

This document is an internal project document, which is an initial step in the process of planning laboratory tests. Thus, the content herein may be subject to change.

Dynamic Test Proposal of Sprinkler Piping Subsystems on NCS

Yuan Tian

Department of Civil Structural and Environmental Engineering
University at Buffalo, SUNY

NSF Award CMMI 0721399

NEESR-GC: Simulation of the Seismic Performance of Nonstructural Systems
PI Manos Maragakis, University at Nevada, Reno

May, 2010



NEES Nonstructural
Simulation of the Seismic Performance of Nonstructural Systems

Host Institution



Funded by

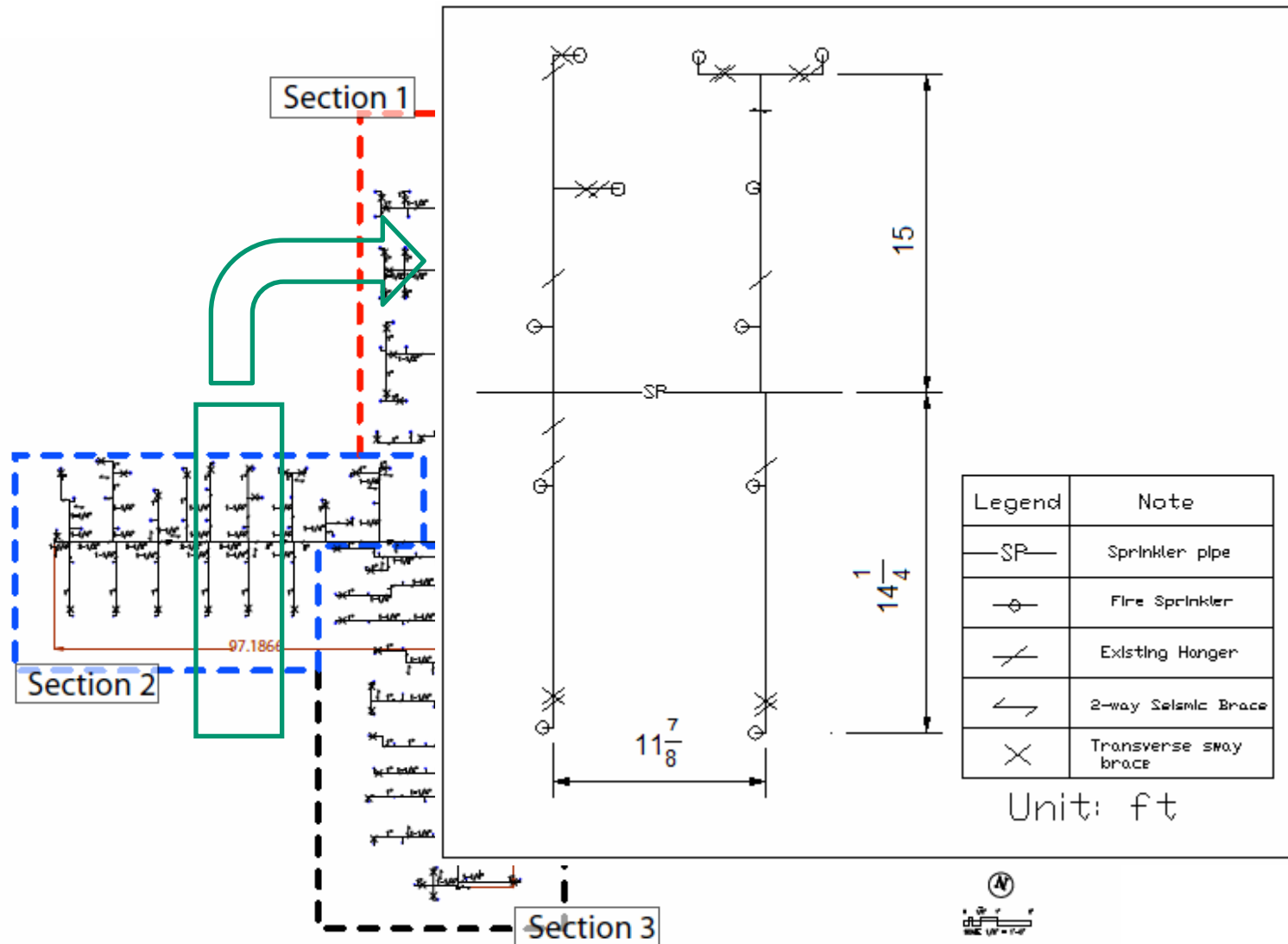


Content

- Introduction of test and specimen
- Details of test setup
 - Piping system
 - Support for piping system
 - Assembly acting as the building structure
- Instrumentation



Dynamic Test Proposal of Sprinkler Piping System



Test matrix

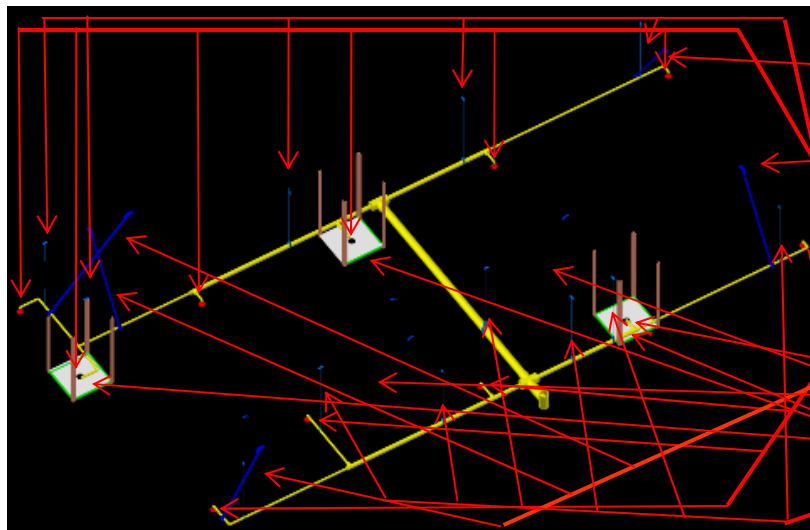
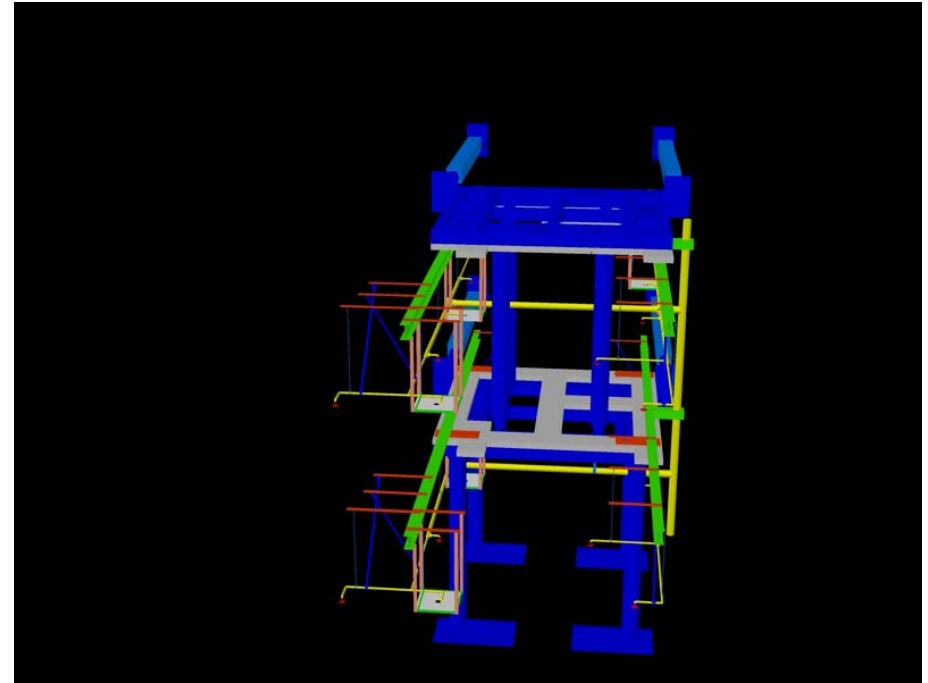
Pipe/Fitting Material	Number of test
Black iron (threaded)	1
CPVC (cement joint)	1
Groove fit	1
Black iron (welded)	1
Total:	4



Dynamic Test Proposal of Sprinkler Piping System

Piping System:

- Riser (4 in)
- Main line (4 in)
- Branch line (2 in / 1 in)



Component	Quantity/Per floor
Sprinkler head	11
Transverse sway brace	5
Wire restraint	2
Ceiling box	3
Vertical hanger	11

5



NEES Nonstructural
Simulation of the Seismic Performance of Nonstructural Systems

Host Institution



Funded by

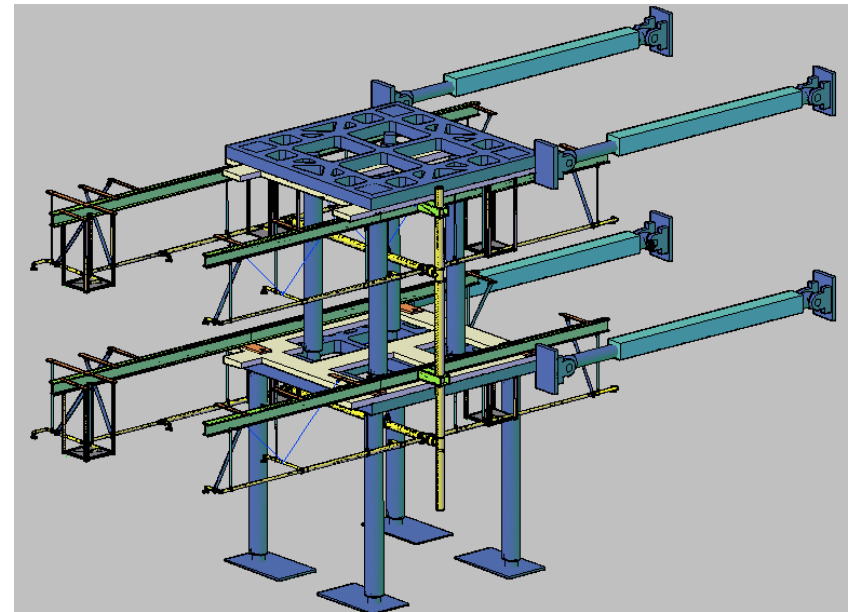


Details of Support for Piping System

Supports :

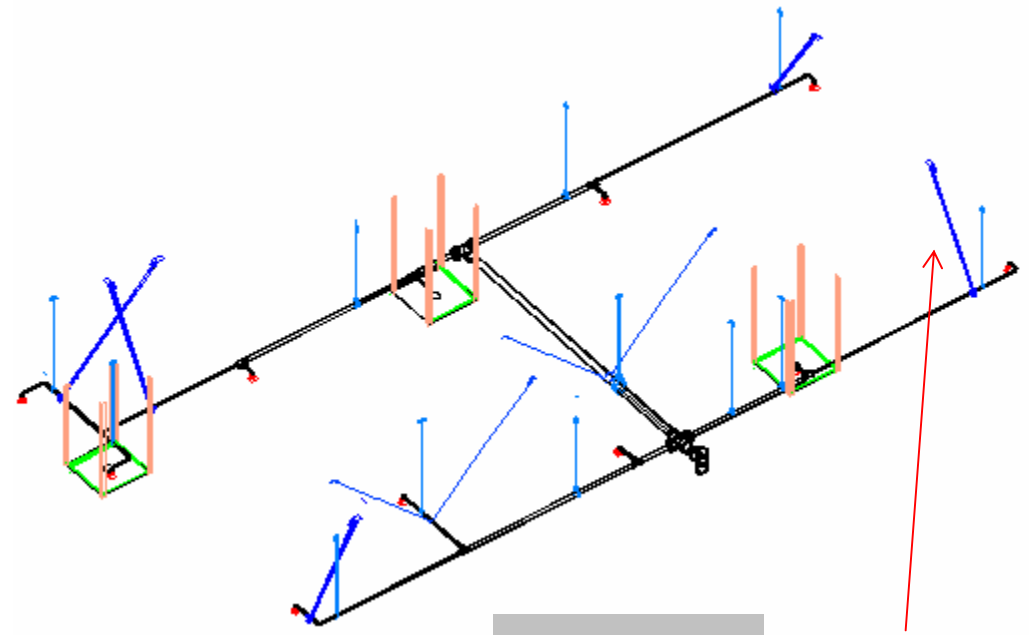
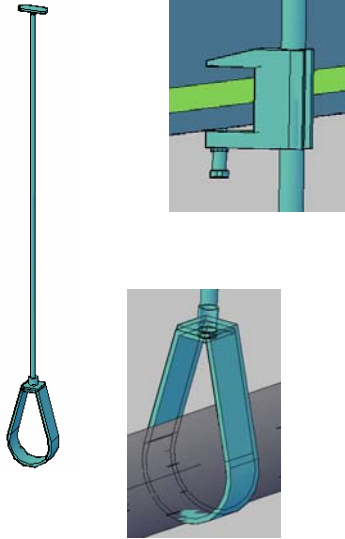
- Building-attached component
- Fastener (*attach the building-attached component to building structure*)
- Hanger assembly (*attached to the sprinkler piping*)
- Connecting piece (*joining the building attachment component with the pipe attachment component*)

Support	Building-attached component	Fastener	Hanger assembly	Connecting piece
Vertical hanger	Ceiling plate/C shape clamp	Wedge anchor bolt/welding	Adjustable band hanger ring	All-thread rod
Transverse bracing	Steel strap	Welding	Double U-bolt	1" schedule 40 steel pipe
Wire restraint	Steel strap	Wedge anchor bolt/welding	Restraint wire	Gauge#12 restraint wire

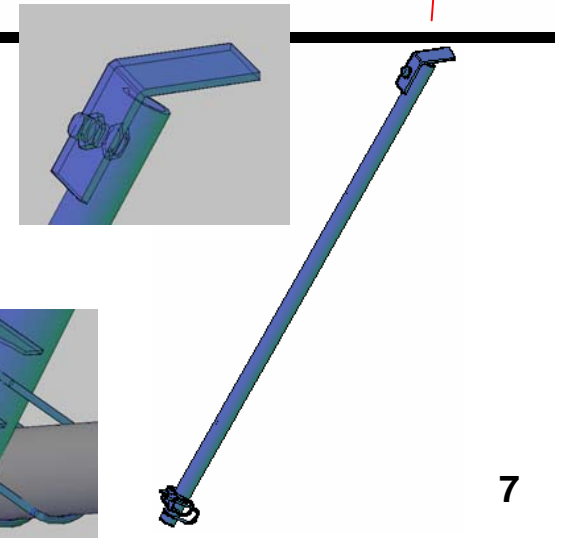


Details of Support System

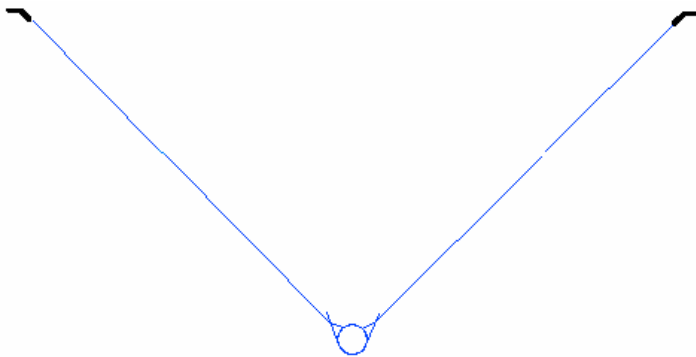
Vertical Hanger



Transverse Bracing



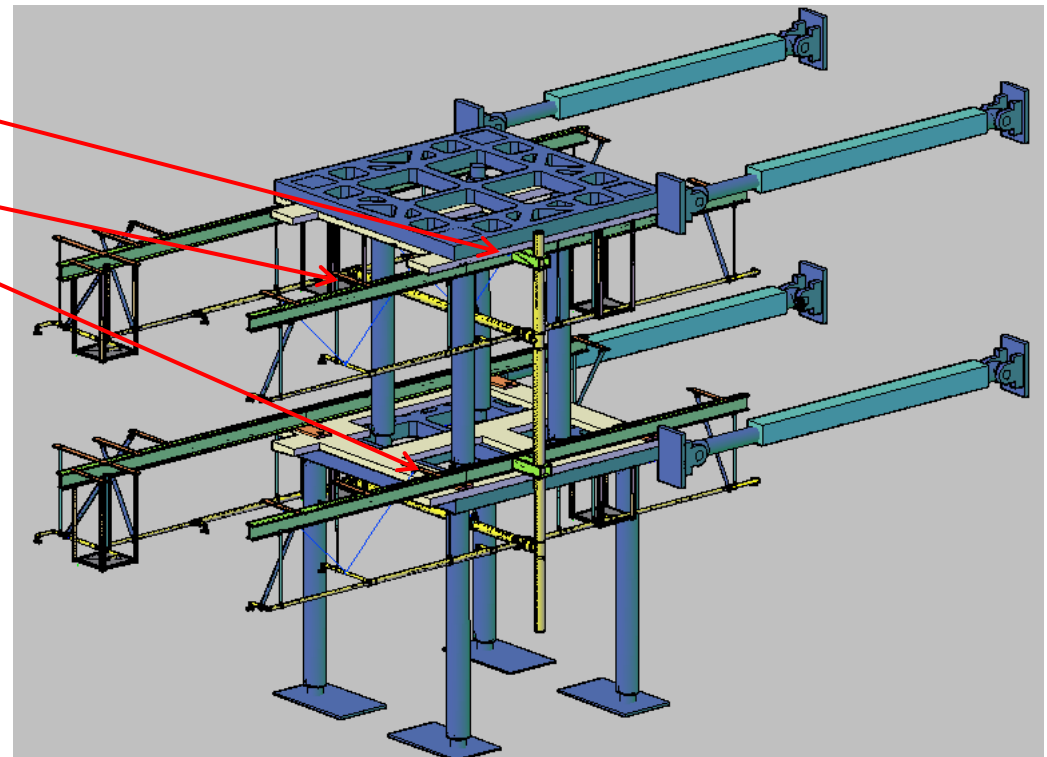
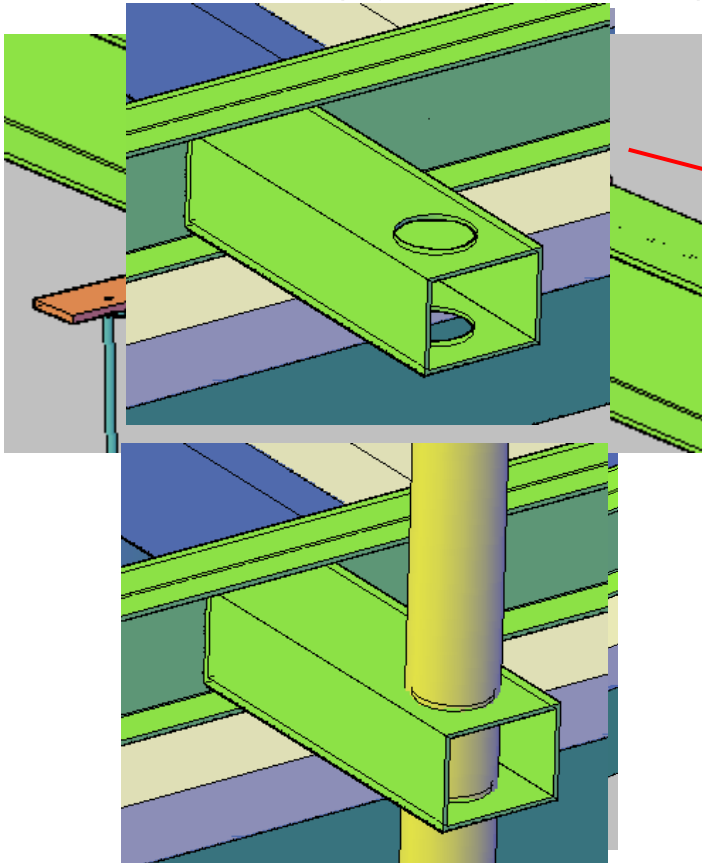
Wire Restraint



Details of Building Structure

Building structure :

- Platform of NCS
- Four 30-ft W8x18(per floor) beams
- 30''(L)x3''(W)x3/4''(T) steel channels



NEES Nonstructural
Simulation of the Seismic Performance of Nonstructural Systems

Host Institution



Funded by



Instrumentation

In general :

Displacement

- Relative displacement b/w piping system and NCS
- Detect rotation at critical tee joint and elbow joint
- Relative displacement b/w ceiling box and sprinkler head

Acceleration

- Acceleration at critical point on the pipe

Force

- Axial force in the bolts for vertical hangers



Thank You!

Question and Feedback?



10



NEES Nonstructural
Simulation of the Seismic Performance of Nonstructural Systems

Host Institution



Funded by

