第4章　フィリピン現地ワークショップ及びブロック積み施工デモンストレーションの開催並びに関連調査

4．1　活動概要

2024 年 1 月 16－26 日（移動日含む）の間、下記の者がフィリピンに出張し、ワークショップ、ブロック積みデモンストレーション、地震被災建物調査を行った。

＊参加者：北海道建築技術協会フィリピン CHB プロジェクト実行委員

石山祐二

楢府龍雄

青野洋之

① 2024 年 1 月 18 日 1－5PM　メトロマニラ・ワークショップ

会場：ケソン市 Luxent Hotel

参加者　107 名（申込者リスト　別添参照）

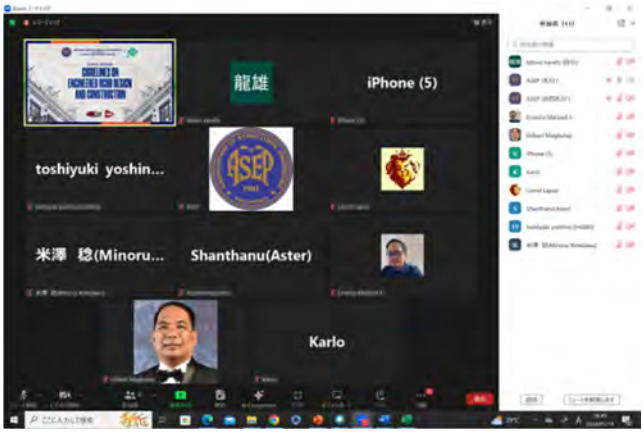
オンライン中継実施

メトロマニラでのワークショップの開催

同左、質疑応答のセッション。講演者などが登壇。右端が、NBCDO／DPWH　のディレクター、その左が BOD/DPWH の技師。

当日配布された次第と 2 冊のガイドライン

ASEP 事務局職員による参加者受付の様子



メトロマニラ会場でのワークショップのオンライン配信の状況

② 2024 年 1 月 19 日10－12AM ブロック積み施工デモンストレーション

会場:ブラカン州栄住ビルディング

参加者:約 50 名(マニラ市より送迎のバスを用意)

ガイドライン概要説明


ブロック積デモンストレーション


ブロック積デモンストレーション

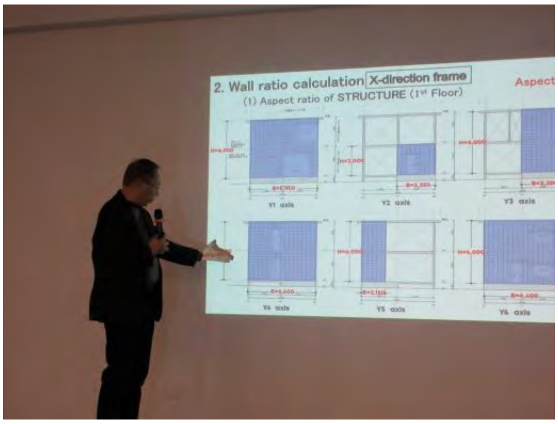
参加者の集合写真

横筋用ブロック製造に必要となる部品
(コアプーラー)

デモンストレーション会場敷地内の日本式
ブロック積による施工中建物の見学

③ 2024 年 1 月 23 日 1－5PM ダバオ市ワークショップ
会場:Rogen Inn
参加者 86 名(申込者リスト 別添参照)

ダバオワークショップの開催



ASEP アリエル氏による設計事例の説明

質疑応答のための発表者の登壇

ASEP 事務局職員による受講証明書の交付

④ 2024 年 1 月 24 日1－5PM セブ市ワークショップ

会場： Bai Hotel Cebu

参加者 参加者 106 名（申込者リスト 別添参照）

セブワークショップの開催

ASEP 事務局職員による受講証明書の交付

ワークショップの開催の案内


ASSOCIATION OF STRUCTURAL ENGINEERS OF THE PHILIPPINES, INC. (ASEP)
in cooperation with
HOKKAIDO BUILDING ENGINEERING ASSOCIATION (HoBEA)

Hereby presents this

CERTIFICATE OF PARTICIPATION

to

for having attended and satisfactorily completed the

TECHNICAL WORKSHOP: GUIDELINES ON ENGINEERED RCHB DESIGN AND CONSTRUCTION

held on January 24, 2024 at bai Hotel Cebu
Ouano Ave, corner C.D.Seno, Mandaue City, 6014 Cebu

Given this 24th day of January 2024 in Mandaue City, Philippines.

RODOLFO P. MENDOZA JR., D.ENG, M.ASEP
Secretary / Chair, CPD Committee

MARK ELSON C. LUCIO, M.ASEP
President

ワークショップ参加者に授与される ASEP の受講証明書
技術者の登録の更新の際に、一定数のワークショップ、セミナー等の参加の実績が必要となる。

（檜府龍雄）

メトロマニラ・ワークショップ　参加者

MANILA

	EMAIL ADDRESS	LAST NAME	FIRST NAME	MIDDLE NAME	MOBILE NUMBER	ORGANIZATION / COMPANY NAME
1	tonypanelojr@gmail.com	PANELO	ANTONIO JR	CHAVES	09175383477	Concrete Ventures Group Inc.
2	arleen25@yahoo.com	PABLO	ARLEEN	SACDALAN	09235700891	National University Manila
3	sejedomantay@yahoo.com	DOMANTAY	JENEFE	SANTOS	09065315625	MBJD Mechanical and Civil Engineering Services
4	rosal.jpf@gmail.com	ROSAL	JOSEPH PATRICK	FERNANDEZ	09053167609	Geoservices Philippines Corporation
5	redjmanila@gmail.com	REGIDOR	RICHARD	SOLOMON	09155698913	ASEP
6	rowi_213@yahoo.com	CONCERMAN	ROWEL	ESPENILLA	09950346776	ASEP
7	edmondo.san-jose@arup.com	SAN JOSE	EDMONDO	DELORIA	09178765337	Arup
8	rlbergonio@dmcihomes.com	BERGONIO	RAYMOND JAY	LIMON	09083364132	DMCI - PDI
9	rentechnical1948@gmail.com	GAÑA	RENATO JR	GUEVARRA	09193110167	Jackbilt Industries Inc.
10	johairaddang@gmail.com	ADDANG	JOHAIR	SISCAR	09174946998	DMCI PDI
11	valsorabled@gmail.com	VALSORABLE	DAN ANGELO	BERNARDINO	09397655329	Jackbilt Industries Incorporated
12	kpfortes@dmcihomes.com	FORTES	KERWIN RAY	PAMATMAT	09178770820	DMCI PDI - DMCI Homes
13	esespina@dmcihomes.com	ESPINA	EDWARD GLENN	SANCHEZ	09953338584	DMCI Project Developers, Inc.
14	cvmirano@dmcihomes.com	CRUZ	MA CRYSTEL	MIRANO	09154067065	DMCI Homes
15	jccallado@dmcihomes.com	CALLADO	JUSTINE BERNARD	CASTILLO	09064069241	DMCI PDI
16	joshiebalbuena@gmail.com	BALBUENA	JOSHIE MAY	SALCEDO	09158993614	DMCI Homes
17	acdmgn@gmail.com	MAGNO	ALMA CLARISSE	DE CHAVEZ	09989950320	DMCI Project Developer, Inc.
18	btlemana@jackbilt.com.ph	LEMANA	BIERNY	TANGHAL	09778143238	Jackbilt Industries Inc.
19	cdinting@jackbilt.com.ph	INTING	CHERRY	D.	09338515858	Jackbilt Industries Inc.
20	m3-okuda@nomura-re.co.jp	OKUDA	MASAO	N/A	+819067917921	Federal Land NRE Global
21	clarhize_castillo@yahoo.com	CARDAÑO	CLARHIZE	CASTILLO	09260231610	Federal Land and Nomura Real Estate Global (FNG)
22	fcalfaro@jackbilt.com.ph	ALFARO	FRANCISCA	CRUZ	09175301107	Jackbilt Industries, Inc.
23	engrjayvee@gmail.com	GAGAN	JAYVEE	LOPEZ	09325803056	Maynilad Water Services Incorporated
24	piaorticio@gmail.com	ORTICIO	MARIA SOPHIA	RAMOS	09162612156	Maynilad Water Services Incorporated
25	calaralap09@gmail.com	CALARA	LEE ANN	PERALTA	09175150456	Jackbilt Industries Inc.
26	edisonmalahito@gmail.com	MALAHITO	EDISON	CALISAY	09064635631	Maynilad Water Services Incorporated
27	reymarkdevilla@gmail.com	DE VILLA	REYMARK	FURTO	09060638969	Maynilad Water Services Incorporated
28	dbmartinez684@gmail.com	MARTINEZ	DANIEL	BRACERO	09610991389	MWSI
29	aldrichfpenaflor30@gmail.com	PEÑAFLOR	ALDRICH FRANCIS	ORTIZ	09662797308	Teragrail Geology & Geotechnics Construction Inc.
30	saechernandez@jackbilt.com.ph	HERNANDEZ	STEVE ANTHONY EMIL	CANTERA	09175708696	Jackbilt
31	janalain_deolazo@yahoo.com	DE OLAZO	JAN-ALAIN	HILARIO	09422172365	FRP Restorations Enterprises
32	jovelovivian25@gmail.com	JOVELO	VIVIAN	RAMOS	09551297892	PICE Member
33	marksocong@gmail.com	SOCONG	MARK	LUBIANO	09082599062	Government / Freelance Structural Designer
34	reggie.untalan@gmail.com	UNTALAN	REGGIE	BALMES	09089525656	SM DEVELOPMENT CORPORATION
35	aero.gozun@gmail.com	GOZUN	AERO NEIL	IGAYA	09209292457	SM DEVELOPMENT CORPORATION
36	erwinbacayo@gmail.com	BACAYO	ERWIN		09457036584	SM DEVELOPMENT CORPORATION
37	engrdelaluna@gmail.com	DELA LUNA	GALICANO	M.	09778130360	SM DEVELOPMENT CORPORATION
38	vincent.foliente@smdevelopment.com	FOLIENTE	VINCENT	P.	09298681785	SM DEVELOPMENT CORPORATION
39	gonzalesxsarahmae@outlook.com	GONZALES	SARAH	T.	09064340147	AboitizLand Inc.,
40	icltumulak@gmail.com	TUMULAK	IAN CHRIS	L.	09175662413	AboitizLand Inc.,
41	marion.vicencio@dlsu.edu.ph	VICENCIO	MARION RYAN	ALUNING	09178059694	DE LA SALLE UNIVERSITY
42	randy.b.salazar@gmail.com	SALAZAR	RANDY	BRIONES	09321704908	DE LA SALLE UNIVERSITY
43	salvador.olaivar7@gmail.com	OLAIVAR	SALVADOR	G.		DE LA SALLE UNIVERSITY
44		TARUC	JOSE ROY	C.		MAKATI DEVELOPMENT CORPORATION
45	kedangal@gmail.com	EDANGAL	MA. FILIPINA	L.	09397251522	MAKATI DEVELOPMENT CORPORATION
46	baquiran.remund@mdc.com.ph	BAQUIRAN	REMUND	B.	09778037173	MAKATI DEVELOPMENT CORPORATION
47	melvirtalde@gmail.com	TALDE	MELVIR	A.	09178674908	MAKATI DEVELOPMENT CORPORATION
48	engrerickmanalang@gmail.com	MANALANG	ERICK	V.	09392884619	MAKATI DEVELOPMENT CORPORATION
49	gomez.kimlimuel@mdc.com.ph	GOMEZ	KIM LIMUEL	T.	09176730902	MAKATI DEVELOPMENT CORPORATION
50		OTA Koji				JICA Philippines Office, Project Formulation Advisor
51		NIWA Kenji				JICA Philippines Office, Project Formulation Advisor
52		DOMINGO	DANILO			DADEC
53	romeoag17@gmail.com	AGUILAR JR.	ROMEO	SAN JUAN	09750123873	DADEC
54	marco mrkomcns@gmail.com	MACANAS	MARKO ALLEN	C.	09929463937	DADEC
55	aristotleg.domingo@gmail.com	DOMINGO	ATISTOTLE	G.	09980871207	DADEC
56	caliwcaliwjudeii@gmail.com	CALIW-CALIW II	JUDE	S.	09177114243	Engineer III - Department of Public Works and Highways - National Building Code Development Office (DPWH-NBCDO)
57	jp.duldulao04@gmail.com	CABRERA	JOHN PAULO	D.	09472837770	Engineer II - Department of Public Works and Highways - National Building Code Development Office (DPWH-NBCDO)
58	rryanchester@gmail.com	ROGERO	RYAN CHESTER	M.	09776367164	Engineer II - Department of Public Works and Highways - National Building Code Development Office (DPWH-NBCDO)
59	jr.batenga@yahoo.com	BATENGA JR.	JAY AR	B.	09157273733	QUEZON CITY LOCAL GOVERNMENT - DEPT. OF ENGINEERING
60	jaysonenriquez8612gmail.com	ENRIQUEZ	JAYSON	A.	09452464611	QUEZON CITY LOCAL GOVERNMENT - DEPT. OF ENGINEERING
61	achancleofe@gmail.com	CLEOFE	CHRISTIAN	A.	09291604853	QUEZON CITY LOCAL GOVERNMENT - DEPT. OF ENGINEERING
62	kevlabrador05@gmail.com	LABRADOR	KELVIN STRAUSS	E.	09068553622	QUEZON CITY LOCAL GOVERNMENT - DEPT. OF ENGINEERING
63	engr.edmarlim@gmail.com	LIM	EDMAR	REGALARIO	09991514526	QUEZON CITY LOCAL GOVERNMENT - DEPT. OF ENGINEERING
64	masaomi@dis-aster.com	MASAOMI SUZUKI				CEO, ASTER
65	shan@dis-aster.com	SHANTHANU RAJASEKHARAN				COO, ASTER
66		BELDEROL	JOHN ALEXANDER	S.		Officer-in-Charge, Executive Director
67	melissesabugdalan06@gmail.com	SABUGDALAN	MELISSE	S.	09669121726	Draftsman III
68		MENDOZA, JR.	RODOLFO	P.		ASEP SECRETARY
69		PINEDA	MARICON	C.		ASEP TREASURER
70		LUCIO	MARK ELSON	C.		ASEP PRESIDENT
71		SANTOS	ARIEL	P.		SPEAKER
72		PABALAN	CESAR	C.		ASEP BOD
73		ISON	RANNIE	S.		SPEAKER
74		ISHIYAMA	YUGI			SPEAKER
75		NARAFU	TATSUO			SPEAKER
76		CUNANAN	JUANITO	D.		SPEAKER
77	randynegrito1228@gmail.com	NEGRITO	RANDY	A.	09198440321	Habitat for Humanity Philippines Foundation, Inc.
78	escalajeffrey87@gmail.com	ESCALA	JEFFREY	MENDOZA	09310280032	Habitat for Humanity Philippines Foundation, Inc.
79	cbebelone17@gmail.com	BEBELONE	CLIFF RICHARD	B.	09437069662	Habitat for Humanity Philippines Foundation, Inc.
80	zenaida.mohammad@habitat.org.ph	MOHAMMAD	ZENAIDA	H.	09560025324	Habitat for Humanity Philippines Foundation, Inc.
81	roseann.lubaton@habitat.org.ph	LUBATON	ROSE ANNE		09267754831	Habitat for Humanity Philippines Foundation, Inc.
82	cecil.anonuevo@habitat.org.ph	ANONUEVO	MARIA CECILIA	C.	09088657602	Habitat for Humanity Philippines Foundation, Inc.
83		NARAG	ISHMAEL	C.		DOST-PHIVOLCS
84		LANUZA	ANGELITO	G.		DOST-PHIVOLCS
85	miguel.abitang@phivolcs.dost.gov.ph	ABITANG	MIGUEL	G.	09156018603	DOST-PHIVOLCS
86	sien.manuel@phivolcs.dost.gov.ph	MANUEL	SIEN IVAN	E.	09276715228	DOST-PHIVOLCS
87	jeryc.dacillo@habitat.org.ph	DACILLO	JERYC	ROSALES	09190642564	HABITAT FOR HUMANITY PHILIPPINES
88	tsky_tan@yahoo.com.ph	TAN	LUVINCCI	DEL ROSARIO	09453170656	DPWH-BUREAU OF DESIGN
89	seeterenceoliver@gmail.com	SEE	TERENCE OLIVER	CHUA	09178501217	MEGAWORLD CORPORATION
90	williamprovido@gmail.com	PROVIDO	WILLIAM	ABERIN	09173254156	FREELANCE / CONSULTANT
91	darrenapolinar@gmail.com	APOLINAR	DARREN	DE CASTRO	09175778863	DPWH
92	mbpagcaliwangan@gmail.com	PAGCALIWANGAN	MELANIE	B.	09054509424	DPWH
93	cruzjesssamarie@gmail.com	CRUZ	JESSA MARIE	STA. MARIA	09163479458	DPWH
94	ariel.nones@habitat.org.ph	NONES	ARIEL	B.	09985383079	HABITAT FOR HUMANITY PHILIPPINES
95	tabios23benjamin@yahoo.com	TABIOS, JR.	BENJAMIN	TALAN	09178741023	DPWH
96	cerdoconstruction@gmail.com	ALDAY	JESREEL	C.	09178136586	CERDO CONSTRUCTION
97	qdst.eljin@gmail.com	LAQUINDANUM	ELJIN	C.	09487815771	QUADSTRUCT INC.
98	Hijikata.Yuji@jica.go.jp	HIJIKATA Yuji				JICA Philippines Office, Project Formulation Advisor
99	katrinasalvador@dti.gov.ph	SALVADOR	KATRINA	T.		DTI-BPS
100	czerreljohncruz@dti.gov.ph	CRUZ	CZERR	V.	09152680321	DTI-BPS
101	rommelsalvador81@gmail.com	SALVADOR	ROMMEL	OCHOA	09228717310	PIMENTEL & ASSOCIATES
102	rodelon.ramos@habitat.org.ph	RAMOS	RODELON	M.	09060093549	HABITAT FOR HUMANITY PHILIPPINES
103	ariel.nones@habitat.org.ph	RAMOS	ARIEL	M.	09985353074	HABITAT FOR HUMANITY PHILIPPINES
104		GALLEVO	MARK	F.	09152698412	DTI-BPS
105	erniefcruz2@yahoo.com	CRUZ	ERNESTO	F.	09176310581	PETRO JIKKEN INC.
106	baseroger@yahoo.com	BASE, JR.	ROGELIO	B.	09511873472	PIMENTEL & ASSOCIATES
107	tonycpimentel@gmail.com	PIMENTEL	ANTHONY VLADIMIR	C.		PIMENTEL & ASSOCIATES

ダバオ市ワークショップ　参加者

DAVAO

	EMAIL ADDRESS	LAST NAME	FIRST NAME	MIDDLE NAME	MOBILE NUMBER	ORGANIZATION / COMPANY NAME
1	novenjusayan@gmail.com	JUSAYAN III	NOVEN JOHN	BASADRE	09177926426	JE
2	marykaseljoy@gmail.com	RICARE	MARY KASEL JOY	BOLONOS	09171146850	DPWH Bukidnon 1st DEO
3	brylleanthonyd@gmail.com	DAYAO	BRYLLE ANTHONY	OROPIEZA	09976224486	DPWH Bukidnon 1st DEO
4	ortuoste24@gmail.com	ORTUOSTE	REY KEVIN	BALONDO	09561250836	Davstruct/ROC/UM
5	Jovenoriel951@gmail.com	ORIEL	JOVEN MARK	DIMPAS	09957404354	DPWH BISLIG CITY
6	predicter22@yahoo.com	VARRON	FRANCIS	VILLARMA	09095149352	Dpwh Surigao Del Sur 2nd DEO
7	stephencarlogagate@gmail.com	GAGATE	STEPHEN CARLO	ALBACEA	09061216817	Dpwh Surigao Del Sur 2nd DEO
8	ddtantoy@gmail.com	TANTOY	DENNIS	DAYAGANON	09666478929	Dpwh Surigao Del Sur 2nd DEO
9	jaylordhinay@gmail.com	HINAY	JAYLORD	AMONCIO	09762447840	Dpwh Surigao Del Sur 2nd DEO
10	daytotos.rodrigo@dpwh.gov.ph	DAYTOTOS JR.	RODRIGO	JACOB	09095976964	Dpwh Surigao Del Sur 2nd
11	jlpantaleon@yahoo.com	PANTALEON	JOIE	LABENIA	09309093793	LGU-BAROBO SURIGAO DEL SUR
12	gsciocon@gmail.com	CIOCON	GARRETTE	SANTILLAN	09361942619	AC Pama Engineering Consultancy
13	romeoaton98@gmail.con	ATON	ROMEO JR.	CELLAN	09667595937	City Engineers Office
14	ffpimentel.engr@gmail.com	PIMENTEL	FRANCIS FLOYD	RAMOS	09071949999	ASEP
15	plazawilcy28@gmail.com	PLAZA	WILCY	MORALES	09774229113	City Engineer's Office
16	charlie.dpaz@gmail.com	DE PAZ	CHARLIE MAY	ANDANTE	09501537899	City Government of Davao
17	bryanearlaplicadordumandan@gmail.com	DUMANDAN	BRYAN EARL	APLICADOR	09154653401	City Engineer's Office of Davao
18	Engrdlorenzo@gmail.com	LORENZO	DANA LEE	IGNACIO	09177734025	CEO
19	kcgfajardo@gmail.com	FAJARDO	KAYE CEE	GERNALIN	09271104197	AC PAMA ENGINEERING CONSULTANCY
20	babarley31@gmail.com	JIMENEZ	BEVERLY	IMBO	09207684818	City Government of Davao
21	hiedegraceb@gmail.com	CABAJES	HIEDE GRACE	BALAGAT	09063673946	CITY ENGINEERS OFFICE
22	elainemarie98.emv@gmail.com	VAPOR	ELAINE MARIE	BAUTISTA	09224230845	AC Pama Engineering and Consultancy
23	noreenstellae@gmail.com	EBAD	NOREEN STELLA	LIM	09672463901	City Engineer's Office
24	acpama.engr@gmail.com	PAMA	ADEMAR	CARBA	09189151479	AC Pama Engineering Consultancy
25	jomariecabisay@gmail.com	CABISAY	JOMARIE	DOÑO	09957096618	DPWH- Bukidnon 2nd DEO
26	Loudiemagante@gmail.com	MAGANTE	LOUDIE	MAQUIRANG	09977858686	DPWH BUKIDNON 2ND DEO
27	mirandajay1998@gmail.com	MIRANDA	CHRISTIAN JAY	MANCIA	09952181958	City Engineer's Office
28	dhonzoy1997@gmail.com	ABEJUELA	CHRISTIAN DHON	LUPIBA	09234107229	ACPama Engineering Consultancy
29	reyalbert_cabotaje@umindanao.edu.ph	CABOTAJE	REY ALBERT	CORPUZ	09297429484	University of Mindanao
30	remojol@gmail.com	REMOJO	LIZARDO	PILLO	09177005542	LPRA Geo-Solutions
31	acjoyodts@gmail.com	JOYO	APPLEGEN	CAVERO	09177166661	AC JOYO DESIGN & TECHNICAL SERVICES
32	evalyncastil@gmail.com	CEA	EVALYN JOY	CASTIL	09165902490	AC Joyo Design & Technical Services
33	reyaquitania@gmail.com	AQUITANIA	REYNALDO	OPIANO	0920 945 8019	COLOSSIAN CONSTRUCTION SUPPLY AND SERVICES
34	evtritabanguil@gmail.com	TABANGUIL	EVTRI	ESPINOZA	09055655249	ASEP/ Ateneo de Davao University
35	kpcsaquin@gmail.com	SAQUIN	KIM PATRICK	CABALLERO	09562984486	City Engineer's Office - Davao
36	geffbern@gmail.com	BERNARDO	GEFFREN	DE LOS REYES	09438139113	University of Mindanao
37	chongskie2002@yahoo.com	GODOY	CHERYL	NASAYAO	9463002009	DPWH
38	sweetannellibarrizo@yahoo.com	BARRIZO-AWA	SWEET ANNELLI	BAUTISTA	09497929841	DPWH
39	johannjovita@gmail.com	JOVITA	JOHANN	GUILLERMO	09989719108	DPWH
40	jamesryan.jabonero@gmail.com	JABONERO	JAMES RYAN	ABAYON	09222120547	DPWH DAVAO OCCIDENTAL DEO
41	johnralphramos@gmail.com	RAMOS	JOHN RALPH	PAGANDAHAN	09382339404	City Engineer's Office
42	ruel_nazareno@yahoo.com	NAZARENO	RUEL	MAQUILING	09512494003	Los Arcos Construction and Supply
43	amadsmalinao@gmail.com	MALINAO	AMADOR JR	NOVAL	09352855356	Bureau Veritas
44	eoechavezii@gmail.com	ECHAVEZ	EUGENIO II	OBALES	09155376608	AC Pama Engineering and Consultancy
45	villafuertejay19@gmail.com	VILLAFUERTE	JAY MARK ROY	ALBELDA	09665684140	City Engineers Office PDD
46	dvganiera@gmail.com	GANIERA	DALE VINCENT	CABIGAS	09457958899	LPRA Geo-Solutions
47	nursabinula@gmail.com	SABINULA	NORIS	SAMAN	0998 539 3735	BJMP
48	ardeeonfire@gmail.com	NALUAN	ARCH DEO	INTO	09954232282	City Engineers Office
49	janreykimos@gmail.com	KIMOS	JAN REY	MAGHUYOP	09095113288	Cebulandmasters Inc.
50	eugenesubido@gmail.com	SUBIDO	EUGENE	L.	09985103118	DPWH BISLIG CITY
51	jong.micu11@gmail.com	MICU	FREDERICK	V.	09317346050	DPWH BISLIG CITY
52	sherwin.masancay@bislig.gov.ph	MASANCAY	SHERWIN	T.	09190921923	DPWH BISLIG CITY
53	glamper@yahoo.com	AMPER JR.	GUILLERMO	L.	09610435704	PRIVATE
54	babesamper@gmail.com	AMPER	MARIALITA	G.	09425846881	Office of the City Building Official (OCBO)
55	reydhannel_24@yahoo.com	RIOS	REY DHANNEL O.	O.	09185201998	Office of the City Building Official (OCBO)
56	ingrid.bania@yahoo.com	BANIA	INGRID R.	R.	09423478295	Office of the City Building Official (OCBO)
57		FAELDONIA	ERLY KRIS	D.		HABITAT FOR HUMANITY PHILIPPINES-DAVAO HUB
58	amcaledia@gmail.com	ALEDIA	AUGUSTO MIGUEL CARLOS	I.	09165790870	DMCI-PDI
59	abonitalla.henryvi@gmail.com	ABONITALLA	HENRY VI	M.	09663055603	AC PAMA ENGINEERING CONSULTANCY
60	tinejoycon@gmail.com	CONCEPTION	CHRISTINE JOY	L.	09177218006	DMCI-PDI
61	theldelesb@gmail.com	BATION	THEA AIRA	D.	09516858179	ACPEC
62	ronnelmelancholy@gmail.com	ANTOLIHAO	RONNEL	ALMEROL	09103087562	DPWH-DNN DEO
63	jescelou@gmail.com	CAASI	JESCELOU	T.	09759069960	LGU LAAK-ENGINEERING
64	engrhinampas2016@gmail.com	HINAMPAS	STEWARD	FAJARDO	09356919046	LGU LAAK-ENGINEERING
65	hectoramagno@gmail.com	MAGNO	HECTOR	ANDRION	09256128168	WIN WIN CONSTRUCTION AND DEVELOPMENT CORPORATION
66	mcsldc2009@yahoo.com	BALAYE	WILFREDO	AQUINO	09992220226	MINDANAO CONSTRUCTION SERVICES AND LAND DEVELOPMENT CORP.
67	restnextdoor@gmail.com	ALISACA	REST KASHYDEE	C.	09774043294	DPWH RO-XI
68	cgsinangote@yahoo.com	SINANGOTE	CHARLYN GAY	F.	09255569868	DPWH RO-XI
69	flordeluna_juyo@yahoo.com	JUYO	FLORDELUNA	J.	09222406253	CEO-CITY ENGINERS OFFICE / PICE
70	kristinematuran@g.cjc.edu.ph	MATURAN	KRISTINE MAY	LIBUT	09102995016	COR JESU COLLEGE, INC.
71	marking_18@yahoo.com	PAGHUBASAN	MARK NEIL	DOLOTINA	09486041524	DEO / AGUSAN DEL NORTE
72	jonasplacer@gmail.com	PLACER	JONAS	MALINAO	09223157797	GREEN TECHNOLOGY RESOURCES
73	jeckay40@gmail.com	DONOZO	MARIA JESUSA CATALINA	CATUBIG	09469837725	PLGU-ADN
74	maricillelabadanr3a@gmail.com	LABADAN	MARICILLE	J.	09183244095	DEO / AGUSAN DEL NORTE
75	fredoring@gmail.com	ORING	ALFREDO JR.	B.	09107327452	DEO / AGUSAN DEL NORTE
76	jacobederen@gmail.com	JACOBE	DEREN	P.	09912112108	DPWH REGIONAL OFFICE XI
77	chbeatisula@yahoo.com	BEATISULA	CARY	H.	09177047625	CH BEATISULA, INC.
78	ndsinangote@gmail.com	SINANGOTE	NEOLVIC	D.	09328708961	1221 STRUCTURES CORP.
79	lancforce_15@yahoo.com	FOROSUELO	LANCE	H.	09088603104	BIM SCAPE IT SOLUTIONS
80	nielcen24@gmail.com	CASAÑA	NIEL CEN	LAUDE	09353410863	CITY ENGINEER'S OFFICE (DAVAO CITY)
81	ac_caballero@yahoo.com.ph	CABALLERO	ARNEL	EMPUERTO	09192530275	CITY ENGINEER'S OFFICE (DAVAO CITY)
82	alexanderturingan7@gmail.com	TURINGAN	ALEXANDER	D.	09328774661	DPWH XI
83	gen.tellano@gmail.com	TELLANO	GENESIS CARLO		09760042698	CITY ENGINEER'S OFFICE (DAVAO CITY)
84	asdermachoy@gmail.com	INSANI	BORHAN	M.	09756810527	OFFICE OF CITY BUILDING OFFICIAL
85	engrwoody@gmail.com	CABARDO	WOODY	M.	09667256065	RSC XI
86	rphsccsi@gmail.com	HINLOG	RAMON		09274436009	R.P. HINLOG CONSTRUCTION

セブ市ワークショップ　参加者

CEBU

1	EMAIL ADDRESS	LAST NAME	FIRST NAME	MIDDLE NAME	MOBILE NO.	ORGANIZATION / COMPANY NAME
2	engr.abranz719@gmail.com	BRANZUELA	ARNEL	AGRAVANTE	09176258276	DPWH CEBU CITY DEO
3	cortsjj92@gmail.com	CORTEL	JAYSON	TIMKANG	09771048657	Cebu Technological University - Main Campus
4	petersoncorominas@gmail.com	COROMINAS	ED PETERSON	LIM	09177172721	Pacific Grande Realty & Dev't Corp.
5	joanahuy@gmail.com	COROMINAS	JOANAH JUNE	UY	09173240982	Pacific Grande Realty & Dev't Corp.
6	teddytuy@yahoo.com	UY	TEDDY	TOLOSA	09173210060	Pacific Grande Realty & Dev't Corp.
7	tfblondeegwenn.masaya@gmail.com	MASAYA	BLONDEE GWENN	TAÑARE	09167318830	Self Employed
8	angelsonlascuna@gmail.com	LASCUÑA	JESS ANGELSON	ABELLANA	09105245869	Cebu Technological University - Main Campus
9	astridcanseco@gmail.com	CANSECO-TUÑACAO	HANA ASTRID	REYES	09226599793	Cebu Technological University
10	eslavamjae@gmail.com	ESLAVA	MARY JOY	AGA	09215432634	JEMAR ENGINEERING SERVICES
11	dariannefroze_25@yahoo.com	VALES	DARIANNE FROZE	MANALO	09059462551	JEMAR ENGINEERING SERVICES
12	tolop.johnmichael20@gmail.com	TOLOP	JOHN MICHAEL	TAGURMACON	09089886317	JEMAR ENGINEERING SERVICES
13	rjflaviano1@gmail.com	FLAVIANO	RJ BRIAN	PIENCENAVES	09381384196	JEMAR ENGINEERING SERVICES
14	engrcf18@gmail.com	FERNANDEZ	ROMMEL	PALOMER	09338751161	N/a
15	mluisa.zapanta@gmail.com	ZAPANTA	MA LUISA	BAÑEZ	09686077589	CTU/DPWH
16	zorekrcansecoce@yahoo.com	CANSECO	ZOREK	RACAZA	09164442299	ZRCanseco Construction
17	gabrieloloap@gmail.com	COLUBIO	GABRIEL PAOLO	CAÑETE	09282937994	CEBU TECHNOLOGICAL UNIVERSITY
18	caminadelaica@gmail.com	CAMINADE	LAICA MARIE	ESTAÑO	09275846533	Cebu Technological University
19	eotandingan@yahoo.com	GUERRERO	ELENITA	TANDINGAN	(0932) 883 3426	ZRCanseco Construction
20	icdamuag@gmail.com	DAMUAG	IMADYL	CAYANONG	09397332891	University of San Carlos
21	dumaranjaybert@gmail.com	DUMARAN	JAYBERT	VARGA	09459961703	DPWH
22	elvira.sales@usjr.edu.ph	SALES	ELVIRA	DAKAY	09212380536	University of San Jose Recoletos
23	jtatillo@usc.edu.ph	ATILLO	JOEY CYNDELL	TAN	09565121149	UNIVERSITY OF SAN CARLOS
24	marchel.bentoy@ctu.edu.ph	BENTOY	MARCHEL	LAURITO	09231120239	Cebu Technological University
25	27monicaali@gmail.com	INTONG	MONICA ANN LOUISE	JOAQUINO	09212763210	University of San Carlos
26	ofseno@usc.edu.ph	SENO	OPALYN	FERRAREN	09175049827	University of San Carlos - TC
27	sycanete@usc.edu.ph	CAÑETE	STEPHANIE	YUSON	09175777738	UNIVERSITY OF SAN CARLOS
28	fglengineering@gmail.com	LOR	FELREM	GAMANA	09176382900	Cebu Institute of Technology-University
29	Josephabellar02@gmail.com	ABELLAR	JOSEPH	SANCHEZ	09065472798	PICE
30	obbardon@usc.edu.ph	BARDON	ORLANDO	BURO	09565514381	University of San Carlos
31	johnraymontecalvo_25@yahoo.com.ph	MONTECALVO	JOHN RAY	GONZAGA	09171741326	University of the Visayas
32	dkb.dave@gmail.com	BOLARIN	DAVE KERWIN	BAS	09959723427	Cebu technological university
33	oswald.trani@genvidev.com	TRANI	OSWALDO JR	GONZALEZ	09171235867	8990 Monterrazas Corp.
34	frankb3.1991@gmail.com	BERIN	FRANCISCO III	CAGAPE	09091627244	Structural engineering
35	mayasprojects2020@gmail.com	MARQUEZ	JEREMIAS JR.	YANG	09504205989	Freelance
36	dongkieli@gmail.com	LIGUTOM	CERINO JR.	OMANDAM	09178173674	Pice
37	junelromero5@gmail.com	ROMERO	JUNEL	RODRIGUEZ	09171868486	Nale Construction
38	ma.carmenpolancos@gmail.com	POLANCOS	MA. CARMEN	LECHADORES	09280000271	CIT University
39	chestan2627@gmail.com	ARCAYA	CHERYL	VIRTUDAZO	09173086764	I AM DEOKMAN CO INC
40	chestan2627@gmail.com	EVANGELIO	JOHN STANLEY	PIOQUINTO	09275822286	I AM DEOKMAN CO INC
41	axcel.amarga23@gmail.com	AMARGA	AXCEL	PARANE	09615092311	NALE CONSTRUCTION
42	gianpaoloteves@gmail.com	TEVES	GIAN PAOLO	BUNIEL	0916528279	National Housing Authority
43	markopollosquare@gmail.com	MORAN	MARK LESTER	BASAS	09561343752	NHA-7
44	archkevinarcala@gmail.com	ARCALA	KEVIN GEM	N/A	09772640652	Cebu Landmasters Inc.
45	jeceldelatorre914@gmail.com	DELATORRE	JECEL	ALIPIN	09661866488	JEMAR ENGINEERING SERVICES
46	jessamaedejito@gmail.com	DEJITO	JESSAMAE	GASPAN	09565544863	JEMAR ENGINEERING SERVICES
47	nilodoyugancanon@gmail.com	CAÑON JR.	NILO	DAYOGAN	09955432623	JEMAR ENGINEERING SERVICES
48	jeceldelatorre914@gmail.com	DELATORRE	JECEL	ALIPIN	09661866488	JEMAR ENGINEERING SERVICES
49	angeloamar1911@gmail.com	AMAR	ANGELO	RAVANERA	09452184629	JEMAR ENGINEERING SERVICES
50	marc.oscares.ce@gmail.com	OSCARES	MARC NATHANIEL	CHUA	09772008224	AI-ALT
51	francistuadles@gmail.com	TUADLES	FRANCIS ROVEN	SALINAS	09053967335	AI-ALT
52	clentboiser21@gmail.com	BOISER	CLENT STEPHEN	ARANGCON	09491294878	Celjem Construction
53	vincebardenas@gmail.com	BAREDENAS	VINCE	INOC	09772578137	AI-ALT INTERNATIONAL INC.
54	rlrnmae@gmail.com	CINCO	REILREN MAE	CALAS	09952946027	CLS Properties Inc.
55	aure.flo.oraya@gmail.com	ORAYA	AURE FLO	ASIS	09177790388	Cebu Technological University
56	marianneybanez23@gmail.com	YBANEZ	MARIANNE	ARANCO	09331114798	Innoland Development Corporation
57	buctotcieny@gmail.com	BUCTOT	CIENY	BOLONGAITA	09573087527	Cebu Landmasters
58	engr.jimcamp@gmail.com	Campanilla	Jim Janser	Lapiña	09453310657	Filinvest Development Corporation
59	Jonathanomandam@gmail.com	OMANDAM	JONATHAN	REYNES	09171023500	CLI
60	braulioycong3@gmail.com	Ycong	Braulio	Capacio	09773969490	Cebu Landmasters
61	rsatago1380@gmail.com	Satago	Ramil	Miasco	09164422778	Cebu Landmasters.Inc

62	amdferrater@gmail.com	Ferrater	Andrra Mariel	D.	09959285178	Cebu Landmasters, Inc.
63	rexurocariza@gmail.com	Ocariza	Rexur Rae	Ababon	09562207947	Cebu Landmasters Inc.
64	wallace_lestano@yahoo.com	MAGLASANG	RAY FRANCIS	SANCHEZ	09177716651	WDL STRUCTURAL ENGINEERING CONSULTANCY
65	jimmytan131@gmail.com	TAN	JIM EARL	Y.	09267289658	WDL STRUCTURAL ENGINEERING CONSULTANCY
66	harayoheaven24@gmail.com	HARAYO	HEAVEN	L.	09994929538	WDL STRUCTURAL ENGINEERING CONSULTANCY
67	lapefrances@gmail.com	LAPE	ANN FRANCES	B.	09955656266	WDL STRUCTURAL ENGINEERING CONSULTANCY
68		UY	TEDDY			
69		COROMINAS	PETERSON			
70	elmer.placido@yahoo.com	PLACIDO	ELMER	TUMULAK	09209744468	ST. JOSEPH CONSTRUCTION
71		GORRE	ARIAN			Habitat for Humanity Philippines Foundation, Inc.
72	ricardoomega1983@gmail.com	OMEGA	RICARDO		09463889329	Habitat for Humanity Philippines Foundation, Inc.
73	tredle7@gmail.com	MASAYON	ELDERT	G.	09161002182	Habitat for Humanity Philippines Foundation, Inc.
74		CABAÑELEZ	NIÑA	C.		Habitat for Humanity Philippines Foundation, Inc.
75		BARICUATRO	LORETTA	C.		Habitat for Humanity Philippines Foundation, Inc.
76	cssolis245@gmail.com	SOLIS	CONCESO	S.	09157254788	Habitat for Humanity Philippines Foundation, Inc.
77		VALLESER	REY			Habitat for Humanity Philippines Foundation, Inc.
78	molinaedwinpia@gmail.com	MOLINA	EDWIN	P.	09289802152	Habitat for Humanity Philippines Foundation, Inc.
79		SUMALINOG	JHON PAUL	C.		Habitat for Humanity Philippines Foundation, Inc.
80	fidelito.mariveles@habitat.org.ph	MARIVELES	FIDELITO	C.	09178131589	Habitat for Humanity Philippines Foundation, Inc.
81	rodney.gerna@habitat.org.ph	GERNA	RODNEY	L.	09167375243	HABITAT FOR HUMANITY PHILIPPINES
82	robertoalforque123@yahoo.com	ALFORQUE	ROBERTO	LAPIZ	09264603204	OBO-MANDAUE CITY
83	macmacdy@gmail.com	DY	MATHEW NIÑO	GO	09173072828	WDL CONSTRUCTION ENGINEERING CONSULTANCY & POST-TENSIONING SYSTEMS
84	rfralota@gmail.com	RALOTA	RAY FRANCIS	GONZALES	09171501942	CG+R CONSULTING ENGINEERS
85	ivandotslash@gmail.com	GARCIA	IVAN JOSEPH		09755072300	Habitat for Humanity Philippines Foundation, Inc.
86	tahadlangitmarkadrian@gmail.com	TAHADLANGIT	MARK ADRIAN	F.	09567146513	DPWH CEBU 1ST DEO
87	chariebahena@gmail.com	BAHENA	CHARIE	ZAMORA	09321852648	DPWH CEBU 4TH DEO
88	jslumbab.ctu@gmail.com	LUMBAB	JEONEL	S.	09233314200	CEBU TECHNOLOGICAL UNIVERSITY
89	bp_batocapala@yahoo.com	BATOCAPALA	BASERODIN	P.	09176251143	DPWH CEBU 5TH DEO
90	ryan.luciano@ctu.edu.ph	LUCIANO	RYAN	PANDAN	09615631935	CEBU TECHNOLOGICAL UNIVERSITY
91	leo152129@yahoo.com	MANULAT	LEO	B.	09338541281	PRIVATE
92	zosahannahjoyce@gmail.com	ZOSA	HANNAH JOYCE	P.	09939053804	DPWH RO7
93	caspeharvy@gmail.com	CASPE	HARVY	ARIAS	09451195181	DPWH RO7
94	michellechua321@gmail.com	CHUA	MICHELLE LYNN	CAI	09176339123	AI-ALT
95	cab6n3les@gmail.com	CABAÑELEZ	NIÑA	C.	09198475926	CSWATS
96	tel.catubig@gmail.com	DELA PEÑA	HAZEL MARIE	C.	09956930441	JEMAR ENGINEERING SERVICES
97	ariellevince@gmail.com	CARDOSA	ARIELLE VINCE		09178808903	DPWH-CC DEO
98	junibelledominguez@gmail.com	DOMINGUEZ	JUNIBELLE	BASNILLO	09458042234	DPWH-CC DEO
99	ohinaut@gmail.com	HINAUT	OLIVER	M.	09398066185	OLHITS PROFESSIONAL BUILDERS CO. LTD.
100	dannysuico2017@gmail.com	SUICO	DANILO	Z.	09662182231	OBO, MANDAUE CITY
101	josephmelencionjr@gmail.com	MELENCION	JOSEPH JR.	C.	09614491346	OFFICE OF CITY BUILDING OFFICIAL - MANDAUE
102	celgen.pateno@yahoo.com	PATEÑO	CELGEN	MAÑABO	09959507395	JEMAR ENGINEERING SERVICES
103	jc_ampo3187@yahoo.com	AMPO	JEAN CLAUDE	Q.	09912131127	JQA CONSTRUCTION & ENGINEERING
104	dpwafilcar@gmail.com	MAGNO	FILCAR	MENDOZA	09154388270	DPWH RO7
105	francistecling26@gmail.com	TECLING	FRANCIS	SUICO	09568391980	DPWH RO7

４．２ ワークショップの開催の状況

① 次第（3 会場共通）

② 各会場での質疑、意見交換要旨

＊メトロマニラ会場 WS 質疑応答要旨（NBCDO／DPWH のディレクター、JICA フィリピン事務所、本部からの出張者が参加）

・Phivolcs：建物の基準上の Classification の扱い。一部充填にするために必要な措置。

この工法はブランドかどうか。(同研究所の観測施設建設の発注の際に特定企業を指定する必要があるかどうか)→工法・方法の一つで、ブランドではない。

・建築主事の対応、DPWH からの措置など。ASEP は、WS 後、DPWH に参照基準としての指定を申請予定。その旨は全国の建築主事に周知される。(イソン氏によれば、NBCDO 課長から、ガイドラインを承認済みと誤解した発言があったとのこと)

・基礎の設計で平家建では地盤調査をする必要が無いか→NSCP に従い、従前どおり行う。

・階高調整のためブロックをカットしてよいかどうか。→カットしても構わないが、梁やスラブで寸法調整ができる。

・ブロックの PNS について。強制規定化の状況。アリエルが、2023 年 10 月 26 日に我々と一緒に DTI 訪問した際の状況を説明。

・本当に低品質を禁止できるか。バックヤードメーカーの対応をどうするか。

＊ダバオ会場 WS 質疑応答要旨(ダバオ市の City Engineer, Building Official の前日の被災建物調査に案内いただいた職員が多数参加)

・ダバオ近郊には、PHIVOLCS により特定されている活断層が多く存在。それらによる強烈な振動により、被害を受けることはないか？

－NSCP による地震荷重の割り増しは考慮することになっている。壁式構造(Bearing Wall system)は、水平力に対する強度が大きく、クラックの発生などはありえるが倒壊のような被害は起きにくいと考えられる。

－日本では、東日本大震災で 1000 ガルを超える振動、津波にも耐えており、強度は高い(Jani)

・このガイドラインによる設計では短柱のような脆弱な破壊は起きないか？

－この設計では、フレーム構造の短柱破壊のような靭性の期待をあまりしていない。短柱現象の発生の可能性は少ない。

・このガイドラインによる設計で、長い固有周期による設計用地震力の低減はどうなるか？靭性の確保はどうなるか？

－この設計法では、固有周期は短く、靭性への期待が少ない。それによる設計用地震力の低減の考え方は採用していない。

・4 階建て以上への適用はできないか？

－日本では全充填の工法で 4 階建て以上を設計できる方法がある。このガイドラインは、部分充填を推奨し、3 階建てまでを対象としている。

・構造設計用のソフトがあるとよい。

－確約はできないが、検討中。

＊セブ会場 WS 質疑応答

・建築家が広い開口部の設計をした場合の設計はどうなるか？

－壁率による必要壁量はそれほど多くなく、通常の開口部であれば制約となることはない。

・行政庁による使用許可の際、許可時点の設計から変更されている場合には許可が難しい。－すべての設計に共通の問題。設計変更の許可を取るなどが必要。

・品質の確保のために必要な措置。監理が重要ではないか？

－技術力のある技術者の監理が重要

－ガイドラインに基づく設計が基本

－監理に加えて、CHB の品質（PHS 遵守の徹底、バックヤードメーカーの能力向上）、職人の技能の向上が必要

・マルコス大統領の社会住宅建設計画への活用の可能性（600 万戸？）

－活用が期待される。リーズナブルなコストで供給できることがメリット。

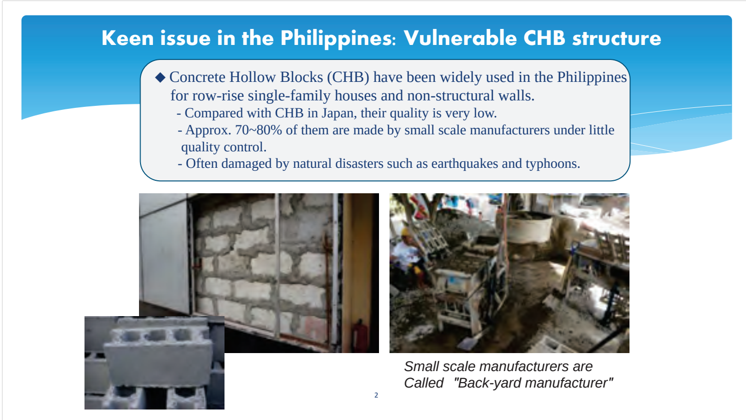
・セブは条件がよい（よい骨材が取れる、セメント工場がありセメント入手がしやすい）

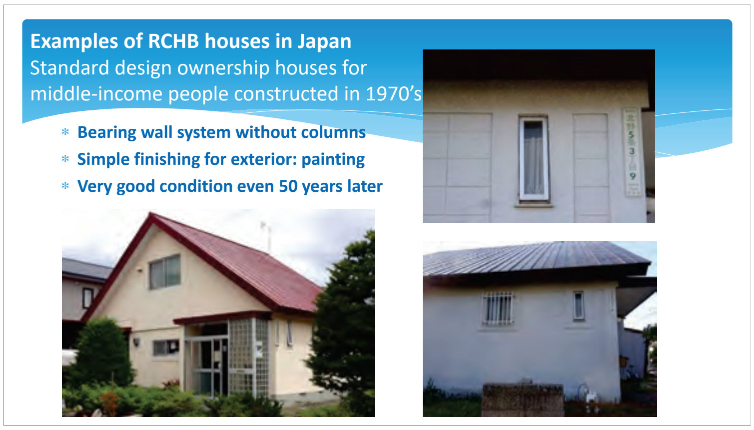
・質の良い CHB 製造が必要、そのための製造機械はどうするか。

－本日参加の HoBEA 青野がタイガーの関係者。機械購入を考えている者はコンタクトをしてほしい（終了後、1 社より照会あり）。

（榆府龍雄）

overview of RCHB in Japan （ワークショッププレゼンテーション）





Under this situation, Hokkaido Building Engineering Association (HoBEA) started a project to disseminate Japanese RCHB technology to the Philippines

◆**Objectives** of the project is;

-to **introduce the concrete hollow block technologies of Japan** to engineers, architects, governmental officials, industries and other relevant people in the Philippines

-to **enhance the safety of concrete block structures** and components in the Philippines

7

Various activities since 2018
Seminar in the Philippines

January 24,2019
Seminar at DPWH Central Office

Demonstration to show the difference of quality of CHB

8

Fiscal Year 2019 (June 2019～March 2020)

Technical visit to Japan by Philippine key persons in 2019
-October 17 to 26, 2019: Invitation of 11 key persons in the Philippines to Japan (Okinawa, Hokkaido and Tokyo) to deepen understanding on Japanese technologies and to discuss on future collaboration for improvement of CHB in the Philippines.

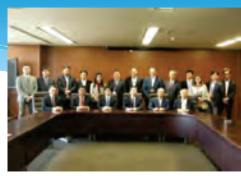
In Okinawa October 18

9

Discussions and technical visits in Japan in 2019

In Sapporo October 20

In Tokyo October 23



10

Presentation at the ASEP seminar "Shake"
-November 15 to 23, 2019: Seminars in the Philippines to introduce Japanese technologies and discuss with DPWH, NHA, ASEP etc.

November 16, at ASEP's seminar "SHAKE"

Presentation by MLIT, Japan

11

Fiscal Year 2021 (August 2021 ~ March 2022)

Technical surveys in Okinawa
-November 22~26, 2021: Visiting Okinawa to deepen understanding and discuss on the Okinawa style houses, where the climate is similar to the Philippines. The rest of the members joined the meetings and observations via a TV conference system from the Philippines.

Meeting with CHB manufacturer

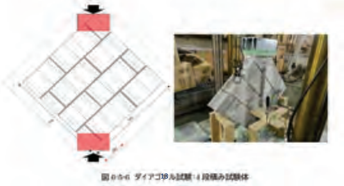
Their construction site of RCHB

12

Fiscal Year 2021
Experimental survey

-Experimental survey to verify safety of proposed RCHB guideline by diagonal and prism compressive strength test and other relevant test of CHB unit or structure.

Diagonal compressive strength Test of 4-tier CHB sample at Hokkai Gakuen Univ.



Fiscal Year 2022
Discussion with Building official in the Philippines

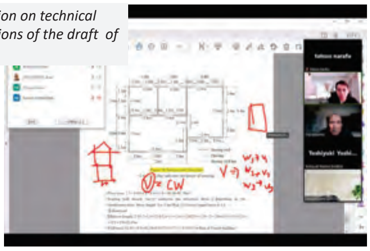
ASEP & HoBEA discuss **formalization of the draft guideline** and **possible ways to obtain Building Permits** for buildings designed on the guideline with officials in offices of Building Official in municipal governments

Discussion with officials of Building Regulatory Offices of Quezon City

Fiscal Year 2023
Creation of the technical guidelines on CHB construction

ASEP & HoBEA jointly **review the draft of the Technical Guideline on RCHB** through monthly on-line meetings.

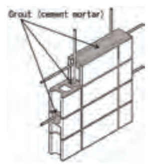
On-line discussion on technical issues in provisions of the draft of RCHB guideline

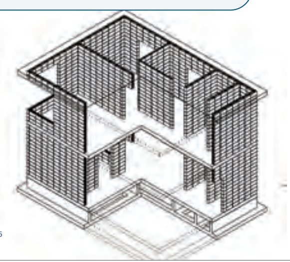


Fiscal Year 2023
Finalizing procedures on the technical guidelines

The **technical visit of the leading persons from the Philippines** to Japan to **confirm significance of the RCHB guideline** and **promote to apply it** in practice in the Philippines

Drawings on design and detailings of RCHB based on the guideline





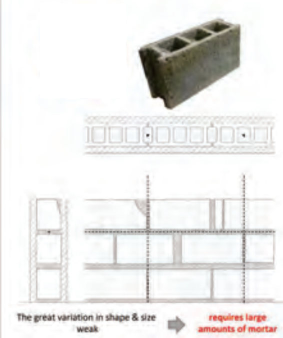
16

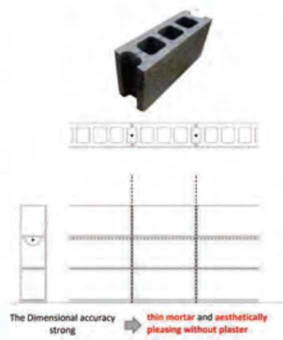
Quality of CHB in the Philippines and Japan

Both look similar in size and shape.
The quality is very different.
Left: Philippine made, Right: Japan made

Conventional practice in the Philippines

Proposed method

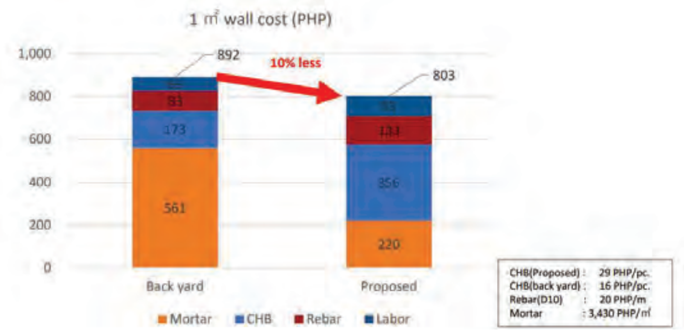




Comparison of two methods

Properties	Unit	Back yard	Proposed	Comparison of Proposed to Back yard
Dimensions	㎠	39×15×19	39×15×19	Accurate more
Strength	psi	250 - 400	1,600	Stronger
Wall area covered by mortar joints	%	19	7	34% less
Pieces for 1 ㎡ wall	Pcs	10.8	12.5	116 % more
Amount of mortar per ㎡ wall	㎥	0.16	0.06	61% less
Length of rebar per ㎡ wall	m	4.7 (D10@600)	6.7 (D10@400)	150 % longer

Comparison of cost of two methods



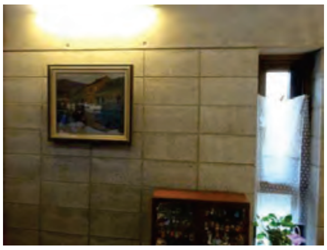
Analysis of Comparison of cost

Break down of the cost

Item	Conventional (A)	Proposed (B)	Comparison (B/A)
Labor	65	93	1.43
Rebar	93	133	1.48
CHB	173	356	2.06
Mortar	561	220	0.39

Comparison of construction works of block laying

No need of finishing in case of Japanese method because of beautiful and smooth surface

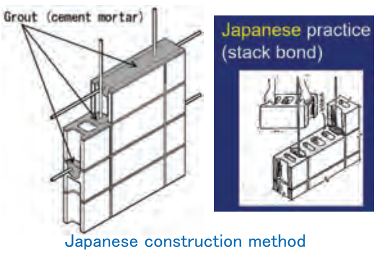


A Japanese example of no-finishing wall

Conventional way in the Philippines

Comparison of construction works of block laying

Easy block laying work because of applying **stack bond** (strength is almost the same as running bond)



Japanese construction method
Stack bond and partial grouting
Block laying work is far easy compared with Philippine practice

Conventional way of block laying in the Philippines. Blocks must be raised up to the top of vertical rebars

Summary of features of Japanese RCHB

- **Very strong** against earthquakes and others
- **Cost effective** by saving amount of mortar (partial grouting, thin bond mortar, and so on)
- **Easier block laying work** by stack bond

24

Hokkaido Building Engineering Association (HoBEA)
Expects your kind interest and understanding on the proposed CHB technologies
To contribute to enhance safety with reasonable cost

Thank you for your attention

January 2024

Background of Guidelines for Engineered RCHB Construction - based on Experience in Japan

Yuji Ishiyama, Dr.Eng.
Advisor, Hokkaido Building Engineering Association (HoBEA)
Professor Emeritus, Hokkaido University, Japan

Reinforced Concrete Hollow Block (RCHB) Improving Japanese Construction

- In order to introduce RCHB construction to the Philippines, Hokkaido Building Engineering Association (HoBEA) started the project in 2018 that has been supported by the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) of the Japanese Government.
- The proposed RCHB construction is not a copy of Japanese CHB construction, but it is the improved one.
- The "Guidelines on Engineered Reinforced Concrete Hollow Block (RCHB) Construction" has been prepared in cooperation with Association of Structural Engineers of the Philippines (ASEP) and HoBEA.
- The background of the guidelines will be explained.

CHB Construction in the Philippines and Japan

- Concrete hollow blocks (CHB) are widely used in the Philippines for low-rise buildings and also for nonstructural walls.
- Most of CHB units are manufactured by small-scale factories with little quality control, and the buildings of CHB construction are often damaged by earthquakes and typhoons.
- The buildings of CHB construction in Japan, on the other hand, are well reinforced and have survived many severe earthquakes, tsunamis and typhoons.

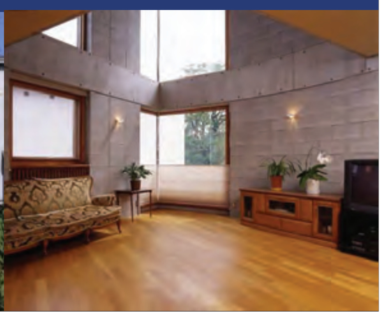
CHB Construction in Japan after Tsunami

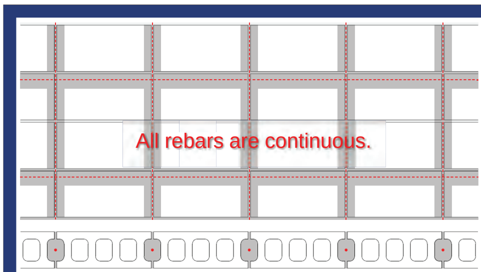
CHB construction in Japan is strong against earthquakes, tsunami, typhoon and fire.

Many houses of CHB construction had survived 2011 Great East Japan Earthquake and Tsunami. On the other hand, most wooden houses around there were destroyed by tsunami and washed away.

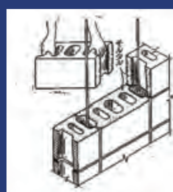
CHB Construction in Japan

No columns are required.
No finishing is required on CHB walls.
(Walls can be covered with finishing materials.)

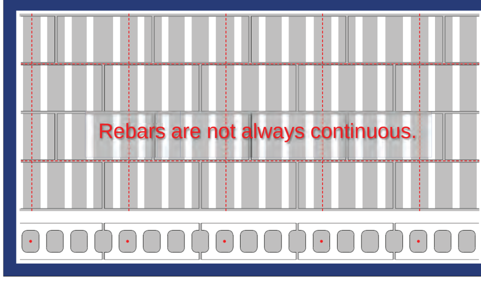




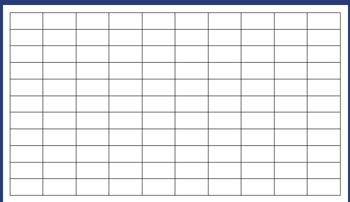
Japanese practice
(stack bond)



Hollows of rebars only are filled with cement mortar, then the cost can be reduced.

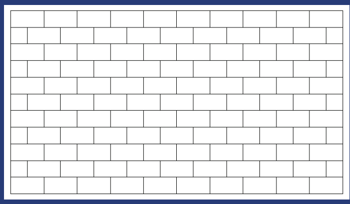


Philippine practice
(running bond)
All hollows are filled with cement mortar. But rebars are not always continuous.



Japanese practice

Stack bond



Philippine practice

Running bond

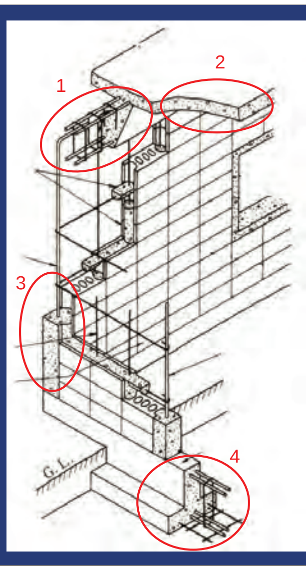
From the structural point of view, running bond seems to be more preferable than stack bond. But there is no difference in terms of strength as long as there is horizontal reinforcement.

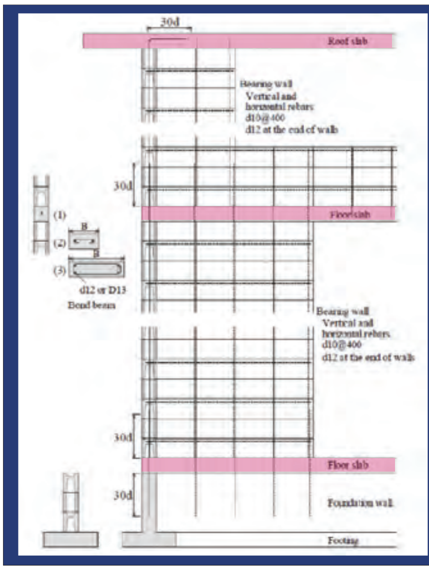
Conventional Japanese CHB Construction

Strong structure, but improvements are expected.

1. Simplification of bond beams
2. Simplification of floor and roof slabs
3. Simplification of corners
4. Simplification of foundations, etc.

The guidelines have been made improving Japanese CHB Construction.





Proposal I

Improved Japanese CHB construction

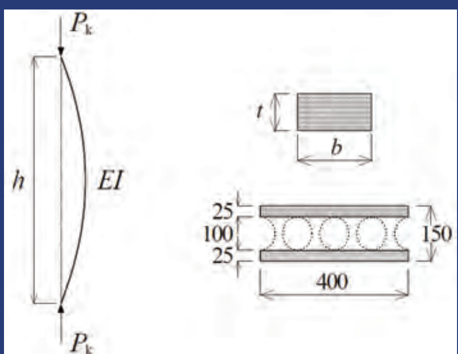
- No columns
- Bearing walls
- Vertical and horizontal rebars of d_b=10mm @400
- Rebars of d_b=12mm at wall ends and around openings
- Strong floor and roof slabs (diaphragm)
- No (less) bond beams
- No (less) use of forms
- Foundation of CHB units

Structural Safety of Engineered RCHB Construction has been confirmed:

1. Vertical load bearing capacity
2. Out-of-plane capacity of CHB walls
3. In-plane shear capacity of CHB walls
4. Uplift of walls and reduction factor of shear capacity of walls according to the aspect ratio

The Guidelines have been proposed.

Vertical load bearing capacity of CHB wall

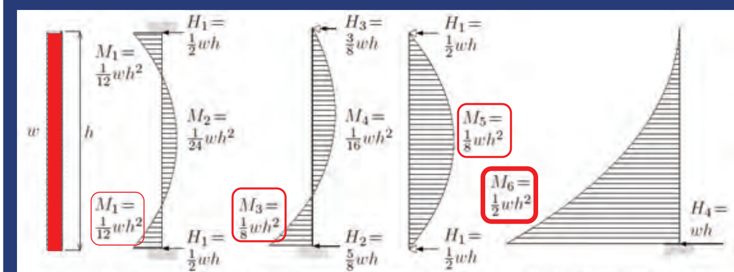


Buckling stress
3.0 MPa
Allowable stress
1.4 MPa
Acting stress
0.4 MPa

More than 3 times allowance

CHB walls have enough capacity against vertical load.

Out-of-plane capacity of walls and vertical rebars



a) b) c) d) e)

- Walls should be supported at top and bottom of walls against shear forces caused by out-of-plane lateral forces, i.e. earthquakes, typhoons (see Figs.b,c,d).
- Vertical rebars should be continuous from the bottom to the top of walls.
- Vertical rebars need to be anchored but need not to transmit tensile forces.
- For cantilever walls like fences (see Fig.e), vertical rebars should be anchored to transmit tensile forces, and the height should be ½ of other walls.

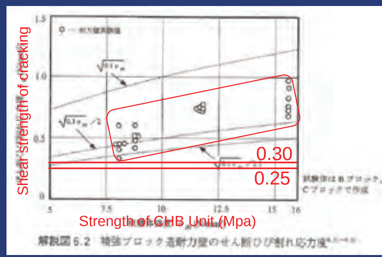
Considering out-of-plane capacity
Height of CHB wall is given in the table.

Rebar and height of CHB wall

Vertical Rebar	k = 0.7	k=1.0
d=10mm@400mm	3.12m	2.61m
d=12mm@400mm	3.73m	3.12m

“k” is the out-of-plane horizontal seismic factor

In-plane shear capacity of CHB bearing wall is most important parts of the guidelines against earthquakes.



Previous experiments of CHB shear strength of cracking by Architectural Institute of Japan (AIJ)

Design method	Shear strength MPa
Allowable strength design	0.25
Strength design	0.30

Using above strength, the wall ratios have been calculated.

How much bearing (shear) walls are required?

Base shear factor C_B according to NSCP

$$V = \frac{2.5\, C_a\, I}{R} W \qquad C_B = \frac{2.5 \times 0.44 \times 1.0 \times 1.0}{4.5} = 0.244$$

Base shear factor $C_B = 0.244$ using 0.30 for strength design is almost equivalent to $C_B = 0.2$ using 0.25 for allowable stress design (0.244/0.3=0.81, 0.2/0.25=0.8). Therefore, the design wall ratio p_d of Table 3 that is derived for the base shear factor $C_B = 0.2$ can be accepted in the Philippines. However, in case Near-Source Factor $N_a > 1.0$, p_d should be incresed by multiplying N_a.

NSCP seismic code is equivalent to Japanese seismic code in terms of design base shear factor.

How much is the ultimate capacity?

According to Building Standard Law (BSL) of Japan, the design base shear factor of short period structures is 0.2 for allowable stress design. Previous experiments of RCHB walls, the shear strength at ultimate capacity level is approximately three times the allowable stress level. Therefore, design base shear factor of 0.2 at allowable stress level means that the base shear factor at ultimate shear level becomes approximately 0.6. Furthermore, the required wall ratios in Table 1 are 1.5 times of the calculated wall ratios taking into account local stress concentration. Therefore, the base shear factor for the ultimate capacity level of RCHB construction is not less than 0.9 on average.

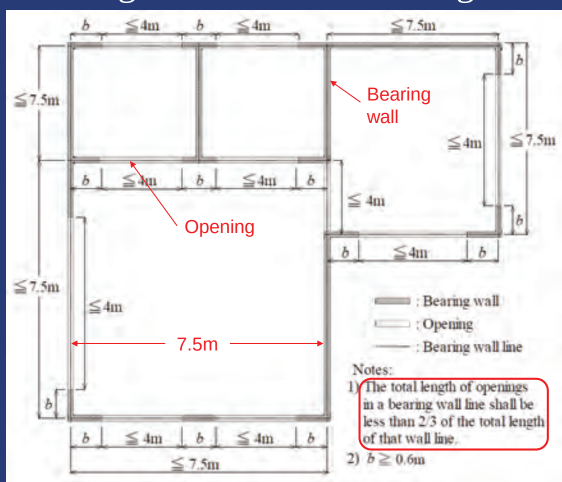
Wall ratio of bearing walls ≧ requirement

Table 1 Minimum wall ratio requirement

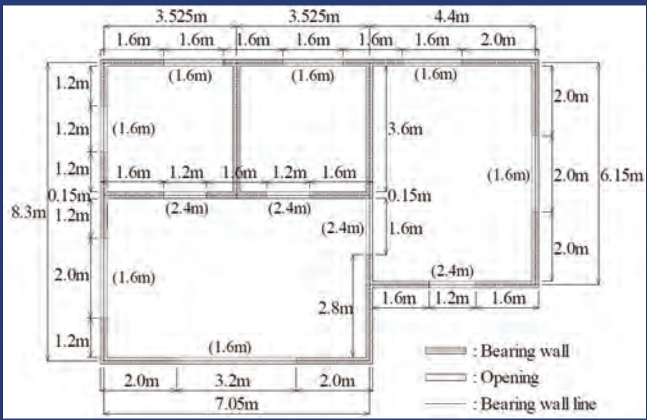
Number of stories	Story number 1st	2nd	3rd
1	1.20%	—	—
2	2.76%	1.46%	—
3	4.32%	3.20%	1.70%

Minimum wall ratio requirement (sum of horizontal sectional area of walls for each direction divided by the floor area) satisfy NSCP seismic forces. The minimum values can be reduced down to ½ using better CHB units, stronger grout mortar, full grout, etc.

Bearing wall lines and bearing walls



Bearing walls for 1st story of 2 story building

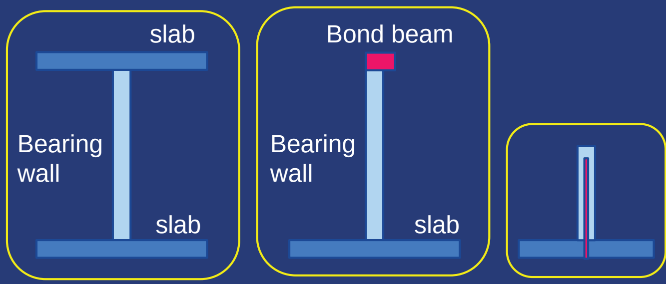


This satisfies guideline requirement.

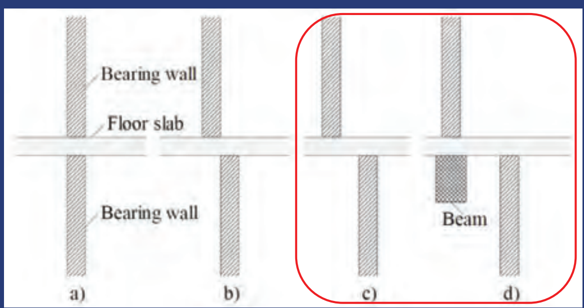
CHB walls should be supported at top and bottom.

Article 7. Floor and Roof Slabs

1. Slabs of RC, i.e. diaphragm
2. In case no slabs, continuous bond beams



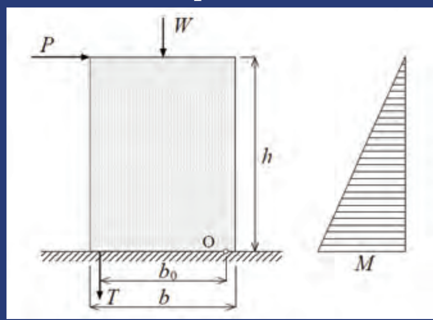
4. Upper story bearing wall supported by lower story bearing walls



Structural calculation is required for c) and d).

Anchors of shear walls?

Lateral force *P* and uplift of the wall

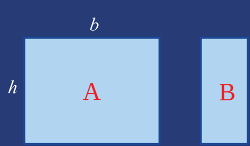


- Lateral force *P* to uplift the wall considering vertical load *W*.
- Critical aspect ratio r_c of wall, i.e. without uplift, neglecting tensile strength of wall and vertical rebars

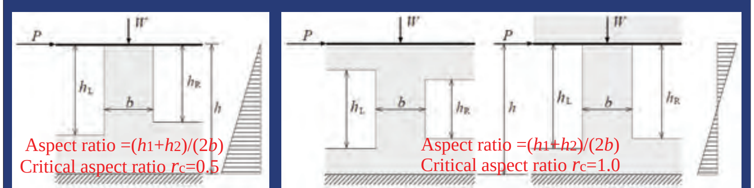
Aspect ratio of wall and reduction factor

A) In case aspect ratio $h/b \leqq$ critical aspect ratio r_c, no reduction is necessary.

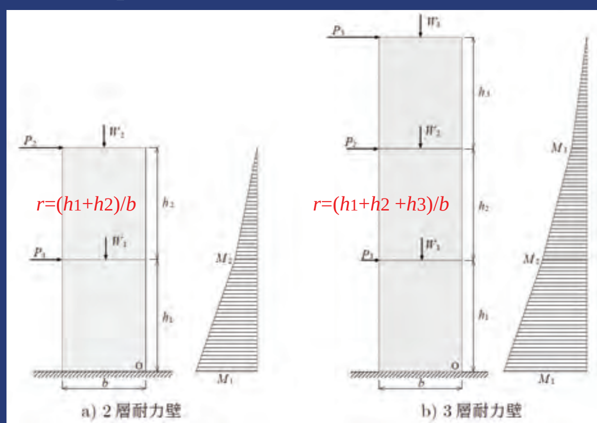
B) In case $h/b \geqq r_c$, reduce the capacity of wall multiplying reduction factor r_c/r.



Bond beams and aspect ratio



Aspect ratio and reduction factor



Critical aspect ratio r_c=0.91 r_c=1.1

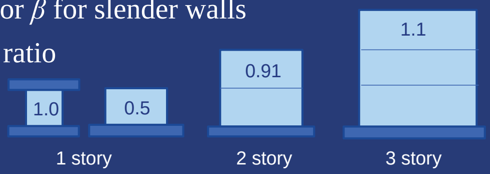
Reduction factor $\beta = r_c/r$

Table 2 Reduction factor β of bearing walls

Bearing wall stories	1	2	3
Critical aspect ratio r_c (Fixed top wall)	0.5 (1.0)	0.91	1.1
Reduction factor β	r_c / r		

Reduction factor β for slender walls

Critical aspect ratio



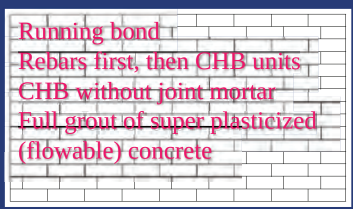
Need not rely on vertical rebars and anchors preventing uplift of walls at design earthquake level (they are effective to give additional capacity and ductility).

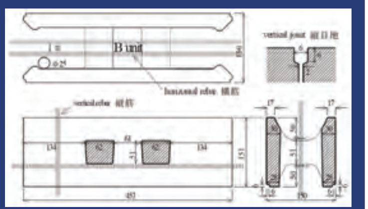
Further Improvement of RCHB Construction Proposal II

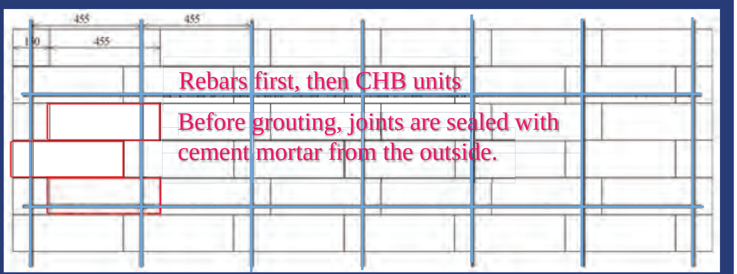
1. Running bond and stack bond
2. Rebars first, then CHB units
3. Laying CHB units without joint mortar
4. Story high grout with super plasticized mortar

The guidelines are applicable not only to Proposal I but also Proposal II.

Proposal II : new construction with new unit, using the same guidelines







The guidelines proposed are applicable not only to Proposal I but also Proposal II.

I hope that RCHB construction will be prevailed in the Philippines to give comfortable houses and reduce damage caused by earthquakes, typhoons, tsunamis, fires, etc.

Thank you for your attention

January 2024

Background of Guidelines for Nonbearing CHB Construction - based on Experience in Japan

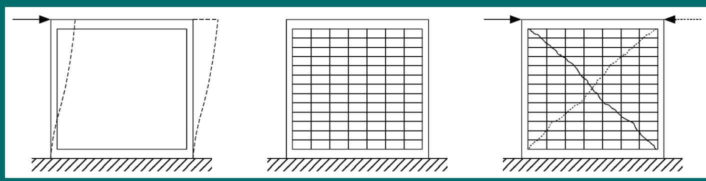
Yuji Ishiyama, Dr.Eng.
Advisor, Hokkaido Building Engineering Association (HoBEA)
Professor Emeritus, Hokkaido University, Japan

- Concrete hollow blocks (CHB) are widely used in the Philippines for nonbearing or nonstructural walls.
- Most of CHB units are manufactured by small-scale factories with little quality control, and the buildings of CHB construction are often damaged by earthquakes and typhoons.
- The situation is the same for many other countries.

Damaged nonstructural infill brick wall (2023 Turkey Earthquake)

Typical reinforced concrete construction in Turkey. Columns, beams and slabs are constructed, then the infill walls are made with hollow bricks or CHBs.

Why the walls are damaged?



(A) Moment resisting frame with columns and beams is flexible against horizontal forces. Drift becomes large when it is subjected to horizontal forces.

(B) Infill partition wall is rigid.

(C) Infill wall may be damaged by horizontal forces and diagonal cracks may be formed. And finally the wall becomes debris, that fall to the floor or ground and may injure the people.

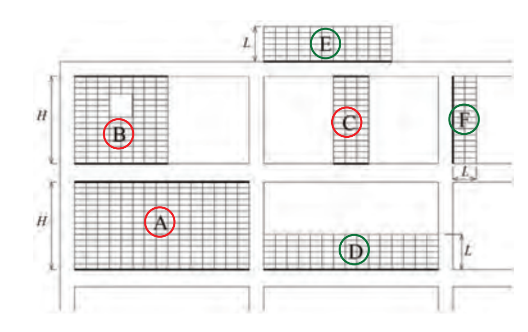
ISO 3010 Bases for design of structures – Seismic Actions on Structures

6.3 Influence of nonstructural elements

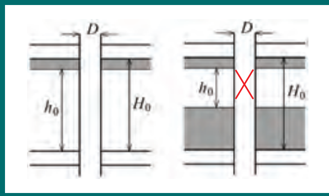
The structure, including nonstructural as well as structural elements, should be clearly defined as a seismic force-resisting system which can be analysed. In computing the earthquake response of a structure, the influence of not only the structural system elements but also nonstructural walls, partitions, stairs, windows, etc. should be considered when they are significant to the structural response.

NOTE Nonstructural elements are often neglected in seismic analysis. In many cases, the nonstructural elements can provide additional strength and stiffness to the structure, which may result in favourable behaviour during earthquakes which justifies their being neglected. However, in some cases, the nonstructural elements can cause unfavourable behaviour. Examples are: spandrel walls that reduce clear height of reinforced concrete columns and cause the brittle shear failure to the columns, and unsymmetrical arrangement of partition walls (which are considered to be nonstructural elements) that causes large torsional moments to the structure. Therefore, it is important to consider all elements as they behave during earthquakes. If neglecting the stiffness and strength of nonstructural elements does not cause any unfavourable behaviour, they need not be included in seismic analysis. ISO 13033 provides additional criteria regarding when nonstructural components should be included in the building seismic analysis model.

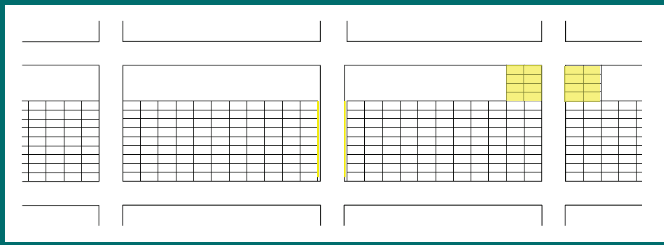
In the guidelines:



Infill nonstructural wall should be supported at both ends, i.e. A, B or C. For cantilever nonstructural walls, i.e. D, E and F, main rebars should be anchored to the structural element to resist tensile forces.



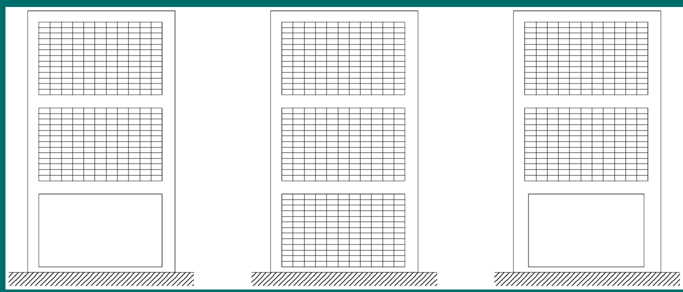
Short columns are very vulnerable. Because columns can not resist vertical forces, if diagonal cracks are formed. Especially in case $h_0/D<2.0$



Structural separation between column and CHB wall is recommended. Or wing walls are provided.

Cracks are not preferable and should be avoided. But formation of cracks means that some energy induced by earthquakes was absorbed.

It is recommended that nonstructural walls should be reinforced. So that they may not injure people and also to protect the weak frame structures.

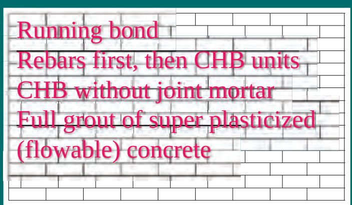


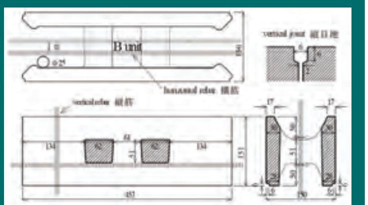
(A) First story may have larger deformation (story drift) than upper stories, then it may be damaged, i.e. soft and weak story.

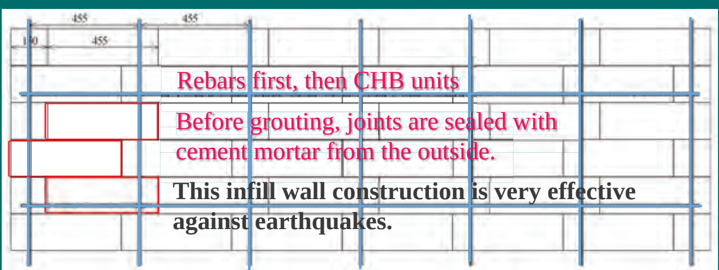
(B) It is recommended that first story also has an infill nonstructural wall.

(C) First story should have larger columns or have more reinforcement.

Proposal II : new construction with new unit, using the same guidelines







Guidelines on Nonbearing/Nonstructural Wall of Concrete Hollow Block Construction

- HoBEA and ASEP collaborated to draft the guidelines of Engineered RCHB construction, but also the guidelines on nonbearing/nonstructural walls.
- Nonstructural CHB walls will be reinforced to prevent their damage and save the people on the street.
- Nonstructural CHB walls can also be used as shear walls, so that the building becomes stronger against earthquakes.
- I hope the guidelines will be utilized not only to protect the wall itself, but also to increase the capacity of buildings against earthquakes.

Thank you for your attention

４．３ ブロック積み施工デモンストレーションの開催

① 次第

開会あいさつ：HoBEA 楢府

ASEP 挨拶：ASEP 会長 Mark

ガイドラインの概要：HoBEA 石山

ブロック積施工デモンストレーション：栄住産業

横筋用ブロックの製造についての説明（コアプーラーの実物展示）：HoBEA 青野

栄住産業のブロック製造機械の概説：栄住産業

敷地内の工事中のブロック造建物見学（RC フレーム、CHB 壁）：栄住産業

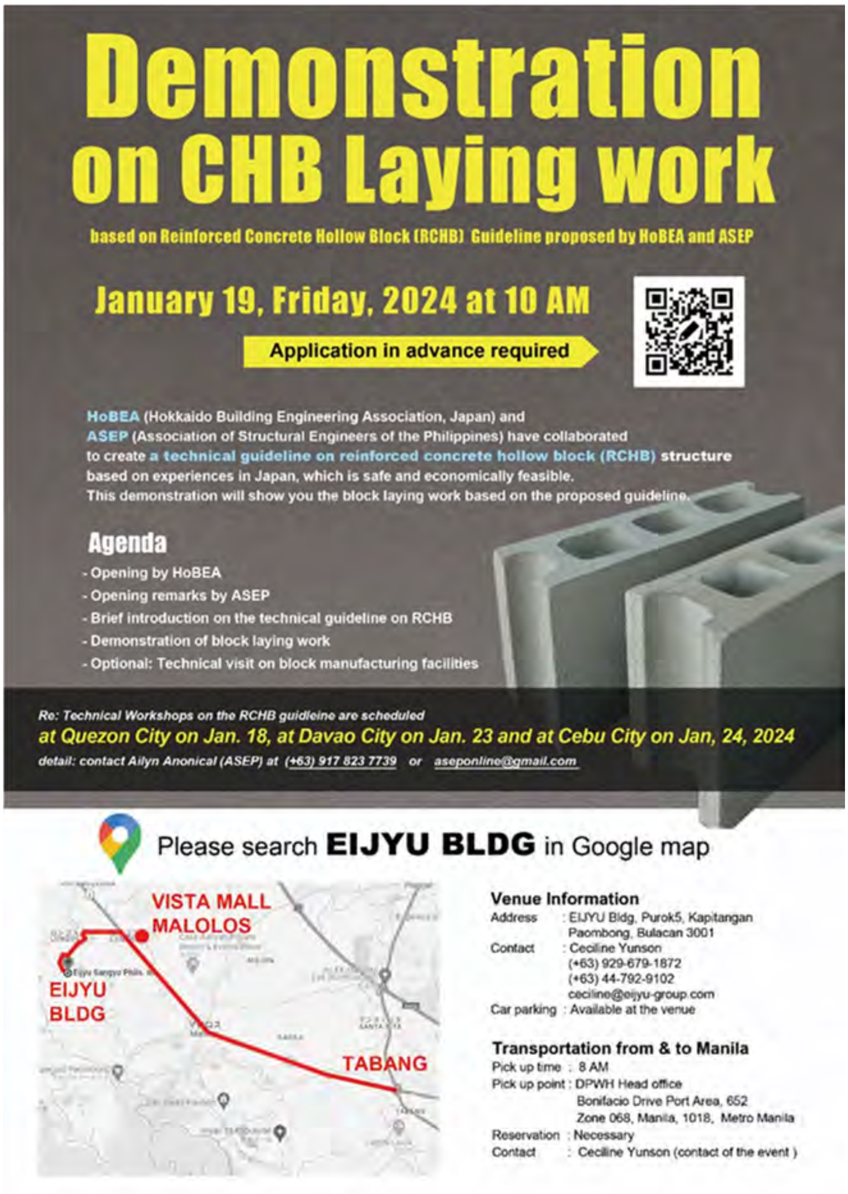
② 参加者

約 50 名（DPWH、ASEP、ハビタットフォーヒュマニティ、Phivolcs 他）

若手が多い。年配者は、現場施工に関心が薄いためか。

③ 会場設営

ブロック積の実演は前もって造られていた高さ H:30cm 程度の RC 布基礎（平面的に L 型）があった。その上にモルタルを用いてブロック積みを開始し、立ち上げ（その上に 6 段目までのブロックを積んだ。1 面は芋目地、もう一面は破れ目地。）



ブロック積み施工デモンストレーションの開催案内

（檜府龍雄）

4.4 関連調査

4.4.1 2023 年 12 月ミンダナオ地震被害調査(ダバオ市)

1．被害調査概要

① 日時:2024 年 1 月 22 日 1:30―17:30

② 調査地:ダバオ市内

③ 調査案内:ASEP 会員 Engr. Ademar Pama

ダバオ市:City Engineer's Office、Building official's Office のスタッフ 5 名

HoBEA:楢府、青野

④ ダバオ市内 3 件の被災建物を、ダバオ市職員の案内で調査

2．概況

2023 年 12 月の地震は、ミンダナオ島北東部スリガオ沖で震源が遠いため、ダバオではフィリピン震度 3－4 程度(PHIVOLCS(フィリピン火山地震研究所)の震度階による。中小レベルではほぼ MMI とほぼ同程度。日本の震度階では、震度 2-3 程度。参考2参照)。市内では、被害の痕跡を見つけることはほとんどできない。2019 年の群発地震でも、ダバオ市は震源が近くないので、同様に震度 3－4 程度(ダバオ市による説明)。

3．被害事例 高層マンションI

・超高層マンション 23 階建て

・構造材の被害はなし。CHB の非構造壁、その補強のための RC 造方立柱が被災。

・居住者には仮住居を提供して全戸仮移転、足場を組んで、非構造材の全面的な補修工事中。工期は、2 月中旬までの約 2 か月の予定。

・CHB 非構造壁:従前は、上部、側面にスタイロフォーム 1/2 インチ、壁面はモルタル塗り、塗装仕上げ。

補修工事では、スタイロフォームを 1 インチ、壁面の表面にプラスチックメッシュを貼り、その上にモルタル塗りとしている。

・外側の階段室回り、内部のエレベーターホール回りは RC 造耐震壁であり、クラックなし。

・補修費用は、当面、ゼネコン持ち、追って、保険会社から 98%の補填がなされ、2%は保険契約者負担。保険は、地震のみでなく、火災、水害などをカバーする総合的な保険。

・2019 年地震の際には、工事中。躯体に被害はなかったが、市からの指導で、駐車場階に鉄骨のブレース、それを支える柱にスチィールバンド、柱・梁をつなぐ頬杖材を追加設置した。

外観

吹き抜けに設置された補修工事用足場

現場視察の状況

エレベーター周り。耐震壁となっており、クラック無し

CHB 被害と壁頂部のスタイロフォーム

同左クローズアップ

CHB 壁支持の RC 方立(20x40 ㎝程度)の上端部が破損。補修のため全面的に斫って補修中。

工事中に 2019 年地震を経験。その際に追加された鉄骨ブレース

2019 年地震後に追加された鉄骨ブレース

柱と梁を繋ぐ類杖材

4． 被害事例　高層マンションⅡ

・21 階建て、RC 構造マンション。構造材被害なし。

・柱が扁平柱で、弱軸方向の揺れによると思われる仕上げ材の破損、落下が見られる。

・3 階部分の非構造壁にせん断クラック(この部分のみとのこと)。現在、保険会社と保険金対象とするための交渉中。

外観

吹き抜け部

側面の壁面仕上げの被害

同左のクローズアップ。仕上げのモルタルの破損（RC の壁柱とコンクリートパネルの外壁材の境界部分が破損）


建物正面部分の仕上げの破損


屋内のクラック。母材は CHB


駐車場階の柱。相当な扁平形状

5．学校

・4 階建て校舎が傾斜（一部のみ）。最上階で 20 ㎝程度の変形。層間変位：0.2m／(4mx4 階＝16m)で、1/80 程度か？地盤の変位と思われる。建設当時は、地盤調査は義務付けではなかった。傾斜は、2023 年 12 月地震によるものか、2019 年地震によるものは不明。

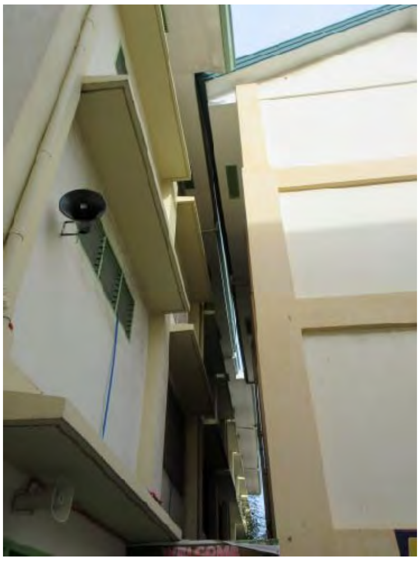
・内部の梁にクラック。軽微であり、表面のモルタルのみのクラックの可能性あり。その上階にも同様のクラックあり。

・教室部分の床にクラック。地震によるものかは不明。

・別の隣接の 2 階建て建物との接近。目視ではどちらが傾いているかの判断不可。

・市に対応（調査、評価）を依頼。予算がないので DPWH に依頼。同省にもすぐに使える予算がなく、予算確保待ちの状態。

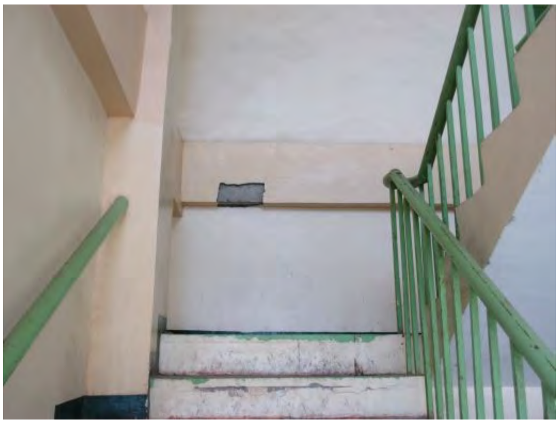
校舎外観



隣棟との隙間の間隔の違いから右側棟の
手前部分が傾いていることが分かる

梁の下面のクラック

1－2 階間踊り場梁のクラック。壁のクラックとつながっており、仕上げのクラックの可能性あり



2－3 階間踊り場の梁の破損

同左クローズアップ。仕上げの破損。

床のクラック。地震によるもの可能性がある
としている。

調査対象校舎（左）に、隣接の 2 階建て建物
（右）の軒が入り込んでいる。

4．4．2　2013 年ボホール地震による被災建物調査（セブ市）

1．　被害調査概要

① 日時：2024 年 1 月 25 日 13：30―15：00

② 調査地：セブ市

③ 参加者：石山、楢府、青野

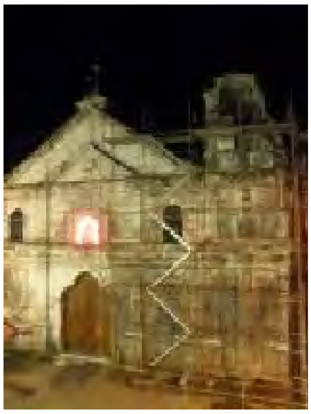
④ 調査対象：セブ市内の 2013 年ボホール地震（参考 3）により被災した、サント・ニーニョ教会及びサン・ペドロ要塞の現状を調査

2．　概況

① サント・ニーニョ教会

・1565 年、スペイン統治時代に設立されたサント・ニーニョ教会は、フィリピン国内最古のローマカトリック教会。2013 年ボホール地震により鐘楼が倒壊するなど甚大な被害を被った。

被災直後のサント・ニーニョ教会。鐘楼が倒壊



被災直後のサント・ニーニョ教会
補修工事用の足が組まれている

被災直後のサント・ニーニョ教会
瓦礫が散在している。

・今回調査時には、下の写真のとおり、完全に修復され、多くの観光客と地元住民でにぎわっていた。

今回調査時のサントニーニョ教会

同左の内部

同上、内部の祭壇。アーチ外側の RC スラブに鉄筋の爆裂が生じている

同左、RC スラブの爆裂の詳細

② サン・ペドロ要塞

・サン・ペドロ要塞はフィリピン最古かつ最小の三角形の稜堡式要塞で、元々はスペインのコンキスタドール・ミゲル・ロペス・デ・レガスピにより建築されたものである。現在に残る石造りの要塞は、1738 年までに敵対するムスリム勢力からの攻撃に対抗するために建設された。次いで 19 世紀後半には、要塞はフィリピン人の反乱に対する拠点として機能するようになった。サン・ペドロ要塞は、初期のスペイン人入植者にとっての中心的な拠点であった。

・2013 年ボホール地震により、城壁の一部が崩落するなどの被害を受けた。

・現在では、完全に修復され、手入れの行き届いた施設として公開されている。

2013 年ボホール地震直後のサン・ペドロ要塞

同左の城壁が崩れた箇所

今回調査時のサン・ペドロ要塞の入り口

サン・ペドロ要塞の中庭と門。奇麗に整備されている。

参考1　2023 年 12 月フィリピン ミンダナオ地震の概要

●特集1 2023 年 12 月2日 フィリピン諸島、ミンダナオの地震

（令和5年 12 月　地震・火山月報（防災編）　気象庁。図表は省略）

（1）概要（注1）

2023 年 12 月2日 23 時 37 分（日本時間、以下同じ）にフィリピン諸島、ミンダナオの深さ 40km で Mw7.5 の地震（Mw は気象庁によるモーメントマグニチュード）が発生した。この地震の発震機構（気象庁による CMT 解）は東西方向に圧力軸を持つ逆断層型で、フィリピン海プレートとユーラシアプレートの境界で発生した。

気象庁はこの地震に伴い、2日 23 時 56 分に千葉県から鹿児島県にかけての太平洋沿岸、伊豆諸島、小笠原諸島及び宮古島・八重山諸島に、3日 03 時 19 分に奄美群島・トカラ列島に津波注意報を発表した(3日 09 時 00 分に解除)。この地震により、伊豆諸島の八丈島八重根で 0.4mなど、宮城県から鹿児島県にかけての太平洋沿岸、沖縄県、伊豆諸島及び小笠原諸島で津波を観測した。また、海外においても、フィリピンのマウェス島で 0.32mなどの津波を観測した。

また、この地震により、フィリピンで死者3人、負傷者 86 人などの被害が生じた（2023 年 12 月 11 日現在）。

今回の地震の震源付近（図2－2の領域b）では、この地震の発生後に地震活動が活発になり、3日 19 時 35 分には Mw6.6 の地震、4日 04 時 49 分には Mw6.8 の地震が発生した（ともに Mw は Global CMT による）。

気象庁はこれらの地震に対して、それぞれ3日 19 時 58 分及び4日 05 時 15 分に遠地地震に関する情報（日本沿岸で若干の海面変動あり）を発表した。

12 月2日のフィリピン諸島、ミンダナオの地震に伴い発表した津波注意報を図1に、12 月2日から4日にかけて気象庁が発表した主な情報及び報道発表を表1に示す。

図1 12 月2日のフィリピン諸島、ミンダナオの地震に対して発表した津波注意報

（注1）震源要素は、米国地質調査所(USGS)による(2024 年1月9日現在)。ただし、発震機構及び Mw は、今回の地震は気象庁、その他の地震は Global CMT による。海外の津波の高さは米国海洋大気庁（NOAA）による（2024 年1月9日現在）。地震の被害は、OCHA(UN Office for the Coordination of Humanitarian Affairs:国連人道問題調整事務所、2023 年 12 月 11 日現在)による。

参考2　フィリピン震度階(PHIVOLCS(フィリピン火山地震研究所)と、MMI、日本の気象庁震度階との比較

PHIVOLCS Earthquake Intensity Scale (PEIS)

Scale	Condition	Modified Mercalli Intensity	Japan Metrological Agency Intensity	Scale	Condition	Modified Mercalli Intensity	Japan Metrological Agency Intensity
I	Scarcely Perceptible	I	0	VI	Very Strong	VI	4
II	Slightly Felt	II	1	VII	Destructive	VII	4
III	Weak	III	2	VIII	Very Destructive	VIII, IX	5-6
IV	Moderately Strong	IV	2-3	IX	Devastating	X, XI	7
V	Strong	V	3	X	Completely Devastating	XII	7

出典:Earthquake Impact Reduction Study for Metropolitan Manila, Republic of the Philippines, Japan International Cooperation Agency (JICA), Metropolitan Manila Development Authority (MMDA), Philippine Institute of Volcanology and Seismology (PHIVOLCS), prepared by Pacific Consultant International, OYO International Corporation, PASCO Corporation, March 2004
https://ndrrmc.gov.ph/attachments/article/1472/Earthquake_Impact_Reduction_Study_Volume_1.PDF

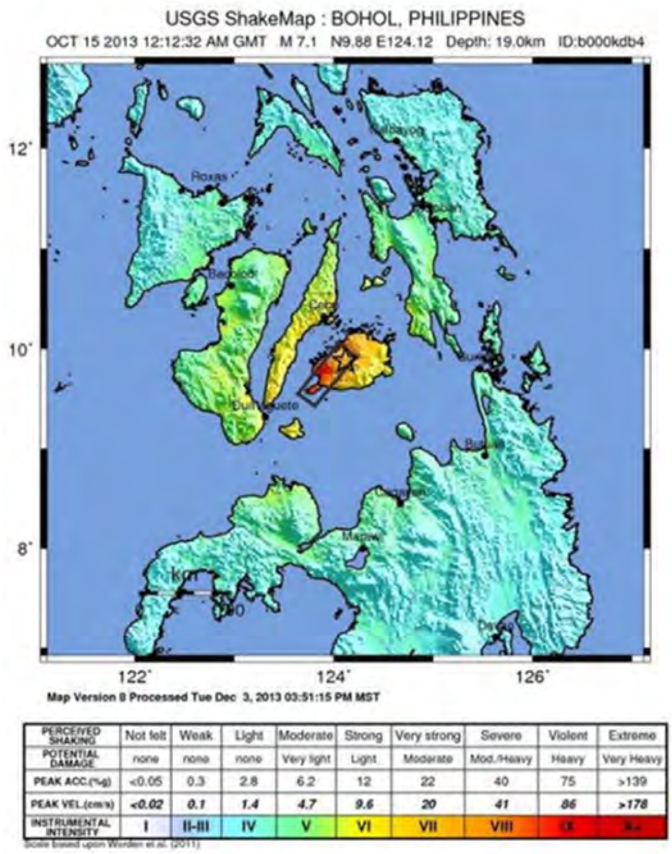
参考 3 2013 年 10 月 15 日発生のボホール地震の建物被害調査

1. 地震被害概要(公式発表:11 月 3 日現在)

NDRRMC(National Disaster Risk Reduction and Management Council)

http://www.ndrrmc.gov.ph/attachments/article/1108/NDRRMC%20Update%20SitRep%20no.%2035%20re%20Effects%20of%20M7.2%20Bohol%20EQ,%203Nov2013,%206AM.pdf

- ・10 月 15 日 8:12AM(現地時間)Sagbayan, Bohol にて 7.2(Ms)の地震発生。
- ・フィリピン震度階 PEIS:PHIVOLCS Earthquake Intensity Scale(10 段階)の震度7が Tagbilaran City にて記録。
- ・地すべり、地盤沈没がボホール島各所にて発生。
- ・津波なし。
- ・死者 222 人、行方不明 8 人、けが人 976 人(11 月 3 日現在)
- ・建築被害は、住宅全壊 14,512 件、半壊 58,490 件。その他、市庁舎、教会の被害多数。(ボホール島及びセブなどの近接地)
- ・インフラは、橋 41 箇所、道路 18 箇所の被害あり。



USGS ShakeMap

(楢府龍雄)