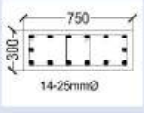
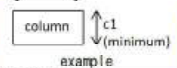
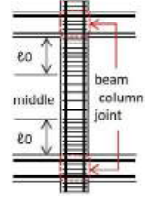
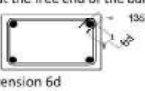
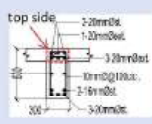
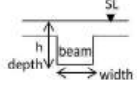
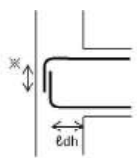
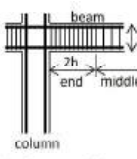
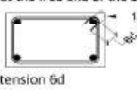


Element	No.	Item	confirm	not confirm	De	
Column  ex) Schedule	68	design	Columns are designed in the design report. (mentioned/not)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	69	symbol	Select one of the column symbols designed in the design report and describe it. (any of them). ex) [3F/C2]	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	70	Schedule	column schedule above in the structural drawing. The following is a review of this column.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	71	Gross-sectional shape	Dimension of section of column above →describe the dimension. ex) 300mm×750mm	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	72	 example	★Confirm below · $c1 \geq 300\text{mm}$ · $c2 \leq c1 \times 2.5$	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Sa
	73	longitudinal rebar	Required reinforcement ratio of column above from computer output →Describe it. ex) 3.06%	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	74		longitudinal rebars of column above from structural drawing are over 4. →Describe the number of longitudinal rebars & diameter(ϕ). ex) 14-25 ϕ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	75		Calculate the total cross-sectional area of longitudinal rebar above from structural drawing (Nominal cross-sectional area : 16 ϕ =201mm ² , 20 ϕ =314mm ² , 22 ϕ =380mm ² , 25 ϕ =491mm ²) →Describe it. ex) 14×491=6874mm ²	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	76		Provided reinforcement ratio of column(=Rebar area/column cross-sectional area) above from structural drawing →Describe it. ex) 6874/(300×750)×100=3.06%	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	77		★Confirm the consistency of reinforcement ratio of column (%) between computer output and structural drawing. · Required (%) = Provided (%)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Sa
	78		★Ast satisfies the following. $0.01A_g \leq A_{st} \leq 0.06A_g$ or $0.04A_g$ ※ (※preferred not to exceed 0.04A _g)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Sa
	79		Capacity ratio of column above.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	80		★Capacity ratio is confirm below. Capacity ratio ≤ 1.0	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Sa
	81	hoop/tie	Diameter of hoop/tie →Describe it. ex) 10 ϕ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	82		Spacing of the end (end) area →Describe it. ex) 125mm	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	83		Spacing of the middle area →Describe it. ex) 200mm	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	84		Spacing of the beam-column joint →Describe the pitch. ex) 125mm (Check if there is a reinforcement drawing of this.)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	85	Note: Transverse reinforcement of beam not shown for clarity a 135° bend plus an Extension at the free end of the bar  Extension 6d ■ hoop/tie $\geq 60\text{mm}$ (OMF) $\geq 75\text{mm}$ (IMF, SMF)	★confirm below [IMF, OMF] Spacing of end area ≤ 8 times of diameter of longitudinal rebar, 24 times of diameter of hoop, half length of short side length of column, 300mm ※ (※OMF is not include 300mm.) Spacing of middle area ≤ 2 times of spacing of end area Spacing of beam-column joint \approx Spacing of end area [SMF] Spacing of end area \leq one-quarter of minimum dimension of column, 6 times of diameter of longitudinal rebar of column, $100\sim 150\text{mm}$ Spacing of middle area ≤ 2 times of spacing of end area. Spacing of beam-column joint \approx Spacing of end area [Extension of 135° hook/bend] More than 6 times the hoop/tie diameter and 60mm (for OMF) or 75mm (for IMF, SMF).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Sa

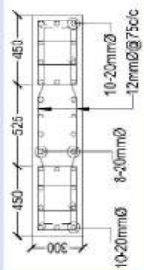
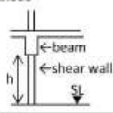

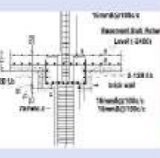
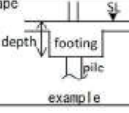
Describe the Contents of the Confirmation	Data source page or No. D:Design Report A:Architectural Drawing S:Structural Drawing	Data source			BNBC2020 Part VI	Manual page	URP P-S	Remarks
		DESIGN REPORT	Architectural DRAWING	Structural DRAWING				
-	D-54-56	<input type="radio"/>			-	-	-	
[3F/C2]	D-54-56	<input type="radio"/>			-	-	-	
-	S-S14			<input type="radio"/>	-	-	-	
300mmx750mm	S-S14			<input type="radio"/>	-	-	-	
Satisfactory					Sec 8.3.5.1 Fig 6.8.6	-	-	
3.06%	D-56	<input type="radio"/> output			Sec 6.3.9.1	-	23, 69	
14-25 φ	S-S14			<input type="radio"/>	Sec 6.3.9.2	-	24, 69	
14 × 49l = 6874mm ^l	-			<input type="radio"/>	-	-	-	
$6874 / (300 \times 750) \times 100 = 3.06\%$	-			<input type="radio"/>	Sec 6.3.9.1	-	23, 69	
Satisfactory					-	-	-	
Satisfactory					Sec 6.3.9.1	-	69	
0.808	D-57-62	<input type="radio"/>			-	-	69	
Satisfactory					-	-	69	
10 φ	S-S14a			<input type="radio"/>	-	-	69	
125mm	S-S14a			<input type="radio"/>			69	
200mm	S-S14a			<input type="radio"/>			69, 82	
125mm	S-S14a, S17a			<input type="radio"/>			62, 69	
Satisfactory					OMF: Sec 8.3.9 IMF: Sec 8.3.10.5 (c) SMF: Sec 8.3.5.4	Annex (6) A-10, 13, 23	-	

The entry in the red box above is an example.

Element	No.	Item	confirm	not confirm	De	
<p>Beam</p>  <p>ex) Schedule</p>	86	design	Beams are designed in the design report.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	87	symbol	Select one of the beam symbols designed in the design report and describe it (any of them). ex) [Story3A4/F.B-1]	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	88	Schedule	Beam schedule above in the structural drawing. The following is a review of this beam.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	89	Gross sectional shape	Dimension of section of beam above mentioned. →describe the length. ex) 300mm×600mm	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	90		★Confirm below (h is depth of beam) •width \geq (0.3h, 250mm)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Sa
	91	longitudinal rebar	Required area of longitudinal rebar above from computer output (top side of the end of the beam) →describe it. ex) 962mm ²	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	92		Diameter and number of longitudinal rebar above from structural drawing (top side of the end of the beam). →describe it. ex) 6-20 ϕ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	93		Calculate the provided area of longitudinal rebar above from structural drawing. (Nominal cross-sectional area : 16 ϕ = 201mm ² , 20 ϕ = 314mm ² , 22 ϕ = 380mm ² , 25 ϕ = 491mm ²) →describe it. ex) 6×314=1884mm ²	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	94		★Confirm below •required area \leq provided area	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Sa
	95	development length extension	Development length (δdh) →describe it. Ex) 185mm	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	96		★Confirm below. (δb is diameter of longitudinal rebar.) • OMF doesn't have a specific stipulation (follow IMF). • IMF : $\delta dh \geq$ (8 δb , 150mm, 0.24fydb/ $\sqrt{f'c}$) • SMF : $\delta dh \geq$ (8 δb , 150mm, fydb/5.4 $\sqrt{f'c}$)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Sa
	97		Extension (※ mark length on the left side figure) →describe it. ex) 300mm	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	98	Note: Transverse reinforcement not shown for clarity	★Confirm below. (δb is diameter of longitudinal rebar) • Extension \geq 12 δb	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Sa
	99	stirrup	Diameter of stirrup →Describe it. ex) 10 ϕ	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
100		Spacing of the end (2h) area →describe it. ex) 100mm	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
101		Spacing of the middle area →Describe it. ex) 100mm	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
102	Note: Transverse reinforcement of column not shown for clarity a 135° bend plus an Extension at the free end of the bar  Extension δd ■stirrup \geq 75mm (OMF, IMF, SMF)	★Confirm below. ($d \approx h - 60$ mm) • OMF doesn't have a specific stipulation (follow IMF). [IMF, SMF] Spacing of end area $\leq d/4$ 8 times of diameter of longitudinal rebar, 24 times of diameter of stirrup, 300mm Spacing of middle area $\leq d/2$ [Extension of 135° hook/bend] More than 6 times the stirrup diameter and 75mm (for OMF, IMF, SMF).	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Sa	

Describe the Contents of the Confirmation	Data source page or No. D: Design Report A: Architectural Drawing S: Structural Drawing	Data source			BNRC2020 Part VI	Manual page	URP P-S	Remarks
		DESIGN REPORT	Architectural DRAWING	Structural DRAWING				
-	D-71-94	<input type="radio"/>			-	-	-	
【Story3&4/F.B 1】	D-84, 85, 94	<input type="radio"/>			-	-	-	
-	S-S53, S57			<input type="radio"/>	-	-	-	
300mmx600mm	D-9 S-S53, S57			<input type="radio"/>	-	-	-	
Satisfactory	-				Sec 8.3.4.1 Fig 6.8.1	-	-	
962mm	D-85, 94	<input type="radio"/> output			-	-	69	
6-20φ	S-S57			<input type="radio"/>	-	-	69	
6×314=1884mm	D-85, 94 S-S57			<input type="radio"/>	-	-	69	
Satisfactory	-				-	-	69	
185mm	S-S57			<input type="radio"/>	Sec 8.2.6 Sec 8.3.7.4	Annex (6) A-7, 8	65, 72	
Satisfactory	-							
300mm	S-S57			<input type="radio"/>	Sec 8.1.2.1	Annex (6) A-6	62, 72	
Satisfactory	-							
10φ	S-S57			<input type="radio"/>	-	-	69	
100mm	S-S57			<input type="radio"/>			69	
100mm	S-S57			<input type="radio"/>			69, 77, 78	
Satisfactory	-				OMF: Sec 8.3.9 IMF: Sec 8.3.10.4 (b) SMF: Sec 8.3.4.3	Annex (6) A-10, 12, 21	69	

The entry in the red box above is an example.

Element	No.	Item	confirm	not confirm	D		
Shear Wall  ex) Schedule	103	design	Shear walls are designed in the design report.	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
	104	symbol	Select one of the shear wall symbols designed in the design report and describe it (any of them). ex) [Story1/SW-3]	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
	105	Schedule	Shear wall schedule above in the structural drawing. The following is a review of this shear wall.	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
	106	thickness	Thickness of section of shear wall above —describe the thickness. ex) 300mm	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
	107		Thickness of section of shear wall above —describe the thickness. ex) 300mm ★Confirm below thickness $\geq h/25$ and 100mm (h=supported height or length)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Sa	
	108	Vertical reinforcement	Diameter and spacing/number of the vertical reinforcement —describe it. ex) 2-20 ϕ -@120 (If the number is displayed (such as the left side schedule), the spacing is estimated from the drawing.)	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
	109		★Confirm below • Walls with a thickness of 250 mm or more are two layers reinforcement. • Maximum spacing of reinforcement shall not be spaced farther apart than three times the wall thickness, nor farther apart than 450 mm.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Sa	
	110		Computer output of required area of vertical reinforcement above —describe it. ex) 4303mm ²	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
	111		Calculate the actual provided area of vertical reinforcement above. —describe it. ex) 28 x 314 = 8792mm ²	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
	112		★Confirm below • required area \leq provided area	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Sa	
	113	Horizontal reinforcement	Diameter and spacing of the horizontal reinforcement —describe it. ex) 2-12 ϕ -@75	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
	114		★Confirm below • Walls with a thickness of 250 mm or more are two layers reinforcement. • Maximum spacing of reinforcement shall not be spaced farther apart than three times the wall thickness, nor farther apart than 450 mm.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Sa	
	Slab  1ST FLOOR SLAB REINFORCING DETAILS. SLAB THICKNESS = 125 EXCEPT SHOWN IN DRAWING. ex) Schedule	115	Type	The type of slab —Describe it. ex) Beam supported cast in situ slab	<input checked="" type="checkbox"/>	<input type="checkbox"/>	E
		116	Schedule	Slab schedule in the structural drawing. The following is a review of this slab.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
117		symbol	Select one of the slab symbols in the structural drawings and describe it (any of them). ex) [1st floor]	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
118		thickness	Thickness of the slab above —describe it. ex) 125mm	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
119			★Confirm below • thickness ≥ 125 mm	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Sa	
Foundation  ex) Schedule	120	Type	The type of foundation —Describe it. ex) pile foundation	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
	121	Schedule	Footing or Pilecap schedule in the structural drawings. The following is a review of this foundation.	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
	122	symbol	Select one of the foundation symbols in the structural drawings and describe it (any of them). ex) [PC-1]	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
	123	shape	Depth of footing above —describe it. ex) 550mm	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
	124		Depth of footing is subject to the following. • depth ≥ 150 mm (on soil) (Column Footing) • depth ≥ 300 mm (on pile) (Pilecap)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Sa	
125	length of pile	length of Pile —If applicable, describe the length of the pile. ex) 29700mm	<input checked="" type="checkbox"/>	<input type="checkbox"/>			
Additional Considerations			<input type="checkbox"/>	<input type="checkbox"/>			

Describe the Contents of the Confirmation	Data source page or No.	Data source			BNBC2020 Par LVI	Manual page	URP P-S	Remarks
	D:Design Report A:Architectural Drawing S:Structural Drawing	DESIGN REPORT	Architectural DRAWING	Structural DRAWING				
-	D-63-70		○		-	-	-	
[story]/SW-3]	D-68, 70		○		-	-	-	
-	S-S16			○	-	-	-	
300mm	S-S16			○	-	-	-	
Satisfactory	-				Sec 6.6.5.3	-	30	
2-20 φ-@120	S-S16			○	-	-	69	
Satisfactory	-				Sec 6.6.3.4 Sec 6.6.3.5	-	35, 36, 69	
4303mm	D-70		○ output		-	-	69	
28 x 314=8792mm	D-70 S-S16			○	-	-	69	
Satisfactory	-				-	-	69	
2-12 φ-@75	S-S16			○	-	-	69	
Satisfactory	-				Sec 6.6.3.4 Sec 6.6.3.5	-	33, 36, 69	
Beam supported cast in situ slab	D-7, 95		○		Sec 6.5	-	-	
-	S-S51			○	-	-	-	
1st Floor	S-S51			○	-	-	-	
125mm	D-95 S-S51		○	○	Sec 6.2.5	-	41, 50, 51	
Satisfactory	-							
pile foundation	D-7 S-S04		○	○	Sec 3.7	-	-	
-	S-S06			○	-	-	-	
[PC-1]	S-S06			○	-	-	-	
550mm	S-G06			○	-	-	-	
Satisfactory	-				Sec 6.8.7	-	11, 16	
29700mm	S-G04			○	-	-	-	

The entry in the red box above is an example.

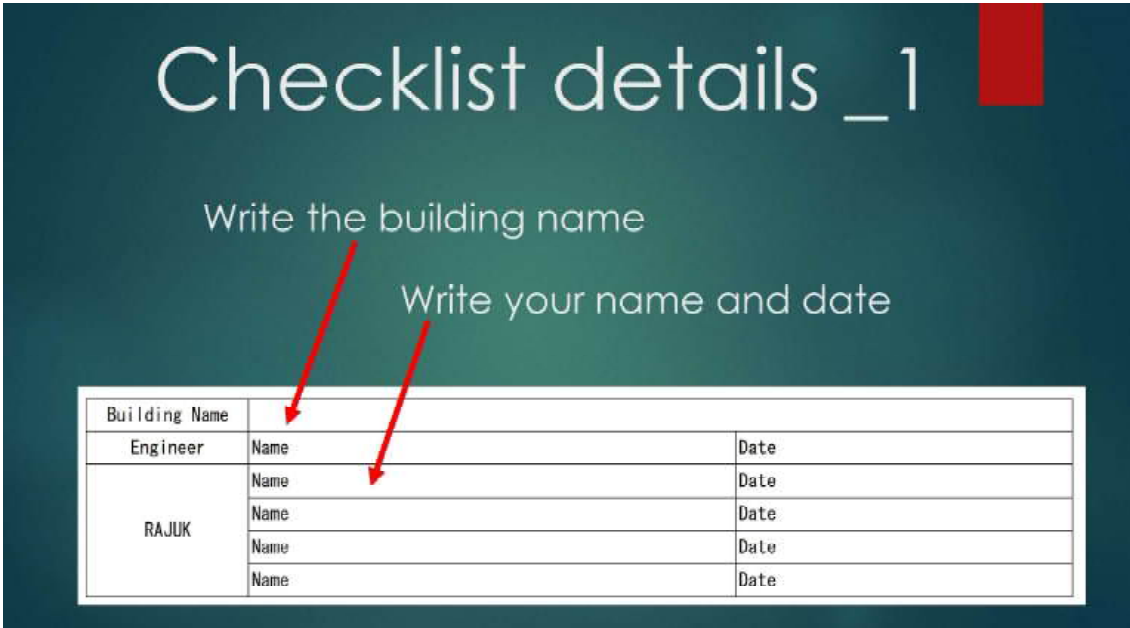
2.3.3 User manuals for structural design checklist

1. Configuration of checklist

At the top of the checklist, there are some instructions for filling out the checklist using design documents.

- Building name and reviewer's names.
- Column 1 shows the element of the items and is numbered sequentially.
- Column 2 shows the detail items. White cells indicate mandatory items (100 items) and green cells indicate items for sampling review (25 items).
- Columns 3,4 and 5 must be filled out manually by the RAJUK reviewers (hereinafter refers as reviewers). However, in order to improve efficiency, it might be better if some of the items (e.g. column 5) are filled in by the structural design engineers for a part of their self-review work.
- Column no. 6 indicates corresponding BNBC2020 reference article and section respectively.
- Column no. 7 indicates corresponding page of the Manual.
- Column no. 8 indicates corresponding number of the URP checklist.
- Column no. 9 is used for remarks.

■ Building name and reviewers name



Checklist details _1

Write the building name

Write your name and date

Building Name		
Engineer	Name	Date
RAJUK	Name	Date
	Name	Date
	Name	Date
	Name	Date

■ Column 1 and 2

Checklist details _2

Element of the items Details of items
 You have to find out this item mentioned or not in the design documents

Number

1		2	
Element	No.	Item	
Building overview	1	Building occupancy type →Describe what you checked. (ex) Residential building	
	2	Total floor area →Describe it. ex) 4353.41m ²	
	3	Ground floor area →Describe it. ex) 527.03m ²	
		Type of Structure	

Sample of contents

■ Column 3, 4 and 5

Checklist details _3

If you find the contents, then make the check.
 Describe the contents Reference page

Cells filled out by RAJUK/designer				
		4	5	
confirm	not confirm	Describe the Contents of the Confirmation	Data source page or No.	Data source
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Residential building	D-7	<input type="radio"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	4353.41m ²	A-01	<input type="radio"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	527.03m ²	A-01	<input type="radio"/>

Source (reference document)

RAJUK RAJUK or designer

■ Column 6, 7, 8 and 9

Checklist details _4

reference BNBC2020 part (from part VI)
reference Manual page
reference URP Checklist page
remarks (your memo)

Reference			
6	7	8	9
DNBC2020 Part VI	Manual page	URP P-S	Remarks
Sec 1.2.3 Table 1.1	Annex (I)	-	
-	-	-	
-	-	-	

reference documents of column 8 (URP Checklist)

Proposed Program for Building Code and Construction Code Enforcement
Vol. 2: Plan Review and Inspection Checklists

PREPARED FOR:
RAJDHANI UNMAYAN KARTIRPAKCHA (RAJUK)
August 31, 2020

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- 1.23 METHOD 2: ANALYTICAL PROCEDURE (C/C).....


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2.5 OCCUPANCY CLASSIFICATION	3.4.19 EARTHING
2.6 GENERAL BUILDING REQUIREMENTS	3.4.20 LIGHTNING PROTECTION OF BUILDINGS
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2.12 FIRE PROTECTION	3.5.3 HOT WATER SUPPLY INSTALLATION
2.13 MEANS OF EGRESS	3.5.4 MATERIALS, FITTINGS AND APPLIANCES
2.14 FIRE PROTECTION EQUIPMENT	3.5.5 GENERAL REQUIREMENT FOR PIPE WORK
CHAPTER 3. MECHANICAL, ELECTRICAL AND PLUMBING	3.5.6 SAFE CONVEYANCE AND DISTRIBUTION OF WATER & PREVENTION OF BACKFLOW
3.1 ELECTRICAL AND ELECTRONIC ENGINEERING SERVICES	3.5.7 LAYING OF PIPES ON SITE
3.2 AIR-CONDITIONING, HEATING AND VENTILATION (HVAC)	3.5.8 HANGERS AND SUPPORT
3.3 BUILDING ACOUSTICS	3.5.9 PROTECTION OF POTABLE WATER SUPPLY
3.4 LIFT, ESCALATOR AND MOVING WALK	3.5.10 HEALTH CARE WATER SUPPLY
3.5 WATER SUPPLY	3.5.11 CLEANING AND DISINFECTING THE SYSTEM
3.6 SANITARY DRAINAGE	3.5.12 INSPECTION, TESTING AND COMPLETION CERTIFICATE
3.7 RAINWATER MANAGEMENT SYSTEM	3.5.13 INDIVIDUAL WATER SUPPLY SYSTEM
3.8 FUEL GAS SUPPLY	3.6 DRAINAGE AND SANITATION REQUIREMENT
3.9 SIZING OF COLD WATER SUPPLY AND DISTRIBUTION PIPING	3.6.1 MATERIALS AND APPLIANCES
3.10 RECOMMENDED WATER QUALITY FOR DOMESTIC PURPOSES	3.6.2 HANGERS AND SUPPORT AND PIPE JOINTING
3.11 DESIGN GUIDELINE OF A SEPTIC TANK	3.6.3 DESIGN AND INSTALLATION OF DRAINAGE SYSTEM
3.12 DETERMINING CATCHMENTS AREA FOR A FLAT SURFACE	3.6.4 INSTALLATION OF VENTING SYSTEM
CHAPTER 4. ENERGY AND ENVIRONMENT	3.6.5 PROTECTION AGAINST RODENT
4.1 ENERGY EFFICIENCY AND SUSTAINABILITY	3.6.6 BEDDING AND BACKFILLING
PART 2 – INSPECTION CHECKLISTS	3.6.7 GREASE TRAPS AND OIL INTERCEPTORS
CHAPTER 1. STRUCTURAL	3.6.8 SEPTIC TANK AND IMI/OFF TANK(S)
1.1 FOOTING AND FOUNDATION INSPECTION	3.6.9 CONSTRUCTION RELATING TO CONVEYANCE OF SANITARY WASTES
1.2 REQUIRED INSPECTIONS AND TESTS OF STEEL CONSTRUCTION	3.6.10 REFUSE CHUTE SYSTEM
1.3 REQUIRED INSPECTIONS AND TESTS OF CONCRETE CONSTRUCTION	3.6.11 BASEMENT FLOOR DRAINAGE SYSTEM
1.4 REQUIRED INSPECTIONS AND TESTS OF SOILS	3.6.12 HEALTH CARE DRAINAGE SYSTEM
1.5 REQUIRED INSPECTIONS AND TESTS OF DRIVEN DEEP FOUNDATION ELEMENTS	3.6.13 INSPECTION, TESTING AND COMPLETION CERTIFICATE
CHAPTER 2. NON STRUCTURAL / FIRE SAFETY / ARCHITECTURAL	3.7 RAINWATER HARVESTING
2.1 FIRE PROTECTION	3.7.1 ROOF TOP RAINWATER HARVESTING
CHAPTER 3. MECHANICAL, ELECTRICAL AND PLUMBING	3.7.2 ARTIFICIAL GROUND WATER RECHARGE
3.1 AIR-CONDITIONING, HEATING AND VENTILATION	3.7.3 DRAINAGE AND SANITATION REQUIREMENT
3.1.1 DUCT WORK	3.7.4 MATERIALS AND APPLIANCES AND CONSTRUCTION OF RAINWATER STORAGE TANK
3.1.2 AIR TERMINALS	3.7.5 INSTALLATION AND CONSTRUCTION OF RAINWATER HARVESTING AND DRAINAGE SYSTEM
3.1.3 EXHAUST AIR SYSTEMS	3.7.6 GRADIENT OF PIPES
3.1.4 GENERAL AIR-CONDITIONING EQUIPMENT	3.7.7 RAINWATER OR STORM WATER DRAINAGE PIPING INSTALLATION
3.1.5 COOLING BY REFRIGERATION	3.8 FUEL AND GAS
3.1.6 EVAPORATIVE COOLING	3.8.1 ACCEPTABLE PIPING MATERIALS
3.1.7 HEATING EQUIPMENT	3.8.2 FABRICATION OF PIPING FOR INSTALLATION
3.1.8 AIR HANDLING UNIT	3.8.3 INSTALLATION OF GAS PIPES
3.1.9 PACKAGED AIR-CONDITIONERS	3.8.4 PRESSURE REGULATORS
3.1.10 ACCESSORY EQUIPMENT	3.8.5 SERVICE SHUTOFF VALVES
3.1.11 PIPING SYSTEM	3.8.6 INSPECTION OF SERVICES
3.1.12 SPLIT AIR-CONDITIONERS	3.8.7 CHECK OF LEAKAGE
3.1.13 VARIABLE REFRIGERANT FLOW (VRF) SYSTEM	3.8.8 PURGING
3.1.14 GENERAL REFRIGERATING EQUIPMENT	3.8.9 PROVISION FOR METER LOCATION
3.1.15 ABSORPTION REFRIGERATING EQUIPMENT	3.8.10 USE OF LIQUEFIED PETROLEUM GAS (LPG)
3.1.16 MECHANICAL REFRIGERATING EQUIPMENT	3.8.11 LPG CYLINDER LOCATION
3.1.17 COOLING TOWER	3.8.12 LPG MANIFOLDS AND PRESSURE REGULATORS
3.1.18 NATURAL VENTILATION	3.8.13 LPG BULK STORAGE INSTALLATIONS
3.1.19 MECHANICAL VENTILATION	3.8.14 INSTALLATION OF SPECIFIC APPLIANCES
3.1.20 MECHANICAL EXHAUST	3.8.15 COOKERS/BURNERS
3.1.21 KITCHEN EXHAUST EQUIPMENT	3.8.16 ILLUMINATING APPLIANCES
3.1.22 ENERGY CONSERVATION EQUIPMENT AND CONTROL	3.8.17 WATER HEATERS
3.1.23 INSPECTION, TESTING AND COMMISSIONING	3.8.18 STATIONERY GAS ENGINE GENERATORS
3.2 GUIDELINES FOR MAINTENANCE OF ELECTRICAL EQUIPMENT	CHAPTER 4. ENERGY AND ENVIRONMENT
3.3 WORK ON THE GAS SUPPLY SYSTEM	4.1 ENERGY EFFICIENCY AND SUSTAINABILITY
3.4 ELECTRICAL	
3.4.1 LIGHTING AND ILLUMINATION	
3.4.2 FITTINGS, FIXTURES AND ACCESSORIES	
3.4.3 CEILING FANS	
3.4.4 DISTRIBUTION WIRING IN A BUILDING	
3.4.5 ELECTRICAL LAYOUT AND INSTALLATION DRAWINGS	
3.4.6 ELECTRICAL WIRING IN THE INTERIOR OF BUILDINGS	
3.4.7 CONDUITS, CHANNELS, CABLES, CONDUCTORS AND RELATED ACCESSORIES	
3.4.8 EXTERIOR LIGHTING, SUB DISTRIBUTION BOARDS	
3.4.9 ELECTRICAL SERVICES SHAFTS, BUS DUCTS, LT, RISER CABLES AND LT, BUSBAR TRUNKINGS	
3.4.10 LT MAIN INCOMING CABLE AND SERVICE CONNECTION	
3.4.11 DESIGN FOR ELECTRICAL WIRING	
3.4.12 TEMPORARY ELECTRICAL CONNECTIONS	
3.4.13 STANDBY POWER SUPPLY	

■ Reference figure and sampling items and mandatory items

- Examples of drawings are provided as Reference Figure for convenience of reviewers
- The white cells in Column 4 is to be filled by picking up from the design documents
- Based on the date/description in the cells above, the reviewer confirms the compliance with the code referencing explanation in Column 2 (This procedure (in green cells) : sampling by the reviewer)

Checklist details _5

Reference figure Green cells : sampling items
White cells : mandatory items

	2	3	4	5
01		Diameter of hook/fin --Describe it. ex) 10φ <input type="checkbox"/>	<input type="checkbox"/>	10φ S-014a
02	Spacing of the end 120 area --Describe it. ex) 125mm	<input type="checkbox"/>	<input type="checkbox"/>	125mm S-014a
03	Spacing of the middle area --Describe it. ex) 200mm	<input type="checkbox"/>	<input type="checkbox"/>	200mm S-014a
04	Spacing of the beam-column joint --Describe the pitch. ex) 125mm (Check if there is a reinforcement drawing of this.)	<input type="checkbox"/>	<input type="checkbox"/>	125mm S-014a, S17a
05	Spacing below (JAM-JAM) Spacing of end area -- 4 times of diameter of longitudinal rebar. -- 24 times of diameter of hoop. -- 1/10 length of what is the length of column -- 200mm (100mm is rel. include 100mm.) Spacing of middle area -- 2.5 times of spacing of end area. Spacing of beam-column joint -- Spacing of end area (JAM)	<input type="checkbox"/>	<input type="checkbox"/>	Mandatory
06	Spacing of end area -- 4 times of diameter of longitudinal rebar. -- 24 times of diameter of hoop. -- 1/10 length of what is the length of column. -- 100~150mm Spacing of middle area -- 2.5 times of spacing of end area. Spacing of beam-column joint -- Spacing of end area (Exclusion of 125' hook/fin) Note: Check 5 times the hoop's diameter and 40mm for CM or 30mm for JM, JRM.	<input type="checkbox"/>	<input type="checkbox"/>	

2. How to use the check list

The following is an explanation of each item. The number is given to each item in the checklist.

● Building Overview

No.1 to No.6

As for the Building occupancy type, Total floor area, Ground floor area, and so on, reviewers fill out the contents in column 4, fill out the data source in column 5, and mark check in column 3.

Reference: BNBC PartVI of column 6 and Manual of column 7

● Declaration

No.7 As for the Declaration of the designer, reviewers fill out designer's name in column 4, fill out the data source in column 5, and mark check in column 3 in case the declaration is described.

Reference: BNBC PartVI of column 6 and Manual of column 7

● Codes and Standards

No.8 As for the Codes and Standards, reviewers fill out the contents in column 4, fill out the data source in column 5, and mark check in column 3.

Reference: BNBC PartVI of column 6

● Design method

No.9 As for the Design methods, reviewers fill out the contents in column 4, fill out the data source in column 5, and mark check in column 3.

Reference: BNBC PartVI of column 6

● Earthquake Analysis methods

No.10 As for the Earthquake Analysis methods, reviewers fill out the contents in column 4, fill out the data source in column 5, and mark check in column 3.

Reference: BNBC PartVI of column 6

● Software

No.11 As for the Design Software Name, reviewers fill out the name and version in column 4, fill out the data source in column 5, and mark check in column 3.

Reference: BNBC PartVI of column 6 and Manual of column 7

● **Soil properties**

No.12 to No.15

As for the Soil report Confirmation, \bar{V}_s , \bar{N} , and \bar{S}_u , reviewers fill out the contents in column 4, fill out the data source in column 5, and mark check in column 3.

If these items are not mentioned in design report, reviewers ask designer to submit them.

Reference: BNBC PartVI of column 6, Manual of column 7, and URP checklist of column 8

Reviewers should make sure to confirm the soil report is attached to the application.

● **Site Conditions**

No.16 to No.21

As for the Site class, occupancy category, seismic zone, and so on, reviewers fill out the contents in column 4, fill out the data source in column 5, and mark check in column 3.

Reference: BNBC PartVI of column 6, Manual of column 7, and URP checklist of column 8

● **Loads etc.**

No.22 to No.31

As for the Total dead load, total live load, seismic weight, and so on, reviewers fill out the contents in column 4, fill out the data source in column 5, and mark check in column 3.

Reference: BNBC PartVI of column 6 and URP checklist of column 8

● **Structural System**

No.32 to No.36

As for the Seismic force-resisting system, the type of moment resisting system, and so on, reviewers fill out the contents in column 4, fill out the data source in column 5, and mark check in column 3.

Reference: BNBC PartVI of column 6, Manual of column 7, and URP checklist of column 8

No.37 This item is for sampling review. If reviewers have confirmed that the height of the building is lower than the height limit indicated in column 4 of No.36, mark check in column 3.

● **Building irregularities**

No.38, 39, 42, 43

As for the stiffness irregularity check, torsional irregularity check, reentrant corner check, and diaphragm discontinuity check, if these items are mentioned in design report, reviewers fill out the data source in column 5, and mark check in column 3.

If these items are not mentioned in design report, reviewers make inquiry on these items

Reference: BNBC PartVI of column 6 and URP checklist of column 8

No.40 As for the drift check, reviewers fill out the maximum value of the X-direction (positive force) in column 4, fill out the data source in column 5, and mark check in column 3.
Reference: BNBC Part VI of column 6 and URP checklist of column 8

No.41 This item is for sampling review. If reviewers have confirmed that the maximum story drift of No.40 is lower than the value of Table 6.2.21 below, mark check in column 3.
Reference: BNBC Part VI of column 6 and URP checklist of column 8

ex) Occupancy Category (OC): II (No.17),

Cd: 5 (No.35), I: 1.00 (No.21), 10 stories and 1 base building (No.5)

$$\delta_x = \delta_{xe} \cdot Cd / I \text{ (by Equation 6.2.45 of BNBC Part VI)}$$

$$\Delta_x = \delta_x - \delta_{x-1} \text{ (by Equation 6.2.46 of BNBC Part VI)}$$

Allowable Story Drift Limit: $\Delta_a = 0.020h_{sx}$ (Table 6.2.21), h_{sx} : the story height below level x
story drift: 0.003139 (6F) (No.40)

$$\therefore \Delta_x = (\delta_x - \delta_{x-1}) = (\delta_{xe} - \delta_{(x-1)e}) \cdot Cd / I \leq \Delta_a = 0.020h_{sx}$$

$$\rightarrow (\delta_{xe} - \delta_{(x-1)e}) / h_{sx} \leq 0.020 \times I / Cd = 0.020 \times 1.00 / 5 = 0.004$$

If “story drift ($= (\delta_{xe} - \delta_{(x-1)e}) / h_{sx} \leq 0.004$ ”, hence, judged to be ok.

Table 6.2.21: Allowable Storey Drift Limit (Δ_a)

Structure	Occupancy Category		
	I and II	III	IV
Structures, other than masonry shear wall structures, 4 stories or less with interior walls, partitions, ceilings and exterior wall systems that have been designed to accommodate the story drifts.	0.025 h_{sx}	0.020 h_{sx}	0.015 h_{sx}
Masonry cantilever shear wall structures	0.010 h_{sx}	0.010 h_{sx}	0.010 h_{sx}
Other masonry shear wall structures	0.007 h_{sx}	0.007 h_{sx}	0.007 h_{sx}
All other structures	0.020 h_{sx}	0.015 h_{sx}	0.010 h_{sx}

Notes:

1. h_{sx} is the story height below Level x.

2. There shall be no drift limit for single-story structures with interior walls, partitions, ceilings, and exterior wall systems that have been designed to accommodate the storey drifts.

3. Structures in which the basic structural system consists of masonry shear walls designed as vertical elements cantilevered from their base or foundation support which are so constructed that moment transfer between shear walls (coupling) is negligible.

4. Occupancy categories are defined in Table 6.1.1

● **Concreting procedure**

No.44 As for the maximum permissible free fall height of concrete depositing/pouring, reviewers fill it out in column 4, fill out the data source in column 5, and mark check in column 3.

Reference: BNBC Part VI and Indian Standard IS-456:2000 of column 6

No.45 This item is for sampling review. If reviewers have confirmed below, mark check in column 3.

The maximum free fall height of No.44 \leq 1.5m

No.46 As for the compaction method, if this item is mentioned in structural drawings, reviewers fill out the data source in column 5, and mark check in column 3.

Reference: BNBC Part VI and Indian Standard IS-456:2000 of column 6

No.47 As for the precautions for frame work, if this item is mentioned in structural drawings, reviewers fill out the data source in column 5, and mark check in column 3.

Reference: BNBC Part VI of column 6

● **Curing (days)**

No.48 As for the curing period in days, reviewers fill it out in column 4, fill out the data source in column 5, and mark check in column 3.

Reference: BNBC Part VI of column 6

No.49 This item is for sampling review. If the curing period of No.48 meets the conditions of column 2, reviewers mark check in column 3.

ex) Curing period: 21 days (from No.48)

If “Curing period \geq 7 days at 10°C or higher (general)”, hence, judged to be ok.

● **Cover**

No.50 As for the cover thickness of column, beam, shear wall, and slab, if these items are mentioned **in design documents**, reviewers fill out the data source in column 5, and mark check in column 3.

Reference: BNBC Part VI of column 6 and URP checklist of column 8

● Concrete

No.51 If the building uses normal weight concrete, reviewers fill out the data source in column 5, and mark check in column 3.

If the building does not use normal weight concrete, reviewers mark check for “not confirm” in column 3.

Reference: BNBC Part VI of column 6

● Concrete compressive strength f_c'

No.52 If concrete compressive strength of column is mentioned **in design report**, reviewers fill it out in column 4, fill out the data source in column 5, and mark check in column 3.

Reference: BNBC Part VI of column 6, Manual of column 7, and URP checklist of column 8

No.53 If concrete compressive strength of column is mentioned **in structural drawings**, reviewers fill it out in column 4, fill out the data source in column 5, and mark check in column 3.

Reference: BNBC Part VI of column 6, Manual of column 7, and URP checklist of column 8

No.54 [This item is for sampling review](#). If reviewers have confirmed that the concrete compressive strength of No.52 and No.53 are the same, mark check in column 3.

No.55 to No.57

As for the concrete compressive strength of beam, shear wall, and slab, if reviewers have confirmed **the consistency between design report and structural drawings**, fill it out in column 4, fill out the data source in column 5, and mark check in column 3.

Reference: BNBC Part VI of column 6, Manual of column 7, and URP checklist of column 8

No.58 This item is for sampling review. If the concrete compressive strength of No.52, 53, 55 to 57 meet the conditions of column 2, reviewers mark check in column 3.

ex) The type of moment resisting frame: IMF (No.33), 11 stories building (No.5)

If “Column $f_c' = 31\text{N/mm}^2 \geq 20\text{N/mm}^2$ ”, hence, judged to be ok.

If “Beam $f_c' = 24.13\text{N/mm}^2 \geq 20\text{N/mm}^2$ ”, hence, judged to be ok.

If “Shear Wall $f_c' = 31\text{N/mm}^2 \geq 20\text{N/mm}^2$ ”, hence, judged to be ok.

If “Slab $f_c' = 24.13\text{N/mm}^2 \geq 20\text{N/mm}^2$ ”, hence, judged to be ok.

No.59 As for the concrete compressive strength of foundation, if reviewers have confirmed **the consistency between design report and structural drawings**, fill it out in column 4, fill out the data source in column 5, and mark check in column 3.

Reference: BNBC Part VI of column 6 and URP checklist of column 8

No.60 As for the type of foundation, reviewers fill it out in column 4, fill out the data source in column 5, and mark check in column 3.

Reference: BNBC Part VI of column 6 and URP checklist of column 8

No.61 This item is for sampling review. If the concrete strength of No.59 meets the conditions of column 2, reviewers mark check in column 3.

Reference: BNBC Part VI of column 6 and URP checklist of column 8

ex) cast in suit pile (from No.60)

If "Pile $f'c = 21\text{N/mm}^2 \geq 18\text{N/mm}^2$ ", hence, judged to be ok.

If "Pole cap $f'c = 31\text{N/mm}^2 \geq 18\text{N/mm}^2$ ", hence, judged to be ok.

● Steel yield strength

No.62 As for the steel yield strength of longitudinal rebar (f_y), if reviewers have confirmed **the consistency between design report and structural drawings**, fill it out in column 4, fill out the data source in column 5, and mark check in column 3.

Reference: BNBC Part VI of column 6, Manual of column 7, and URP checklist of column 8

No.63 This item is for sampling review. If steel yield strength (f_y) of No.62 meets the conditions of column 2, reviewers mark check in column 3.

ex) The type of moment resisting frame: IMF (No.33)

If " $f_y = 414\text{ N/mm}^2 \leq 550\text{N/mm}^2$ ", hence, judged to be ok.

No.64 As for the steel yield strength of transverse rebar (f_{yt}), if reviewers have confirmed **the consistency between design report and structural drawings**, fill it out in column 4, fill out the data source in column 5, and mark check in column 3.

If f_{yt} isn't described, the value of f_y is adopted.

Reference: BNBC Part VI of column 6, Manual of column 7, and URP checklist of column 8

No.65 This item is for sampling review. If steel yield strength (f_{yt}) of No.64 meets the conditions of column 2, reviewers mark check in column 3.

ex) The type of moment resisting frame: IMF (No.33)

If " $f_{yt} = 414\text{ N/mm}^2 \leq 550\text{N/mm}^2$ ", hence, judged to be ok.

●Lap splices

No.66, 67

As for the position of lap splices (ℓ_d) of column and beam, if these items are described **in structural drawings**, reviewers fill out the data source in column 5, and mark check in column 3.

Reference: BNBC PartVI of column 6, Manual of column 7, and URP checklist of column 8

●Column

No.68 If the column design is described **in design report**, reviewers fill out the data source in column 5, and mark check in column 3.

No.69 The reviewer selects one of the columns **in design report** and fills out the symbol in column 4, fills out the data source in column 5, and gives mark (confirm) in column 3.

No.70 If the column of No.69 is described **in the structural drawings**, reviewers fill out the data source in column 5, and make mark in column 3.

No.71 As for the dimension of the column of No.70, reviewers describe the dimensions of it in column 4, fill out the data source in column 5, and mark check in column 3.

No.72 This item is for sampling review. If reviewers have confirmed below, mark check in column 3.

The shortest cross-sectional dimension of column ($c1$) ≥ 300 mm

Perpendicular dimension ($c2$) $\leq c1 \times 2.5$

Reference: BNBC PartVI of column 6

ex) If “ $c1 = 300$ mm ≥ 300 mm”, hence, judged to be ok.

If “ $c2 = 750$ mm $\leq c1 \times 2.5 = 300$ mm $\times 2.5 = 750$ mm”, hence, judged to be ok.

No.73 The reviewers fill out the value of the required reinforcement ratio of longitudinal rebar of column in column 4 from the **computer output**, fill out the data source in column 5, and mark check in column 3.

Reference: BNBC PartVI of column 6 and URP checklist of column 8

No.74 As for the number of longitudinal rebar of No.69, if there are 4 or more numbers of longitudinal rebar, reviewers fill out the number of longitudinal rebar and diameter in column 4, fill out the data source in column 5, and mark check in column 3.

Reference: BNBC Part VI of column 6 and URP checklist of column 8

No.75 As for the total cross-sectional area of longitudinal rebar of No.69, using **structural drawings**, reviewers calculate it and fill out the value in column 4, and mark check in column 3.

ex) Column: 14-25 ϕ , 25 ϕ = 491 mm²

$$\therefore 14 \times 491 \text{ mm}^2 = 6,874 \text{ mm}^2$$

No.76 As for the provided reinforcement ratio of longitudinal rebar of column, using **structural drawings**, reviewers fill out the value in column 4, fill out the data source in column 5, and mark check in column 3.

Reference: BNBC Part VI of column 6 and URP checklist of column 8

ex) Total cross-sectional area of longitudinal rebar (A_{st}) = $14 \times 491 \text{ mm}^2 = 6,874 \text{ mm}^2$

Gross area of concrete section (A_g) = $300 \text{ mm} \times 750 \text{ mm} = 225,000 \text{ mm}^2$

Reinforcement ratio of longitudinal rebar = $\rho_g = A_{st}/A_g = 6,874/225,000 = 0.03055 \rightarrow 3.06\%$

No.77 This item is for sampling review. If reviewers have confirmed that **the values of reinforcement ratio of longitudinal rebar of column for No.73 and No.76 are the same value**, mark check in column 3.

No.78 This item is for sampling review. If reviewers have confirmed that the ratio of the A_{st} is between $0.01A_g$ and $0.06A_g$, mark check in column 3.

Reference: BNBC Part VI of column 6 and URP checklist of column 8

No.79 As for the capacity ratio of the column, using **design report**, reviewers fill out the value in column 4, fill out the data source in column 5, and mark check in column 3.

Reference: URP checklist of column 8

No.80 This item is for sampling review. If reviewers have confirmed that the capacity ratio is 1.0 or less, mark check in column 3.

Reference: URP checklist of column 8

No.81 As for the diameter of hoop/tie of the column of No.69, using **structural drawings**, reviewers fill out the diameter in column 4, fill out the data source in column 5, and mark check in column 3.

Reference: URP checklist of column 8

No.82 As for the spacing of the end (00) area of hoop of the column of No.69, using **structural drawings**, reviewers fill out the spacing in column 4, fill out the data source in column 5, and mark check in column 3.

Reference: BNBC PartVI of column 6, Manual of column 7, and URP checklist of column 8

No.83 As for the Spacing of the middle area of hoop of the column of No.69, using **structural drawings**, reviewers fill out the spacing in column 4, fill out the data source in column 5, and mark check in column 3.

Reference: BNBC PartVI of column 6, Manual of column 7, and URP checklist of column 8

No.84 As for the spacing of the beam-column joint, using **structural drawings**, reviewers fill out the spacing in column 4, fill out the data source in column 5, and mark check in column 3. **Drawings of reinforcement of beam-column joint aren't mentioned in structural drawings, reviewers ask designer to submit them.**

Reference: BNBC PartVI of column 6, Manual of column 7, and URP checklist of column 8

No.85 This item is for sampling review. If the spacing **and the extension** of **hoop/tie** meets the conditions of column 2, reviewers mark check in column 3.

Reference: BNBC PartVI of column 6 and Manual of column 7

ex) The type of moment resisting frame: IMF (No.33)

Column: 300 mm × 750 mm, Longitudinal rebar: 25 ϕ , **Hoop/Tie**: 10 ϕ

◆ Spacing of end area = 125mm (No.82)

If “Spacing of end area

\leq 8 times of diameter of longitudinal rebar = $8 \times 25 \text{ mm} = 200 \text{ mm}$,

24 times of diameter of **hoop/tie** = $24 \times 10 \text{ mm} = 240 \text{ mm}$,

Half length of short side length of column = 150 mm,

300mm”, hence, judged to be ok.

◆ Spacing of middle area = 200 mm (No.83)

If “Spacing of middle area

\leq 2 times of spacing of end area = $2 \times 125 \text{ mm} = 250 \text{ mm}$ ”, hence, judged to be ok.

◆ Spacing of beam-column joint = 125 mm (No.84)

If “Spacing of beam-column joint \leq Spacing of end area = 125 mm”, hence, judged to be ok.

● Beam

No.86 If the beams are designed in the design report, reviewers fill out the data source in column 5, and mark check in column 3.

No.87 Select one of the beam symbols designed in the design report and reviewers fill out the symbol in column 4, fill out the data source in column 5, and mark check in column 3.

No.88 If the beam of No.87 is described in the structural drawings, reviewers fill out the data source in column 5, and make mark in column 3.

No.89 As for the dimension of the beam of No.87, reviewers fill out the dimension in column 4, fill out the data source in column 5, and mark check in column 3.

No.90 This item is for sampling review. If reviewers have confirmed “width $\geq (0.3h, 250\text{mm})$ ”, mark check in column 3.

Reference: BNBC Part VI of column 6

ex) Beam: $300\text{mm} \times 600\text{mm}$, h: depth of beam=600mm

◆ width=300mm

If “width $\geq 0.3h = 0.3 \times 600\text{mm} = 180\text{mm}, 250\text{mm}$ ”, hence, judged to be ok.

No.91 As for the required area of longitudinal rebar, using computer output, reviewers fill out the value in column 4, fill out the data source in column 5, and mark check in column 3.

Reference: URP checklist of column 8

No.92 As for the diameter and number of longitudinal rebar of No.91, using structural drawings, reviewers fill out the contents in column 4, fill out the data source in column 5, and mark check in column 3.

Reference: URP checklist of column 8

No.93 As for the provided area of longitudinal rebar, using structural drawings, reviewers calculate it and fill out the value in column 4, using structural drawings, fill out the data source in column 5, and mark check in column 3.

Reference: URP checklist of column 8

ex) Column: $6-20 \phi, 20 \phi = 314 \text{ mm}^2$

$\therefore 6 \times 314 \text{ mm}^2 = 1,884 \text{ mm}^2$

No.94 This item is for sampling review. If reviewers have confirmed that required area (No.91) is less than provided area (No.93), mark check in column 3.

Reference: URP checklist of column 8

No.95 As for the development length (l_{dh}) of the beam of No.87, using structural drawings, reviewers fill out the length in column 4, fill out the data source in column 5, and mark check in column 3.

Reference: BNBC Part VI of column 6, Manual of column 7, and URP checklist of column 8

No.96 This item is for sampling review. If the development length (l_{dh}) meets the conditions of column 2, reviewers mark check in column 3.

Reference: BNBC Part VI of column 6, Manual of column 7, and URP checklist of column 8

ex) The type of moment resisting frame: IMF (No.33)

Longitudinal rebar: 20ϕ , db: diameter of longitudinal rebar = 20mm

$f_y=414 \text{ N/mm}^2$, $f'_c=24.13 \text{ N/mm}^2$, $\sqrt{f'_c}=4.91$

◆ $l_{dh}=185 \text{ mm}$ (No.95)

If " $l_{dh} \geq 8db = 8 \times 20 \text{ mm} = 160 \text{ mm}$, 150 mm,

$\leq 0.24f_ydb/\sqrt{f'_c}=0.24 \times 414 \times 20/4.91=404.5 \text{ mm}$ ", hence, judged to be NG※.

※ l_{dh} can be reduced by increasing the amount of beam reinforcement.

See Part 6 Chapter 8 Sec 8.2.6.3 (d).

8.2.6 Development of Standard Hooks in Tension

8.2.6.1 Development length l_{dh} for deformed bars in tension terminating in a standard hook shall be computed as the product of the basic development length for deformed bars, l_{dh} of Sec 8.2.6.2 below and the applicable modification factor(s) of Sec 8.2.6.3, but l_{dh} shall be not less than $8d_b$ nor less than 150 mm.

8.2.6.2 For deformed bars, l_{dh} shall be $\frac{0.24\psi_e f_y d_b}{\lambda \sqrt{f'_c}}$ with ψ_e taken as 1.2 for epoxy-coated reinforcement, and λ taken as 0.75 for lightweight concrete. For other cases, ψ_e and λ shall be taken as 1.0.

8.2.6.3 Length l_{dh} in Sec 8.2.6.2 shall be permitted to be multiplied by the following applicable factors:

--- Text partly omitted ---

(d) Where anchorage or development for f_y is not specifically required, reinforcement in excess of that required by analysis $\left[\frac{A_s \text{ required}}{A_s \text{ provided}} \right]$

[Development length (l_{dh}) check]

FB-1=300X600

For $f_y=414$ MPa, $d_b=20$ mm, $f'_c= 24.13$ MPa

Development length= $0.24 \cdot f_y \cdot d_b / \sqrt{f'_c} = 0.24 \cdot 414 \cdot 20 / \sqrt{24.13} = 404.5$ mm

Available width= 300 mm, Clear width for $l_{dh}=300-40-20-10 = 230$ mm

Number of bar need to increase at first layer = $404.5/230= 1.76$ times

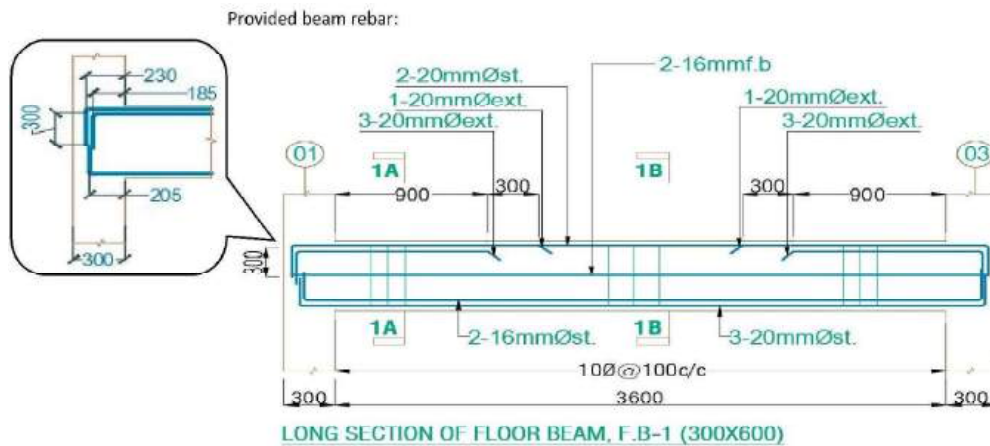
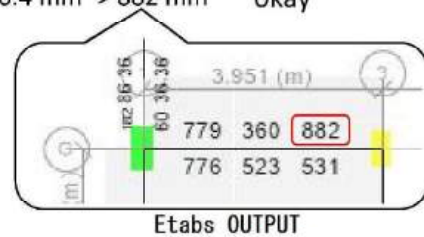
Number of bar need to increase at second layer = $404.5/(230-45) = 2.19$ times

Top rebar

Provided 1st layer reinforcement 3 nos 20mm bar = $3 \cdot 314 \cdot 230 / 404.5 = 535.6$ mm²

Provided 2nd layer reinforcement 3 nos 20mm bar = $3 \cdot 314 \cdot 185 / 404.5 = 430.8$ mm²

Total provided reinforcement = $535.6+430.8= 966.4$ mm² > 882 mm² okay



No.97 As for the extension of the beam of No.87, using **structural drawings**, reviewers fill out the length in column 4, fill out the data source in column 5, and mark check in column 3.

Reference: BNBC Part VI of column 6, Manual of column 7, and URP checklist of column 8

No.98 This item is for sampling review. If reviewers have confirmed “extension $\geq 12db$ ”, mark check in column 3.

Reference: BNBC PartVI of column 6, Manual of column 7, and URP checklist of column 8

ex) Beam: 6-20 ϕ , $db=20$ mm

◆Extension=300 mm (No.97)

If “Extension $\geq 12db = 12 \times 20 = 240$ mm”, hence, judged to be ok.

No.99 As for the diameter of stirrup of the beam of No.87, using **structural drawings**, reviewers fill out the diameter in column 4, fill out the data source in column 5, and mark check in column 3.

Reference: URP checklist of column 8

No.100 As for the spacing of the end (2h) area of stirrup of the beam of No.87, using **structural drawings**, reviewers fill out the spacing in column 4, fill out the data source in column 5, and mark check in column 3.

Reference: BNBC PartVI of column 6, Manual of column 7, and URP checklist of column 8

No.101 As for the spacing of the middle area of stirrup of the beam of No.87, using **structural drawings**, reviewers fill out the spacing in column 4, fill out the data source in column 5, and mark check in column 3.

Reference: BNBC PartVI of column 6, Manual of column 7, and URP checklist of column 8

No.102 This item is for sampling review. If the spacing **and the extension** of the stirrup meets the conditions of column 2, reviewers mark check in column 3.

Reference: BNBC PartVI of column 6, Manual of column 7, and URP checklist of column 8

ex) The type of moment resisting frame: IMF (No.33)

Beam: 300 mm \times 600 mm, h: depth of beam= 600 mm, d: $h-60$ mm=600-60=540 mm

Longitudinal rebar: 20 ϕ , Stirrup: 10 ϕ

◆Spacing of end area = 100 mm (No.100)

If “Spacing of end area

$\leq d/4=540$ mm/4=135 mm,

8 times of diameter of longitudinal rebar = 8×20 mm=160 mm,

24 times of diameter of stirrup = 24×10 mm=240 mm,

300 mm”, hence, judged to be ok.

◆Spacing of middle area = 100 mm (No.101)

If “Spacing of middle area $\leq d/2=540$ mm/2=270 mm”, hence, judged to be ok.

● Shear wall

No.103 If the shear walls are designed in the design report, reviewers fill out the data source in column 5, and mark check in column 3.

No.104 Select one of the shear wall symbols designed in the design report and reviewers fill out the symbol in column 4, fill out the data source in column 5, and mark check in column 3.

No.105 If the shear wall of No.104 is described in the structural drawings, reviewers fill out the data source in column 5, and make mark in column 3.

No.106 As for the thickness of the shear wall of No.104, reviewers fill out the thickness in column 4, fill out the data source in column 5, and mark check in column 3.

Reference: BNBC Part VI of column 6 and URP checklist of column 8

No.107 This item is for sampling review. If reviewers have confirmed “thickness $\geq (h/25, 100\text{mm})$ ”, mark check in column 3.

Reference: BNBC Part VI of column 6 and URP checklist of column 8

ex) story height: 3,000 mm, depth of beam: 600 mm,

h: story height - depth of beam = 3,000 mm - 600 mm = 2,400 mm

◆ Thickness = 300 mm (No.106)

If “Thickness $\geq h/25 = 2400 \text{ mm} / 25 = 96 \text{ mm}, 100 \text{ mm}$ ”, hence, judged to be ok.

No.108 As for the diameter and spacing/number of vertical reinforcement of the shear wall of No.104, using structural drawings, reviewers fill out the contents in column 4, fill out the data source in column 5, and mark check in column 3.

Reference: URP checklist of column 8

No.109 This item is for sampling review. If the vertical reinforcement meets the conditions of column 2, reviewers mark check in column 3.

Reference: BNBC Part VI of column 6 and URP checklist of column 8

ex) The thickness of shear wall: 300 mm, Reinforcement: 2-20 ϕ -@120 mm

If “The thickness of shear wall is 250 mm or more and has two layers reinforcement.”, hence, judged to be ok.

If “Maximum spacing of reinforcement

$\leq 3 \times \text{wall thickness} = 3 \times 300 \text{ mm} = 900 \text{ mm}, 450 \text{ mm}$ ”, hence, judged to be ok.

No.110 As for the required area of vertical reinforcement of No.104, using **computer output**, reviewers fill out the value in column 4, fill out the data source in column 5, and mark check in column 3.

Reference: URP checklist of column 8

No.111 As for the provided area of vertical reinforcement, using **structural drawings**, reviewers calculate it and fill out the value in column 4, fill out the data source in column 5, and mark check in column 3.

Reference: URP checklist of column 8

ex) The total number of vertical reinforcement: 28

vertical reinforcement: 20ϕ , $20 \phi = 314 \text{ mm}^2$

$\therefore 28 \times 314 \text{ mm}^2 = 8,792 \text{ mm}^2$

No.112 This item is for sampling review. If reviewers have confirmed that required area (No.110) is less than provided area (No.111), mark check in column 3.

Reference: URP checklist of column 8

No.113 As for the diameter and spacing of horizontal reinforcement of No.104, using **structural drawings**, reviewers fill out the contents in column 4, fill out the data source in column 5, and mark check in column 3.

Reference: URP checklist of column 8

No.114 This item is for sampling review. If the horizontal reinforcement meets the conditions of column 2, reviewers mark check in column 3.

Reference: BNBC Part VI of column 6 and URP checklist of column 8

ex) The thickness of shear wall: 300 mm, Reinforcement: 2-12 ϕ -@75 mm

If “The thickness of shear wall is 250 mm or more and has two layers reinforcement.”,

hence, judged to be ok.

If “Maximum spacing of reinforcement

$\leq 3 \times \text{wall thickness} = 3 \times 300 \text{ mm} = 900 \text{ mm}$, 450 mm”, hence, judged to be ok.

● Slab

No.115 As for the type of slab, reviewers fill out the type in column 4, fill out the data source in column 5, and mark check in column 3.

Reference: BNBC Part VI of column 6

No.116 If slab schedules are described in **structural drawings**, reviewers fill out the data source in column 5, and mark check in column 3.