THE BEHAVIOUR OF A MULTI-STOREY STEEL FRAMED BUILDING SUBJECTED TO FIRE ATTACK

EXPERIMENTAL DATA

Sponsored by:-
European Coal & Steel Community
British Steel plc, Swinden Technology Centre
TNO Building & Construction Research
Centre Technique Industriel de la Construction Métallique

British Steel

SWINDEN TECHNOLOGY CENTRE
WORLD BEATERS IN APPLIED STEEL RESEARCH
THE BEHAVIOUR OF A MULTI-STOREY STEEL FRAMED BUILDING SUBJECTED TO FIRE ATTACK

Forward

During the last three years British Steel's Swinden Technology Centre in Rotherham has been leading a major European fire research programme on a modern multi-storey composite steel framed structure built within the BRE large scale test facility at Cardington. This project was co-sponsored by the European Coal and Steel Community (ECSC) with TNO (The Netherlands) and CTICM (France) as partners.

One of the principal objectives of the research programme was to understand and develop numerical calculation procedures that are capable of describing and predicting the structural behaviour of modern multi-storey composite steel framed buildings subject to fire attack. This involved four major fire tests being carried out on different parts of the frame to study various aspects of structural behaviour and included a real full scale demonstration fire in an open plan office. Because of the uniqueness of the experimental programme in terms of the size and scope of the tests, the project team are pleased to be able to make the data available to other research organisations involved in understanding and the development of fire safety engineering applied to steel framed buildings.

British Steel Swinden Technology Centre would welcome hearing from other organisations who have used the information provided in developing numerical calculations for describing both the thermal and structural response of steel structures in fire by writing to the address given below.

Dr B R Kirby

Address for correspondence:
British Steel plc., Swinden Technology Centre
Moorgate
Rotherham
S60 3AR
United Kingdom

Fax: +44 (0)1709 825337

Although care has been taken to ensure that all the data and information contained within this publication are accurate, British Steel and its subsidiary companies do not accept any responsibility for errors in or misinterpretations of such data and/or information or any loss or damage arising from or related to their use.

COPYRIGHT AND DESIGN RIGHT ©1998, BRITISH STEEL plc
THE BEHAVIOUR OF A MULTI-STOREY STEEL FRAMED BUILDING SUBJECTED TO FIRE ATTACK

Introduction

This document and the accompanying CD has been prepared so that researchers in the field of Fire Safety Engineering have ready access to the actual data electronically logged during each of the four fire tests.

The format of the document is such that a general description of the location and construction of each test within the BRE 8-storey building is provided followed by detailed drawings showing the exact location of each piece of instrumentation. Each drawing refers to a data file which is cross referenced with the actual data stored on the CD.

The data on the CD can be accessed using Windows 95 with Microsoft Internet Explorer. In the Address Window type \BREDISKS\INDEX.html click on hyperlinks to access menus/data. For X insert letter of CD port.

The BRE 8-Storey Frame

The experimental programme was conducted on the 8-storey frame built within the UK Building Research Establishment large scale test facility at Cardington. This is a composite steel and concrete structure designed to meet current UK national design codes (BS 5950) and checked for compliance with the provisions of the EC3 ENV 1993-1-1. The structure is a braced frame incorporating three stiff cores (a central lift shaft and two stair wells at either end of the building), with primary partial depth end plate and secondary fin plate connections.

Composite action is achieved by shear studs welded through trapezoidal steel decking onto both the primary and secondary beams. The slab was cast using lightweight concrete with an in-situ density of 1900kg/m³ to provide a maximum floor thickness of 130 mm. This incorporates an A142 anti-cracking mesh.

The structure is laid out in five 9m bays along the elevation and 6m-9m-6m bays across the gables thereby providing a total floor area in plan of 45m x 21m. In order to rationalise on sizes, standardise on connection details and so reduce fabrication and erection costs, only four beam sections (254UB trimmers, 305UB ribs, 356UB and 616UB spine members) and three column sections (305UC x 198 & 118kg/m and 254UC x 89kg/m) were used. The internal columns were spliced twice within the height of the structure whereas the peripheral columns were spliced only once. Figure 1 shows the general floor layout.

Table 1 provides details of the floor loading for the structure. It will be noted that the design imposed floor loads were taken to be 2.5kN/m² on all floors except for the roof which was designed to support a plant room with 7.5kN/m² loading. With the exception of the 5th floor, the
imposed loads were obtained with sand bags each weighing 11 kN uniformly distributed throughout the building.

Table 1: Details of Floor Loading

<table>
<thead>
<tr>
<th>Load Case</th>
<th>Value (kN/m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Composite slab</td>
<td>2.06</td>
</tr>
<tr>
<td>Steel sections</td>
<td>0.25</td>
</tr>
<tr>
<td>Raised floor</td>
<td>0.4</td>
</tr>
<tr>
<td>Services</td>
<td>0.25</td>
</tr>
<tr>
<td>Ceiling</td>
<td>0.15</td>
</tr>
<tr>
<td>Partitions</td>
<td>1.0</td>
</tr>
<tr>
<td>Imposed</td>
<td>0.83 (½ design load)</td>
</tr>
</tbody>
</table>

It should be noted that although the purpose of the building was for conducting research it was designed and built under normal commercial pressures and is therefore a 'real structure.'

Fire Tests

In the programme four major fire tests were designed and carried out to investigate different aspects of structural behaviour. These increased in complexity as the programme progressed and are generically referred to as:

(i) 1D - Restrained Beam
(ii) 2D - Plane Frame
(iii) 3D - Corner
(iv) Office Fire (Demonstration)

(i) 1D - Restrained Beam

The objective of the first test was to understand the structural deformation mechanisms involved when a single beam is heated and restrained by a composite slab spanning in two directions with the surrounding steel frame remaining at ambient temperature.

The test was carried out on the 7th floor of the building as shown in Figure 2 around a 305 x 165mm UB spanning 9 m into the minor axes of a pair of 254 x 254 UCs. In view of the importance of achieving a uniform temperature profile along the length of the beam and maintaining the connections as near as possible at ambient temperature, a gas fired furnace 8 m long x 3 m wide was built up to the underside of the composite floor. This incorporated a flexible ceramic fibre curtain fixed between the steel decking and the top of the furnace to allow the beam and surrounding floor to vertically deflect unimpeded. Ceramic fibre collars were also fitted around the ends of the beams as they passed through the furnace walls to minimise spurious heat losses.
Temperature measurements:
Locations for measuring the temperature profiles through the heated beam and composite floor slab are shown in Figures 3 and 4.

Strain gauge measurements:
Localized strain was measured at the ends of the beam around the connections, on the surface of the floor slab immediately above the test beam as well as in the concrete reinforcement, see Figures 5-7. In addition, Figure 8 provides the correction factor to be applied to the high temperature strain gauges fitted to the ends of the test beam, just outside the furnace line.

Vertical deflection:
Vertical deflection along the test beam was measured through the floor slab directly above the upper flange as well as the relative movement between the lower flange tips, see Figure 9.

Lateral displacements:
Lateral displacements (thermal expansion effects) were measured between the columns around the test beam as shown in Figure 10.

Rotation measurements:
Locations for measuring rotation at the connections and along the length of the test beam are illustrated in Figure 11.

(ii) 2D - Plane Frame

The second test was designed to evaluate the behaviour of a series of beams and columns supporting the fourth floor by taking a 2D slice across the full width of the building as shown schematically in Figures 12 and 13. It was also necessary to determine how important fire protection should be extended around the type of connection used in the BRE frame when the columns would normally be insulated. For these reasons, all the columns were lightly protected up to a height of 200 mm below the connections. The beams as well as the beam/beam and beam/column connections remained totally exposed.

To heat the structure a gas fired furnace 21 m long x 4 m high was constructed to form a 2.5 m wide corridor across the full width of the building. This incorporated a ceramic fibre curtain fitted between the underside of the steel decking and the top of the wall to allow the floor slab to deflect without providing additional support. Slots were also built in the wall to allow the secondary beams to deflect and for instrumentation bars to transmit the movement of the internal structure to externally placed transducer measuring systems. Heating was provided by eight independent industrial burners mounted on one side of the furnace near floor level. The final test arrangement was over four times longer than the normal Standard fire resistance furnace and is believed to be the largest gas fired test furnace ever constructed within a steel framed building. Detailed structural drawings of the test compartment are shown in Figures 14-16.
Temperature measurements:
Figures 17A-C identify the locations of the temperature profiles measured along the beams (primary and secondary), at the connections, around the columns and through the composite floor slab immediately above the furnace.

Strain gauge measurements:
Strain gauges were fitted to the columns above, below and within the test compartment behind the fire protection (high temperature type) as indicated in Figures 18A-D. For the latter a correction for temperature as given in Figure 8 can be applied.

Vertical deflection:
Vertical deflection of the primary beams within the test compartment were measured relative to the floor above. The measuring locations are identified in Figure 19 and in each case both the upper flange and relative movement between the lower flange tips were monitored as shown in Figure 20. Note however, that as result of structural movement in the frame above the furnace during the latter stages of the test, these measurements are not absolute.

Column displacements:
Instrumentation for measuring lateral displacement of the columns at the height of the test furnace is illustrated in Figure 21. For the edge columns, movement was measured relative to the Cardington building and therefore are absolute values.

Rotation measurements:
Rotations at each of the main connections within the test compartment were measured as illustrated in Figures 22 and 23.

(iii) 3D - Corner

The objective of the third test was to evaluate the behaviour of a complete composite floor system and in particular the importance of membrane action. However, since it was also necessary to create a 'real fire' to achieve the required level of thermal input into the structure, instrumentation was included to provide additional information that would be helpful in the validation of the parametric equations for fire growth given in EC1 ENV 1991-2-2 'Actions on structures exposed to fire'.

A compartment with a floor area of approximately 80 m² was built on the first floor in one corner of the structure as shown in Figure 24. To ensure that the gable end walls and wind posts did not provide a load bearing function, all restraints and ties were removed. Figures 25-27 show details on the construction of the compartment and as in the previous tests a gap of approximately 400 mm was provided between the top of the walls and the underside of the steel decking to permit unimpeded movement of the floor slab. This was closed off with 50 mm ceramic fibre blanket. Slots in the wall construction were also provided below the beams as they passed through the
compartment to ensure no additional support was given to the floor slab. In essence the wall structure was no more than a non-loadbearing construction for containing the fire.

Ventilation was provided by a single 7 m wide opening partially covered by an adjustable insulated screen. Although the initial ventilation conditions were pre-calculated to provide an effective opening factor $A_e/p/A_o$ of 0.031 m$^{-1}$ (modified to take account of the thermal properties of compartment boundaries), the screen allowed some control over the burning rates and temperatures attained within the compartment.

Based upon the behaviour of the structural frame in the 2D plane frame test, all the columns were protected to their full height including the main beam to column connections, using 25 mm ceramic fibre blanket. The edge beams were also protected in the same manner. However, all the internal beams (primary and secondary) remained totally exposed including the beam to beam fin plate connections.

To test the structure it was necessary to develop temperatures of around 1060 °C. From EC1, this was achieved with a fire loading of 45 kg of wood/m$^2$ of floor area accompanied by a small increase in the ventilation conditions during the test to an effective opening factor of 0.034 m$^{-1}$.

Temperature measurements:
Temperature profiles were measured in the beams, columns and connections as well as in the floor slab. These locations are identified in Figures 28 and 29. Temperatures of the atmosphere gases were also measured across the compartment primarily at 500 mm below the decking with additional selected positions at 1600 mm and 2000 mm, see Figure 30.

Strain gauge measurements:
The structure around the test compartment was extensively instrumented with strain gauges fitted to the columns, beams and surface of the floor slab immediately above the compartment, see Figures 31 - 38. Those fitted to the columns within the compartment were capable of operating at elevated temperatures and were positioned behind the fire protection for which a temperature correction as given in Figure 8, can be applied.

Vertical deflection:
Vertical deflection of the beams and floor slab exposed to fire were measured relative to the third floor above the compartment as indicated in Figure 39. Longitudinal thermal expansion effects of the columns around the perimeter of the compartment were also measured relative to the ground floor as shown in Figure 39.

Column displacements:
Horizontal displacements between the columns were measured at the locations identified in Figure 40.

Rotation measurements:
Rotations at each of the main connections were measured in the vertical plane as shown in Figure 41.
(iv)  Office Fire (Demonstration)

The purpose of the fourth test in the programme was to demonstrate some of the important conclusions reached in the earlier studies in a more realistic fire scenario while at the same time evaluating other aspects of structural behaviour not previously addressed.

A compartment up to 18 m wide and 10 m deep was built on the first floor (see Figure 42) to represent an open plan office. Details of the construction are shown in Figures 43 - 45. While the blockwork wall construction was built in a similar manner to the previous tests by leaving a gap to the underside of the steel decking, in this test no attempt was made to decouple the existing ties and wall restraints.

The compartment was fitted out with modern day furnishings, computers and filing systems using similar proportions of wood to plastic as found from surveys carried out in modern office accommodation, Figure 46. To quantify the fire loading all the contents placed in the compartment were separated into their component parts, the materials identified, accurately weighed and re-assembled. The total fire loading available for combustion was equivalent to 45.6 kg of wood/m² of floor area which is in excess of the 95% fractile for fire loading in offices (the 80% fractile is currently proposed in draft design codes). Table 2 summarises the fire load contents.

Based upon the lessons learnt in the earlier studies, the columns were protected to their full height including the main beam to column connections using 25 mm ceramic fibre. However, both the primary and secondary beams remained totally exposed. The height of the external dado wall was also increased to 1350 mm. Single pane aluminium framed glazing was installed along one external wall but note that a central area within each bay remained unfilled.

In designing for the type of fire required, while it was possible to identify a wide range of scenarios the overriding factor was to create a severe condition that would test the structure and generate the levels of heating that could be experienced in real building fires. For these reasons the method of ignition and the initial ventilation conditions were designed to assist fire growth and increase the likelihood of flash-over. It was also necessary to ensure that while the ventilation area was calculated to develop high temperatures, it was important that the fire did not burn-out before the structure had time to respond. These requirements were achieved with the partially glazed system installed within the external wall and starting the test by igniting several cribs made up of a combination of wood and plastic located at the rear of the compartment. Measures were also taken to reduce the height of the hot gas layer at ceiling level to increase downward radiation. Once flash-over occurred the fire was ventilation controlled with a maximum heat release rate of 58 MW.

Temperature measurements:

Temperature profiles were measured in the primary, secondary and edge beams, selected columns and connections as identified in Figures 47 and 48. The vertical temperature profile of the atmosphere gases were measured throughout the compartment including those at the windows and just outside the facade, see Figures 49 and 50.
Strain gauge measurements:
Strain gauges were installed solely along the columns within the compartment behind the protection (high temperature type), as well as immediately above the test floor. The locations are identified in Figures 51 and 52.

Vertical deflection:
Vertical deflection of the beams and floor slab were measured relative to the third floor above the compartment as shown in Figure 53.

Dr B R Kirby
British Steel plc., Swinden Technology Centre
Moorgate
Rotherham
S60 3AR
United Kingdom
## Summary of Fire Loading: Wood Equivalent

<table>
<thead>
<tr>
<th>Location</th>
<th>Wood kg</th>
<th>Plastic kg</th>
<th>Paper kg</th>
<th>Others kg</th>
<th>Total kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work Station 1</td>
<td>459.7</td>
<td>74.4</td>
<td>42.8</td>
<td>2.3</td>
<td>579.2</td>
</tr>
<tr>
<td>Work Station 2</td>
<td>419.0</td>
<td>63.2</td>
<td>42.8</td>
<td>2.2</td>
<td>547.2</td>
</tr>
<tr>
<td>Work Station 3</td>
<td>543.6</td>
<td>76.8</td>
<td>26.8</td>
<td>2.8</td>
<td>650.0</td>
</tr>
<tr>
<td>Work Station 4</td>
<td>642.7</td>
<td>64.7</td>
<td>42.8</td>
<td>1.3</td>
<td>751.5</td>
</tr>
<tr>
<td>Manager</td>
<td>191.0</td>
<td>47.5</td>
<td>90.5</td>
<td>1.4</td>
<td>320.4</td>
</tr>
<tr>
<td>Secretary</td>
<td>158.9</td>
<td>46.5</td>
<td>110.2</td>
<td>4.7</td>
<td>320.3</td>
</tr>
<tr>
<td>Seating/Rest Area</td>
<td>195.7</td>
<td>45.6</td>
<td>2.7</td>
<td>6.7</td>
<td>250.7</td>
</tr>
<tr>
<td>Reception</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage: Bookshelves</td>
<td>185.6</td>
<td>36.0</td>
<td>384.5</td>
<td>606.1</td>
<td></td>
</tr>
<tr>
<td>Files</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carpet</td>
<td>-</td>
<td>50.6</td>
<td>-</td>
<td>501.6</td>
<td></td>
</tr>
<tr>
<td>Cribs</td>
<td>1310.0</td>
<td>278.0</td>
<td>-</td>
<td>1588.0</td>
<td></td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>-</td>
<td>-</td>
<td>38.4</td>
<td>38.4</td>
<td></td>
</tr>
<tr>
<td>Totals</td>
<td>4105.2</td>
<td>1254.3</td>
<td>743.1</td>
<td>6183.4</td>
<td></td>
</tr>
<tr>
<td>% of Total</td>
<td>66.6</td>
<td>20.4</td>
<td>12.1</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

Floor Area = 135.12 m²

Fire Loading = 6183.4 kg of wood

Fire Load Density = 45.6 kg of wood/m² of Floor Area
TEST 1: RESTRAINED BEAM: LOCATIONS OF INSTRUMENTATION FOR MEASURING TEMPERATURE PROFILES WITHIN THE FLOOR SLAB: Figure 4
TEST 1: RESTRAINED BEAM: LOCATION OF INSTRUMENTATION FOR MEASURING STRAIN
PROFILES IN THE STEEL MEMBERS: Figure 5
TEST 1: RESTRAINED BEAM: CONCRETE STRAIN GAUGE POSITIONS ON FLOOR
ABOVE THE TEST BEAM: Figure 6
TEST 1: RESTRAINED BEAM: LOCATIONS OF STRAIN GAUGES INSTALLED ON THE MESH REINFORCEMENT IN THE FLOOR ABOVE THE TEST BEAM: Figure 7
TML STRAIN GAUGE TEST DATA
DATA NO. SA18
GAUGE TYPE: AW-6
LOT NO.: 5503211
ADHESIVE: Spot welding
G.F. SET: 2.00

APPARENT STRAIN ——— GAUGE FACTOR

TEMPERATURE (°C)

Tokyo Sokki Kenkyujo Co., Ltd.

Apparent Strain = A + Bx + Cx^2 + Dx^3
Correction
(0 - 300°C)

where

\[ x = \text{temperature in} \ °C \]
\[ A = -24.6431 \]
\[ B = 1.47965 \]
\[ C = -0.129173 \times 10^7 \]
\[ D = 0.220324 \times 10^8 \]

Correction Factor for High Temperature Strain Gauges

Figure 8
Locations For Measuring Vertical Deflection

Figure 9
TEST 1: RESTRAINED BEAM: LOCATION OF INSTRUMENTATION FOR MEASURING HORIZONTAL DISPLACEMENTS BETWEEN COLUMNS ABOVE THE TEST FLOOR

Figure 10
Figure 12

PLANE FRAME : TEST 2 - LOCATION OF COMPARTMENT
GRID LINE 2
GRID LINE 2A
GRID LINE 2B
GRID LINE 3

3003
3000
3000

KEY
PB = PRIMARY BEAM
BB = SECONDARY BEAM
CB = CONCRETE CUT-OUT OVER BEAM
CB2 = CONCRETE CUT-OUT IN SLAB
C = CONNECTION

IDENTIFICATION OF TEMPERATURE PROFILES
Figure 17B
LOCATION OF THE AMBIENT TEMPERATURE STRAIN GAUGES FITTED TO THE FOURTH FLOOR COLUMNS 500mm ABOVE THE TEST FURNACE: Figure 18A

B1 305x305x137 kg/m

B2 305x305x198 kg/m

B3 305x305x198 kg/m

B4 305x305x197 kg/m
LOCATION OF THE AMBIENT TEMPERATURE STRAIN GAUGES FITTED TO THE SECOND FLOOR COLUMNS BELOW THE TEST FURNACE: Figure 1&8

B1
305x305x137 kg/m

B2
305x305x198 kg/m

B3
305x305x198 kg/m

B4
305x305x137 kg/m

655mm BELOW DECKING
(300mm BELOW 350x170mm BEAM)

910mm BELOW DECKING
(300mm BELOW 610x225mm BEAM)

655mm BELOW DECKING
(300mm BELOW 350x170mm BEAM)
LOCATION OF THE HIGH TEMPERATURE STRAIN GAUGES FITTED TO THE THIRD FLOOR COLUMNS WITHIN THE TEST FURNACE, 2000mm ABOVE THE CONCRETE SLAB : Figure 18C

B1
305x305x137 kg/m

B2
305x305x188 kg/m

B3
305x305x188 kg/m

B4
305x305x137 kg/m
LOCATION OF THE HIGH TEMPERATURE STRAIN GAUGES FITTED TO THE THIRD FLOOR COLUMNS WITHIN THE TEST FURNACE, 500mm ABOVE THE CONCRETE SLAB ; Figure 18D
Test 2 - Measurement Stations for the Primary Floor Beams

Figure 19

Measurement Positions

Column B1

Column B4

D = Vertical Deflection
H = Horizontal Deflection
V = Vertical Deflection

- Top Flange
- Bottom Flange
- Bottom Flange
D = VERTICAL DEFLECTIONS: UPPER FLANGE
V = VERTICAL DEFLECTIONS: LOWER FLANGE
H = LATERAL DISPLACEMENTS: LOWER FLANGE

DETAIL VIEW OF INSTRUMENTATION LOCATIONS FOR THE PRIMARY BEAMS

Figure 20
Figure 22

Test 2 - Measurement Positions for Beam and Column Rotations

I = Clinometer Positions
Test 2 - Measurement Positions for Column B1 and B4 Rotations

Figure 23
TEST 3: CORNER COMPARTMENT TEST
Figure 27
TEST 3: LOCATIONS FOR MEASURING BEAM TEMPERATURE PROFILES

Figure 28
TEST 3: LOCATIONS FOR MEASURING TEMPERATURE PROFILES IN THE COLUMNS, CONNECTIONS & THROUGH THE SLAB

Figure 29
TEST 3: LOCATIONS FOR MEASURING ATMOSPHERE TEMPERATURES

Figure 30
SECOND FLOOR LAYOUT - LOCATION OF COLUMN STRAIN GAUGES:
500 mm BELOW LEVEL 3 SLAB
Figure 36
SECOND FLOOR LAYOUT - LOCATION OF BEAM STRAIN GAUGES

Figure 37
CONCRETE STRAIN GAUGE MEASUREMENTS ON THE SURFACE
OF LEVEL 2 SLAB (ABOVE THE TEST COMPARTMENT)

Figure 38
V = Vertical deflections relative to ground level
D = Vertical deflections relative to level 3

Outline of furnace wall

Test 3: Transducer Positions for Measuring Vertical Deflections

Figure 39
H1, H3, H5, H7 = Test beam centre height
H2, H4, H6, H8 = Half column height,
level 1
L1 to L7 = Half column height, level 2

Outline of furnace wall

Test 3 - Transducer Positions for Measuring Horizontal Displacements
TEST 4: DEMONSTRATION TEST
TEST 4: LOCATIONS FOR MEASURING BEAM TEMPERATURE PROFILES & LOCAL ATMOS. (DETAILED ELSEWHERE)
LOCATION OF THERMOCOUPLES FOR MEASURING
THE PROFILE OF HOT GASES AT THE FACADE

Figure 50
LOCATION OF STRAIN GAUGES ON LEVEL 1 (TEST COMPARTMENT)
1.5m ABOVE FLOOR SLAB

Figure 51
Test 4 - Location of Transducer Positions for Measuring Deflections Figure 53
TEST 1

RESTRAINED BEAM
13 STEEL THERMOCOUPLES
4 ATMOSPHERE THERMOCOUPLES

THERMOCOUPLE LOCATIONS ON GRID LINE 1

Data File: PROGL1, Figure 1/1
THERMOCOUPLE LOCATIONS ON GRID LINE 2

Data File: PROGL2, Figure 1/2
13 STEEL THERMOCOUPLES
4 ATMOSPHERE THERMOCOUPLES

THERMOCOUPLE LOCATIONS ON GRID LINE 2

Data File: PROGL2, Figure 1/2
13 STEEL THERMOCOUPLES
4 ATMOSPHERE THERMOCOUPLES

THERMOCOUPLE LOCATIONS ON GRID LINE 3

Data File: PROGL3, Figure 1/3
6 STEEL THERMOCOUPLES
4 ATMOSPHERE THERMOCOUPLES

THERMOCOUPLE LOCATIONS ON GRID LINE 4

Data File: PROGL4, Figure 1/4
THERMOCOUPLE LOCATIONS ON GRID LINE 5

Data File: PROGL5, Figure 1/5
THERMOCOUPLE LOCATIONS AT GRID LINE 1(a-d)

Data File: GL1ad, Figure 1/6
THERMOCOUPLE LOCATIONS AT GRID LINE 3(d-e)

Data File: Gl3ad, Figure 1/7
I STEEL THERMOCOUPLE

THERMOCOUPLE LOCATIONS IN THE END PLATES AT A AND I

Data File: PROAI, Figure 1/8
6 STEEL THERMOCOUPLES

THERMOCOUPLE LOCATIONS AT B

Data File: PROB, Figure 1/9
13 STEEL THERMOCOUPLES
1 ATMOSPHERE THERMOCOUPLE

THERMOCOUPLE LOCATIONS AT C

Data File: PROC, Figure 1/10
13 STEEL THERMOCouples
1 ATMOSPHERE THERMOCouple

THERMOCouple LOCATIONS AT D

Data File: PROD , Figure 1/11
SEE DETAIL A ON MAIN DRAWING

13 STEEL THERMOCOUPLES
1 ATMOSPHERE THERMOCOUPLE

THERMOCOUPLE LOCATIONS AT E

Data File: PROE, Figure 1/12
6 STEEL THERMOCOUPLES
1 ATMOSPHERE THERMOCOUPLE

THERMOCOUPLE LOCATIONS AT F

Data File: PROF, Figure 1/13
6 STEEL THERMOCOUPLES
1 ATMOSPHERE THERMOCOUPLE

THERMOCOUPLE LOCATIONS AT G

Data File: PROG , Figure 1/14
6 STEEL THERMOCOUPLES
1 ATMOSPHERE THERMOCOUPLE

THERMOCOUPLE LOCATIONS AT H

Data File: PROH, Figure 1/15
7 CONCRETE THERMOCOUPLES
5 METAL DECKING THERMOCOUPLES
2 REINFORCEMENT THERMOCOUPLES

THERMOCOUPLE LOCATIONS IN THE FLOOR SLAB OVER BEAM AT A1

Data File: PROA1, Figure 1/16
7 CONCRETE THERMOCOUPLES
5 METAL DECKING THERMOCOUPLES
2 REINFORCEMENT THERMOCOUPLES

THERMOCOUPLE LOCATIONS IN THE FLOOR SLAB OVER BEAM AT A2

Data File: PROA2 , Figure 1/17
8 CONCRETE THERMOCOUPLES
2 METAL DECKING THERMOCOUPLES
2 REINFORCEMENT THERMOCOUPLES

THERMOCOUPLE LOCATIONS IN THE FLOOR SLAB BETWEEN BEAM AND FURNACE WALL AT B1

Data File: PROB1 , Figure 1/18
7 CONCRETE THERMOCOUPLES
2 METAL DECKING THERMOCOUPLES
2 REINFORCEMENT THERMOCOUPLES

THERMOCOUPLE LOCATIONS IN THE FLOOR SLAB BETWEEN BEAM AND FURNACE WALL AT B2

Data File: PROB2, Figure 1/19
DIMENSIONS IN mm

STRAIN GAUGE LOCATIONS AT C1

Data File: PROC1 , Figure 1/20
DIMENSIONS IN mm

STRAIN GAUGE LOCATIONS AT C2

Data File: PROC2, Figure 1/21
DIMENSIONS IN mm

STRAIN GAUGE LOCATIONS AT C3

Data File: PROC3, Figure 1/22
DIMENSIONS IN mm

STRAIN GAUGE LOCATIONS AT C4

Data File: PROC4, Figure 1/23
STRAIN GAUGE LOCATIONS AT B1

Data File: PROB1, Figure 1/24
DIMENSIONS IN mm

STRAIN GAUGE LOCATIONS AT B2

Data File: PROB2, Figure 1/25
DIMENSIONS IN mm

STRAIN GAUGE LOCATIONS AT B3

Data File: PROB3, Figure 1/26
DIMENSIONS IN mm

STRAIN GAUGE LOCATIONS AT B4

Data File: PROB4, Figure 1/27
TEST 1: RESTRAINED BEAM: STRAIN GAUGE POSITIONS AT LOCATION 1

LOCATION 1
S068
S069
S070
S071
S072
S073

LOCATION 2
S074
S075
S076
S077
S078
S079

LOCATION 3
S080
S081
S082
S083
S084
S085

TEST BEAM
COLUMN E2

Data File: PR01, Figure 1/28
TEST 1: RESTRAINED BEAM: STRAIN GAUGE POSITIONS AT LOCATION 2

LOCATION 1
- 5068
- 5069

LOCATION 2
- 5074
- 5075

LOCATION 3
- 5080
- 5081

COLUMN E2
- 5082

TEST BEAM

Dimensions:
- 9000
- 4380
- 2300

Data File: PRO2, Figure 1/29
TEST 1: RESTRAINED BEAM: STRAIN GAUGE POSITIONS AT LOCATION 3

LOCATION 1
S068
S069
S070

LOCATION 2
S074
S075
S076

LOCATION 3
S080
S081
S082

COLUMN E2

TEST BEAM

1375
1150

S071
S072
S073

S077
S078
S079
S083
S084
S085

300
2300

4380

9000

Data File: PRO3, Figure 1/30
TEST 1: RESTRAINED BEAM - LOCATIONS OF STRAIN GAUGES INSTALLED ON THE MESH REINFORCEMENT IN THE FLOOR ABOVE THE TEST BEAM.
D = VERTICAL DEFLECTIONS UPPER FLANGE
V = VERTICAL DEFLECTIONS LOWER FLANGE

DETAIL VIEW OF INSTRUMENTATION LOCATIONS

Data File: DEFL1 & DEFL2, Figure 1/33
TEST 1: RESTRAINED BEAM. LOCATION OF INSTRUMENTATION FOR MEASURING HORIZONTAL DISPLACEMENTS BETWEEN COLUMNS ABOVE THE TEST FLOOR.
TEST 1: RESTRAINED BEAM: INCLINOMETER POSITIONS FOR MEASURING ROTATION OF THE TEST BEAM AND COLUMN FLANGES AT THE CONNECTIONS.

NOTE:
INCLINOMETERS I8 AND I11 ARE FIXED TO THE COLUMN FACE
INCLINOMETERS I9 AND I10 ARE FIXED TO THE BEAM WEB

Data File: ROT, Figure 1/35
TEST 2

PLANE FRAME
12 STEEL THERMOCOUPLES
1 ATMOSPHERE THERMOCOUPLE

THERMOCOUPLE LOCATIONS ON PRIMARY BEAM AT PB1
356x171x51 K/m

Data File: PB1, Figure 2/1
12 STEEL THERMOCOUPLES
1 ATMOSPHERE THERMOCOUPLE

THERMOCOUPLE LOCATIONS ON PRIMARY BEAM AT PB2
366x171x51k/°m

Data File: PB2, Figure 2/2
THERMOCOUPLE LOCATIONS ON PRIMARY BEAM AT PB3
610x229x101 Kg/m

Data File: PB3 , Figure 2/3
THERMOCOUPLE LOCATIONS ON PRIMARY BEAM AT PB4
610x259x101Kp/m

Data File: PB4, Figure 2/4
THERMOCOUPLE LOCATIONS ON PRIMARY BEAM AT PB5
610 x 229 x 101 kg/m

Data File: PB5, Figure 2/5
THERMOCOUPLE LOCATIONS ON PRIMARY BEAM AT PB6
366x171x51 Kg/m

Data File: PB6 , Figure 2/6
4 STEEL THERMOCOUPLES
1 ATMOSPHERE THERMOCOUPLE

THERMOCOUPLE LOCATIONS ON PRIMARY BEAM AT PB7
358x171x61 Kg/m

Data File: PB7, Figure 2/7
THERMOCOUPLE LOCATIONS ON EDGE BEAM AT SB1E
356x171x61 Kg/m

Data File: SB1E, Figure 2/8
THERMOCOUPLE LOCATIONS ON EDGE BEAM AT SB1E_d
356x171x51 Kg/m

Data File: SB1E_d, Figure 2/9
11 STEEL THERMOCOUPLES

THERMOCOUPLE LOCATIONS ON EDGE BEAM AT SB1W
356x71x51 Kg/m

Data File: SB1W Figure 2/10
END OF FURNACE

THERMOCOUPLE LOCATIONS ON EDGE BEAM AT SB1We_d
356x171x51 Kg/m

Data File: SB1We_d, Figure 2/11
9 STEEL THERMOCOUPLES

THERMOCOUPLE LOCATIONS ON SECONDARY BEAM AT SB2E
305x165x40 Kg/m

Data File: SB2E, Figure 2/12
THERMOCOUPLE LOCATIONS ON SECONDARY BEAM AT SB2E_d
305x165x40 Kg/m

Data File: SB2E_d, Figure 2/13
2 STEEL THERMOCOUPLES

THERMOCOUPLE LOCATIONS ON SECONDARY BEAM AT SB2W
305x185x40 Kg/m

Data File: SB2W, Figure 2/14
2 STEEL THERMOCOUPLES

THERMOCOUPLE LOCATIONS ON SECONDARY BEAM AT SB3E
305x186x40Kg/m

Data File: SB3E, Figure 2/15
THERMOCOUPLE LOCATIONS ON SECONDARY BEAM AT SB3W
305x186x40 Kg/m

Data File: SB3W, Figure 2/16
9 STEEL THERMOCOUPLES

THERMOCOUPLE LOCATIONS ON SECONDARY BEAM AT SB4E
305x185x40Kg/m

Data File: SB4E, Figure 2/17
THERMOCOUPLE LOCATIONS ON SECONDARY BEAM AT SB4Ea_d
305x165x40 Kg/m

Data File: SB4Ea_d , Figure 2/18
2 STEEL THERMOCOUPLES

THERMOCOUPLE LOCATIONS ON SECONDARY BEAM AT SB4W
305x165x40Kg/m

Data File: SB4W, Figure 2/19
THERMOCOUPLE LOCATIONS ON SECONDARY BEAM AT SB5E
305x165x40 Kg/m

Data File: SB5E, Figure 2/20
THERMOCOUPLE LOCATIONS ON SECONDARY BEAM AT SB6W
305x165x40 Kg/m

Data File: SB6W, Figure 2/21
3 STEEL THERMOCOUPLES

THERMOCOUPLE LOCATIONS ON SECONDARY BEAM AT SB7E
305x165x40 Kg/m

Data File: SB7E, Figure 2/22
3 STEEL THERMOCOUPLES

THERMOCOUPLE LOCATIONS ON EDGE BEAM AT SB8E
356x171x51Kg/m

Data File: SB8E, Figure 2/23
4 STEEL THERMOCOUPLES

THERMOCOUPLE LOCATIONS ON EDGE BEAM AT SB8W
356x171x61 Kg/m

Data File: SB8W, Figure 2/24
THERMOCOUPLE LOCATIONS AT COLUMN B1
ABOVE THE TEST FLOOR

Data File: PRO2, Figure 2/26_2
COLUMN AT B3 - 305 x 305mm x 137kg/m
VIEW LOOKING EAST
CONNECTIONS C1 AND C4 AT COLUMNS B1 AND B4
GENERAL ARRANGEMENT VIEWED ON GRID LINES 1 (WEST)
AND 4 (EAST)
C1—CONNECTION DETAIL AT COLUMN B1
PRIMARY BEAM: 356x171mmx51kg/m
VIEW LOOKING SOUTH

Data File: PRO7, Figure 2/31_1
SECTION B-B
50mm FROM END PLATE

C1—CONNECTION DETAIL AT COLUMN B1
PRIMARY BEAM : 356x171mmx51kg/m
VIEW LOOKING SOUTH

Data File: PRO7, Figure 2/31_2
C1—CONNECTION DETAIL AT COLUMN B1
PRIMARY BEAM: 356x171mmx51kg/m (PB1)
VIEW LOOKING SOUTH

Data File: PRO7, Figure 2/51_3
C1—CONNECTION DETAIL AT COLUMN B1
SECONDARY BEAM: 356x71mmx51kg/m (SB1W)
VIEW LOOKING EAST
C1—CONNECTION DETAIL AT COLUMN B1
SECONDARY BEAM: 356x171mmx51kg/m (SB1W)
VIEW LOOKING EAST

Data File: PROB , Figure 2/32_2
C1—CONNECTION DETAIL AT COLUMN B1
SECONDARY BEAM: 356x171mmx51kg/m (SB1E)
VIEW LOOKING WEST

50mm FROM END PLATE

Data File: PRO8 , Figure 2/32_3
C1—CONNECTION DETAIL AT COLUMN B1
SECONDARY BEAM: 356x171x51 kg/m (SB1E)
VIEW LOOKING WEST

Data File: PROB , Figure 2/32_4
SECTION C-C
BETWEEN 1st AND 2nd BOLTS

SECTION D-D
BETWEEN 3rd AND 4th BOLTS

SECTION E-E
IN LINE WITH LOWER FLANGE

DETAIL AT CONNECTION C1 AT COLUMN B1

Data File: PRO9, Figure 2/33
SECTION A–A
150mm FROM
END PLATE

C2—CONNECTION DETAIL AT COLUMN B2
PRIMARY BEAM : 356x171mmx51kg/m
SECTION THROUGH A–A VIEW LOOKING NORTH

Data File: PRO10 , Figure 2/34_1
C2—CONNECTION DETAIL AT COLUMN B2
PRIMARY BEAM: 356x171mmx51kg/m
SECTION THROUGH B—B VIEW LOOKING NORTH

SECTION B—B
50mm FROM
END PLATE

Data File: PRO10, Figure 2/34_2
SECTION C-C
50mm FROM END PLATE

C2—CONNECTION DETAIL AT COLUMN B2
PRIMARY BEAM : 610x229mmx101kg/m
SECTION THROUGH C–C VIEW LOOKING SOUTH

Data File: PRO10 , Figure 2/34_3
SECTION D–D
150mm FROM END PLATE

C2–CONNECTION DETAIL AT COLUMN B2
PRIMARY BEAM : 610x229mmx101kg/m
SECTION THROUGH D–D VIEW LOOKING SOUTH

Data File: PRO10, Figure 2/34_4
C2-CONNECTION DETAIL AT COLUMN B2
PRIMARY BEAM : 356x171mmx51kg/m (PB2)
VIEW LOOKING NORTH

Data File: PRO11, Figure 2/35_1
C2 CONNECTION DETAIL, AT COLUMN B2
PRIMARY BEAM: 610x229x101 kg/m (PB2)
VIEW LOOKING SOUTH

Data File: PRO11, Figure 2/35_2
C2—CONNECTION DETAIL AT COLUMN B2
SECONDARY BEAM : 305x165mmx40kg/m (SB3E)
VIEW LOOKING WEST

150mm FROM END PLATE

Data File: PRO12, Figure 2/36_1
C2-CONNECTION DETAIL AT COLUMN B2
SECONDARY BEAM: 305x185mmx40kg/m (SB3F)
VIEW LOOKING WEST

Data File: PRC12 , Figure 2/36_2
C2-CONNECTION DETAIL AT COLUMN B2
SECONDARY BEAM : 305x165mmx40kg/m (SB3E)
VIEW LOOKING WEST

Data File: PRO12, Figure 2/36_3
C2—CONNECTION DETAIL AT COLUMN B2
SECONDARY BEAM: 356x171mmx51kg/m (SB3W)
VIEW LOOKING EAST

Data File: PRO13, Figure 2/37_1
C2—CONNECTION DETAIL AT COLUMN B2
SECONDARY BEAM: 356x171mmx51kg/m (SB3W)
VIEW LOOKING EAST

50mm FROM END PLATE

Data File: PRO13, Figure 2/37_2
T/C IN BOLT SHANK (TOP)

T/C IN BOLT SHANK (3rd)

T/C's MIDWAY BETWEEN 1st & 2nd BOLTS

T/C's MIDWAY BETWEEN 3rd & 4th BOLTS

EDGE OF FILLET WELD

LINE OF BOLTS

C2—CONNECTION DETAIL AT COLUMN B2
SECONDARY BEAM: 356x171x51 kg/m (SB3W)
VIEW LOOKING EAST
SECTION H-H

SECTION E-E
POSITION OF FLANGE T/C's
LOCATED BETWEEN 1st & 2nd BOLTS
POSITION OF WEB T/C's
LOCATED BETWEEN 2nd & 3rd BOLTS
ON SOUTH SIDE AND 1st & 2nd BOLTS
ON NORTH SIDE

SECTION F-F
(50mm BELOW LOWER FLANGE OF
356x171mmx51kg/m PRIMARY BEAM)

SECTION G-G
(T/C's IN LINE WITH LOWER FLANGE
OF 610x101kg/m PRIMARY BEAM)

DETAIL AT CONNECTION C2 ON COLUMN B2

Data File: PRO14 , Figure 2/38
GENERAL ARRANGEMENT OF CONNECTION C3
AT COLUMN B3 VIEWED EAST

Data File: PRO15, Figure 2/39_0
SECTION B-B
50mm FROM END PLATE

C3-CONNECTION DETAIL AT COLUMN B3
PRIMARY BEAM: 356x171mmx51kg/m
SECTION THROUGH B-B VIEW LOOKING SOUTH

Data File: PRO15, Figure 2/39_1
C3—CONNECTION DETAIL AT COLUMN B3
PRIMARY BEAM: 356x171mmx51kg/m (PB3)
VIEW LOOKING SOUTH

Data File: PRC15 , Figure 2/39_2
SECTION E–E

POSITION OF FLANGE T/C's
LOCATED BETWEEN 1st & 2nd BOLTS
POSITION OF WEB T/C's
LOCATED BETWEEN 2nd & 3rd BOLTS
ON NORTH SIDE AND 1st & 2nd BOLTS
ON SOUTH SIDE

DETAIL AT CONNECTION C3 ON COLUMN B3

Data File: PRO15 , Figure 2/39_3
CONNECTION DETAIL AT COLUMN B3
SECONDARY BEAM (SB6E): 305x165mmx40kg/m
VIEW LOOKING WEST

Data File: PRO16, Figure 2/40_1
T/C’S BETWEEN 1st & 2nd BOLTS

LINE OF BOLTS

LINE OF FILLET WELD

150mm FROM END PLATE

CONNECTION DETAIL AT COLUMN B3
SECONDARY BEAM (SB6E) : 305x165mmx40kg/m
VIEW LOOKING WEST

Data File: PRO16, Figure 2/40_2
C3—CONNECTION DETAIL AT COLUMN B3
PRIMARY BEAM (PBS) : 610x229mmx101kg/m
VIEW LOOKING NORTH

Data File: PRO16 , Figure 2/40.3
C3—CONNECTION DETAIL AT COLUMN B3
PRIMARY BEAM (PB5) : 610x229mmx101kg/m
VIEW LOOKING NORTH

Data File: PRO16 , Figure 2/40_4
CONNECTIONS C1 AND C4 AT COLUMNS B1 AND B4
GENERAL ARRANGEMENT VIEWED ON GRID LINES 1 (WEST) AND 4 (EAST)

Data File: PRO17 , Figure 2/41_0
C4—CONNECTION DETAIL AT COLUMN B4
PRIMARY BEAM : 356x171mmx51kg/m
VIEW LOOKING NORTH

Data File: PRO17, Figure 2/41_1
C4—CONNECTION DETAIL AT COLUMN B4
PRIMARY BEAM: 356x171mmx51kg/m (PB3)
VIEW LOOKING NORTH

Data File: PRO17, Figure 2/41_2
SECTION C-C

BETWEEN 1st & 2nd BOLTS

DETAIL AT CONNECTION C4 ON COLUMN B4

Data File: PRO17, Figure 2/41_3
DETAIL AT FIN PLATE CONNECTION AT C1A
VIEW ON GRID LINE B LOOKING SOUTH

Data File: PRO18, Figure 2/43_1
DETAIL AT FIN PLATE CONNECTION AT C1A
VIEW LOOKING WEST

PRIMARY BEAM
356x171mmx51 kg/m

Data File: PRO18, Figure 2/43_2
DETAIL AT FIN PLATE CONNECTION AT C2A
VIEW LOOKING NORTH

Data File: PRO19, Figure 2/44_1
DETAIL AT FIN PLATE CONNECTION AT C2B
VIEW LOOKING WEST

Data File: PRO19, Figure 2/44_2
DETAIL AT FIN PLATE CONNECTION AT C28
VIEW ON GRID LINE B LOOKING NORTH

Data File: PRO19, Figure 2/44_3
STRAIN GAUGE LOCATIONS AT COLUMN B4 ON THE FOURTH FLOOR, 500mm ABOVE THE TEST FLOOR

305x305x137 kg/m

Data File: PRO1 , Figure 2/50
STRAIN GAUGE LOCATIONS AT COLUMN B3 ON THE FOURTH FLOOR, 500 mm ABOVE THE TEST FLOOR

305x305x18 mm kg/m

Data File: PRO2, Figure 2/51
DIMENSIONS IN mm

STRAIN GAUGE LOCATIONS AT COLUMN B2 ON THE FOURTH FLOOR, 500mm ABOVE THE TEST FLOOR
305x305x186 kg/m

Data File: PRO3, Figure 2/52
STRAIN GAUGE LOCATIONS AT COLUMN B1 ON THE FOURTH FLOOR, 500 mm ABOVE THE TEST FLOOR

305x305x137 kg/m

Data File: PRO4, Figure 2/53
Strain gauge locations at column B4 on the second floor below the test furnace.

305x305x137 kg/m

Data File: PRO5, Figure 2/54
DIMENSIONS IN mm

STRAIN GAUGE LOCATIONS AT COLUMN B3 ON THE SECOND FLOOR BELOW THE TEST FURNACE

305x305x198 kg/m

Data File: PRO6, Figure 2/55
DIMENSIONS IN mm

STRAIN GAUGE LOCATIONS AT COLUMN B2 ON THE SECOND FLOOR BELOW THE TEST FURNACE

305×305×198 kg/m

Data File: PRO7, Figure 2/56
DIMENSIONS IN mm

STRAIN GAUGE LOCATIONS AT COLUMN B1 ON THE SECOND FLOOR BELOW THE TEST FURNACE
305×305×137 kg/m

Data File: PRO8, Figure 2/57
DIMENSIONS IN mm

STRAIN GAUGE LOCATIONS AT COLUMN B2 WITHIN THE TEST FURNACE, 2000 mm ABOVE THE CONCRETE SLAB (MID-HEIGHT)

305x305x198 kg/m

Data File: PRO9, Figure 2/58
DIMENSIONS IN mm

STRAIN GAUGE LOCATIONS AT COLUMN B1 WITHIN THE TEST FURNACE. 2000 mm ABOVE THE CONCRETE SLAB (MID-HEIGHT)

305x305x137 kg/m

Data File: PRO10, Figure 2/59
DIMENSIONS IN mm

STRAIN GAUGE LOCATIONS AT COLUMN B2 WITHIN THE
TEST FURNACE, 500mm ABOVE THE CONCRETE SLAB

305x305x198 kg/m

Data File: PRO11, Figure 2/60
STRAIN GAUGE LOCATIONS AT COLUMN B1 WITHIN THE TEST FURNACE, 500 mm ABOVE THE CONCRETE SLAB

305x305x137 kg/m

Data File: PRO12 , Figure 2/61
Test 2 - Measurement Stations for the Primary Floor Beams

Measurement Positions

H1W V1W
H2W V2W
H3W V3W
H4W V4W
H5W V5W
H6W V6W
H7W V7W

Column B1

D1 D1a D2
D3 D3a D4
D5

H1E V1E
H2E V2E
H3E V3E
H4E V4E
H5E V5E
H6E V6E
H7E V7E

D = Vertical Deflection - Top Flange
H = Horizontal Deflection - Bottom Flange
V = Vertical Deflection - Bottom Flange

Data File: VUF, HLF, VLF, Figure 2/62_1
D = VERTICAL DEFLECTIONS: UPPER FLANGE
V = VERTICAL DEFLECTIONS: LOWER FLANGE
H = LATERAL DISPLACEMENTS: LOWER FLANGE

DETAIL VIEW OF INSTRUMENTATION LOCATIONS FOR THE PRIMARY BEAMS

Data File: VUF, HLF, VLF, Figure 2/62_2
Test 2 - Measurement Positions for Column Displacements

NORTH

Column B1

Column B4

L3

L4

L5

L6

L7

L2

L1

Level 3

Ground

2000

3000

3000

9000

3000

6000

3000

6000

2000

L = Horizontal Displacements Between Columns

Data File: LDC, Figure 2/63
Test 2 - Measurement Positions for Beam and Column Rotations

Column B1

Column B4

11&12

115&116

I = Clinometer Positions

Data File: ROT, Figure 2/64_1
Test 2 - Measurement Positions for Column B1 and B4 Rotations

Data File: ROT_2, Figure 2/64_2
TEST 3

CORNER
12 STEEL THERMOCOUPLES

THERMOCOUPLE POSITIONS ON PRIMARY BEAM ON GRID LINE E, LOCATION 8
356x171x51Kg/m

Data File: PRO1, Figure 3/1
THERMOCOUPLE POSITIONS ON PRIMARY BEAM ON GRID LINE E, LOCATION H
366x171x61kg/m

Data File: PRO2, Figure 3/2
12 STEEL THERMOCOUPLES

THERMOCOUPLE POSITIONS ON PRIMARY BEAM ON GRID LINE E, LOCATION I
366x171x51Kg/m

Data File: PROC3, Figure 3/3
6 STEEL THERMOCOUPLES

THERMOCOUPLE POSITIONS ON PRIMARY BEAM ON GRID LINE E, LOCATION J
366x171 x61Kg/m

Data File: PRO4 , Figure 3/4
12 STEEL THERMOCOUPLES

THERMOCOUPLE POSITIONS ON PRIMARY
BEAM ON GRID LINE E, LOCATION K
610x229x101Kg/m

Data File: PRO5, Figure 3/5
5 STEEL THERMOCOUPLES

THERMOCOUPLE POSITIONS ON SECONDARY BEAM ON
GRID LINE E/F, LOCATION K
254x146x31 Kg/m

Data File: PRO6, Figure 3/6
8 STEEL THERMOCOUPLES

THERMOCOUPLE POSITIONS ON EDGE BEAM ON GRID LINE F, LOCATION 8
366x171x51Kg/m

Data File: PRO7, Figure 3/7
3 STEEL THERMOCOUPLES

THERMOCOUPLE POSITIONS ON EDGE BEAM
ON GRID LINE F, LOCATION H
365x171x61Kg/m

Data File: PRO8, Figure 3/8
THERMOCOUPLE POSITIONS ON EDGE BEAM
ON GRID LINE F, LOCATION I
360x171x51Kg/m

Data File: PRO9, Figure 3/9
3 STEEL THERMOCOUPLES

THERMOCOUPLE POSITIONS ON EDGE BEAM ON GRID LINE F, LOCATION J
368x171x51Kg/m

Data File: PRO10 , Figure 3/10
5 STEEL THERMOCOUPLES

THERMOCOUPLE POSITIONS ON EDGE BEAM ON GRID LINE F, LOCATION K
356 x 17 x 51 Kg/m

Data File: PRO11, Figure 3/11
OUTSIDE FURNACE

INSIDE FURNACE

6 STEEL THERMOCOUPLES

THERMOCOUPLE POSITIONS ON EDGE BEAM ON GRID LINE 1, LOCATION A
356x171x61Kg/m

Data File: PRO12, Figure 3/12
3 STEEL THERMOCOUPLES

THERMOCOUPLE POSITIONS ON EDGE BEAM
ON GRID LINE 1, LOCATION B
358x171x51Kg/m

Data File: PRO13 , Figure 3/13
3 STEEL THERMOCOUPLES

THERMOCOUPLE POSITIONS ON EDGE BEAM ON GRID LINE 1, LOCATION C
356x171x51Kp/m

Data File: PRO14, Figure 3/14
11 STEEL THERMOCOUPLES

THERMOCOUPLE POSITIONS ON EDGE BEAM
ON GRID LINE 1, LOCATION D
356x171x51Kg/m³

Data File: PRO15, Figure 3/15
3 STEEL THERMOCOUPLES

THERMOCOUPLE POSITIONS ON EDGE BEAM
ON GRID LINE 1, LOCATION E
366x171x61Kg/m

Data File: PRO17, Figure 3/17
3 STEEL THERMOCOUPLES

THERMOCOUPLE POSITIONS ON EDGE BEAM
ON GRID LINE 1, LOCATION F
356x171x51Kg/m

Data File: PRO18, Figure 3/18
5 STEEL THERMOCOPLES

THERMOCOUPLE POSITIONS ON SECONDARY BEAM ON GRID LINE 1/2, LOCATION A
305x185x40 Kg/m

Data File: PRO19 , Figure 3/19
3 STEEL THERMOCOUPLES

THERMOCOUPLE POSITIONS ON SECONDARY BEAM ON GRID LINE LINE 1/2, LOCATION B
305x165x40 Kg/m

Data File: PRO20, Figure 3/20
3 steel thermocouples

Thermocouple positions on secondary beam on grid line 1/2, location C
305x165x40 Kg/m

Data File: PRO21, Figure 3/21
THERMOCOUPLE POSITIONS ON SECONDARY BEAM ON GRID LINE 1/2, LOCATION D
305x185x40 Kg/m

Data File: PRO22 , Figure 3/22
THERMOCOUPLE POSITIONS ON SECONDARY BEAM
ON GRID LINE 1/2, LOCATION Dn-d
356x171x51Kg/m

1/2-D (D)
5 STEEL THERMOCOUPLES

Data File: PRO23 , Figure 3/23
3 STEEL THERMOCOUPLES

THERMOCOUPLE POSITIONS ON SECONDARY BEAM ON GRID LINE 1/2, LOCATION E
305x185x40 Kg/m

Data File: PRO24, Figure 3/24
3 STEEL THERMOCOUPLES

THERMOCOUPLE POSITIONS ON SECONDARY BEAM ON GRID LINE 1/2, LOCATION F
305x165x40 Kg/m

Data File: PRO25 , Figure 3/25
5 STEEL THERMOCOUPLES

THERMOCOUPLE POSITIONS ON SECONDARY BEAM ON GRID LINE 2, LOCATION A
305x185x40 Kg/m

Data File: PRO26, Figure 3/26
3 STEEL THERMOCOUPLES

THERMOCOUPLE POSITIONS ON SECONDARY BEAM ON GRID LINE 2, LOCATION B
305x155x40 Kg/m

Data File: PRO27, Figure 3/27
3 STEEL THERMOCOUPLES

THERMOCOUPLE POSITIONS ON SECONDARY BEAM ON GRID LINE 2, LOCATION C
335x165x40 Kg/m

Data File: PRO28 , Figure 3/28
10 STEEL THERMOCOUPLES

THERMOCOUPLE POSITIONS ON SECONDARY BEAM ON GRID LINE 2, LOCATION D
305x165x40 Kg/m

Data File: PRO29 , Figure 3/29
THERMOCOUPLE POSITIONS ON SECONDARY BEAM ON GRID LINE 2, LOCATION Da-d
305x165x40Kg/m

Data File: PRO30, Figure 3/30
3 STEEL THERMOCOUPLES

THERMOCOUPLE POSITIONS ON SECONDARY BEAM
ON GRID LINE 2, LOCATION E
305x165x40Kg/m

Data File: PRO31, Figure 3/31
3 STEEL THERMOCOUPLES

THERMOCOUPLE POSITIONS ON SECONDARY BEAM
ON GRID LINE 2, LOCATION F
305x165x40 kg/m

Data File: PRO32 , Figure 3:32
EDGE COLUMN AT 1E - 305x305mmx137kg/m
VIEW LOOKING WEST

Data File: PRO33, Figure 3/33_1
EDGE COLUMN AT 2F - 305x305mmx137kg/m

VIEW LOOKING EAST

Data File: PRO37 , Figure 3/37_1
EDGE COLUMN AT 2F - 305x305mmx137kg/m

VIEW LOOKING EAST

Data File: PRO37 , Figure 3/37_2
SECTION AT A-A

SECONDARY BEAM: 356x171mmx51kg/m
CONNECTION AT F1 VIEWED EAST

Data File: PRO38, Figure 3/38_1
SECTION AT B–B

SECONDARY BEAM : 356x171mmx51kg/m

CONNECTION AT F1 VIEWED SOUTH

Data File: PRO38, Figure 3/38_2
T/C's MIDWAY BETWEEN 1st & 2nd BOLTS
T/C's IN BOLT HEADS
EDGE OF FILLET WELD
LINE OF BOLTS

CONNECTION AT F1 : END PLATE
SECONDARY BEAM : 356x171x51 kg/m
VIEW LOOKING SOUTH

Data File: PROC88 , Figure 3/38_3
CONNECTION AT F1 : END PLATE
SECONDARY BEAM : 356x171x51 kg/m
VIEW LOOKING EAST

Data File: PRO38 , Figure 3/38_4
DETAIL AT FIN PLATE CONNECTION AT E-1/2
VIEW ON GRID LINE E 100mm FROM WELD
NORTH SIDE OF CONNECTION - 356x171mmx51kg/m

Data File: PRO39, Figure 3/39_1
DETAIL AT FIN PLATE CONNECTION AT E-1/2
VIEWED LOOKING SOUTH

Data File: PRC39, Figure 3/39_2
DETAIL AT FIN PLATE CONNECTION AT F-1/2
VIEWED LOOKING SOUTH

Data File: PRO39, Figure 3/39_3
BOLT HEADS ON EAST SIDE

356x171mmx51kg/m

305x305mmx137kg/m

GENERAL ARRANGEMENT – CONNECTION AT COLUMN E1

Data File: PRO40 , Figure 3/40_0
SECTION A-A
150mm FROM END PLATE

CONNECTION DETAIL AT COLUMN E1
PRIMARY BEAM: 356x171mmx51kg/m
VIEW LOOKING SOUTH

Data File: PRO40, Figure 3/40_1
CONNECTION DETAIL AT COLUMN E1
PRIMARY BEAM: 356x171x51 kg/m
VIEW LOOKING SOUTH

Data File: PRO40, Figure 3/40_2
150mm FROM ENDPLATE

CONNECTION AT COLUMN E1
EDGE BEAM : 356x171mmx51kg/m
VIEW LOOKING EAST

Data File: PRO40 , Figure 3/40_3
Connection Detail at Column E1
Secondary Beam: 356x171mm x 51 kg/m
View Looking West

Data File: PRO41, Figure 3/41.1
SECTION C-C
BETWEEN 1st ANL 2nd BOLTS

DETAIL AT CONNECTION AT COLUMN E1

Data File: PRO41 , Figure 3/41_2
GENERAL ARRANGEMENT OF CONNECTION AT COLUMN E2 VIEWED ON GRID LINE 2 LOOKING WEST

Data File: PRO42 , Figure 3/42_0
SECTION A-A
150mm FROM
END PLATE

CONNECTION DETAIL AT COLUMN E2
PRIMARY BEAM: 356x171mmx51kg/m
VIEW LOOKING NORTH

Data File: PRO42, Figure 3/42_1
SECTION B-B
150mm FROM END PLATE

CONNECTION DETAIL AT COLUMN E2
PRIMARY BEAM: 610x229mmx101kg/m
VIEW LOOKING SOUTH

Data File: PRO42, Figure 3/42_2
SECTION C-C

SECTION D-D

(50mm BELOW LOWER FLANGE OF 356x171mmx51kg/m PRIMARY BEAM)

DETAIL AT CONNECTION AT COLUMN E2

Data File: PRO42, Figure 3/42_3
CONNECTION AT COLUMN E2
SECONDARY BEAM: 305x165mmx40kg/m
VIEW LOOKING WEST

Data File: PRO43, Figure 3/43_1
CONNECTION DETAIL AT COLUMN E1
PRIMARY BEAM : 356x171x51 kg/m
VIEW LOOKING NORTH

Data File: PRO43, Figure 3/43_2
T/C's MIDWAY BETWEEN 1st & 2nd BOLTS

T/C IN BOLT SHANK 2nd FROM TOP

T/C IN BOLT SHANK 6th FROM TOP

T/C's MIDWAY BETWEEN 6th & 7th BOLTS

EDGES OF FILLET WELD

LINE OF BOLTS

CONNECTION DETAIL AT COLUMN E2
SECONDARY BEAM: 610x229x'01 kg/m
VIEW LOOKING SOUTH

Data File: PRO43, Figure 3/43_3
CONNECTION DETAIL AT COLUMN E2
SECONDARY BEAM : 305x165x40kg/m
VIEW LOOKING WEST

Data File: PRO43 , Figure 3/43_4
CONCRETE SLAB THERMOCOUPLE LOCATIONS
CS1

Data File: PRO44, Figure 3/44
CONCRETE/BEAM THERMOCOUPLE LOCATIONS
OVER PRIMARY BEAM : CB1
356x171x51 Kg/m

Data File: PRO46 , Figure 3/46
KEY
1. C = CONCRETE
2. CS = CONCRETE SURFACE
3. MD = METAL DECK
4. R = REINFORCEMENT

CONCRETE/BEAM THERMOCOUPLE LOCATIONS
CB3

Data File: PRO47 , Figure 3/47
DIMENSIONS IN mm

STRAIN GAUGE LOCATIONS AT COLUMN E1 300mm
ABOVE GROUND FLOOR SLAB
305x305=137 kg/m

Data File: PRO1, Figure 3/49
DIMENSIONS IN mm

STRAIN GAUGE LOCATIONS AT COLUMN F1 300 mm
ABOVE GROUND FLOOR SLAB

254x254x69 kg/m

Data File: PRO2 , Figure 3/50
STRAIN GAUGE LOCATIONS AT COLUMN E2 300 mm ABOVE GROUND FLOOR SLAB

305x305x198 kg/m

Data File: PRO3, Figure 3/51
DIMENSIONS IN mm

STRAIN GAUGE LOCATIONS AT COLUMN P2 300mm ABOVE GROUND FLOOR SLAB

305x305x137 kg/m

Data File: PRO4, Figure 3/52
DIMENSIONS IN mm

STRAIN GAUGE LOCATIONS AT COLUMN E1 300 mm
BELOW FIRST FLOOR SLAB

305 x 305 x 137 kg/m

Data File: PRO5, Figure 3/53
DIMENSIONS IN mm

STRAIN GAUGE LOCATIONS AT COLUMN F1 300mm BELOW FIRST FLOOR SLAB

254x254x89 kg/m

Data File: PRO6, Figure 3/54
DIMENSIONS IN mm

STRAIN GAUGE LOCATIONS AT COLUMN E2 300mm
BELOW FIRST FLOOR SLAB

305x305x198 kg/m

Data File: PRO7, Figure 3/55
DIMENSIONS IN mm

STRAIN GAUGE LOCATIONS AT COLUMN F2 300mm BELOW FIRST FLOOR SLAB
306x305x137 kg/m

Data File: PRO8, Figure 3/56
DIMENSIONS IN mm

STRAIN GAUGE LOCATIONS AT COLUMN D1 500mm ABOVE FIRST FLOOR SLAB

305x305x198 kg/m

Data File: PRO9, Figure 3/57
DIMENSIONS IN mm

STRAIN GAUGE LOCATIONS AT COLUMN E: 500mm ABOVE FIRST FLOOR SLAB
305x305x137 kg/m

Data File: PRO10, Figure 3/58
DIMENSIONS IN mm

STRAIN GAUGE LOCATIONS AT COLUMN F1 500mm ABOVE FIRST FLOOR SLAB

254x254x69 kg/m

Data File: PRO11, Figure 3/59
STRAIN GAUGE LOCATIONS AT COLUMN E2 500mm ABOVE FIRST FLOOR SLAB

305x305x196 kN/m

Data File: PRO12, Figure 3/60
DIMENSIONS IN mm

STRAIN GAUGE LOCATIONS AT COLUMN F2 500mm
ABOVE FIRST FLOOR SLAB
305x305x137 kg/m

Data File: PRO13, Figure 3/61
DIMENSIONS IN mm

STRAIN GAUGE LOCATIONS AT COLUMN E/F-2/3
500mm ABOVE FIRST FLOOR SLAB
305x305x137 kg/m

Data File: PRO14, Figure 3/62
STRAIN GAUGE LOCATIONS AT COLUMN D1 500 mm BELOW SECOND FLOOR SLAB

305x305x198 kg/m

Data File: PRO15, Figure 3/33
DIMENSIONS IN mm

STRAIN GAUGE LOCATIONS AT COLUMN E/F-2/3
500mm BELOW SECOND FLOOR SLAB
305x205x137 kg/m

Data File: PRO16, Figure 3/64
DIMENSIONS IN mm

STRAIN GAUGE LOCATIONS AT COLUMN E1 500mm ABOVE SECOND FLOOR SLAB
305×305×13? kg/m²

Data File: PRO17, Figure 3/65
DIMENSIONS IN mm

STRAIN GAUGE LOCATIONS AT COLUMN F1 500mm ABOVE SECOND FLOOR SLAB
254x254x89 kg/m

Data File: PRO18 , Figure 3/66
STRAIN GAUGE LOCATIONS AT COLUMN E2 500mm
ABOVE SECOND FLOOR SLAB

305x305=1.06 kg/m

Data File: PRO19, Figure 3/67
DIMENSIONS IN mm

STRAIN GAUGE LOCATIONS AT COLUMN F2 500mm ABOVE SECOND FLOOR SLAB
305x305x137 kg/m

Data File: PRO20, Figure 3/68
DIMENSIONS IN mm

STRAIN GAUGE LOCATIONS AT COLUMN F1 500mm BELOW THIRD FLOOR SLAB
254x254x69 kg/m

Data File: PRO21, Figure 3/69
DIMENSIONS IN mm

STRAIN GAUGE LOCATIONS AT COLUMN F2 500 mm
BELOW THIRD FLOORSLAB
365x305x137 kg/m

Data File: PRO22 , Figure 3/70
STRAIN GAUGE LOCATIONS AT BEAM D/E-2 SUPPORTING SECOND FLOOR SLAB, LOCATION B1

305x305x198 kg/m

Data File: PRO23, Figure 3/71
DIMENSIONS IN mm

STRAIN GAUGE LOCATIONS AT BEAM D/E-2 SUPPORTING SECOND FLOOR SLAB, LOCATION B2

305x305x198 kg/m

Data File: PRO24, Figure 3/72
Test 3 - Transducer Positions for Measuring Vertical Deflections
Test 3 - Transducer Positions for Measuring Horizontal Displacements
Test 3 - Clinometer Positions for Measuring Rotation at the Connections (Vertical Plane)
TEST 4

OFFICE FIRE
(DEMONSTRATION)
3 STEEL THERMOCOUPLES

THERMOCOUPLE LOCATIONS ON PRIMARY BEAM AT GRID LINE D POSITION B11
356 x 171mm x 51kg/m

Data File: PRO1, Figure 4/1
3 STEEL THERMOCOUPLES

THERMOCOUPLE LOCATIONS ON PRIMARY BEAM AT GRID LINE E POSITION B12
356 x 171mm x 51kg/m

Data File: PR02, Figure 4/2
THERMOCOUPLE LOCATIONS ON PRIMARY BEAM (FACING NORTH)
ON GRID LINE E POSITION B14
356 × 171mm × 51kg/m

Data File: PRO3, Figure 4/3
4 STEEL THERMOCOUPLES
1 ATMOSPHERE THERMOCOUPLE

THERMOCOUPLE LOCATIONS ON PRIMARY BEAM (FACING NORTH)
ON GRID LINE E POSITION B15
610 x 229mm x 101kg/m

Data File: PRO4, Figure 4/4
3 STEEL THERMOCOUPLES

THERMOCOUPLE LOCATIONS ON EDGE BEAM AT GRID LINE 4 POSITION B1
356 x 171mm x 51kg/m

Data File: PRO5, Figure 4/5
3 STEEL THERMOCOUPLES

THERMOCOUPLE LOCATIONS ON EDGE BEAM AT GRID LINE 4 POSITION B2
356 x 171mm x 51kg/m

Data File: PRO6, Figure 4/6
4 STEEL THERMOCOUPLES

THERMOCOUPLE LOCATIONS ON EDGE BEAM AT GRID LINE 4 POSITION B3
356 x 171mm x 51kg/m

Data File: PRO7, Figure 4/7
3 STEEL THERMOCOUPLES

THERMOCOUPLE LOCATIONS ON EDGE BEAM AT GRID LINE F POSITION B13
356 x 171mm x 51kg/m

Data File: PROB , Figure 4/8
3 STEEL THERMOCOUPLES

THERMOCOUPLE LOCATIONS ON SECONDARY BEAM AT GRID LINE 3/4 POSITION B4
305 x 165mm x 40kg/m

Data File: PRC09 , Figure 4/9
3 STEEL THERMOCOUPLES

THERMOCOUPLE LOCATIONS ON SECONDARY BEAM AT GRID LINE 3/4 POSITION 85
305 x 165mm x 40kg/h

Data File: PRO10 , Figure 4/10
4 STEEL THERMOCOUPLES

THERMOCOUPLE LOCATIONS ON SECONDARY BEAM AT GRID LINE 3/4 POSITION B6
305 x 165mm x 40kg/m

Data File: PRO11, Figure 4/11
4 STEEL THERMOCOUPLES

THERMOCOUPLE LOCATIONS ON SECONDARY BEAM AT GRID LINE 3 POSITION B7
305 x 165mm x 40kg/m

Data File: PRO12, Figure 4/12
3 STEEL THERMOCOUPLES

THERMOCOUPLE LOCATIONS ON SECONDARY BEAM AT GRID LINE 3 POSITION B8
305 x 165mm x 40kg/m

Data File: PRO13 , Figure 4/13
3 STEEL THERMOCOUPLES

THERMOCOUPLE LOCATIONS ON SECONDARY BEAM AT GRID LINE 3 POSITION B9
305 x 165mm x 40kg/m

Data File: PRO14, Figure 4/14
3 STEEL THERMOCOUPLES

THERMOCOUPLE LOCATIONS ON SECONDARY BEAM AT GRID LINE 3 POSITION B10
305 x 165mm x 40kg/m

Data File: PRO15 , Figure 4/15
THERMOCOUPLE DETAIL AT COLUMN 4D
305 x 305 x 196 kg/m

Data File: PRO16 , Figure 4/16
1m BELOW DECKING

2.5m BELOW DECKING

THERMOCOUPLE DETAIL AT COLUMN 4E
305 x 305x190 kg/m

Data File: PRO17, Figure 4/17
INNER COMPARTMENT

EXISTING GABLE WALL (140mm)

THERMOCOUPLE DETAIL AT COLUMN 4F
254 x 254 x 69 kg/m

Data File: PRO18, Figure 4/18
THERMOCOUPLER DETAIL AT COLUMN 3E
VIEW LOOKING EAST

LINE OF BOLTS

VIEW LOOKING NORTH

CONNECTION C1 AT COLUMN 4E

Data File: PRO20 , Figure 4/20
FIN PLATE CONNECTION C2 AT 3/4-E
VIEW LOOKING NORTH

Data File: PRO21, Figure 4/21
CONNECTION DETAIL C3, C4, AND C5 AT 3E LOOKING EAST

Data File: PRO22, Figure 4/22_1
356x171x51 kg/m

610x229x101 kg/m

CONNECTION C3 AT COLUMN 3E
VIEW LOOKING SOUTH

CONNECTION C5 AT COLUMN 3E
VIEW LOOKING NORTH

Data File: PRO22, Figure 4/22_2
50 mm CERAMIC FIBRE BARRIER

UNDERSIDE OF SLAB

INSIDE COMPARTMENT

190 mm BLOCKWORK WALL

LOCATION OF THERMOCOUPLES ON THE SURFACE OF THE FIRE BARRIER

Data File: PRO23, Figure 4/23
203x203x52 kg/m U/C's PROTECTED WITH 15mm MINERAL FIBRE BOARD

PARTIALLY PROTECTED STEEL INDICATIVES-LOCATION OF THERMOCOUPLES

Data File: PRO24, Figure 4/24
FACADE TEMPERATURES AT LOCATIONS K & L

Data File: PRO29, Figure 4/26
STRAIN GAUGE LOCATIONS ON COLUMN 3D AT LEVEL 1
305 x 305 x 198 kg/m

Data File: PRO1, Figure 4/27
STRAIN GAUGE LOCATIONS ON COLUMN 3E AT LEVEL 1
305 x 305 x 198kg/m

Data File: PRC2 , Figure 4/28
STRAIN GAUGE LOCATIONS ON COLUMN 4D AT LEVEL 1
254 x 254 x 89kg/m

Data File: PRO3 , Figure 4/29
STRAIN GAUGE LOCATIONS ON COLUMN 4E AT LEVEL 1
254 x 254 x 89kg/m

Data File: PRO4, Figure 4/30
STRAIN GAUGE LOCATIONS ON COLUMN 3D AT LEVEL 2

305 x 305 x 198 kg/m

Data File: PRO5 , Figure 4/31
STRAIN GAUGE LOCATIONS ON COLUMN 3E AT LEVEL 2
305 x 305 x 198kg/m

Data File: PRO6 , Figure 4/32
STRAIN GAUGE LOCATIONS ON COLUMN 4D AT LEVEL 2
254 x 254 x 89 kg/m

Data File: PRO7, Figure 4/33
STRAIN GAUGE LOCATIONS ON COLUMN 4E AT LEVEL 2
254 x 254 x 89 kg/m

Data File: PRO8, Figure 4/34
STRAIN GAUGE LOCATIONS ON COLUMN 4F AT LEVEL 2

254 x 254 x 89 kg/m

Data File: PRO9 , Figure 4/35
Test 4 - Transducer Positions for Measuring Vertical Deflections

Data File: V1-V15 & V16-V32, Figure 4/36