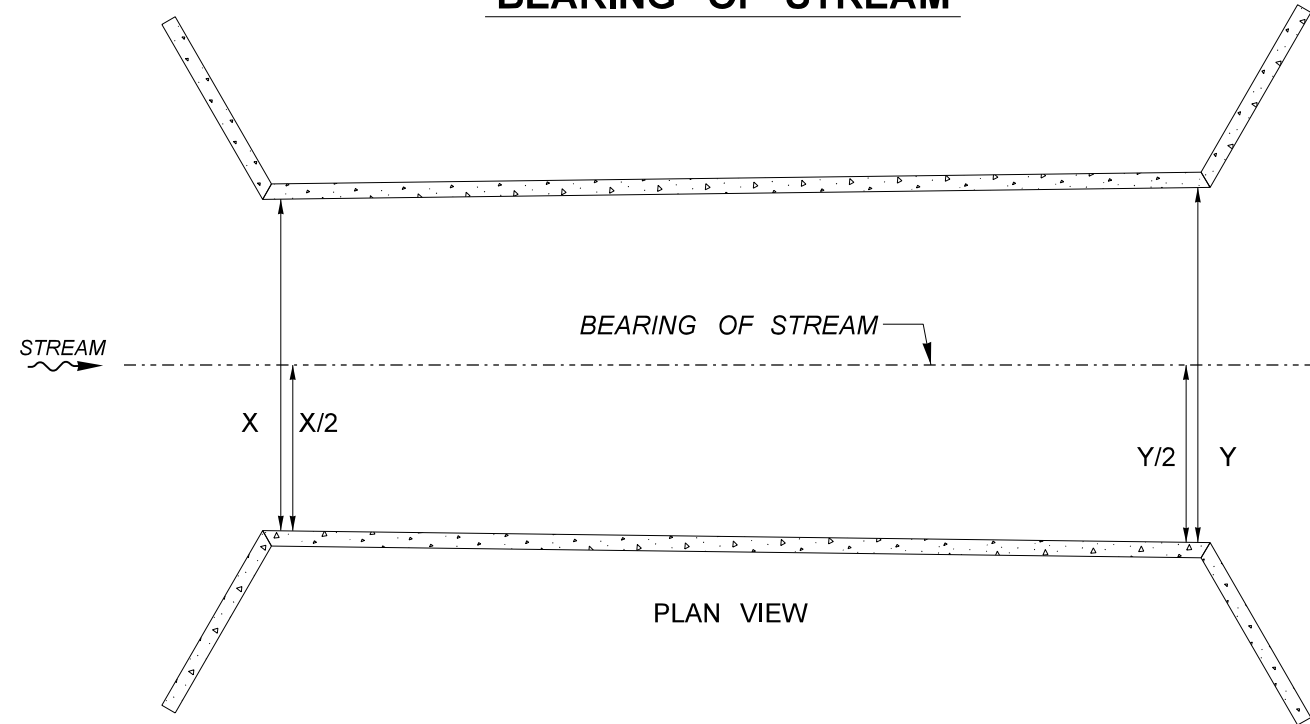
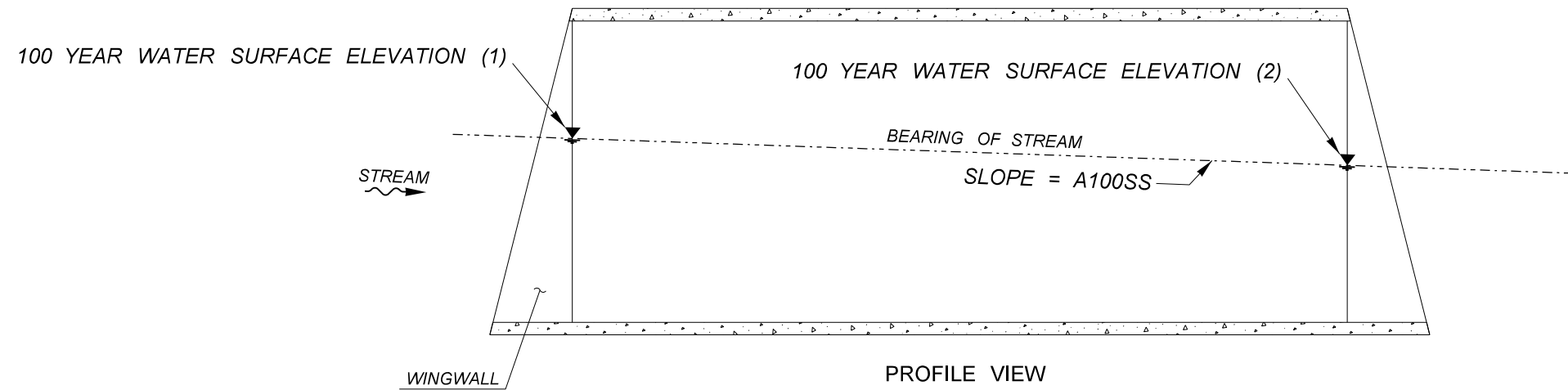


## BEARING OF STREAM



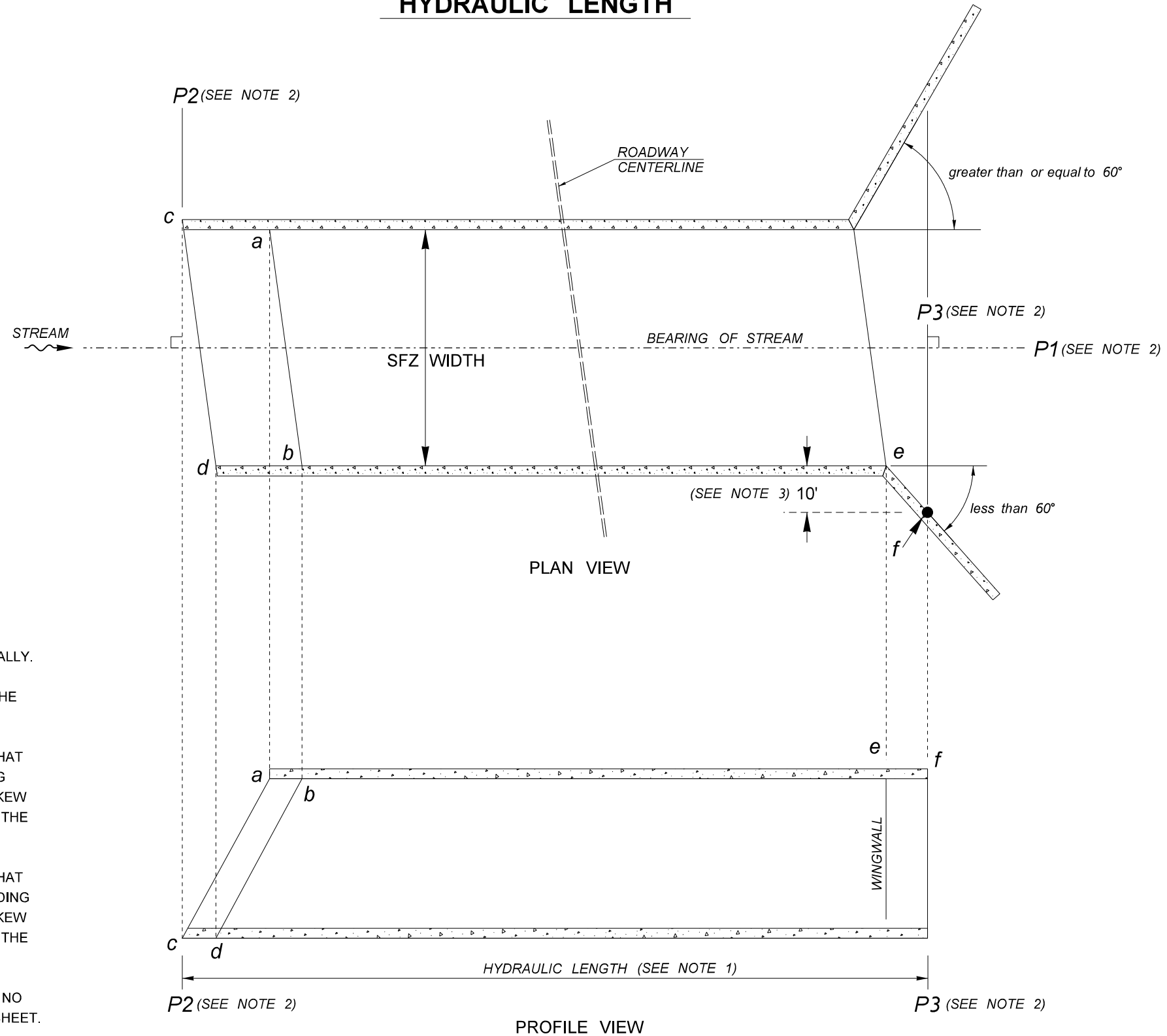
$$A100SS = \frac{(100 \text{ YR WATER SURFACE ELEV 2}) - (100 \text{ YR WATER SURFACE ELEV 1})}{\text{HYDRAULIC LENGTH (SEE SFZ2)}}$$



## STRUCTURE FREE ZONE DEFINITIONS EXHIBIT

FILE NAME T:\412358\DESIGN RESOURCES\Structure Free Zone (SFZ)\SFZ_Sheets\SFZ_Sheets.dgn		REGION NO.		STATE	FED.AID PROJ.NO.		 Washington State Department of Transportation		Plot 11	
TIME	1:04:01 PM	10		WASH					PLAN REF NO <b>SFZ1</b>	
DATE	6/1/2022	JOB NUMBER		LOCATION NO.				SHEET		
PLOTTED BY	wintere	CONTRACT NO.						OF		
DESIGNED BY								BEARING OF STREAM / A100SS		
ENTERED BY								SHEETS		
CHECKED BY										
PROJ. ENGR.										
REGIONAL ADM.		REVISION	DATE	BY	P.E. STAMP BOX	DATE	P.E. STAMP BOX			

# HYDRAULIC LENGTH



**NOTES:**

1. HYDRAULIC LENGTH IS MEASURED HORIZONTALLY.
2. LET P1 BE A VERTICAL PLANE CONTAINING THE BEARING OF STREAM. LET P2 BE A VERTICAL PLANE, PERPENDICULAR TO P1, AND PASSING THROUGH THE POINT ON THE STRUCTURE THAT IS FURTHER-MOST UPSTREAM (NOT INCLUDING WING WALLS THAT ARE AT A HORIZONTAL SKEW ANGLE OF 60 DEGREES OR GREATER FROM THE BEARING OF STREAM). LET P3 BE A VERTICAL PLANE, PERPENDICULAR TO P1, AND PASSING THROUGH THE POINT ON THE STRUCTURE THAT IS FURTHER-MOST DOWNSTREAM (NOT INCLUDING WING WALLS THAT ARE AT A HORIZONTAL SKEW ANGLE OF 60 DEGREES OR GREATER FROM THE BEARING OF STREAM).
3. THE 10' RULE APPLIES TO WING WALLS AND NO OTHER PART OF THE STRUCTURE ON THIS SHEET.

## STRUCTURE FREE ZONE DEFINITIONS EXHIBIT

FILE NAME T:\412358\DESIGN_RESOURCES\Structure Free Zone (SFZ)\SFZ_Sheets\SFZ_Sheets.dgn				REGION NO. STATE		FED.AID PROJ.NO.		 Washington State Department of Transportation		Plot 12	
TIME 1:04:02 PM	DATE 6/1/2022	PLOTTED BY wintere	DESIGNED BY	ENTERED BY	CHECKED BY	PROJ. ENGR.	REGIONAL ADM.			REVISION	DATE
				10	WASH			P.E. STAMP BOX      DATE P.E. STAMP BOX      DATE		SHEET OF SHEETS	
				JOB NUMBER	CONTRACT NO.	LOCATION NO.				HYDRAULIC LENGTH	

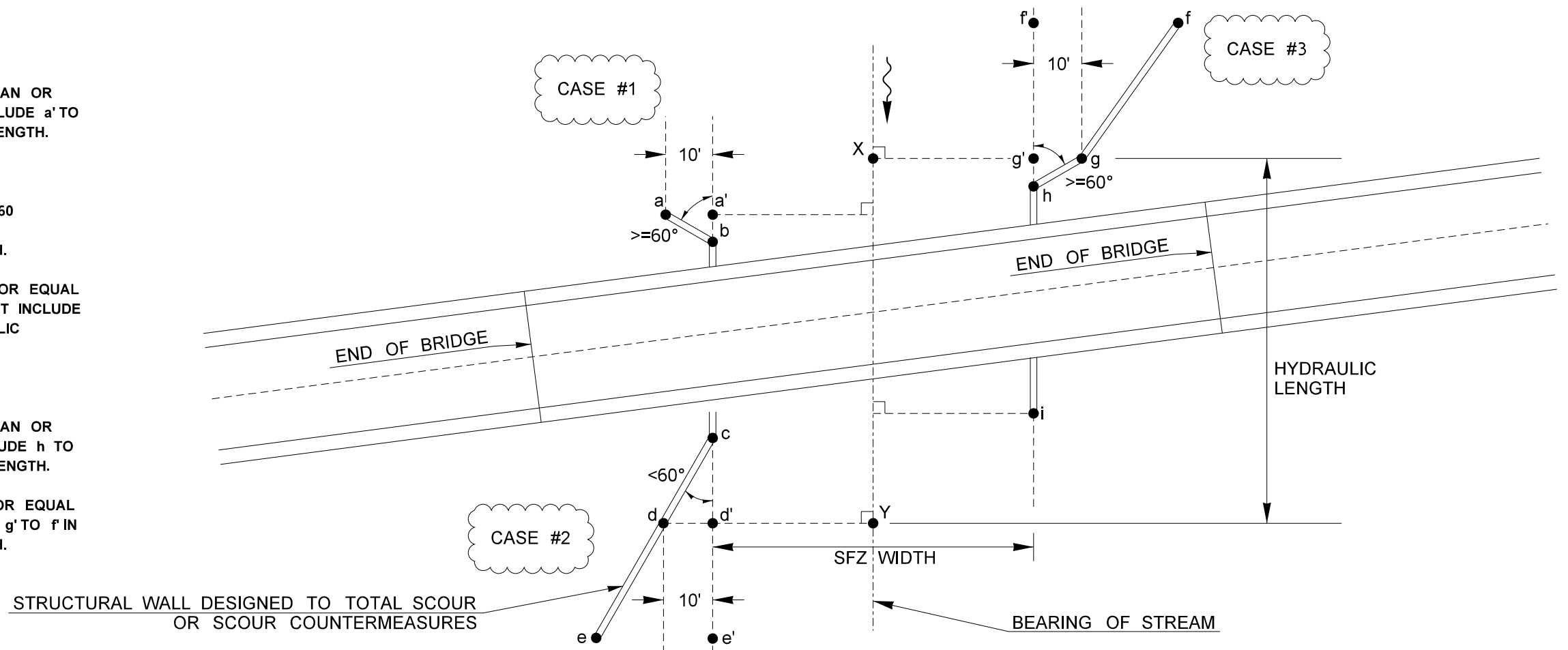
**CASE #1**  
BECAUSE THE ANGLE IS GREATER THAN OR EQUAL TO 60 DEGREES, DO NOT INCLUDE a' TO b IN MEASUREMENT OF HYDRAULIC LENGTH.

**CASE #2**  
BECAUSE THE ANGLE IS LESS THAN 60 DEGREES, MUST INCLUDE c TO d' IN MEASUREMENT OF HYDRAULIC LENGTH.

BECAUSE d TO e IS GREATER THAN OR EQUAL TO 10' OUTSIDE OF SFZ WIDTH, DO NOT INCLUDE d' TO e' IN MEASUREMENT OF HYDRAULIC LENGTH.

**CASE #3**  
BECAUSE THE ANGLE IS GREATER THAN OR EQUAL TO 60 DEGREES, DO NOT INCLUDE h TO g' IN MEASUREMENT OF HYDRAULIC LENGTH.

BECAUSE g TO f IS GREATER THAN OR EQUAL TO 10' BEYOND SFZ, DO NOT INCLUDE g' TO f' IN MEASUREMENT OF HYDRAULIC LENGTH.

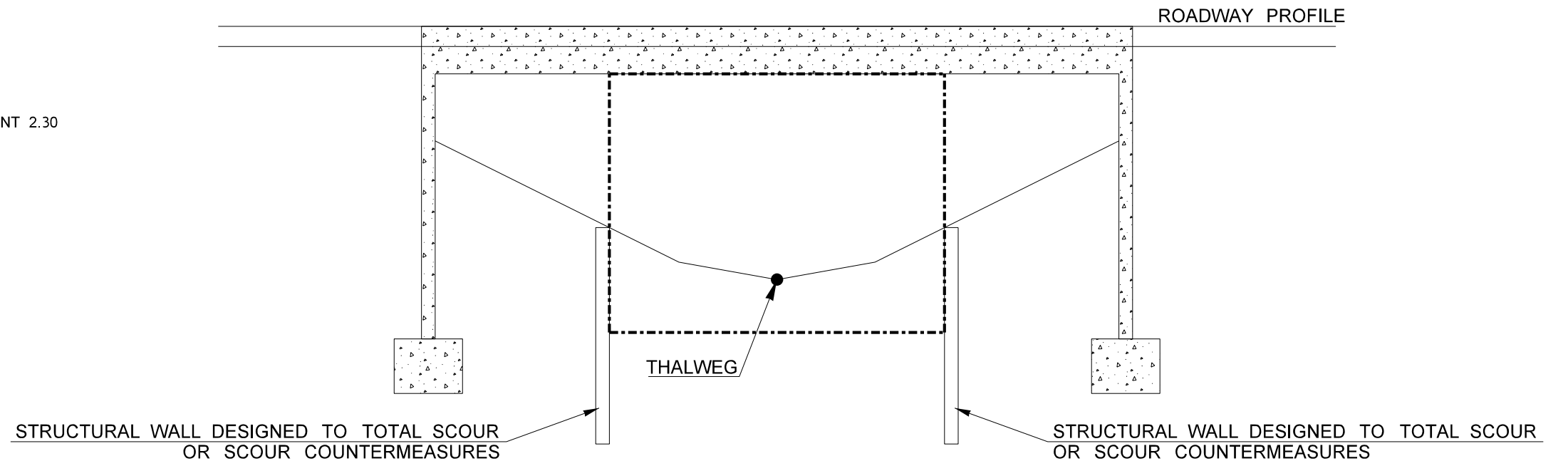


STRUCTURAL WALL DESIGNED TO TOTAL SCOUR OR SCOUR COUNTERMEASURES

**NOTES:**

- REFER TO DEFINITIONS IN TECHNICAL REQUIREMENT 2.30

----- STRUCTURE FREE ZONE



STRUCTURAL WALL DESIGNED TO TOTAL SCOUR OR SCOUR COUNTERMEASURES

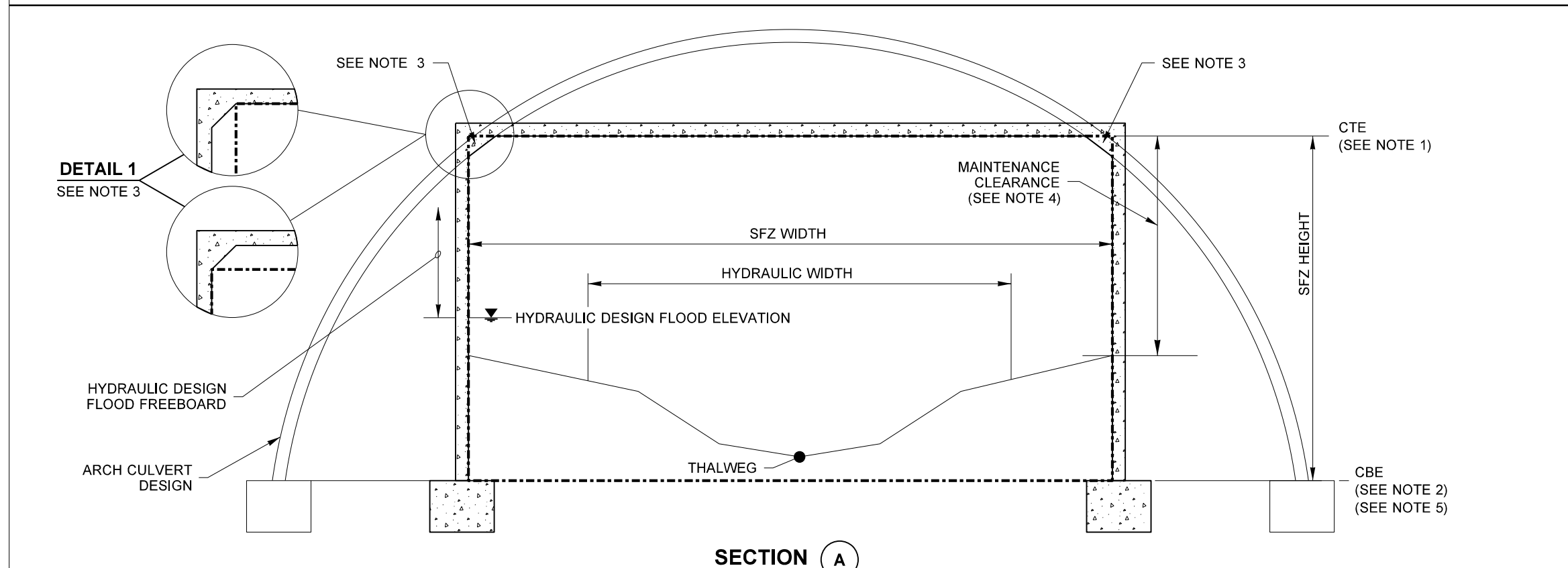
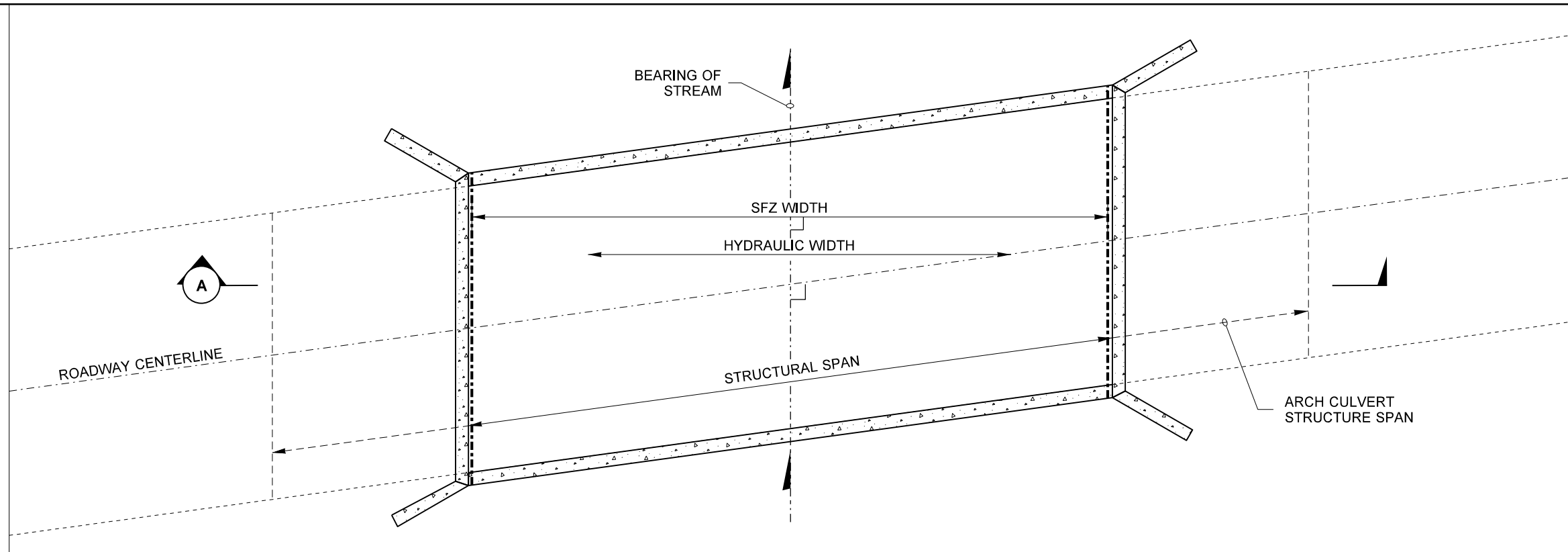
STRUCTURAL WALL DESIGNED TO TOTAL SCOUR OR SCOUR COUNTERMEASURES

**STRUCTURE FREE ZONE DEFINITIONS EXHIBIT**

FILE NAME	T:\412358\DESIGN_RESOURCES\Structure Free Zone (SFZ)\SFZ_Sheets\SFZ_Sheets.dgn				REGION NO.	STATE	FED.AID PROJ.NO.	Washington State Department of Transportation	Plot 13
TIME	1:09:37 PM				10	WASH			PLAN REF NO SFZ3
DATE	6/1/2022				JOB NUMBER				SHEET
PLOTTED BY	wintere				CONTRACT NO.		LOCATION NO.		OF
DESIGNED BY									SHEETS
ENTERED BY									
CHECKED BY									
PROJ. ENGR.									
REGIONAL ADM.	REVISION	DATE	BY					HYDRAULIC LENGTH & SCOUR COUNTERMEASURES	

**NOTES:**

1. CTE = CONTROLLING TOP ELEVATION
2. CBE = CONTROLLING BOTTOM ELEVATION
3. FILLETS AND ARCHES SHALL BE OUTSIDE SFZ PER DETAIL 1 UNLESS NOTED IN THE WSDOT HYDRAULICS MANUAL AS AN ALLOWABLE EXCEPTION.
4. MEASURE MAINTENANCE CLEARANCE FROM THE HIGHEST GROUND ELEVATION WITHIN THE HORIZONTAL LIMITS OF THE SFZ WIDTH.
5. CONTROLLING BOTTOM ELEVATION (CBE) AN IMAGINARY SURFACE THAT REPRESENTS THE BOTTOM BOUNDARY OF THE STRUCTURE FREE ZONE (SFZ). AT ANY VERTICAL CROSS SECTION OF THE SFZ, TAKEN AT A HORIZONTAL ANGLE OF 90 DEGREES TO THE BEARING OF STREAM, THE CBE SHALL BE A HORIZONTAL LINE LOCATED:
  - a) WHEN ANY PART OF THE STRUCTURE OR ITS FOUNDATION IS LOCATED UNDER THE SHADOW OF THE HYDRAULIC WIDTH WHEN THE SHADOW IS ORTHOGONALLY PROJECTED TOWARDS A HORIZONTAL PLANE BELOW THE SFZ, THE CBE SHALL BE AT THE LOWEST OF THE FOLLOWING ELEVATIONS:
    - i) TWO FEET BELOW THE ELEVATION OF TOTAL SCOUR FOR THE SCOUR DESIGN FLOOD.
    - ii) THE ELEVATION OF TOTAL SCOUR FOR THE SCOUR CHECK FLOOD.
  - b) WHEN NO PART OF THE STRUCTURE OR ITS FOUNDATION IS LOCATED UNDER THE SHADOW OF THE HYDRAULIC WIDTH WHEN THE SHADOW IS ORTHOGONALLY PROJECTED TOWARDS A HORIZONTAL PLANE BELOW THE SFZ, THE CBE SHALL BE AT THE ELEVATION OF TOTAL SCOUR FOR THE SCOUR CHECK FLOOD, OR LOWER.
  - c) WHEN SPECIFICATIONS FOR SCOUR REQUIRE THE TOP OF FOUNDATIONS TO BE DEEPER THAN ALLOWED BY THE CONTROLLING BOTTOM ELEVATION DETERMINED BY 5.a OR 5.b ABOVE, THE SCOUR SPECIFICATIONS SHALL CONTROL.



**LEGEND**  
 - - - - - STRUCTURE FREE ZONE

**STRUCTURE FREE ZONE DEFINITIONS EXHIBIT**

FILE NAME: S:\Design R P & S\4-Standards\2-Plan Sheet Library\02-Published PSL(SFZ) Structure Free Zone\SFZ.dgn		REGION NO.:	STATE:	FED.AID PROJ.NO.:	Washington State Department of Transportation	PLAN REF NO: <b>SFZ</b>
TIME: 1:03:01 PM	DATE: 6/1/2023	10	WASH			
PLOTTED BY: liddelf	DESIGNED BY:	JOB NUMBER:	CONTRACT NO.:	LOCATION NO.:	SHEET 4 OF 4 SHEETS	
ENTERED BY:	CHECKED BY:	PROJ. ENGR.:	REGIONAL ADM.:	REVISION:		
		DATE:	BY:	DATE:	CTE, CBE, SFZ WIDTH & SFZ HEIGHT	