ANNEX 20

Checklist for control of the design

The design control should be carried out on the design documents. As a guide, the checklist for each document shall be as follows.

1. Calculation report

1.1. Geometric study

1.2. Geotechnical report

Check that the report specifies:

a) Relevant recommendations for definition of the foundations;
b) strength, strain and ground stability properties;
c) groundwater level;
d) geotechnical characteristics of the ground that can produce or mobilize thrust;
e) aggressivity properties of soil; and
f) aggressivity characteristics of groundwater in contact with the foundations.

1.3. Actions

1.3.1. Identification and consistency,

a) Types of actions
   a.1) direct and indirect;
   a.2) fixed and variable;
   a.3) permanent, variable and accidental.

b) These agree with
   b.1) standards on actions corresponding to the type of structure in question;
   b.2) geotechnical report;
   b.3) specific documents on actions to be considered, accepted by the Owner.

1.3.2. Actions during the construction process

Check whether actions have been evaluated during the construction process by examining

a) incidence in force calculations; and
b) effect on sizing.

1.4. Structural proposal

Check whether the structural layout adopted guarantees

a) overall structure stability;
b) stability of each one of its parts; and
c) stability during the stages of the construction process

1.5. Structural models

Check whether

a) they are correct and consistent with sizing criteria with regard to final structure; and
b) they are correct and consistent with sizing with regard to construction process stages.

1.6. Calculation of forces

1.6.1. Combinations of actions

Check whether
a) the action combinations considered are relevant; and
b) the action combinations not considered are irrelevant.

1.6.2. Weighting coefficients;

Check whether

a) partial safety coefficients of actions are adapted to those laid down by specific current regulations or otherwise to those indicated in this Code; and
b) combination coefficients are adapted to those laid down in the specific regulations or otherwise those indicated in this Code.
c) they comply with conditions for reduction of partial material coefficients, where applicable

1.6.3. Calculations methods or computer programs used

Check whether the calculations programs or methods used

a) are correctly specified in accordance with the provisions of the standards; and
b) are approved as acceptable.

1.6.4. Data entry in programs for the calculation of forces

Check whether these agree with:

a) the structural proposal adopted;
b) the model adopted;
c) the geometry of the structure;
d) the suggested combination of significant actions

1.6.5. Outputs of results of calculation programs

Check whether the results are consistent with the models used and the actions adopted, having carried out an independent evaluation of forces on a significant sample of selected components in accordance with structural importance and representativeness criteria. The following aspects shall be officially noted in accordance with the level of control (table 82.2):

a) sample selected;
b) selection criteria
c) check processes;
d) assumptions adopted; and
e) results obtained

1.6.6. Consideration of the construction process

Check whether forces have been evaluated during the construction process, particularly during falsework installation, to establish limits and factors conditioning the structure. Depending on the control level (table 82.2) officially note whether:

a) the loads transmitted during falsework installations are evaluated;
b) the transmitted load evaluations are correct;
c) the conclusions are correct;
d) additional studies are required.

1.7. Checking of limit states

1.7.1. Consistency between the results of the calculation and checking forces

Check the suitability of the forces adopted in limit state checks. Depending on the control level (table 82.2) take the sample corresponding to the structural components shown in this table.

1.7.2. Characteristics of materials and reduction factors

Check whether the characteristics of materials and their partial safety factors are correctly specified for:

a) concrete;
b) steel for reinforcements

1.7.3. Dimensioning and checking

Examine whether the dimensioning of sections and elements and also checks on ultimate and serviceability limit states are in accordance with the standards. Depending on the control level (table 82.2), take the sample corresponding to the structural components shown in this table.

1.7.4. Durability

Check whether specifications relating to durability are met with regard to:

a) exposure class;
b) concrete specification and justification of cement type; and
c) covers

1.7.5. Fire resistance

Check whether specifications relating to fire resistance are met with regard to:

a) fire resistance times;
b) mechanical covers;
c) thicknesses; and
d) additional studies required.

1.7.6. Seismic resistance

Check whether specifications relating to seismic behaviour are met with regard to:

a) suitability of structural hypothesis;
b) seismic area;

c) construction class;
d) workability:
e) ties; and
f) other aspects.

1.7.7. Consistency of dimensioning with the models

Check whether the dimensioning results are consistent with the models used by carrying out an independent evaluation of dimensioning by means of safety checks, strain checks and other relevant limit states, on a significant sample of components chosen in accordance with criteria of structural importance and representativeness. Depending on the inspection level (table 82.2), take a corresponding sample, identifying:

a) sample selected;
b) selection criteria;
c) check processes;
d) assumptions adopted; and
e) results obtained

1.7.8. Impact on the construction process

Check whether the effects of dimensioning on the construction process have been evaluated, particularly during falsework installation, to establish their limitations and conditioning effects on the structure. Depending on the inspection level (table 82.2), take the corresponding sample and note officially whether:

a) the loads transmitted during falsework installations have been evaluated;
b) the transmitted load evaluations are correct;
c) the conclusions are correct;
d) additional studies are required.

1.7.9. Case of specific elements

If particular components are present, such as special supports, corbels or wall beams take a sample check to evaluate whether the dimensioning is correct. Depending on the inspection level (table 82.2), take the corresponding sample and note officially whether:

a) samples selected;
b) selection criteria;
c) check processes;
d) assumptions adopted; and
e) results obtained

1.7.10. Consistency with geotechnical report

Check whether the foundation component dimensioning respects the conclusions in the geotechnical report with regard to:

a) foundation type;
b) cement type;
c) covers;
d) permissible pressure; and
e) differential movements.

2. Drawings

2.1. Consistency with calculation report

Check whether the force and dimensioning calculation results have been respected by checking a significant sample of elements selected in accordance with criteria of structural importance and representativeness. Depending on the inspection level (table 82.2), take a corresponding sample and note officially whether:

a) samples selected;
b) selection criteria;
c) check processes;
d) assumptions adopted; and
e) results obtained

2.2. Consistency with other definition drawings of the work

Check whether the layout, squares and dimensions of the various structural components, openings affecting the structural behaviour of components and other conditioning factors that may affect the structure defined in non-structural drawings have been taken into consideration in these structural drawings and to define the structural model.

Depending on the control level (table 82.2), take a corresponding sample and note officially whether:

a) samples selected;
b) selection criteria;
c) check processes;
d) assumptions adopted; and
e) results obtained

2.3. Graphic documentation

Depending on the control level (table 82.2), take a corresponding sample, identifying.

a) foundations;
b) walls and buttresses;
c) pillars;
d) beams;
e) slabs and flooring; and
f) special components.

It shall be included:

a) samples selected;
b) selection criteria;
c) check processes;
d) assumptions adopted; and
e) results obtained

Check by sampling in accordance with the inspection level (table 82.2):

a) whether the layout heights, the squares and dimensions of the various structural components agree with the forecast figures in the structural model adopted;
b) whether construction openings have been allowed for in the installations and whether these agree with the assumptions made when calculating forces and dimensions;
c) whether provisions for reinforcements in cross-sections and reinforcements diagrams have been defined by means of detailed quartering views that allow the steelwork to be processed and facilitate the positioning of reinforcements in the

parts to make them viable;

d) whether the reinforcement overlaps and anchorages and their bending radiuses have been defined or whether clear criteria have been laid down for their definition;
e) whether reinforcement transitions have been defined at joints and their construction viability evaluated;
f) whether details of the support of prefabricated or composite parts have been defined as a function of the supposed joint actions in the structural model and their required stability conditions;
g) whether geometrical conditions have been defined together with other details to be met by the surroundings of parts of a lightening nature, depending on their influence in the definition of the resistance section of composite parts;
h) whether the covers have been respected in accordance with the environmental exposure and fire resistance conditions;
i) whether all these structural elements have been defined without any gaps in their definition or severe lack of information on components; and
j) whether the material characteristics partial safety coefficients adopted and associated inspection levels have been defined.
k) whether the geotechnical characteristics for the design have been described.
l) whether the proposed construction process has been defined, where necessary.

3. Technical specifications

3.1. Consistency with calculation report

It shall be checked

a) whether the material and construction specifications have been met and also its associated reception control levels specified in the calculation report;
b) whether aspects have been specified such as wall backfill conditions that affect ground thrust, respecting the assumptions laid down in the calculation reports; and
c) whether the essential aspects of the construction process affecting the structural models have been specified together with actions adopted in the force calculation and in the ultimate and serviceability limit checks.

3.2. Consistency with structural plans

A check shall be carried out to ensure that the material and construction specifications have been met and also its associated reception control levels specified in the calculation report.

3.3. Tolerances

A check shall be carried out to ensure that the dimensional tolerances have been specified or specifically referred to in order to adopt those given in the standards.