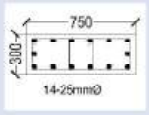
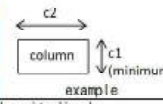
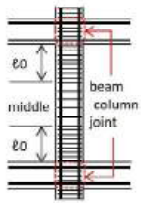
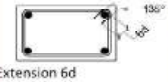
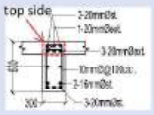
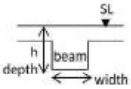
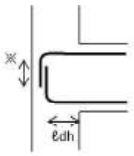
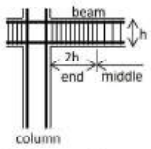
Element	No.	Item		confirm	not confirm	De
Column  ex) Schedule	68	design	Columns are designed in the design report. (mentioned/not)	☑	☐	
	69	symbol	Select one of the column symbols designed in the design report and describe it (any of them). ex) 【3F/C2】	☑	☐	
	70	Schedule	column schedule above in the structural drawing. The following is a review of this column.	☑	☐	
	71	Cross-sectional shape  example	Dimension of section of column above →describe the dimension. ex) 300mm×750mm	☑	☐	
	72		★Comfirm below ・c1 ≧ 300mm ・c2 ≦ c1×2.5	☑←		Sa
	73	longitudinal rebar	Required reinforcement ratio of column above from computer output →Describe it. ex) 3.06%	☑	☐	
	74		longitudinal rebars of column above from structural drawing are over 4. →Describe the number of longitudinal rebars & diameter(φ). ex) 14-25φ	☑	☐	
	75		Calculate the total cross-sectional area of longitudinal rebar above from structural drawing (Nominal cross-sectional area : 16φ＝201㎟, 20φ＝314㎟, 22φ＝380㎟, 25φ＝491㎟) →Describe it. ex) 14×491＝6874㎟	☑	☐	
	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%	☑	☐	
	77		★Confirm the consistency of reinforcement ratio of column (%) between computer output and structural drawing. ・Required (%) ＝ Provided (%)	☑←		Sa
	78		★Ast satisfies the following. 0.01Ag ≦ Ast ≦ 0.06Ag or 0.04Ag※ (※preferred not to exceed 0.04Ag)	☑←		Sa
	79		Capacity ratio of column above.	☑	☐	
	80		★Capacity ratio is confirm below. Capacity ratio ≦ 1.0	☑←		Sa
	81	hoop/tie	Diameter of hoop/tie →Describe it. ex) 10φ	☑	☐	
	82		Spacing of the end (ℓ0) area →Describe it. ex) 125mm	☑	☐	
	83		Spacing of the middle area →Describe it. ex) 200mm	☑	☐	
	84		Spacing of the beam-column joint →Describe the pitch. ex) 125mm (Check if there is a reinforcement drawing of this.)	☑	☐	
	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 ≧60mm (OMF) ≧75mm (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 ≒ Spacing of end area [SMF] Spacing of end area ≦ one-quarter of minimum dimension of column. 6 times of diameter of longitudinal rebar of column. 100～150mm Spacing of middle area ≦ 2 times of spacing of end area. Spacing of beam-column joint ≒ 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).	☑←		Sa

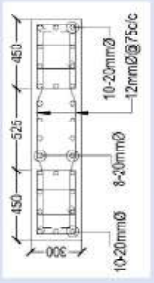
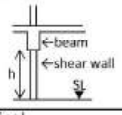
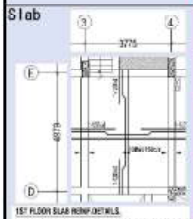
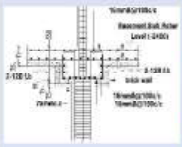
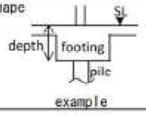
Describe the Contents of the Confirmation	Data source page or No. D:Design Report A:Architectural Drawing S:Structural Drawing	Data source			BNBC2020 PartVI	Manual page	URP P-S	Remarks
		DESIGN REPORT	Architectural DRAWING	Structural DRAWING				
-	D-54-56	○			-	-	-	
【3F/C2】	D-54-56	○			-	-	-	
-	S-S14			○	-	-	-	
300mm×750mm	S-S14			○	-	-	-	
Satisfactory	-				Sec 8.3.5.1 Fig 6.8.6	-	-	
3.06%	D-56	○ output			Sec 6.3.9.1	-	23, 69	
14-25φ	S-S14			○	Sec 6.3.9.2	-	24, 69	
14×491=6874㎟	-			○	-	-	-	
6874/(300×750) ×100=3.06%	-			○	Sec 6.3.9.1	-	23, 69	
Satisfactory	-				-	-	-	
Satisfactory	-				Sec 6.3.9.1	-	69	
0.808	D-57-62	○			-	-	69	
Satisfactory	-				-	-	69	
10φ	S-S14a			○	-	-	69	
125mm	S-S14a			○			69	
200mm	S-S14a			○			69, 82	
125mm	S-S14a, S17a			○			62, 69	
Satisfactory	-				OMF:Sec 8.3.9 IMF:Sec 8.3.10.5 (a) 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
Beam  ex) Schedule	86	design	Beams are designed in the design report.	☑	☐	
	87	symbol	Select one of the beam symbols designed in the design report and describe it (any of them). ex) [Story3&4/F.B-1]	☑	☐	
	88	Schedule	Beam schedule above in the structural drawing. The following is a review of this beam.	☑	☐	
	89	Cross sectional shape  	Dimention of section of beam above mentioned. →describe the length. ex) 300mm×600mm	☑	☐	
	90		★Comfirm below (h is depth of beam) ・width ≧ (0.3h、250mm)	☑←		Sat
	91	longitudinal rebar	Required area of longitudinal rebar above from computer output (top side of the end of the beam) →describe it. ex) 962㎟	☑	☐	
	92		Diameter and number of longitudinal rebar above from structural drawing (top side of the end of the beam). →describe it. ex) 6-20φ	☑	☐	
	93		Calculate the provided area of longitudinal rebar above from structural drawing. (Nominal cross-sectional area : 16φ＝201㎟, 20φ＝314㎟, 22φ＝380㎟, 25φ＝491㎟) →describe it. ex) 6×314=1884㎟	☑	☐	
	94		★Comfirm below ・required area ≦ provided area	☑←		Sat
	95	development length extension	Development length (ℓdh) →describe it. Ex) 185mm	☑	☐	
	96	 Note:Transverse reinforcement not shown for clarity	★Confirm below. (db is diameter of longitudinal rebar.) ・OMF doesn't have a specific stipulation (follow IMF). ・IMF : ℓdh≧ (8db、150mm、0.24fydb/√f'c) ・SMF : ℓdh≧ (8db、150mm、fydb/5.4√f'c)	☑←		Sat
	97		Extension (※ mark length on the left side figure) →describe it. ex) 300mm	☑	☐	
	98		★Confirm below. (db is diameter of longitudinal rebar.) ・Extension ≧ 12db	☑←		Sat
	99	stirrup  Note:Transverse reinforcement of column not shown for clarity	Diameter of stirrup →Describe it. ex) 10φ	☑	☐	
	100		Spacing of the end (2h) area →describe it. ex) 100mm	☑	☐	
	101		Spacing of the middle area →Describe it. ex) 100mm	☑	☐	
	102	a 135° bend plus an Extension at the free end of the bar  Extension 6d ■stirrup ≧75mm (OMF, IMF,SMF)	★Confirm below. (d≒h-60mm) ・OMF doesn't have a specific stipulation (follow IMF). [IMF, SMF] Spacing of end area ≦ d/4. 8 times of diameter of longitudinal rebar, 24 times of diameter of stirrup, 300mm Spacing of middle area ≦ d/2 [Extension of 135° hook/bend] More than 6 times the stirrup diameter and 75mm (for OMF, IMF, SMF).	☑←		Sat

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-71-94	○			-	-	-	
【Story3&4/F.B 1】	D-84, 85, 94	○			-	-	-	
-	S-S53, S57			○	-	-	-	
300mmx600mm	D-9 S-S53, S57			○	-	-	-	
Satisfactory	-				Sec 8.3.4.1 Fig 6.8.1	-	-	
962㎟	D-85,94	○ output			-	-	69	
6-20φ	S-S57			○	-	-	69	
6×314=1884㎟	D-85,94 S-S57			○	-	-	69	
Satisfactory	-				-	-	69	
185mm	S-S57			○				
Satisfactory	-				Sec 8.2.6 Sec 8.3.7.4	Annex (6) A-7, 8	65, 72	
300mm	S-S57			○				
Satisfactory	-				Sec 8.1.2.1	Annex (6) A-6	62, 72	
10φ	S-S57			○	-	-	69	
100mm	S-S57			○			69	
100mm	S-S57			○			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.	☑	☐	
	104	symbol	Select one of the shear wall symbols designed in the design report and describe it (any of them). ex) 【Story1/SW-3】	☑	☐	
	105	Schedule	Shear wall schedule above in the structural drawing. The following is a review of this shear wall.	☑	☐	
	106	thickness	Thickness of section of shear wall above →describe the thickness. ex) 300mm	☑	☐	
	107		★Comfirm below thickness ≧ h/25 and 100mm (h=supported hight or length)	☑		Sa
	108	Vertical reinforcement	Diameter and spacing/number of the vertical reinforcement →describe it. ex) 2-20φ-@120 (If the number is displayed (such as the left side schedule), the spacing is estimated from the drawing.)	☑	☐	
	109		★Comfirm 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.	☑		Se
	110		Computer output of required area of vertical reinforcement above →describe it. ex) 4303㎟	☑	☐	
	111		Calculate the actual provided area of vertical reinforcement above. →describe it. ex) 28×314=8792㎟	☑	☐	
	112		★Comfirm below ・required area ≦ provided area	☑		Sa
	113	Horizontal reinforcement	Diameter and spacing of the horizontal reinforcement →describe it. ex) 2-12φ-@75	☑	☐	
	114		★Comfirm 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.	☑		Sa
Slab  ex) Schedule	115	Type	The type of slab →Describe it. ex) Beam supported cast in suit slab	☑	☐	
	116	Schedule	Slab schedule in the structural drawing. The following is a review of this slab.	☑	☐	
	117	symbol	Select one of the slab symbols in the structural drawings and describe it (any of them). ex) 【1st floor】	☑	☐	
	118	thickness	Thickness of the slab above →descrive it. ex) 125mm	☑	☐	
	119		★Comfirm below ・thickness ≧ 125mm	☑		Sa
Foundation  ex) Schedule	120	Type	The type of foundation →Describe it. ex) pile foundation	☑	☐	
	121	Schedule	Footing or Pilecap schedule in the structural drawings. The following is a review of this foundation.	☑	☐	
	122	symbol	Select one of the foundation symbols in the structural drawings and describe it (any of them). ex) 【PC-1】	☑	☐	
	123	shape  example	Depth of footing above →describe it. ex) 550mm	☑	☐	
	124		★Depth of footing is subject to the following. ・depth ≧ 150mm(on soil)(Column Footing) ・depth ≧ 300mm(on pile)(Pilecap)	☑		Se
	125	length of pile	length of Pile →If applicable, describe the length of the pile. ex) 29700mm	☑	☐	
Additional Considerations				☐	☐	

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-63-70	○			-	-	-	
【story1/SW-3】	D-68, 70	○			-	-	-	
-	S-S16			○	-	-	-	
300mm	S-S16			○				
Satisfactory	-				Sec 6.6.5.3	-	30	
2-20φ-@120	S-S16			○	-	-	69	
Satisfactory	-				Sec 6.6.3.4 Sec 6.6.3.5	-	35, 36, 69	
4303㎡	D-70	○ output			-	-	69	
28×314=8792㎡	D-70 S-S16			○	-	-	69	
Satisfactory	-				-	-	69	
2-12φ-@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	○		○				
Satisfactory	-				Sec 6.2.5	-	41, 50, 51	
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.

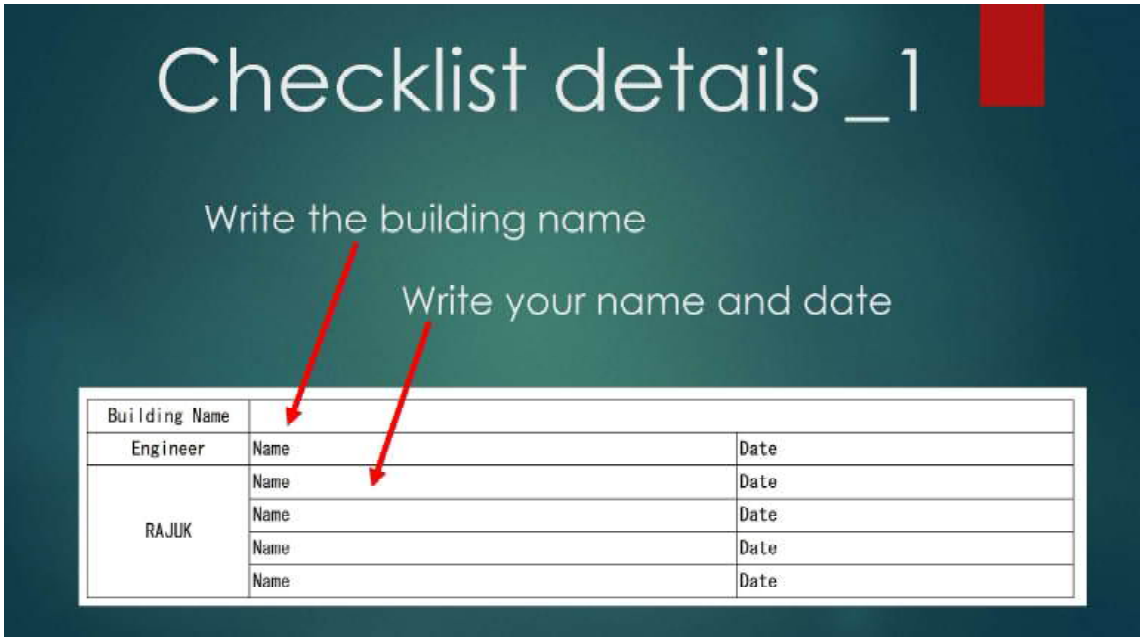
-Column no. 6 indicates corresponding BNBC2020 reference article and section respectively.

-Column no. 7 indicates corresponding page of the Manual.

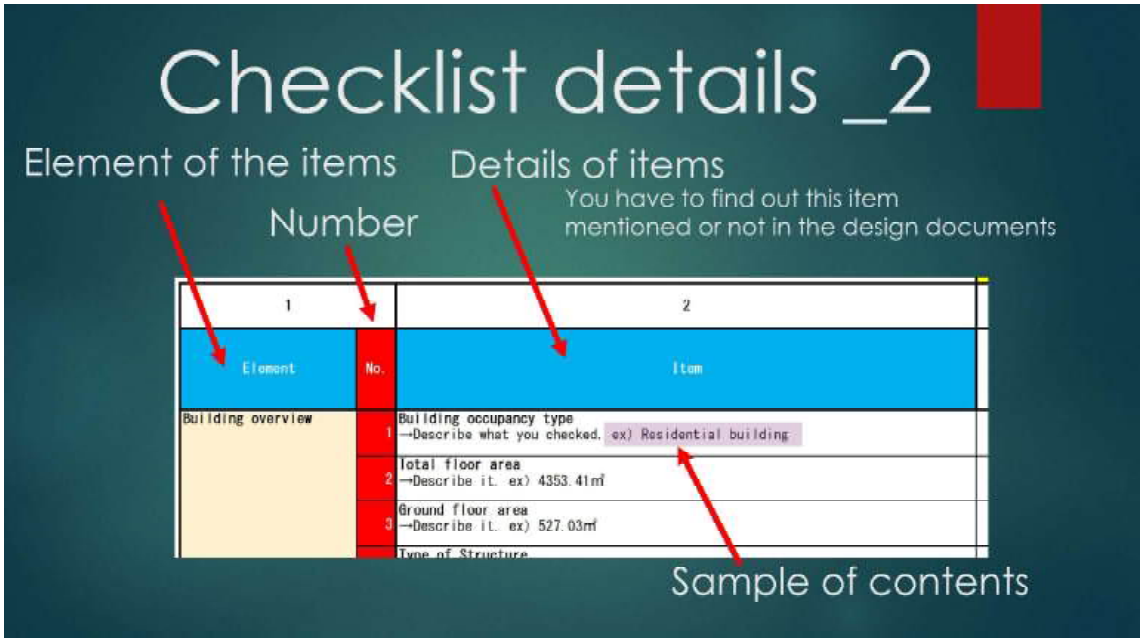
-Column no. 8 indicates corresponding number of the URP checklist.

-Column no. 9 is used for remarks.

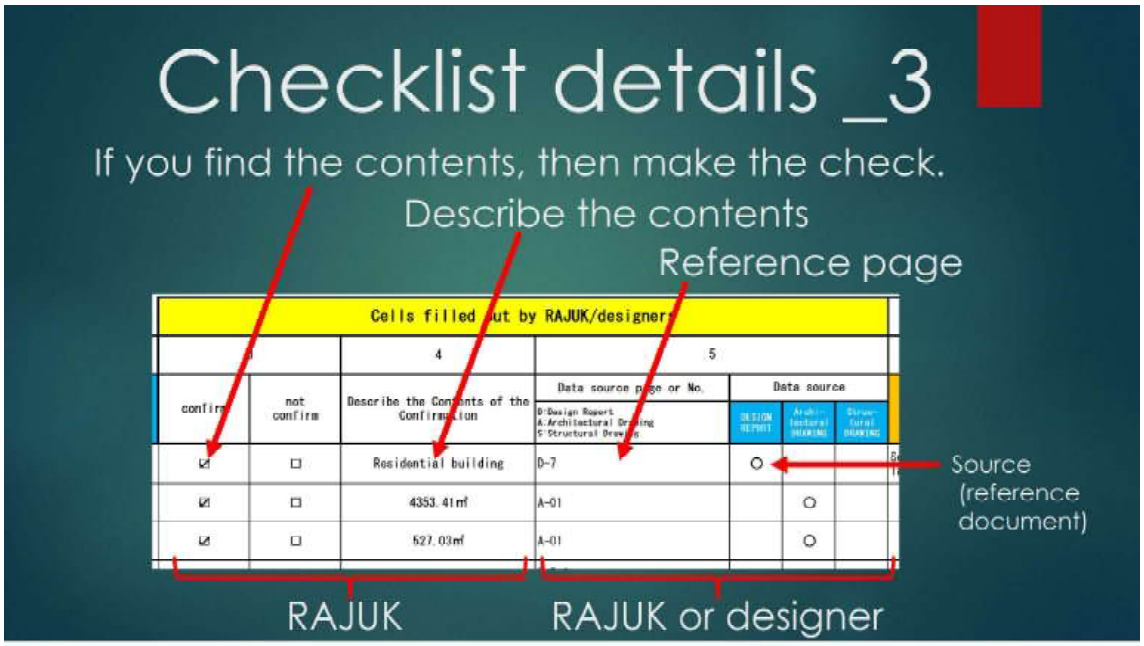
■Building name and reviewers name



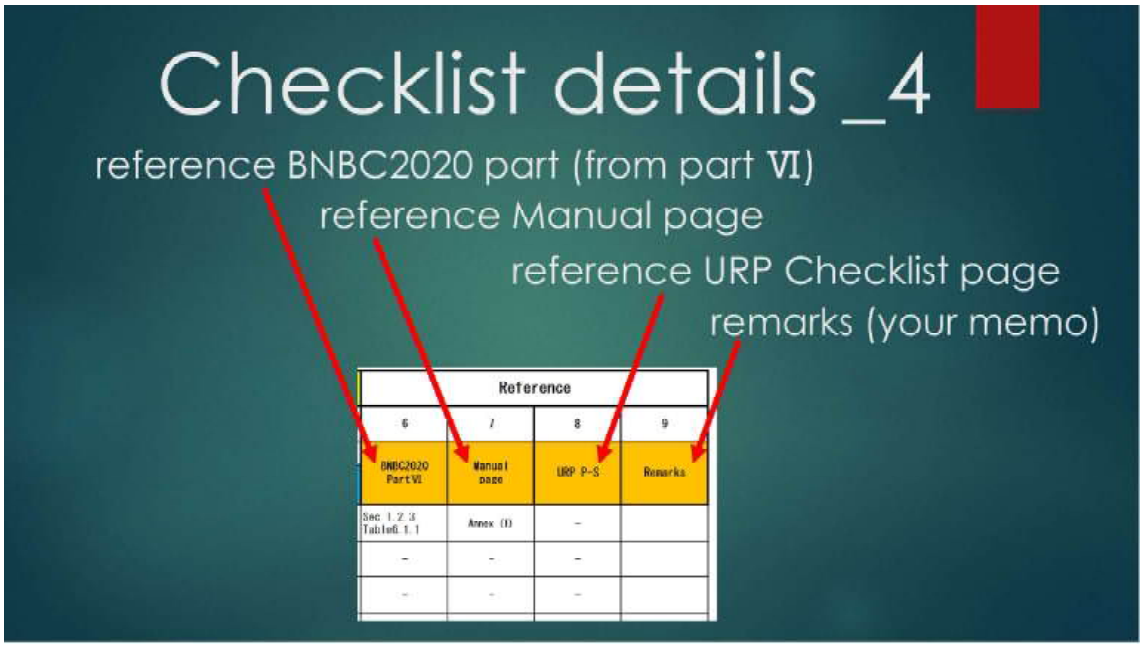
■Column 1 and 2



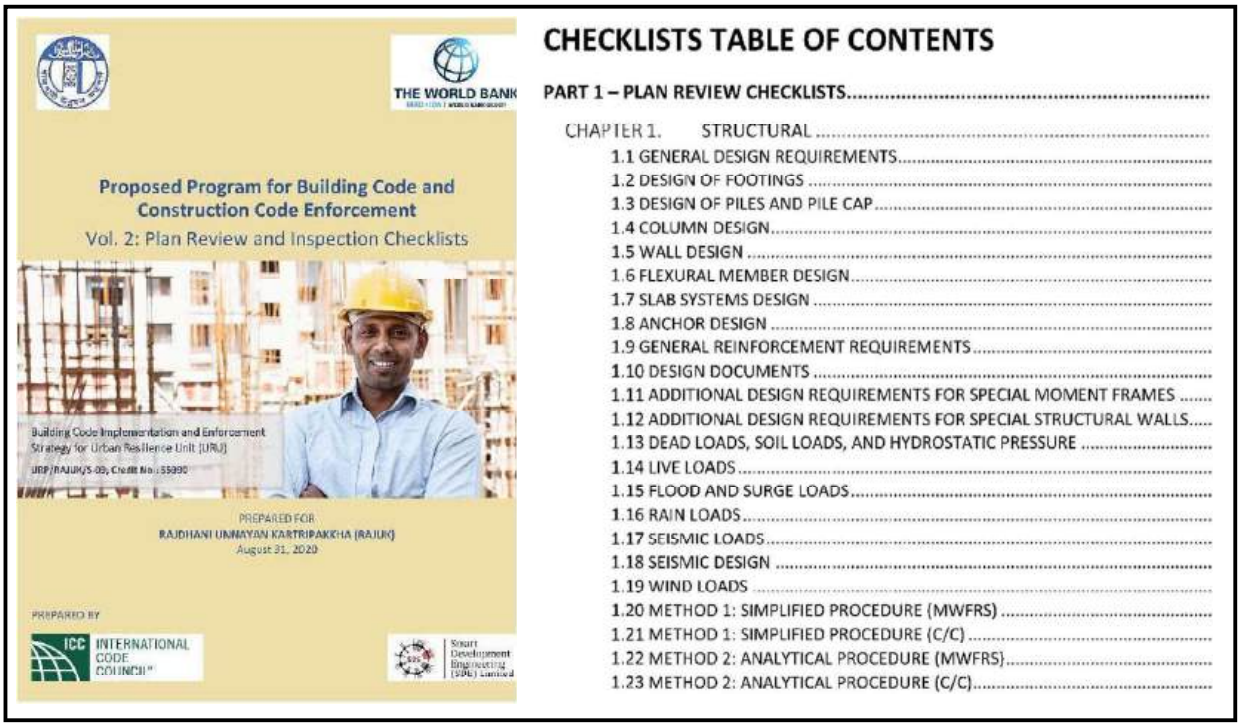
■Column 3, 4 and 5



■Column 6, 7, 8 and 9

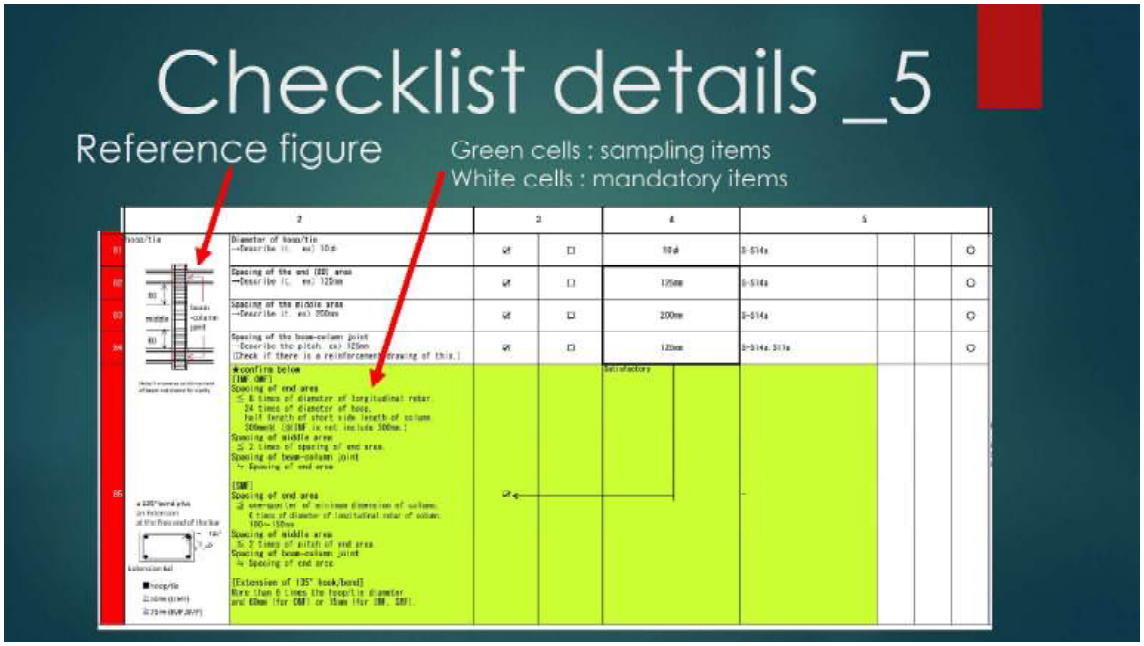


reference documents of column 8 (URP Checklist)



■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)



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, $\overline{Vs}$, $\overline{N}$, and $\overline{Su}$, 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, tortional 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 PartⅥ 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 PartⅥ 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)

$\delta_x = \delta_{xe} \cdot Cd / I$ (by Equation 6.2.45 of BNBC PartⅥ)
$\Delta_x = \delta_x - \delta_{x-1}$ (by Equation 6.2.46 of BNBC PartⅥ)
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)

$\therefore \Delta_x = (\delta_x - \delta_{x-1}) = (\delta_{xe} - \delta_{(x-1)e}) \cdot Cd / I \leqq \Delta_a = 0.020h_{sx}$
$\rightarrow (\delta_{xe} - \delta_{(x-1)e}) / h_{sx} \leqq 0.020 \times I / Cd = 0.020 \times 1.00 / 5 = 0.004$
If "story drift ($= (\delta_{xe} - \delta_{(x-1)e}) / h_{sx}$) $\leqq 0.004$", 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.	$0.025h_{sx}$	$0.020h_{sx}$	$0.015h_{sx}$
Masonry cantilever shear wall structures	$0.010h_{sx}$	$0.010h_{sx}$	$0.010h_{sx}$
Other masonry shear wall structures	$0.007h_{sx}$	$0.007h_{sx}$	$0.007h_{sx}$
All other structures	$0.020h_{sx}$	$0.015h_{sx}$	$0.010h_{sx}$

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 PartⅥ 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 ≦ 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 PartⅥ 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 PartⅥ 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 PartⅥ 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 ≧ 7 days at 10℃ 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 PartⅥ 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 PartⅥ of column 6

●Concrete compressive strength fc'

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 PartⅥ 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 PartⅥ 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 PartⅥ 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 = 31N/㎟ ≧ 20N/㎟", hence, judged to be ok.

If "Beam f´c = 24.13N/㎟ ≧ 20N/㎟", hence, judged to be ok.

If "Shear Wall f´c = 31N/㎟ ≧ 20N/㎟", hence, judged to be ok.

If "Slab f´c = 24.13N/㎟ ≧ 20N/㎟", 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 PartⅥ 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 PartⅥ 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 PartⅥ of column 6 and URP checklist of column 8

ex) cast in suit pile (from No.60)
If "Pile f´c = 21N/㎟ ≧ 18N/㎟", hence, judged to be ok.
If "Pole cap f´c = 31N/㎟ ≧ 18N/㎟", hence, judged to be ok.

●Steel yield strength

No.62 As for the steel yield strength of longitudinal rebar (fy), 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 PartⅥ 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 (fy) 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 "fy = 414 N/㎟ ≦ 550N/㎟", hence, judged to be ok.

No.64 As for the steel yield strength of transverse rebar (fyt), 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 fyt isn't described, the value of fy is adopted.
Reference: BNBC PartⅥ of column 6, Manual of column 7, and URP checklist of column 8

No.65 This item is fro sampling review. If steel yield strength (fyt) 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 "fyt = 414 N/㎟ ≦ 550N/㎟", hence, judged to be ok.

●Lap splices

No.66, 67

As for the position of lap splices (ℓd) 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 ㎜

Perpendicular dimension (c2) ≦ c1 × 2.5

Reference: BNBC PartVI of column 6

ex) If "c1 = 300 ㎜ ≧ 300 ㎜", hence, judged to be ok.

If "c2 = 750 ㎜ ≦ c1 × 2.5 = 300 ㎜ × 2.5 = 750 ㎜", 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 PartⅥ 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 ㎟
∴14×491 ㎟=6,874 ㎟

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 PartⅥ of column 6 and URP checklist of column 8

ex) Total cross-sectional area of longitudinal rebar (Ast) = 14 × 491 ㎟ = 6,874 ㎟
Gross area of concrete section (Ag)=300 ㎜ × 750 ㎜ = 225,000 ㎟
Reinforcement ratio of longitudinal rebar = ρ_g = Ast/Ag = 6,874/225,000 = 0.03055 →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 Ast is between 0.01Ag and 0.06Ag, mark check ☑ in column 3.
Reference: BNBC PartⅥ 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 (ℓ0) 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 ㎜×750 ㎜, Longitudinal rebar: 25 ϕ , Hoop/Tie: 10 ϕ

◆Spacing of end area = 125mm (No.82)
If "Spacing of end area
≦ 8 times of diameter of longitudinal rebar = 8×25 ㎜=200 ㎜,
24 times of diameter of hoop/tie = 24×10 ㎜=240 ㎜,
Half length of short side length of column = 150 ㎜,
300mm", hence, judged to be ok.

◆Spacing of middle area = 200 ㎜ (No.83)
If "Spacing of middle area
≦ 2 times of spacing of end area = 2×125 ㎜=250 ㎜", hence, judged to be ok.

◆Spacing of beam-column joint = 125 ㎜ (No.84)
If "Spacing of beam-column joint≒Spacing of end area = 125 ㎜", 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 ≧ (0.3h, 250mm)", mark check ☑ in column 3.
Reference: BNBC PartⅥ of column 6

ex) Beam: 300mm×600mm, h: depth of beam=600mm
◆width=300mm
If "width ≧ 0.3h = 0.3×600mm=180mm, 250mm", 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 ϕ , 20 ϕ =314 ㎟
∴6×314 ㎟=1,884 ㎟

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 (ℓdh) 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 PartⅥ 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 (ℓdh) 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)
Longitudinal rebar: 20 ϕ , db: diameter of longitudinal rebar = 20mm
fy=414 N/㎟, f´c=24.13 N/㎟, √f´c=4.91

◆ℓdh=185 ㎜ (No.95)
If "ℓdh ≧ 8db = 8×20 ㎜=160 ㎜, 150 ㎜,
≦ 0.24fydb/√f´c=0.24×414×20/4.91=404.5 ㎜", hence, judged to be NG※.
※ ℓdh 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 $\left[\frac{A_{s\,required}}{A_{s\,provided}}\right]$

[Development length (ℓdh) check]

FB-1=300X600

For fy=414 MPa, db=20mm, f'c= 24.13 MPa

Development length= 0.24*fy*db/√f'c = 0.24*414*20/√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

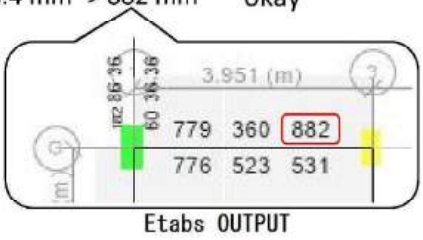
Number of bar need to increase at second layer = 404.5/(230-45) = 2.19 times

Top rebar

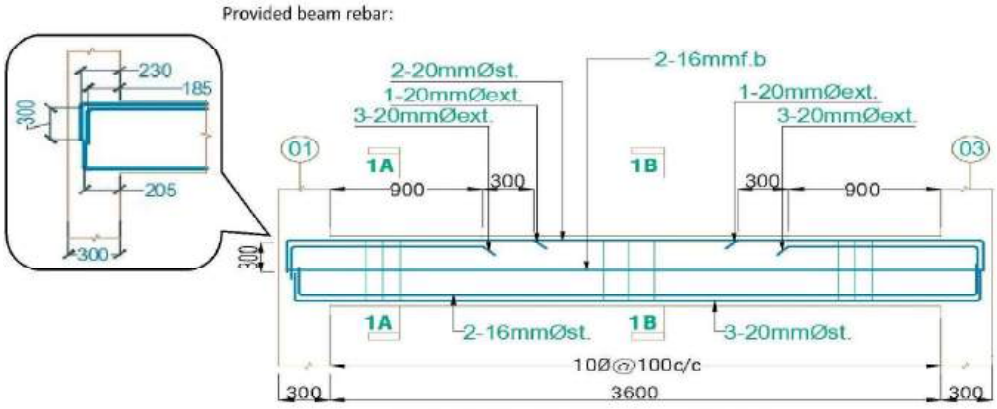
Provided 1st layer reinforcement 3 nos 20mm bar = 3*314*230/404.5 = 535.6 mm^2

Provided 2nd layer reinforcement 3 nos 20mm bar = 3*314*185/404.5 = 430.8 mm^2

Total provided reinforcement = 535.6+430.8= 966.4 mm^2 > 882 mm^2 okay



Etabs OUTPUT



LONG SECTION OF FLOOR BEAM, F.B-1 (300X600)

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 PartⅥ 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 ≧ 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 ㎜
◆Extension=300 ㎜ (No.97)
If “Extension ≧ 12db = 12×20=240 ㎜”, 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 ㎜×600 ㎜, h: depth of beam= 600 ㎜, d: h-60 ㎜=600-60=540 ㎜
Longitudinal rebar: 20 ϕ , Stirrup: 10 ϕ
◆Spacing of end area = 100 ㎜ (No.100)
If “Spacing of end area
≦ d/4=540 ㎜/4=135 ㎜,
8 times of diameter of longitudinal rebar = 8×20 ㎜=160 ㎜,
24 rimes of diameter of stirrup = 24×10 ㎜=240 ㎜,
300 ㎜”, hence, judged to be ok.
◆Spacing of middle area = 100 ㎜ (No.101)
If “Spacing of middle area ≦ d/2=540 ㎜/2=270 ㎜”, 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 PartⅥ of column 6 and URP checklist of column 8

No.107 This item is for sampling review. If reviewers have confirmed "thickness ≧ (h/25, 100mm)", mark check ☑ in column 3.
Reference: BNBC PartⅥ of column 6 and URP checklist of column 8

ex) story hight: 3,000 ㎜, depth of beam: 600 ㎜,
h: story hight - depth of beam=3,000 ㎜-600 ㎜=2,400 ㎜
◆Thickness=300 ㎜ (No.106)
If "Thickness ≧ h/25 = 2400 ㎜/25=96 ㎜, 100 ㎜", 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 PartⅥ of column 6 and URP checklist of column 8

ex) The thickness of shear wall: 300 ㎜, Reinforcement: 2-20φ-@120 ㎜
If "The thickness of shear wall is 250 ㎜ or more and has two layers reinforcement.",
hence, judged to be ok.
If "Maximum spacing of reinforcement
≦ 3×wall thickness=3×300 ㎜=900 ㎜, 450 ㎜", 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: 20 ϕ , 20 ϕ =314 ㎟
∴28×314 ㎟=8,792 ㎟

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 PartⅥ of column 6 and URP checklist of column 8

ex) The thickness of shear wall: 300 ㎜, Reinforcement: 2-12 ϕ -@75 ㎜
If "The thickness of shear wall is 250 ㎜ or more and has two layers reinforcement.", hence, judged to be ok.
If "Maximum spacing of reinforcement
≦ 3×wall thickness=3×300 ㎜=900 ㎜, 450 ㎜", 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 PartⅥ 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.