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STEELWORK NOTES:

- ALL STRUCTURAL STEELWORK SHALL BE DESIGNED AND DETAILED IN ACCORDANCE WITH BS EN 1993 AND BS EN 1994 AND EXECUTED IN ACCORDANCE WITH BS EN 1090.
- UNLESS NOTED OTHERWISE STRUCTURAL STEELWORK SHALL BE GRADE S355 TO BS EN 10 025 BS EN 10 113 AND BS EN 10 210. ALL STEEL SHALL BE OF WELDABLE QUALITY. ALL BOLTS SHALL BE GRADE 8.8 UNLESS NOTED OTHERWISE.
- STEEL SUBGRADES SHALL BE DETERMINED BY THE CONTRACTOR TO SUIT THE FABRICATION DETAILS. SUBMIT DETAILS TO THE ENGINEER FOR APPROVAL.
- PROTECTIVE COATING SYSTEMS TO ALL STRUCTURAL STEELWORK SHALL BE IN ACCORDANCE WITH THE SCHEDULE AND THE STRUCTURAL STEELWORK SPECIFICATION.
- TOP OF BEAMS ARE TO BE UNPAINTED WHERE SHEAR STUDS ARE TO BE THROUGH DECK WELDED.
- ALL STRUCTURAL STEEL SHALL BE FIREPROOFED TO ACHIEVE THE APPLICABLE FIRE-RESISTANCE RATINGS. FOR DETAILS OF FIRE PROTECTION REFER TO THE ARCHITECTS DRAWINGS. SECONDARY STRUCTURAL STEEL TO RECEIVE FIRE PROTECTION AND COATINGS AS PRIMARY MEMBERS.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE CONTROL OF ALL ERECTION PROCEDURES AND SEQUENCES ESPECIALLY IN RELATION TO TEMPERATURE DIFFERENTIALS, ERECTION TOLERANCES AND TEMPORARY STABILITY.
- THE CONTRACTOR SHALL SUBMIT THE FOLLOWING INFORMATION TO THE ENGINEER FOR REVIEW PRIOR TO FABRICATION:
(A) ERECTION SEQUENCE METHOD STATEMENT INCLUDING PROPOSALS FOR MAINTAINING STRUCTURAL STABILITY DURING ALL PHASES OF CONSTRUCTION.
(B) DETAILS OF ERECTION LOADS APPLIED TO THE STRUCTURE.
(C) DETAILS OF ANY TEMPORARY WORKS OR PROPPING PROPOSED.
(D) DETAILED, CO-ORDINATED AND CHECKED SHOP DRAWINGS FOR ALL STRUCTURAL STEEL.
(E) CONNECTION DETAIL DRAWINGS AND CALCULATIONS (PRIOR TO SUBMISSION OF SHOP DRAWINGS) FOR STANDARD AND TYPICAL CONNECTIONS INCLUDING THOSE FULLY DETAILED ON THE ENGINEERS DRAWINGS.
(F) DETAIL DRAWINGS AND CALCULATIONS FOR METAL DECK FLOOR SLABS.
- NO REMEDIAL WORK WILL BE PERMITTED WITHOUT PRIOR APPROVAL.
- ALL ADDITIONAL STEEL REQUIRED BY THE CONTRACTOR FOR ERECTION PURPOSES SHALL BE PROVIDED AT NO COST TO THE EMPLOYER. ALL SUCH ADDITIONAL STEEL SHALL BE REMOVED BY THE CONTRACTOR UNLESS APPROVED BY THE ENGINEER.
- ALL BEAMS, JOISTS AND TRUSSES SHALL BE FABRICATED WITH THE NATURAL CAMBER UP. ADDITIONAL CAMBERS ARE AS INDICATED ON THE STRUCTURAL DRAWINGS.
- CANTILEVER BEAMS SHALL BE FABRICATED SO THAT NATURAL CAMBER RAISES THE CANTILEVER END.
- ALL BEAMS ARE ASSUMED TO BE UNPROPPED UNLESS NOTED OTHERWISE.
- SOME STEELWORK ELEMENTS MAY BE OF AESTHETIC IMPORTANCE AND REQUIRE SPECIAL ARCHITECTURAL TREATMENT. ANY SUCH STEELWORK NOT FULLY COMPLIANT WITH THE SPECIFIED REQUIREMENTS WILL BE REJECTED FROM THE WORKS. REFER TO THE DRAWINGS FOR LOCATION OF SUCH STEELWORK.
- DIMENSIONAL CONSTRAINTS APPLY TO COLUMN SPICES. REFER TO ARCHITECTS COLUMN CASING DETAILS. PROPOSED SPICE DETAILS SHOULD BE SUBMITTED TO THE ARCHITECT AND ENGINEER FOR APPROVAL PRIOR TO THE PREPARATION OF FABRICATION DRAWINGS.
- ALL MINOR FRAMING MEMBERS WHERE SIZE IS NOT INDICATED ON PLAN TO BE UB254x146x31 WITH MINIMUM 1 No. STUD PER TROUGH SPACING, UNLESS NOTED OTHERWISE.
- CANTILEVER STUBS WHERE SIZE IS NOT INDICATED ON PLAN TO BE UC203x203x46 WITH MINIMUM 1 No. STUD PER TROUGH SPACING, UNLESS NOTED OTHERWISE.
- THE CONTRACTOR IS TO MAKE ADEQUATE ALLOWANCE FOR THE PROVISION AND FITTING OF SECONDARY STRUCTURAL STEELWORK AND BRACKETS TO INCLUDE A) TO SUPPORT HORIZONTAL AND VERTICAL LOADS FROM CLADDING PANELS OR PARTITIONS. B) FOR TRIMMING AROUND OPENINGS IN SLABS AND WALLS. C) TO SUPPORT BUILDING SERVICES INSTALLATIONS. D) MESH FLOORS INSIDE RISERS AND SUPPORTING STEELWORK.
- THE DESIGN, FABRICATION AND ERECTION OF ALL RISER MESH FLOORS AND SUPPORTING BEAMS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
- FABRICATED SECTIONS ARE CALLED UP AS FOLLOWS:

BEAMS

BEAM MARK: P_DGG

P_ = PG - PLATED GIRDER (I-SECTIONS & H-SECTIONS)
PB - PLATED BOX SECTIONS
PC - PLATED CHANNEL SECTIONS
PX - BESPOKE SHAPES, REFER TO DRAWING

DD = BEAM DEPTH (cm)
GG = SECTION GROUP NUMBER

FULL SECTION DESCRIPTION:
P_DGGG_DxBFWxTFW BFT TFT TW xWT

P_DGGG = Beam mark
D = Beam Depth (mm)
BFW = Bottom Flange Width (mm)
TFW = Top Flange Width (mm)
BFT = Bottom Flange Thickness (mm)
TFT = Top Flange Thickness (mm)
TW = Thickness of Web (mm)
WT = Weight in kilograms per metre length (Kg/m)

eg. PG5001_500x150x150 10 10 8 x53.7

COLUMNS

COLUMN MARK: F_DGGG

F_ = IS - I-SECTION
HS - HOLLOW SECTION

DD = COLUMN DEPTH (cm)
GG = SECTION GROUP NUMBER

FULL DESCRIPTION:
F_DGGG_DxW FT TW xWT

F_DGGG = Column mark
D = Column depth (mm)
W = Column width (mm)
FT = Flange thickness (mm)
TW = Web thickness (mm)
WT = Weight in kilograms per metre length (Kg/m)

eg. FIS6001_600x400 125 100 x1059.8

CONNECTION DESIGN:

- THE CONTRACTOR SHALL DESIGN AND SUBMIT CALCULATIONS FOR ALL CONNECTIONS INCLUDING THOSE FULLY DETAILED. CALCULATIONS SHALL CONFORM TO THE REQUIREMENTS OF BS EN 1993-1-8.
- THE CONTRACTOR SHALL DESIGN CONNECTIONS FOR THE LOADS AND CRITERIA GIVEN ON THE DRAWINGS. THE CONTRACTOR SHALL CALCULATE TIE FORCES REQUIRED IN ACCORDANCE WITH BS EN 1991.
- ANY CONNECTIONS INDICATED ON THE ENGINEERS DRAWINGS SHOULD BE CONSIDERED AS INDICATIVE ONLY AND SHOULD BE VALIDATED BY THE CONTRACTOR AT TENDER STAGE. DETAILS INDICATING THE NUMBER OF BOLTS, WELD SIZES AND PLATE THICKNESS SHALL BE CONSIDERED TO REPRESENT THE MINIMUM REQUIREMENTS.
- IF FOR ANY REASON THE CONNECTION NEEDS TO BE CHANGED, THE CONTRACTOR SHALL REDESIGN THE CONNECTION TO DEVELOP THE REQUIRED CAPACITY. THE REVISIONS SHALL BE MADE AT NO ADDITIONAL COST AND WITH NO DELAY TO THE PROJECT.
- BEAM END REACTIONS SHOWN ON THE DRAWINGS ARE ULTIMATE LIMIT STATE LOADS. UNLESS NOTED OTHERWISE THE CONNECTIONS SHALL BE DESIGNED FOR THE FORCES AND MOMENTS SHOWN ACTING CONCURRENTLY
- ALL BEAM TO COLUMN AND BEAM TO CORE CONNECTIONS SHALL BE DESIGNED BY THE STEELWORK CONTRACTOR TO SUPPORT THE REACTION LOADS GIVEN ON THE DRAWINGS AND THE TIE FORCES REQUIRED BY BS EN 1993. IN ADDITION, THE CONNECTIONS SHOULD BE DESIGNED TO BE AS FLEXIBLE AS POSSIBLE UNDER THE ACTION OF THE TIE FORCES. THE GUIDANCE GIVEN IN 'JOINTS IN STEEL CONSTRUCTION' - SIMPLE JOINTS TO BE EUROCODE 3' - SCI PUBLICATION P358 SHOULD BE FOLLOWED. CLEATED WEB OR FLANGE CONNECTIONS WILL BE ACCEPTABLE AS WELL AS OTHER CONNECTIONS OF SIMILAR FLEXIBILITY. THE CLEATS MAY SUPPORT BOTH THE REACTION LOAD AND THE TIE FORCES OR JUST THE TIE FORCES, WITH A SEPARATE CONNECTION FOR THE REACTION LOADS. THE CONTRACTOR IS TO DEVELOP THE CONNECTION DESIGN AND DETAILS TO ALLOW ADEQUATE END ROTATION OF THE BEAM AS IT TAKES UP ITS SIMPLY SUPPORTED DEFLECTED PROFILE. THIS ROTATION MUST NOT IMPAIR THE SHEAR AND TYING CAPACITY. THE CONNECTION SHALL BE DESIGNED WITH SUFFICIENT DUCTILITY TO ENSURE A BEARING MODE OF FAILURE IN EITHER THE FIN PLATE OR BEAM WEB AND NOT IN ANY EMBEDDED CONNECTION.
- ALL BOLTED BEAM END CONNECTIONS ARE TO BE OF A CONFIGURATION WHICH INHERENTLY PROVIDES LOAD REVERSAL CAPACITY e.g. FIN PLATES OR END PLATES.
- CONNECTION SHALL BE DESIGNED FOR THE GREATEST OF THE FOLLOWING:
(A) REACTIONS INDICATING ON THE DRAWINGS. IF UNAVAILABLE REACTIONS SHOULD BE CALCULATED FROM UNIFORM LOAD CAPACITIES x 1.2.
(B) TIE FORCES IN ACCORDANCE WITH BS EN 1991-1-7 FOR LOCALISING ACCIDENTAL DAMAGE.
- ALL BOLTED CONNECTIONS SHALL USE GRADE 8.8 BOLTS UNLESS NOTED OTHERWISE.
- THE FOLLOWING MINIMUM REQUIREMENTS SHALL BE ASSUMED UNLESS NOTED OTHERWISE:
(A) MEMBERS SUPPORTING OTHER MEMBERS - 4 No. M16 GRADE 8.8 BOLTS.
(B) MEMBERS NOT SUPPORTING OTHER MEMBERS - 2 No. M16 GRADE 8.8 BOLTS.
(C) BRACING MEMBERS - 2 No. M16 GRADE 8.8 BOLTS.
- BOLTED MOMENT CONNECTIONS WHERE SHOWN SHALL UTILISE HIGH-STRENGTH FRICTION GRIP BOLTS FOR BOTH FLANGE AND WEB BOLTS.
- ALL CONTACT SURFACES FOR HSFG BOLTS ARE TO BE LEFT UNPAINTED.

- SPICE LOCATIONS WHERE SHOWN ON THE DRAWINGS ARE INDICATIVE ONLY. FINAL LOCATION IS TO BE AGREED WITH THE ENGINEER. SPICE LOADS ARE TO BE DETERMINED BY THE CONTRACTOR.

- ALL BOLT HOLES SHALL BE PRE-DRILLED AND WHERE REQUIRED, REAMED. UNLESS NOTED OTHERWISE PROVIDE STANDARD CLEARANCE HOLES. PROVIDE OVERSIZED HOLES WHERE REQUIRED FOR ERECTION OR WHERE SHOWN.

- UNLESS NOTED OTHERWISE 8mm THICK HARDENED WASHERS ARE TO BE USED OVER ALL SLOTTED HOLES.

STEELWORK (CONTINUED)

WELDING

- ALL WELDING TO BE IN ACCORDANCE WITH BS EN 1090 AND THE STEELWORK SPECIFICATION.
- NO SITE WELDING IS PERMITTED WITHOUT PRIOR APPROVAL.

3. MINIMUM WELD SIZE:

MINIMUM SIZE FILLET WELD	
MATERIAL THICKNESS OF THICKER PART JOINED (mm)	MINIMUM SIZE OF FILLET WELD (mm)
TO 6 INCLUSIVE	3
OVER 6 TO 12	5
OVER 12 TO 19	6
OVER 19	8
ALL WELD SIZES ARE THROAT SIZES	

- SHOP AND FIELD TESTING AND INSPECTION OF STRUCTURAL STEEL FABRICATION AND ERECTION WORK, INCLUDING WELDED CONNECTIONS SHALL BE AS FOLLOWS:

a - ALL STRUCTURAL STEEL FABRICATION AND ERECTION SHALL BE VISUALLY INSPECTED AS PER BS EN 970

b - ALL WELDERS SHALL BE QUALIFIED AS PER BS 287-1

c - ALL WELDS SHALL CONFORM TO BS 5135

d - ALL WELDS SHALL BE VISUALLY INSPECTED. WELD MEASUREMENTS SHALL BE PERFORMED FOR 15% OF ALL WELDS ON A RANDOM BASIS

e - MAGNETIC PARTICLE TESTING IN ACCORDANCE WITH BS 6072 SHALL BE PERFORMED FOR A MINIMUM OF: 10% OF ALL FILLET WELDS UNO.

f - ULTRA SONIC TESTING IN ACCORDANCE WITH BS EN 1714 AND BS 3923 PART 2 SHALL BE PERFORMED FOR A MINIMUM OF: 100 % OF ALL BUTT WELDS UNO.

g - REFER TO STRUCTURAL STEELWORK SPECIFICATION FOR ADDITIONAL TESTING AND INSPECTION REQUIREMENTS. REFERENCE TBC.

WELD TESTING

SHOP AND FIELD TESTING AND INSPECTION OF STRUCTURAL STEEL FABRICATION AND ERECTION WORK, INCLUDING WELDED AND BOLTED CONNECTIONS, SHALL BE AS FOLLOWS:

a - ALL STRUCTURAL STEEL FABRICATION AND ERECTION SHALL BE VISUALLY INSPECTED. VISUALLY INSPECT ALL WELDS TO BS5289.

b - ALL WELDERS SHALL BE CERTIFIED PER BS4871, PART 1

c - ALL WELDING PROCEDURES SHALL BE APPROVED TO BS4870, PART 1

d - WELD MEASUREMENTS SHALL BE PERFORMED FOR 15% OF ALL WELDS ON A RANDOM BASIS.

e - MAGNETIC PARTICLE TESTING TO BS6072 SHALL BE PERFORMED FOR A MINIMUM OF:

1. 100% BEAM FLANGE TO END PLATE OR COLUMN FLANGE FILLET WELDS.

2. 10% OF ALL SHEAR PLATE, TRUSS CONNECTIONS, AND MISCELLANEOUS FILLET WELDS, AT RANDOM.

3. 20% OF ALL CONTINUITY PLATE FILLET WELDS, AT RANDOM.

4. 100% OF TENSION MEMBER CONNECTION FILLET WELDS (I.E. HANGER CONNECTION PLATES, ETC.).

5. 20% ALL BUILT-UP MEMBER FLANGE TO WEB WELDS, AT RANDOM.

f - ULTRASONIC TESTING, IN ACCORDANCE WITH BS3923, PART 1. EXAMINATION LEVEL SHALL BE PERFORMED FOR A MINIMUM OF:

1. 100% OF ALL FULL PENETRATION WELDS.

2. 100% OF ALL PARTIAL PENETRATION WELDS.

g - ULTRASONIC TESTING IN ACCORDANCE WITH BS5996 AND VISUAL INSPECTION IN ACCORDANCE WITH BS4360 OR BS4848 IN AT LEAST THE FOLLOWING AREAS:

1. COLUMN FLANGES IN THE ZONE OF WELDED BEAM FLANGE, WELDED FLANGE PLATE AND/OR CONTINUITY PLATE. THE TEST AREAS SHALL EXTEND 150MM ABOVE AND BELOW EACH BEAM FLANGE AND/OR CONTINUITY PLATE, WITH 100% SCANNING OF THE TEST AREA. TEST TO GRADE I4.

2. BEAM FLANGES IN THE ZONE OF WELDED HANGER AND HANGER STIFFENER CONNECTIONS. THE TEST AREA IS TO EXTEND 150MM BEYOND THE END OF ANY WELD, WITH 100% SCANNING OF THE TEST AREA.

3. FOR BUILT-UP GIRDERS WITH FLANGE PLATES GREATER THAN 50MM, THE TEST AREA FOR 100% SCANNING SHALL INCLUDE THE MIDDLE ONE-THIRD OF THE LENGTH OF THE BEAM, AND A MINIMUM OF ONE (1) METER AT EACH END OF THE BEAM IF THE BEAM IS MOMENT-CONNECTED AT ITS ENDS. TEST TO GRADE LC2E.

h - WELD DEFECT ACCEPTANCE CRITERIA: UNLESS NOTED OTHERWISE, WELD ACCEPTANCE CRITERIA SHALL BE IN ACCORDANCE WITH BS5135, CATEGORY A, FOR BUTT JOINT WELDS AND CATEGORY B FOR FILLET WELDS.

i - ALL BOLTED CONNECTIONS SHALL BE VISUALLY INSPECTED. IN ADDITION, HIGH-STRENGTH, FRICTION GRIP BOLTED CONNECTIONS SHALL BE TESTED BY A CALIBRATED TORQUE WRENCH FOR A MINIMUM OF 25% OF THE BOLTS IN EACH CONNECTION, BUT NOT LESS THAN 2 BOLTS IN EACH CONNECTION. CHECK FIT AND TIGHTNESS OF 5% OF ORDINARY BOLTED CONNECTIONS.

j - THE REQUIRED CONTACT SURFACE CONDITION OF ALL CONNECTIONS SHALL BE VISUALLY INSPECTED IMMEDIATELY PRIOR TO BOLT TIGHTENING. THE TRADE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY REMEDIAL WORK TO CONTACT SURFACES.

k - AN INDEPENDENT STRUCTURAL STEEL TESTING LABORATORY SHALL PERFORM ALL FIELD INSPECTION AND TESTING, AS OUTLINED ABOVE, AND MONITOR THE TRADE CONTRACTOR'S INSPECTION AND SETTING FOR ALL SHOP WORK. IF THE TRADE CONTRACTOR'S QUALITY CONTROL PROGRAM IS NOT CERTIFIED, AN INDEPENDENT STRUCTURAL STEEL TESTING LABORATORY SHALL ALSO PERFORM ALL SHOP TESTING AND INSPECTION WORK.

l - THE STRUCTURAL STEEL FABRICATOR AND ERECTION SHALL SCHEDULE ALL WORK TO ALLOW THE ABOVE INSPECTION AND TESTING REQUIREMENTS TO BE COMPLETED.

DO NOT SCALE

NOTES:

- THIS DRAWING IS TO BE READ IN CONIUNCTION WITH ALL RELEVANT ARCHITECTS, SERVICES AND ENGINEERS DRAWINGS TOGETHER WITH RELEVANT SPECIFICATIONS.

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