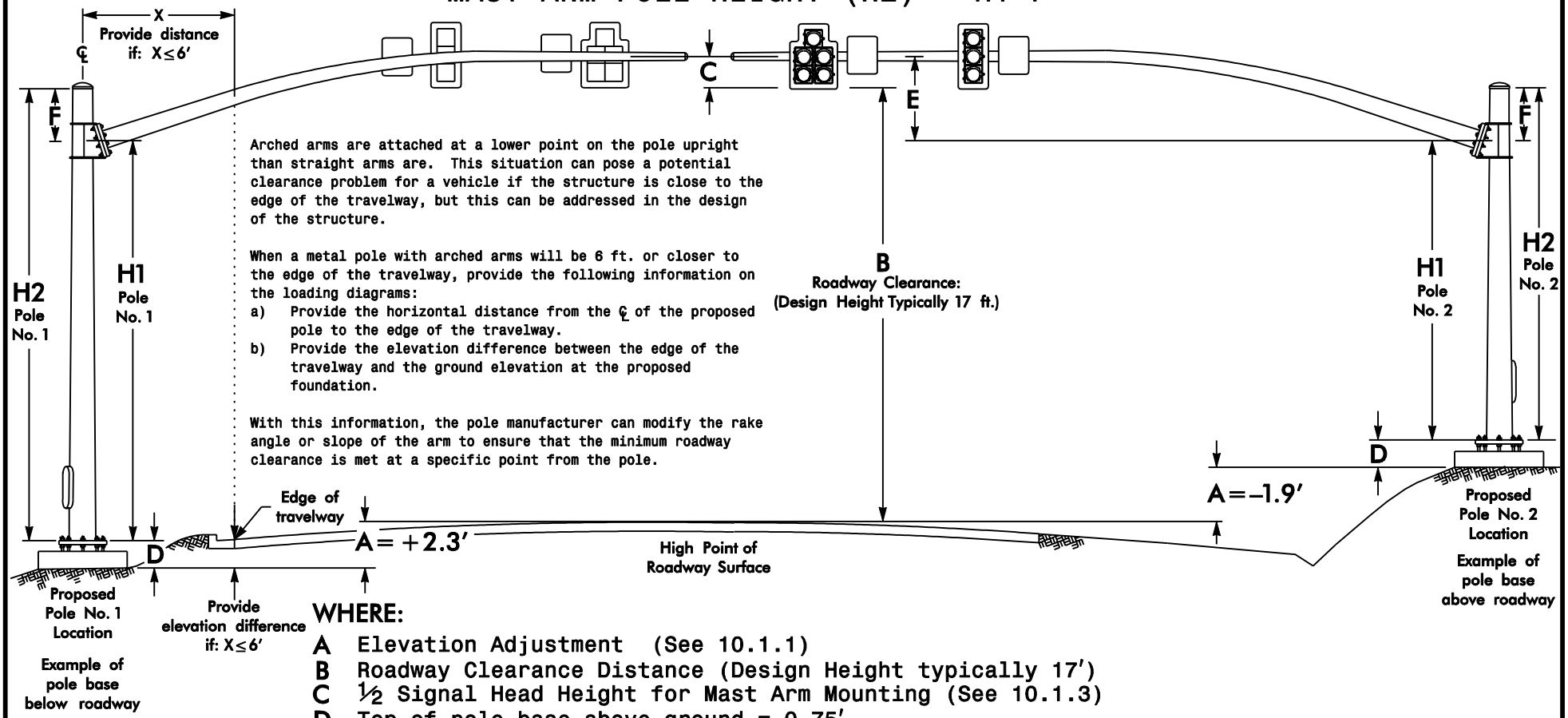
10.1.2
SHEET 2 OF 3

# MAST ARM ATTACHMENT HEIGHT (H1) =A+B+C-D-E
# MAST ARM POLE HEIGHT (H2) = H1+F




Arched arms are attached at a lower point on the pole upright than straight arms are. This situation can pose a potential clearance problem for a vehicle if the structure is close to the edge of the travelway, but this can be addressed in the design of the structure.

When a metal pole with arched arms will be 6 ft. or closer to the edge of the travelway, provide the following information on the loading diagrams:

a) Provide the horizontal distance from the ℄ of the proposed pole to the edge of the travelway.
b) Provide the elevation difference between the edge of the travelway and the ground elevation at the proposed foundation.

With this information, the pole manufacturer can modify the rake angle or slope of the arm to ensure that the minimum roadway clearance is met at a specific point from the pole.

**WHERE:**

- A Elevation Adjustment (See 10.1.1)
- B Roadway Clearance Distance (Design Height typically 17′)
- C ½ Signal Head Height for Mast Arm Mounting (See 10.1.3)
- D Top of pole base above ground = 0.75′
- E Nominal Rise in Mast Arm = 5′
- F ℄ Arm Attachment Point to Top of Pole = 2′

**EXAMPLES:**

Calculating H1 (Round up to .1 ft.)
- Mast Arm attachment height for pole No. 1 (H1): +2.3′+17′+(4.67′/2)-.75′-5.0′ = 15.885′ => 15.9 ft.
- Mast Arm attachment height for pole No. 2 (H1): -1.9′+17′+(4.67′/2)-.75′-5.0′ = 11.685′ => 11.7 ft.

Calculating H2 (Round up to .5 ft.)
- Pole height for pole No. 1 (H2): 15.9′+2′ = 17.9′ => 18.0 ft.
- Pole height for pole No. 2 (H2): 11.7′+2′ = 13.7′ => 14.0 ft.

# Pole Height Determination – Curved /Arched Mast Arms

SIGNALS & GEOMETRICS SECTION
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7-04

STD. NO.
10.1.2
SHEET 3 OF 3

## LOADING SCHEDULE FOR STRAIN POLES

| DESCRIPTION | AREA | SIZE | WEIGHT |
|---|---|---|---|
| SIGNAL HEAD 12"-3 SECTION-WITH BACKPLATE, HANGER, AND BALANCE ADJUSTER | 9.2 S.F. | 25.5" W x 52.0" L | 56 LBS |
| SIGNAL HEAD 12"-4 SECTION (T-TYPE)-WITH BACKPLATE, HANGER, AND BALANCE ADJUSTER | 16.3 S.F. | 42.0" W x 56.0" L | 73 LBS |
| SIGNAL HEAD 12"-4 SECTION (VERTICAL)-WITH BACKPLATE, HANGER, AND BALANCE ADJUSTER | 11.6 S.F. | 25.5" W x 65.5" L | 69 LBS |
| SIGNAL HEAD 12"-5 SECTION-WITH BACKPLATE, HANGER, AND BALANCE ADJUSTER | 16.3 S.F. | 42.0" W x 56.0" L | 89 LBS |
| SIGNAL HEAD 8"-3 SECTION-WITH BACKPLATE, HANGER, AND BALANCE ADJUSTER | 6.3 S.F. | 22.0" W x 41.5" L | 41 LBS |
| SIGNAL HEAD 8"-4 SECTION (VERTICAL)-WITH BACKPLATE, HANGER, AND BALANCE ADJUSTER | 7.9 S.F. | 22.0" W x 51.5" L | 49 LBS |
| SIGNAL HEAD 8"-5 SECTION-WITH BACKPLATE, HANGER, AND BALANCE ADJUSTER | 10.6 S.F. | 35.0" W x 43.5" L | 62 LBS |
| SIGN WITH HANGER | 5.0 S.F. | 24.0" W x 30.0" L | 11 LBS |
| SIGN WITH HANGER | 7.5 S.F. | 30.0" W x 36.0" L | 14 LBS |
| SIGN, LED BLANKOUT WITH HANGER | 6.0 S.F. | 24.0" W x 36.0" L | 110 LBS |
| | | | |

## LOADING SCHEDULE FOR MAST ARM POLES

| DESCRIPTION | AREA | SIZE | WEIGHT |
|---|---|---|---|
| SIGNAL HEAD 12"-3 SECTION-WITH BACKPLATE AND ASTRO-BRAC | 9.3 S.F. | 25.5" W x 52.5" L | 60 LBS |
| SIGNAL HEAD 12"-4 SECTION (T-TYPE)-WITH BACKPLATE AND ASTRO-BRAC | 16.3 S.F. | 42.0" W x 56.0" L | 90 LBS |
| SIGNAL HEAD 12"-4 SECTION (VERTICAL)-WITH BACKPLATE AND ASTRO-BRAC | 11.7 S.F. | 25.5" W x 66.0" L | 74 LBS |
| SIGNAL HEAD 12"-5 SECTION-WITH BACKPLATE AND ASTRO-BRAC | 16.3 S.F. | 42.0" W x 56.0" L | 103 LBS |
| SIGNAL HEAD 8"-3 SECTION-WITH BACKPLATE AND ASTRO-BRAC | 6.4 S.F. | 22.0" W x 42.0" L | 43 LBS |
| SIGNAL HEAD 8"-4 SECTION (VERTICAL)-WITH BACKPLATE AND ASTRO-BRAC | 7.9 S.F. | 22.0" W x 52.0" L | 53.5 LBS |
| SIGNAL HEAD 8"-5 SECTION-WITH BACKPLATE AND ASTRO-BRAC | 10.6 S.F. | 35.0" W x 43.5" L | 75 LBS |
| SIGN RIGID MOUNTED WITH ASTRO-SIGN-BRAC | 5.0 S.F. | 24.0" W x 30.0" L | 11 LBS |
| SIGN RIGID MOUNTED WITH ASTRO-SIGN-BRAC | 7.5 S.F. | 30.0" W x 36.0" L | 14 LBS |
| SIGN, LED BLANKOUT WITH HANGER | 6.0 S.F. | 24.0" W x 36.0" L | 110 LBS |
| | | | |

# Loading Schedules For Metal Poles

SIGNALS & GEOMETRICS SECTION
TRAFFIC ENGINEERING AND SAFETY SYSTEMS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

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