Science and Technology Research Partnership
for Sustainable Development : **SATREPS**

The 3rd Japan-Peru Workshop on
Enhancement of Earthquake and Tsunami Disaster Mitigation Technology

Development of Structural Testing Systems in CISMID

March 13, 2012

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Building Group G3

Structural Behavior of low ductility Concrete Wall

Japanese Team

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Peruvian Team

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Associate Prof. Patricia Gibu
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Assistant Prof. Luis Lavado
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Msc. Jenny Taira
(CISMID-FIC-UNI)

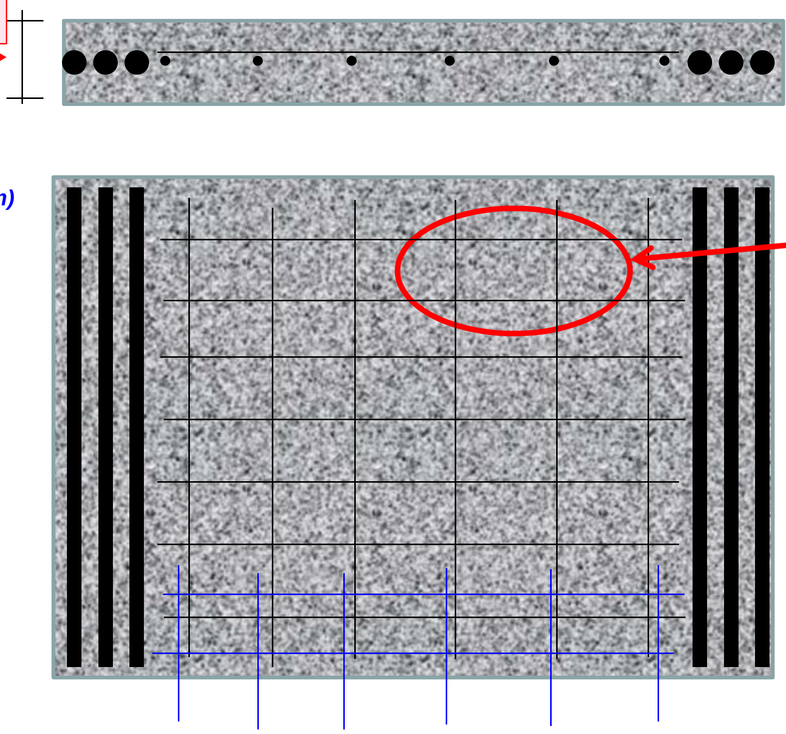
This walls are widely used on Middle rise buildings

Low ductility wall: main differences

1 *thickness*

100mm thick

(RC walls: min150mm)



Electrowelded wire mesh

2 *reinforcement*

(RC walls: only deformed steel bars)

Deformed steel bars at edges

Dowells tied to basement

Low ductility wall :main differences

3 *construction*

(RC : walls, then slabs)

One day, one story:
walls and slabs placed
at once

Low ductility wall :main differences

3 *construction*

One day, one story:
walls and slabs placed
at once

(RC : walls, then slabs)

X ▼Massive, continuous placement: joint at base of wall, hole air bags (cangrejeras)

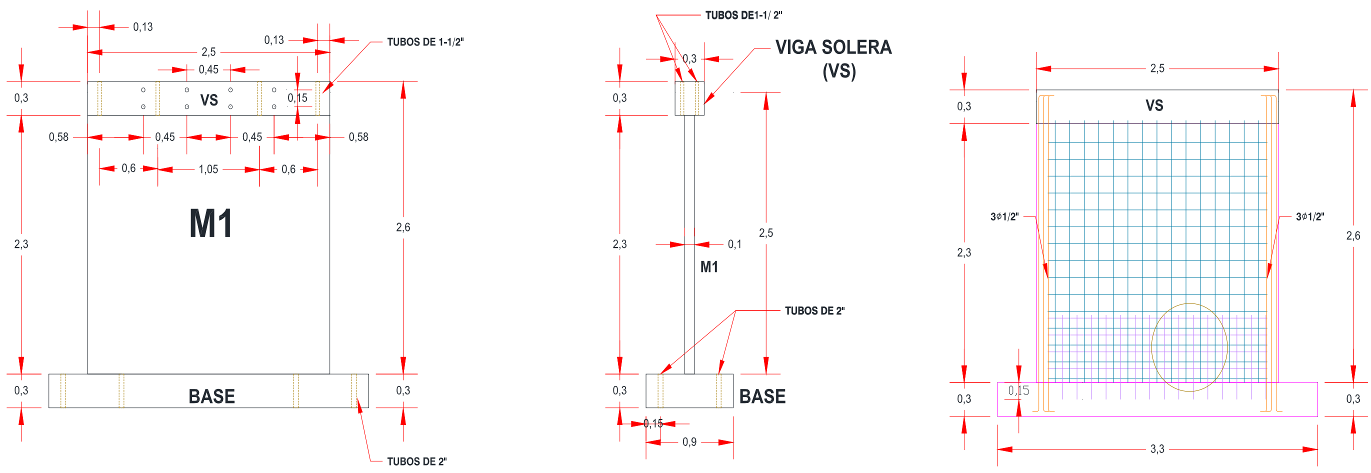
ok ▲Fluid concrete with fibers

Reduce total time of construction

Why to study this walls

- During 1998 to 2003 non regulation was applied in the construction of this kind of wall due to were not consider shear walls. The application was on 5 story buildings, however many constructors start to build structures of 12, 14 and 16 stories, just like that, without confinement columns.
- On 2003 the NTE-060 Peruvian Concrete Standard include recommendations for construction of this kind of walls.
- Stiffness contribution of the perpendicular wall is need in order to know the inelastic behavior under lateral load with and without perpendicular wall.
- Check the new equipment received by UNI from SATREPS project.
- Compare stresses levels with test results performed at Yokohama University

DRAWINGS OF SPECIMENS



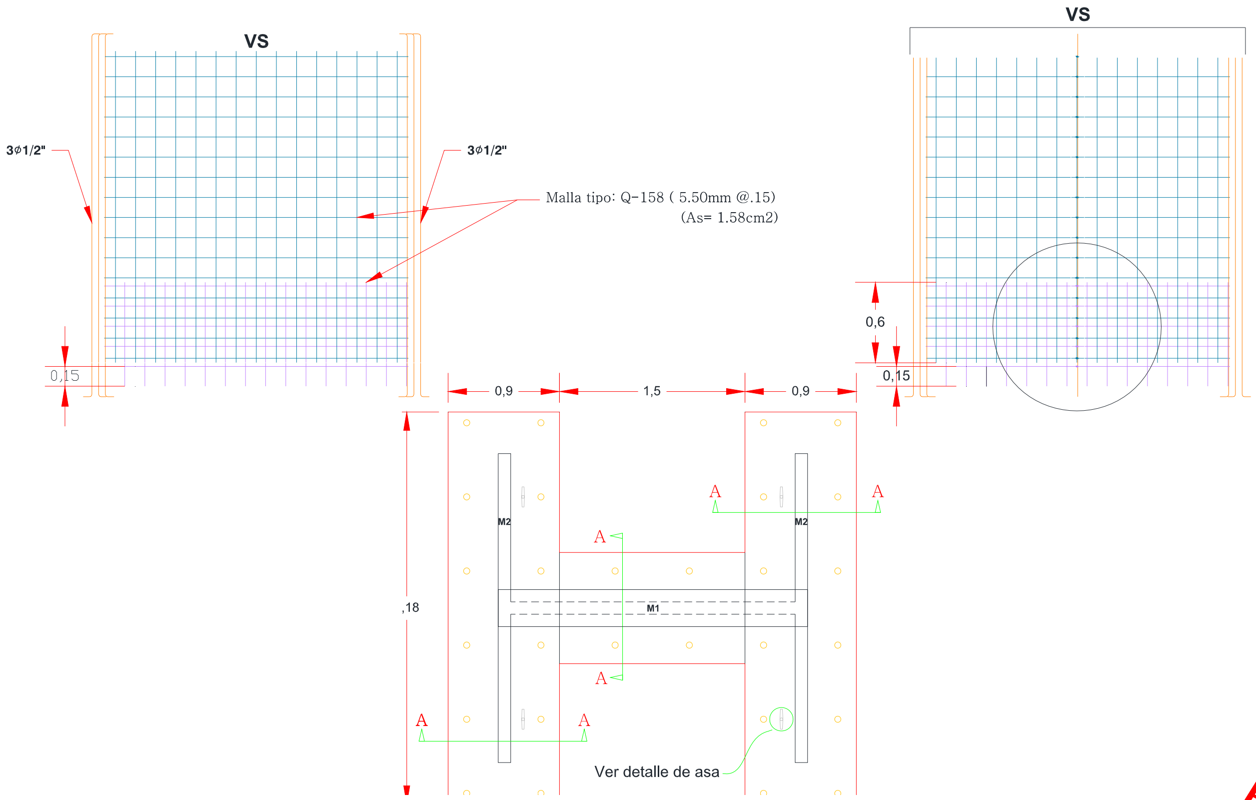
ELEVACIÓN FRONTAL
ESC. 1/50

ELEVACIÓN LATERAL
ESC. 1/50

M1 (e=0.10m)
ESC. 1/25

I Wall: Wall-01 & Wall-02

DRAWINGS OF SPECIMENS



T - Wall: Wall-03

SPECIMENS: I and H types

Simple : I walls (2 specimens)

SPECIMENS: I (simple) and H

With orthogonal walls : H wall (1 specimen)

Construction of Specimen

SIMPLE WALL

H type WALL

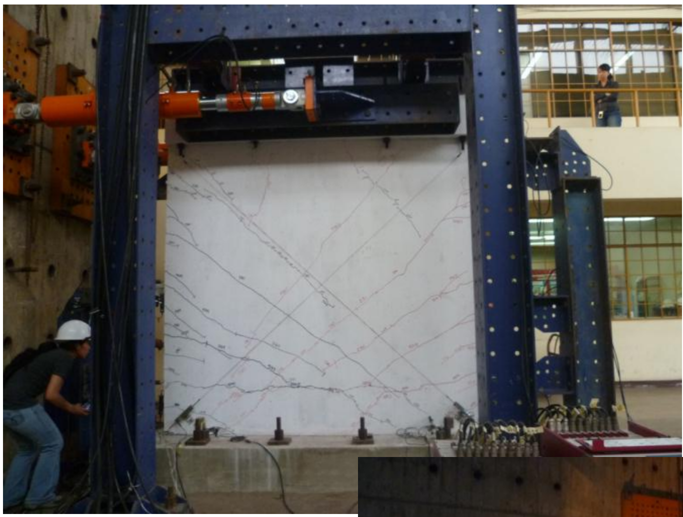
Construction of Specimen

REINFORCEMENT AND FORMS

Test Setup

Test Setup

Test of I-walls



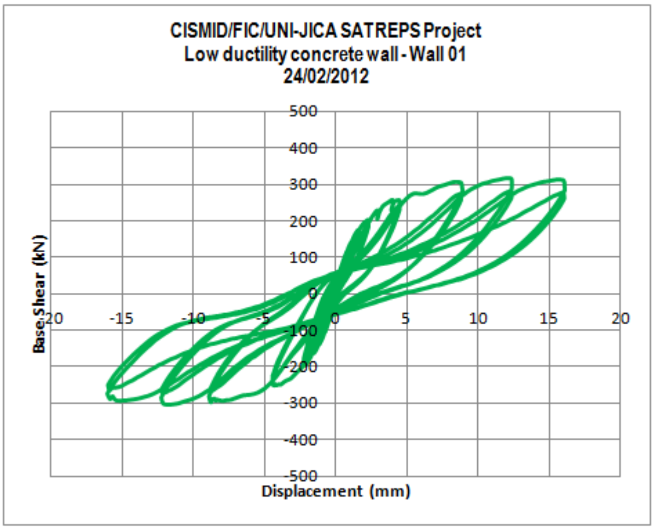
Test: hysteresis wall-01

ADQUISITION SENSORS FOR MEASURING

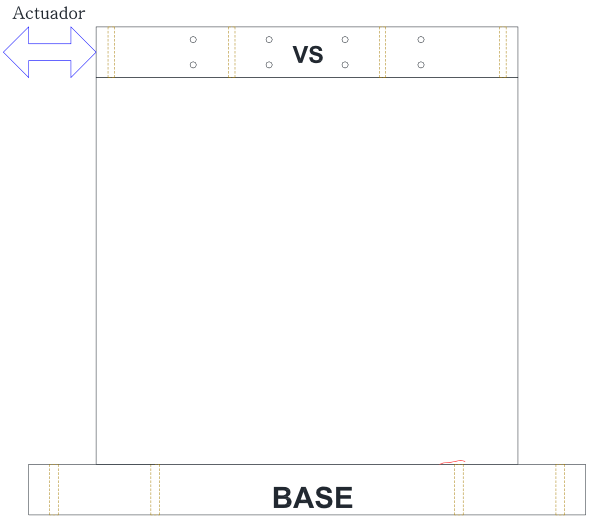
CH-NUMBER	RANGE	TIPO	UNIT	ORIGIN
CH-0	25	ACT. 25t/4755μ	T	AXIAL LOAD
CH-1	50	JACK A	T	FEEDBACK HORIZONTAL LOAD-A
CH-2	50	JACK B	T	FEEDBACK HORIZONTAL LOAD-B
CH-3	100	CDP	mm	HORIZONTAL DISPLACEMENT SOUTH
CH-4	100	CDP	mm	HORIZONTAL DISPLACEMENT NORTH
CH-5	50	CDP	mm	HORIZONTAL DISPLACEMENT EAST H/2
CH-6	50	CDP	mm	HORIZONTAL DISPLACEMENT WEST H/2
CH-7	30	CDP	mm	HORIZONTAL DISPLACEMENT EAST H/6
CH-8	30	CDP	mm	HORIZONTAL DISPLACEMENT WEST H/6
CH-9	30	CDP	mm	VERTICAL DISPLACEMENT EAST H/6
CH-10	30	CDP	mm	VERTICAL DISPLACEMENT WEST H/6
CH-11	50	KY 2794μ/FS	mm	DIAGONAL DISPLACEMENT EAST
CH-12	50	KY 2819μ/FS	mm	DIAGONAL DISPLACEMENT WEST
CH-13	30	KY	mm	HORIZONTAL DISPLACEMENT EAST H/6 CENTER
CH-14	30	KY	mm	HORIZONTAL DISPLACEMENT WEST H/6 CENTER
CH-15	10	CDP	mm	HORIZONTAL DISPLACEMENT EAST BOTTON BASE
CH-16	50	CDP	mm	VERTICAL DISPLACEMENT WEST
CH-17	50	CDP	mm	VERTICAL DISPLACEMENT WEST
CH-18	50	CDP	mm	VERTICAL DISPLACEMENT EAST
CH-19	50	CDP	mm	VERTICAL DISPLACEMENT EAST
CH-20-ST 07	2000	gage factor 2.08	μ	EAST ϕ 1/2 BORDES
CH-21-ST 08	2000	gage factor 2.08	μ	EAST ϕ MALLA DE MURO
CH-22-ST 09	2000	gage factor 2.08	μ	EAST ϕ MALLA DE CIMENTACION
CH-23-ST 10	2000	gage factor 2.08	μ	WEST ϕ MALLA DE CIMENTACION
CH-24-ST 11	2000	gage factor 2.08	μ	WEST ϕ MALLA DE MURO
CH-25-ST 12	2000	gage factor 2.08	μ	WEST ϕ 1/2 BORDES

CONTROL SENSORS FOR DRIVE JACKS ON CONTROLLER

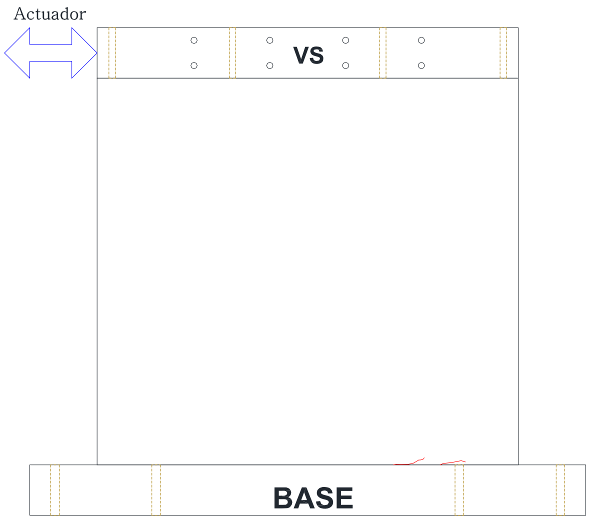
CH-MONITOR	RANGE	TIPO	UNIT	ORIGIN
CH-1	50	JACK A	T	FEEDBACK HORIZONTAL LOAD-A
CH-2	100	CDP	mm	JACK CONTROL MASTER
CH-3	50	JACK B	T	FEEDBACK HORIZONTAL LOAD-B
CH-4	-----	-----	-----	-----



Cyclic Test : cracks on wall-01

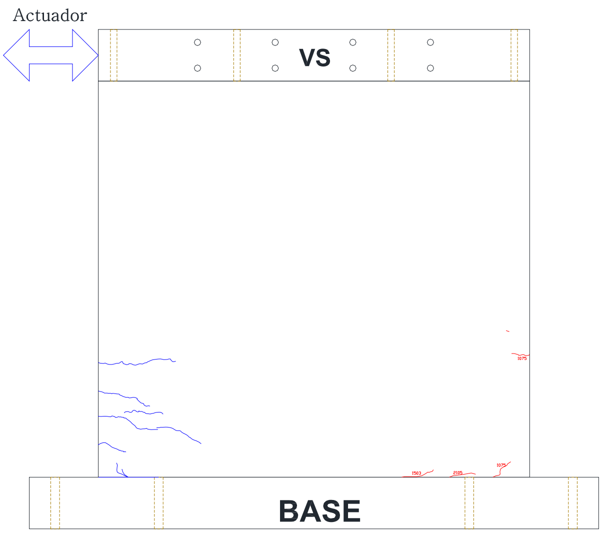


AGRIETAMIENTO MURO 1
Cara Sur
Drift:. 1/2015

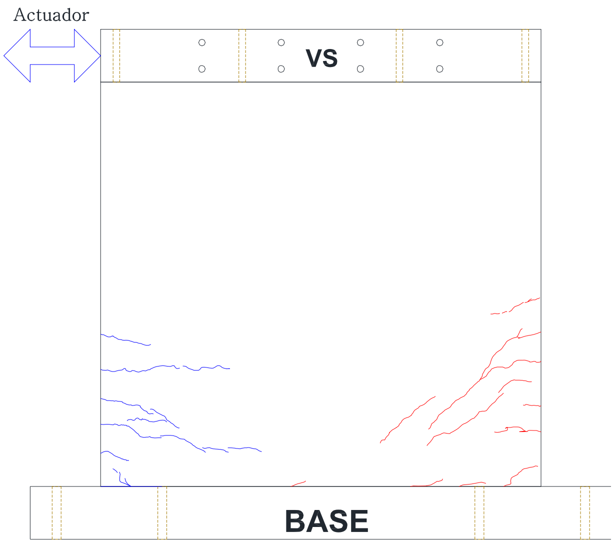


AGRIETAMIENTO MURO 1
Cara Sur
Drift:. 1/1503

Cyclic Test: cracks on wall-01

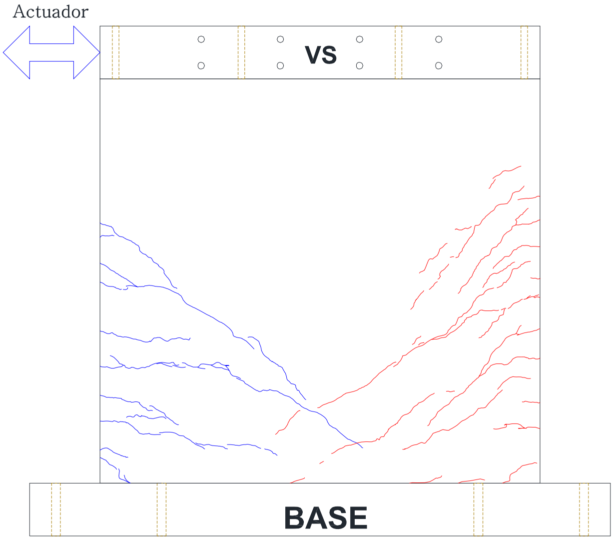


AGRIETAMIENTO MURO 1
Cara Sur
Drift:. 1/1075

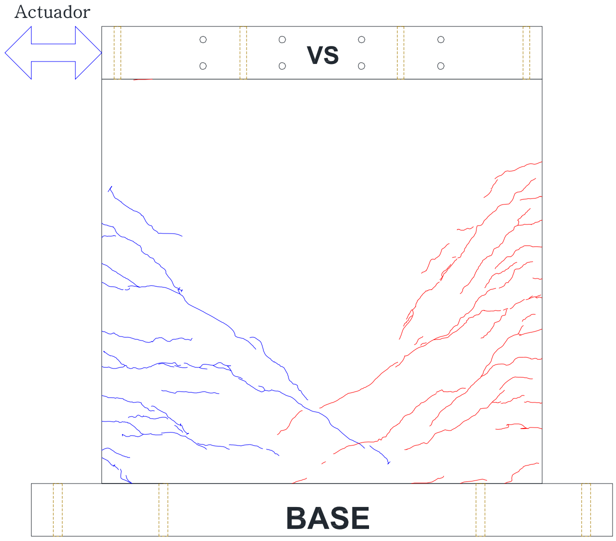


AGRIETAMIENTO MURO 1
Cara Sur
Drift:. 1/549

Cyclic Test : cracks on wall-01

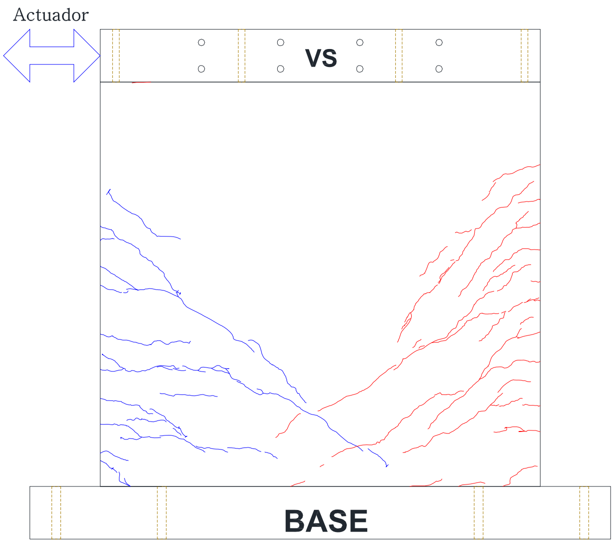


AGRIETAMIENTO MURO 1
Cara Sur
Drift:. 1/280

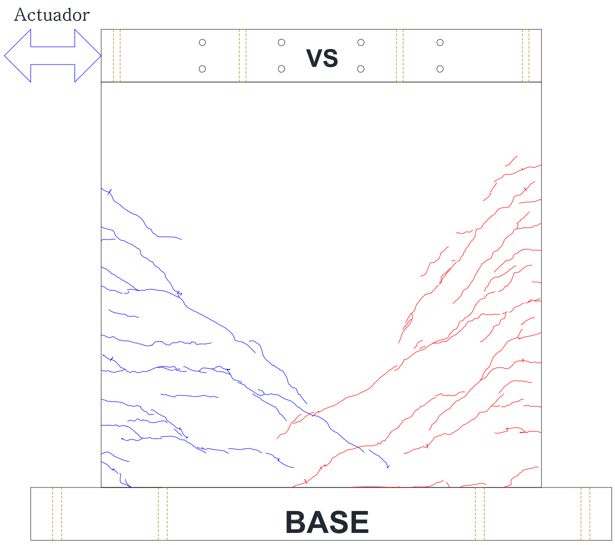


AGRIETAMIENTO MURO 1
Cara Sur
Drift:. 1/200

Cyclic Test : cracks on wall-01



AGRIETAMIENTO MURO 1
Cara Sur
Drift:. 1/200

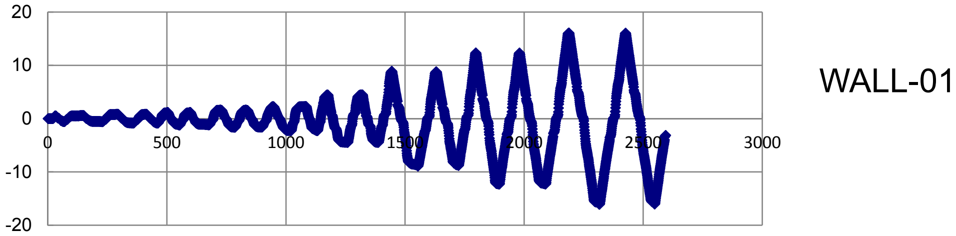


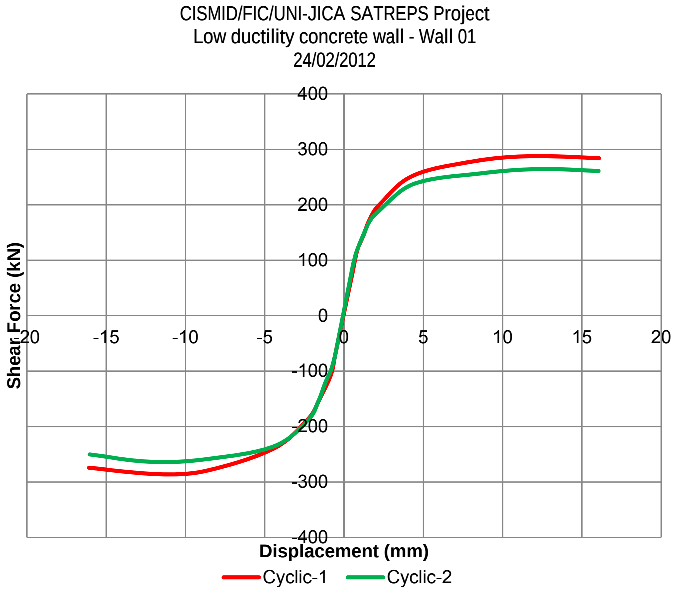
AGRIETAMIENTO MURO 1
Cara Sur
Drift:. 1/154

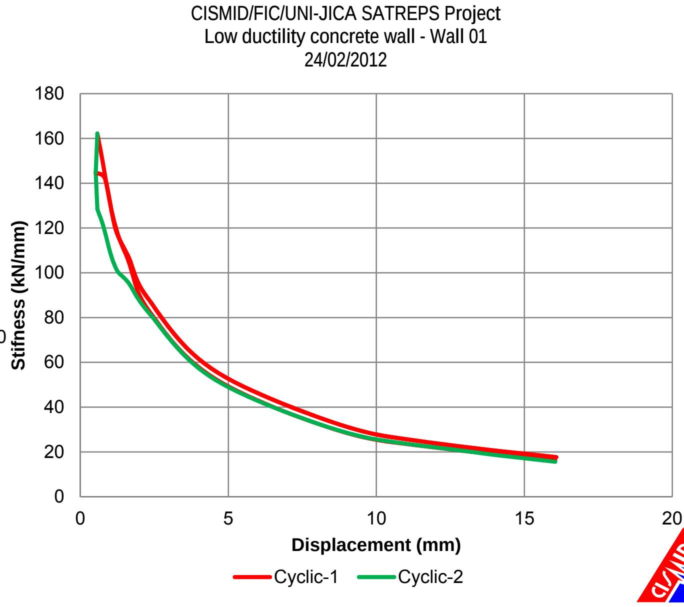
Wall-01- Final State

Wall-01- Final State

Cyclic Load Test Wall-01







Test: hysteresis wall-02

ADQUISITION SENSORS FOR MEASURING

CH-NUMBER	RANGE	TIPO	UNIT	ORIGIN
CH-0	25	ACT. 25t/4755μ	T	AXIAL LOAD
CH-1	50	JACK A	T	FEEDBACK HORIZONTAL LOAD-A
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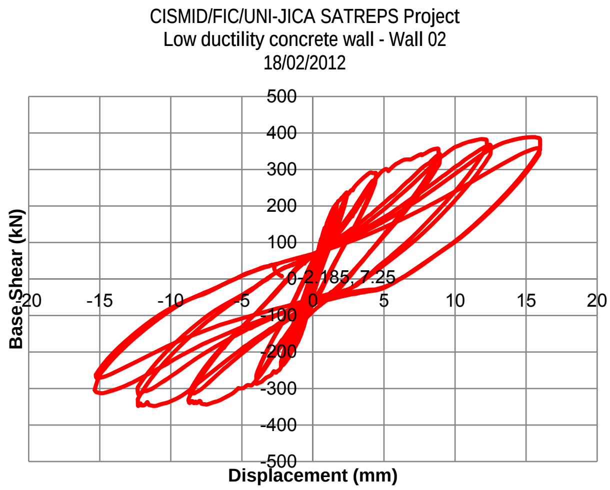
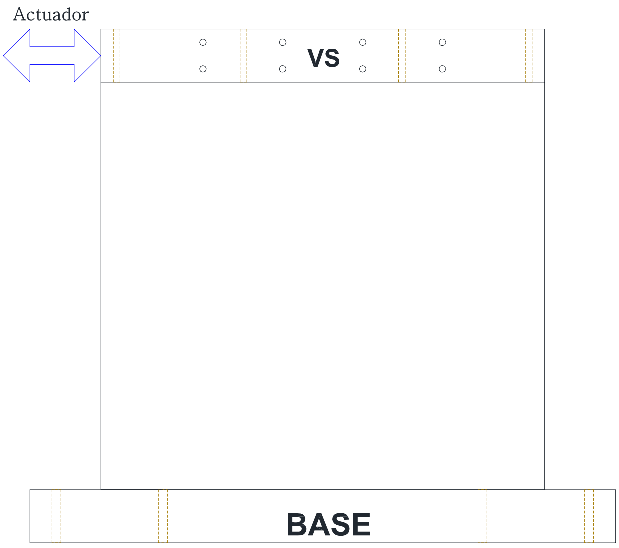
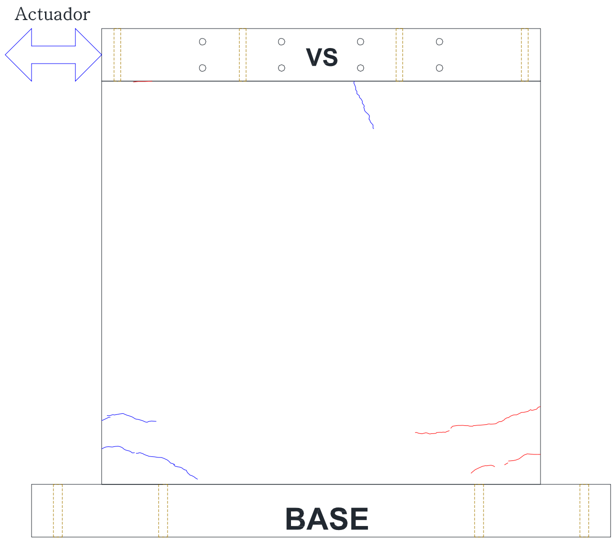


Cyclic Test : cracks on wall-02

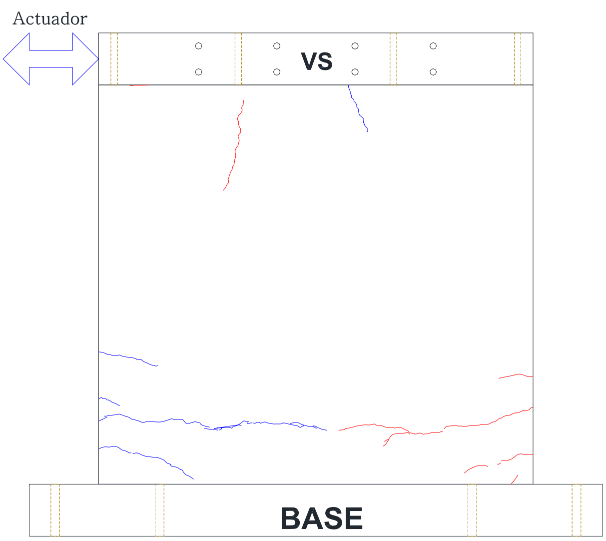


AGRIETAMIENTO MURO 2
Cara Sur
Drift:. 1/2015

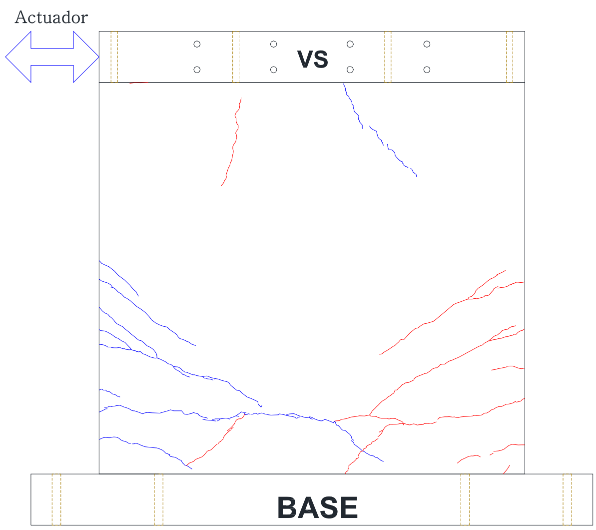


AGRIETAMIENTO MURO 2
Cara Sur
Drift:. 1/1503

Cyclic Test : cracks on wall-02

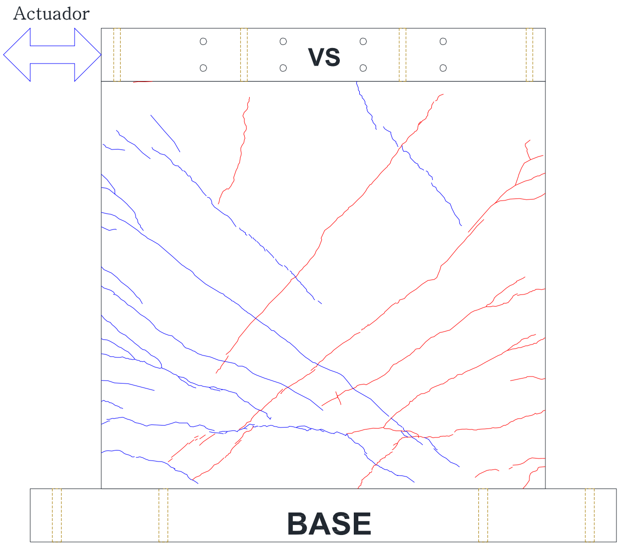


AGRIETAMIENTO MURO 2
Cara Sur
Drift:. 1/1075

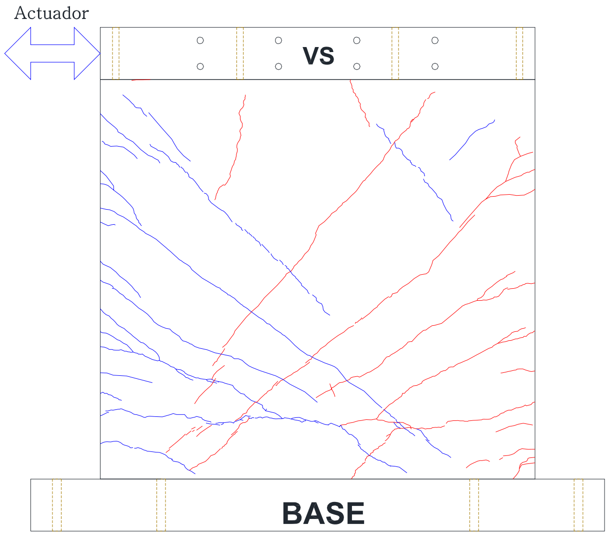


AGRIETAMIENTO MURO 2
Cara Sur
Drift:. 1/549

Cyclic Test : cracks on wall-02

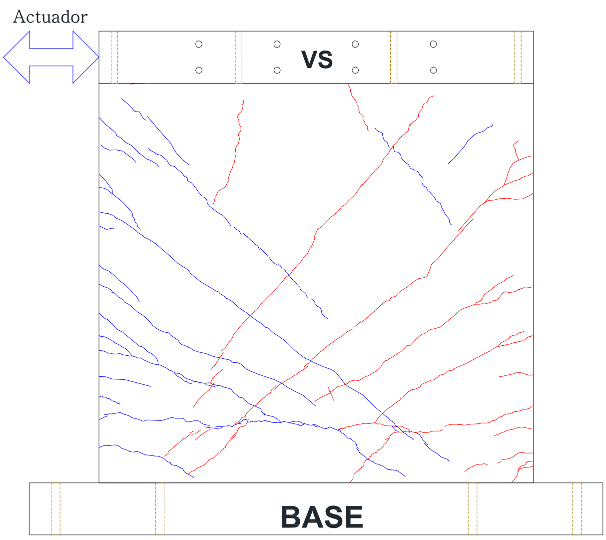


AGRIETAMIENTO MURO 2
Cara Sur
Drift:. 1/280

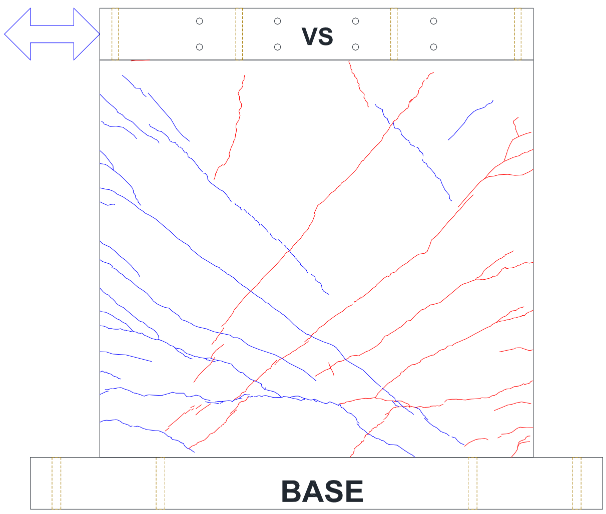


AGRIETAMIENTO MURO 2
Cara Sur
Drift:. 1/200

Cyclic Test : cracks on wall-02



AGRIETAMIENTO MURO 2
Cara Sur
Drift:. 1/200

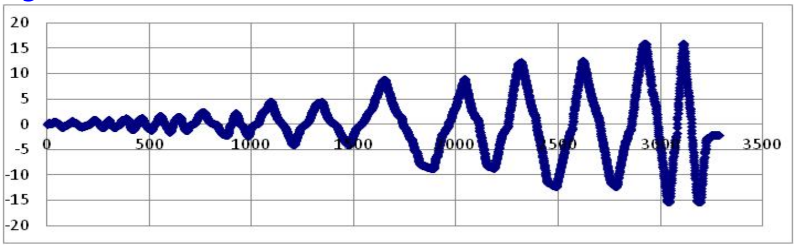


AGRIETAMIENTO MURO 2
Cara Sur
Drift:. 1/154

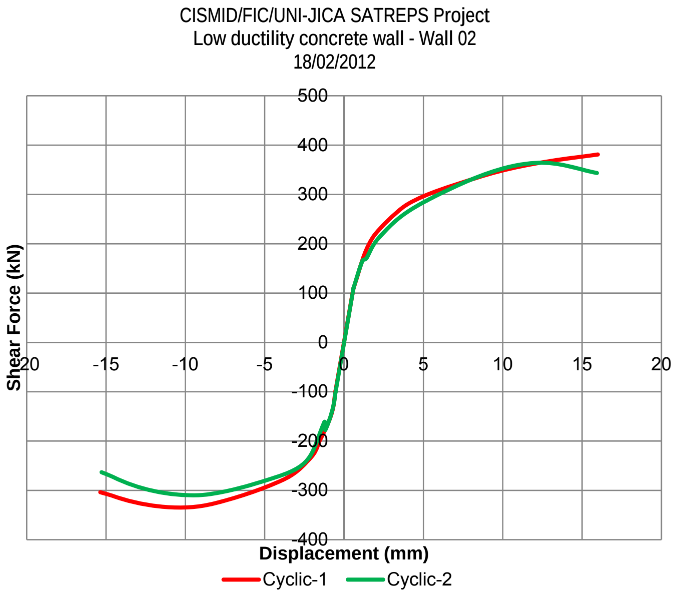
Wall-02- Final State

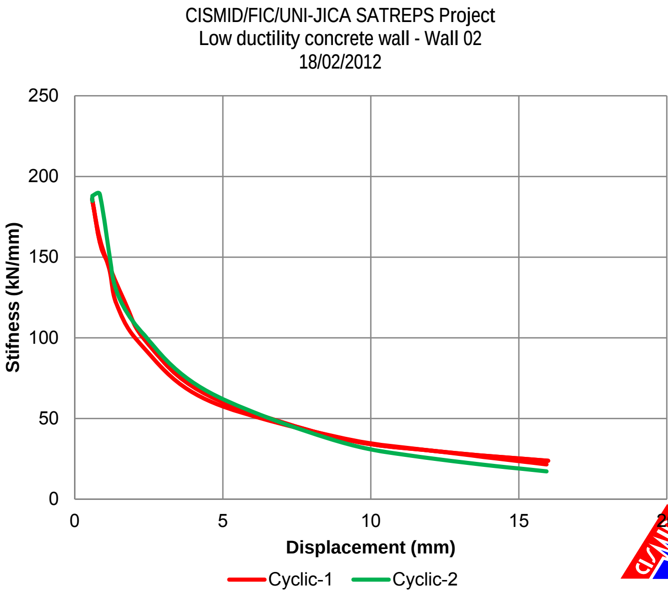
Wall-02

Cyclic Load Test Wall-02



WALL-02





Building Group G3

On line real time Vibration Monitoring System in Peru

Japanese Team

Prof. Masaomi Teshigawara
(Nagoya University)

Prof.Koichi Kusunoki
(Yokohama National University)

Dr. Go Takayama
(ITK Sensors Co.)

Peruvian Team

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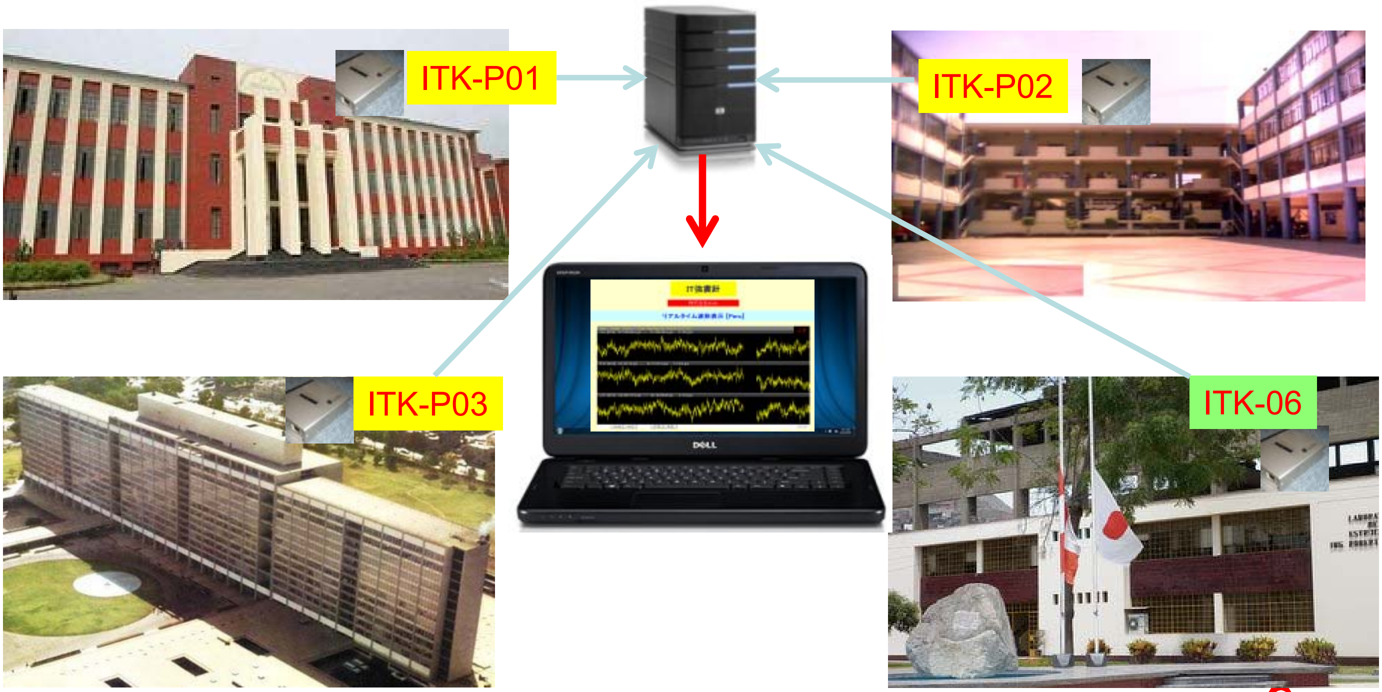
NATIONAL UNIVERSITY OF ENGINEERING
FACULTY OF CIVIL ENGINEERING
JAPAN-PERU CENTER FOR EARTHQUAKE
ENGINEERING RESEARCH AND
DISASTER MITIGATION - CISMID

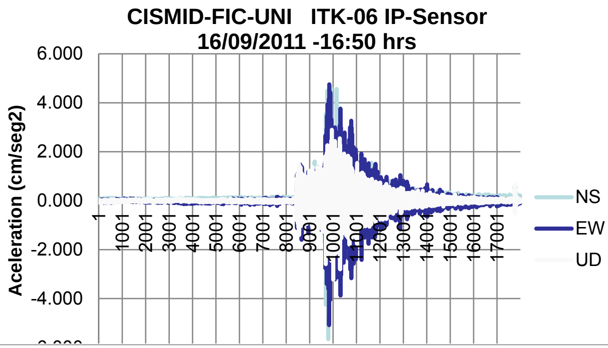
ITK Sensor Monitoring Network

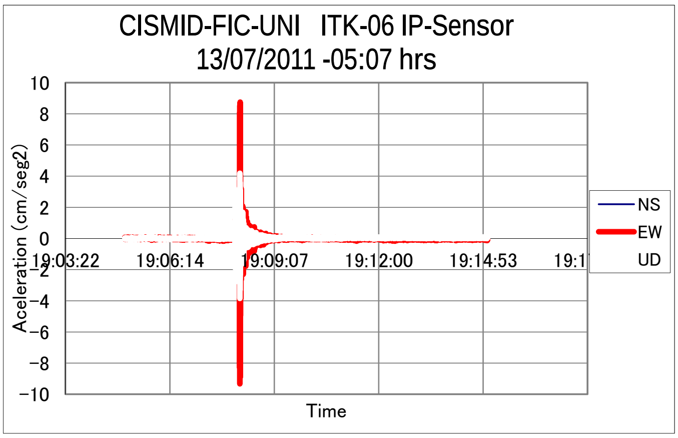


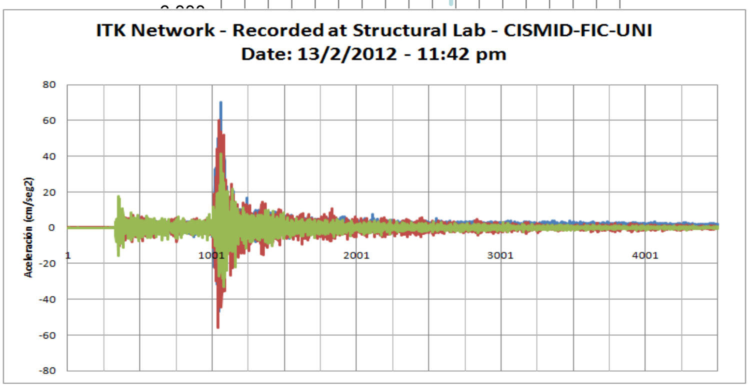
Proposal Location

Sensor Working

Capture Signal at Structural Lab CISMID-FIC-UNI



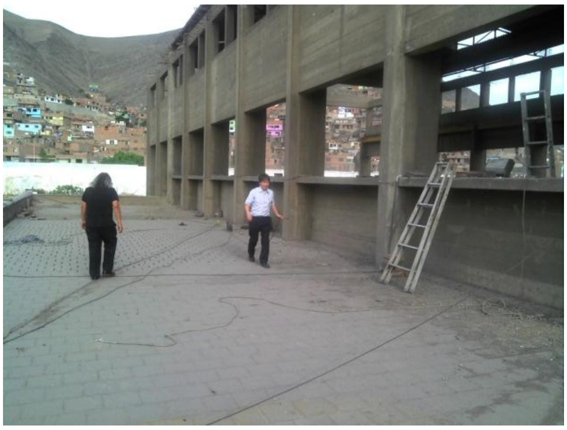




Sensors - testing local network

At Laboratory rooms building

3rd Floor: top of bldg, 3 places



2nd Floor: office room

1st Floor: Control room

CONCLUSIONS

- New equipment was implemented in the structural Lab of CISMID.
- A program for test Two I walls and One H wall has been initiated.
- Results of the first the walls provide information to continue the study of the behavior of low ductility wall.
- Next step is the research of the influence of perpendicular wall on low ductility specimens.
- The results will complement our Japanese counterparts research and we can discuss in order to learn about the influence of the flange to web wall.