



# DESIGN CONSIDERATIONS FOR WATER MAIN BRIDGE CROSSINGS

STACI A. HARTZ, PE

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Engineering | Planning | Infrastructure Solutions

1

## AGENDA

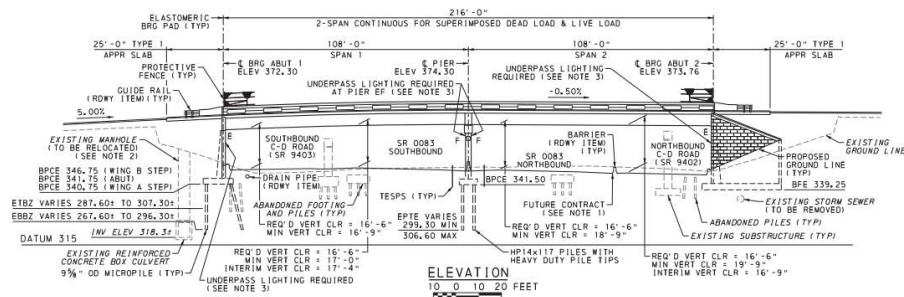
1. GETTING STARTED AND CRITICAL DESIGN FEATURES
2. PREDESIGN SUBMITTALS AND APPROVALS
3. WATER MAIN MATERIALS
4. LOCATION
5. WATER MAIN SUPPORTS
6. ABUTMENTS AND APPROACH PIPING
7. EXPANSION AND CONTRACTION
8. OTHER CONSIDERATIONS
9. DESIGN DOCUMENTS AND EXAMPLES



2

# GETTING STARTED

- EXISTING VS. PROPOSED BRIDGE STRUCTURES
- LENGTH
- RADIUS
- LOCAL TEMPERATURES
- PIPE LOCATION
- TRANSITION FROM BRIDGE TO UNDERGROUND
- SETTLEMENT



3

# CRITICAL DESIGN FEATURES

- OPTIMAL ROUTING – STRAIGHT LINE
- AVOID THRUST FORCES AND SEPARATION
- AVOID SNAKING
- REDUNDANCY AND SAFETY FACTOR FOR SUPPORTS AND ANCHORS
- PROVIDE FLEXIBLE RESTRAINED JOINTS AND LATERAL SUPPORTS



4

## PREDESIGN SUBMITTALS AND APPROVALS

- RIGHT OF WAY AUTHORITY APPROVAL
- PRELIMINARY DESIGN CALCULATIONS SHOWING THE ADDITIONAL LOAD AND ANY THRUST ON THE BRIDGE STRUCTURE
- PLAN AND PROFILE SKETCHES
- INFORMATION ON THE WATER MAIN (SIZE, PROPOSED PIPE MATERIAL, ETC.)
- SKETCHES OF THE PROPOSED MEANS OF SUPPORTING THE WATER MAIN



5

## WATER MAIN MATERIALS

- DUCTILE IRON PIPE
  - TR Flex Joints
  - HDSS (High Pressure Restrained Pipe with Deflection)
  - Restrained Joint Gaskets – DO NOT USE
- GALVANIZED STEEL (CARRIER OR CASING PIPE)
- FUSIBLE PVC



6

## LOCATION



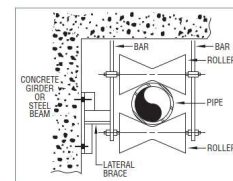
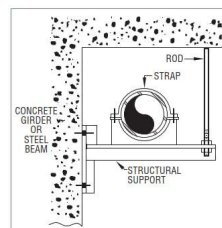
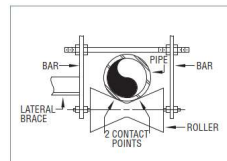
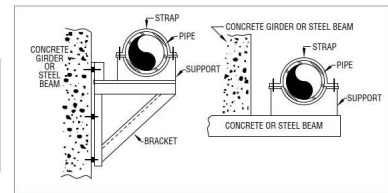
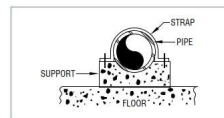
- LOCATE ON DOWNSTREAM SIDE TO PROTECT FROM RIVER DEBRIS OR TRUCK IMPACT
- LOCATE NEAR EXTERIOR FOR ACCESS WITH SNOOPER CRANE
- PROVIDE SUFFICIENT SPACE AROUND UTILITIES FOR CLEANING, REPAINTING BRIDGE, ETC.
- DON'T EXTEND UTILITY BELOW BRIDGE SUPERSTRUCTURE



7

## WATER MAIN SUPPORTS

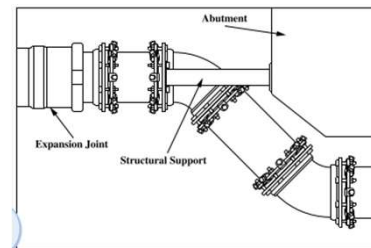
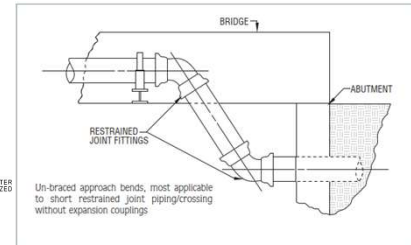
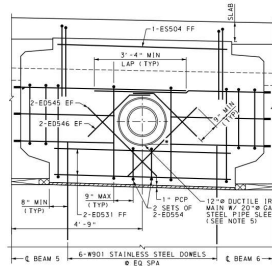
- PIPE LOCATION WILL DETERMINE THE TYPE OF HANGERS REQUIRED AS WELL AS SPACING
- SUPPORTS SHOULD PROVIDE BOTH VERTICAL AND HORIZONTAL SUPPORT



8

# ABUTMENTS AND APPROACH PIPING

- **CASING IS OFTEN REQUIRED THROUGH ABUTMENT**
  - Provide size to pass bells
  - Reinforce as required
- **REDUCE ANGLES WHENEVER POSSIBLE**
- **ADDITIONAL SUPPORTS AT BENDS AND ALIGNMENT DEVIATIONS ARE RECOMMENDED**



9

# EXPANSION AND CONTRACTION



- **TEMPERATURE MOVEMENTS**
- **SHORT SPAN MAY USE COUPLINGS**
- **LONG SPANS MAY REQUIRE EXPANSION JOINTS**
- **LONG SPANS REQUIRE SUPPORT ROLLERS**
- **PROVIDE PIPE EXPANSION JOINTS AT BRIDGE EXPANSION JOINTS**



10

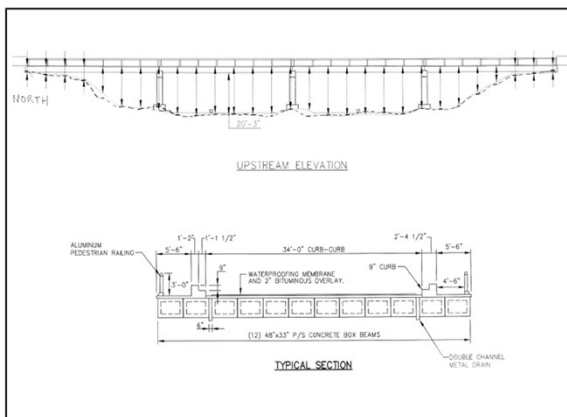
## OTHER CONSIDERATIONS

- INSULATION AGAINST FREEZING
- ARV AT HIGH POINTS
- EXTERNAL PROTECTION
- DRAIN PLUGS



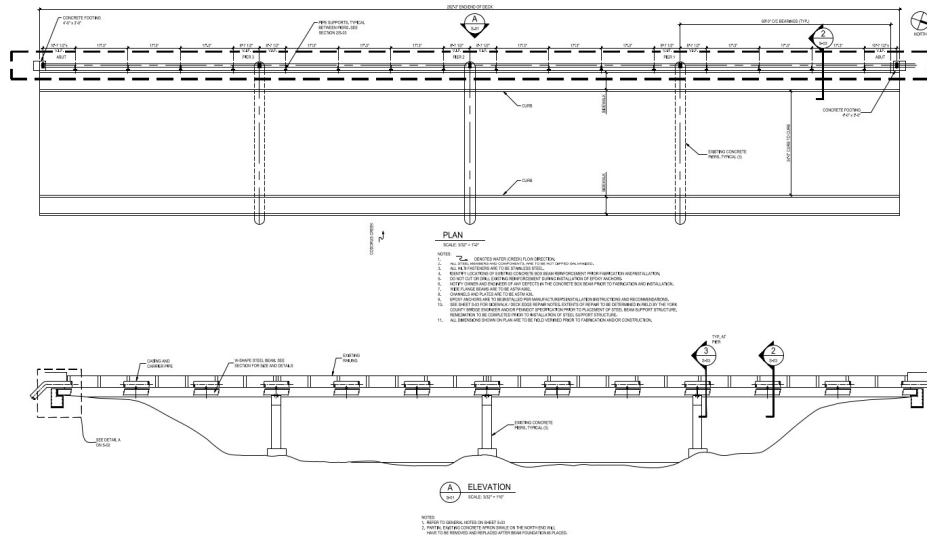
11

## SOUTH PENN STREET



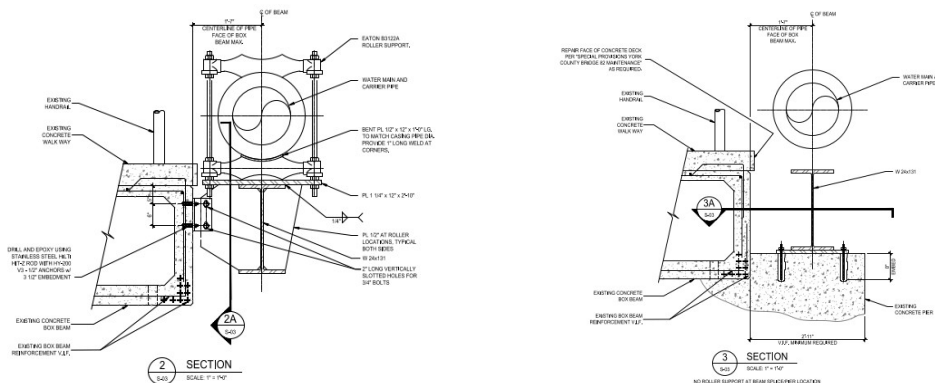
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# SOUTH PENN STREET



13

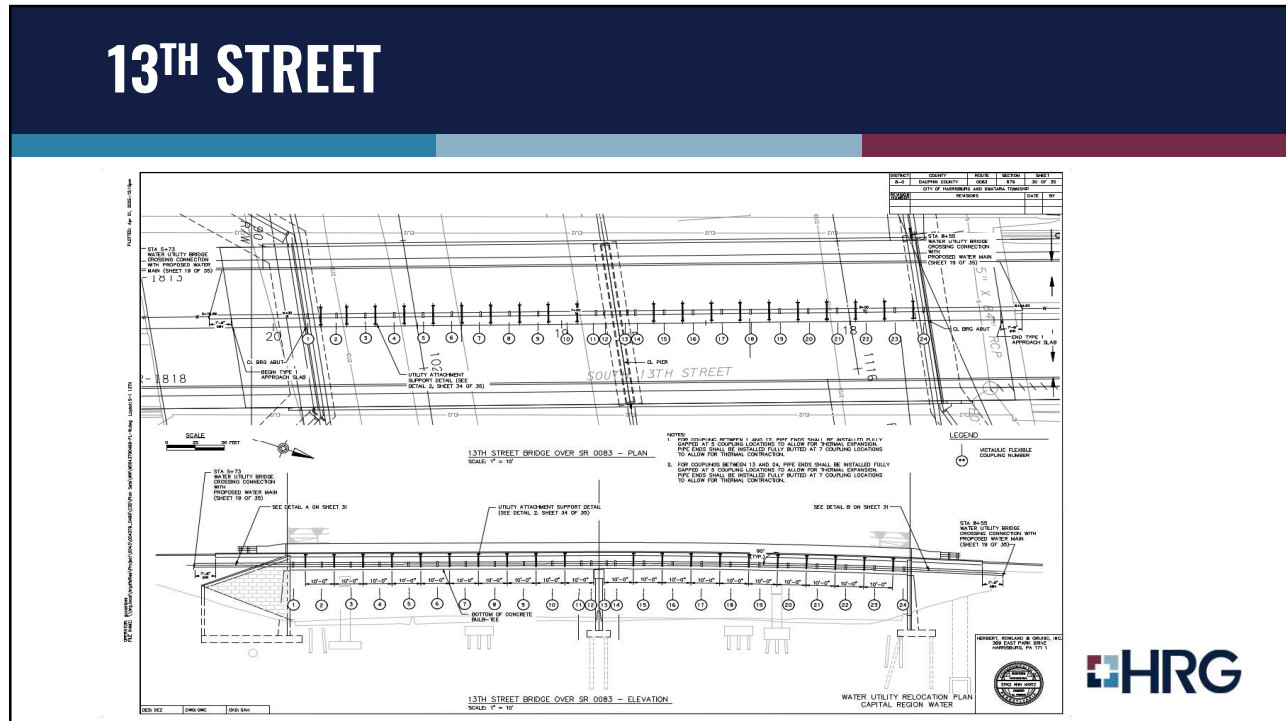
# SOUTH PENN STREET



14

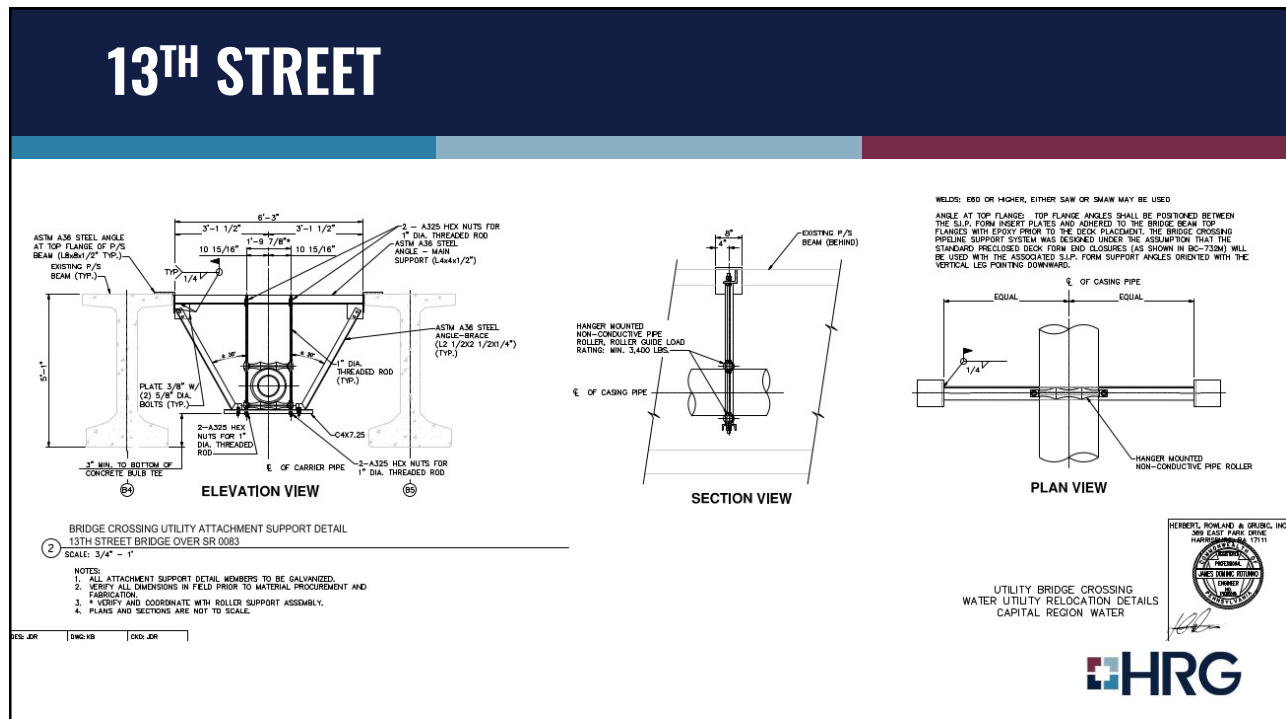


# 13TH STREET



15

# 13TH STREET



16



**Q&A**

**HOW TO REACH STACI**

**STACI A. HARTZ, PE**

Project Engineer | Water & Wastewater

Herbert, Rowland & Grubic, Inc.

[shartz@hrg-inc.com](mailto:shartz@hrg-inc.com)

(717) 564-1121

