



**METRO NORTH
ORAL HEARING**

**SD-2.6I RevA Designer Risk
Assessment**

Mater Stop

Designer's Risk Assessment

M000384/243231/SD-2.6I/A

RPA
PG2 Parkgate Business Centre
Parkgate Street
Dublin 9

Mater Stop

Designer's Risk Assessment

M000384/243231/SD-2.6I/A

April 2009

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Railway Procurement Agency

Document Title:
Project Title:
Client:
Project Number:

Designers Risk Assessment
Metro North - Mater Stop
RPA
M000384

Revision Number: A
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Issued By: David Cook
Checked By: Des Marmion
Approved By: Saleem Akbar

Notes:

1. This Spreadsheet is a Project Specific Risk Assessment Worksheet and Register for the RPA Metro North Project
2. This Risk Assessment Worksheet is to be read in conjunction with all relevant discipline drawings, plans, design statements and reports.

Process for Adding Risks:

1. There is a separate sheet for each design discipline, owned & approved by the design lead for that discipline. See signature sheet for the list of nominated design Leads and Disciplines at the date of issue.
2. Each discipline should regularly update their discipline specific risk assessment as design progresses.
3. If Residual Risk Rating (as per matrix below) remains 'amber' or 'red' then it will be specifically mentioned in the Preliminary Safety and Health Plan
4. Periodically, the discipline risk assessments (accepted/approved by the discipline lead) will be combined into the complete risk assessment register for the project (by copying them into the combined register). This will be done before the regular project risk register review.
5. The designers and discipline leads should review the project specific list of risks, discipline risk assessment and the signature page before evaluating their design risk.

Activity when Risk Arises	
D =	Demolish and/or Adapt
M =	Maintain / Clean
C =	Construct
O =	Operate

Severity (S)	Description
1	Nil or slight injury/ illness (possibly requiring first aid treatment on site), property damage or environmental issue.
2	Minor injury/ illness (requiring medical treatment off site), property damage or environmental issue.
3	Moderate injury or illness (including those where a person would be off work for up to 3 days or would be on light duties), property damage or environmental issue.
4	Major injury or illness (including those where a person would be off work for more than 3 days) property damage or environmental issue.
5	Fatal or long term disabling injury or illness. Massive property damage or environmental issue.

Likelihood (L)	Description
1	Highly unlikely event
2	Unlikely event
3	Possible event
4	Likely event
5	Highly likely event

Hierarchy of Mitigation	
1.	Eliminate hazard (design out)
2.	Reduce risk at source (amend design)
3.	Provide collective protection (add to design)
4.	Provide information to identify and manage

Population at Risk	
GP =	General Public
PP =	Passenger
O =	Operator
M =	Maintenance
C =	Construction Personnel

Since the "Population at Risk" and "Activity when Risk Arises" section largely overlap, the two are combined in the Risk Assessment by the addition of a GP and PP column. This is because not all risks relevant to system construction, demolition, operation or maintenance create a risk of harm to the general public or passengers on the system.

		RISK				
		1	2	3	4	5
L I K E L I H O O D	5	5	10	15	20	25
	4	4	8	12	16	20
	3	3	6	9	12	15
	2	2	4	6	8	10
	1	1	2	3	4	5
		1	2	3	4	5
		SEVERITY				

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ID	Description
1	Work which puts persons at work at risk of - (a) falling from a height, (b) burial under earthfalls, or (c) engulfment in swampland
2	Work which puts persons at work at risk from chemical or biological substances constituting a particular danger to the safety and health of such persons or involving a statutory requirement for health monitoring. Exposure to hazardous materials, particularly
3	Work with ionising radiation requiring the designation of controlled or supervised areas as defined in Directive 96/29/Euratom2.
4	Work near high voltage power lines.
5	Work exposing persons at work to the risk of drowning.
6	Work on wells, underground earthworks and tunnels.
7	Work carried out by divers at work having a system of air supply. [This may not be intended, but is potentially required if problems arise during construction of underground works with water ingress].
8	Work carried out in a caisson with a compressed-air atmosphere. [This may not be intended, but is potentially required if problems arise during construction of underground works with water ingress].
9	Work involving the use of explosives. [This may not be intended, but is potentially required if ground conditions require during construction].
10	Work involving the assembly or dismantling of heavy prefabricated components.
11	Working in close proximity to or entirely within existing public infrastructure with presence of traffic, including roads, Motorways, Luas, railways and Dublin airport
12	Confined spaces, whether created by the construction works, or existing confined spaces (typically basements) visited for survey or inspection
13	Safety of workforce & others from rail construction traffic particularly during commissioning
14	Security threats to construction personnel, and effects of vandalism on the construction works
15	Settlement and collapse of existing structures arising from the construction works
16	Subsidence or engulfment of the works arising from unfavourable ground conditions (typically swampland), or from underground man made or natural features traversing the construction works (pre existing tunnels, services or underground streams).
17	Risk arising from existing aboveground or buried utility services, including gas, power and telecoms.
18	Risk from Noise.
19	Risk to the passengers during operation and maintenance of the system.
20	Risk arising from decommissioning and demolition of the system at End of Life.

Note - Risks 1-10 in the list above correspond to the ten particular risks stated in Schedule 1 of the Safety, Health and Welfare at Work (Construction) Regulations 2006.

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Discipline	Owner	Signature	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Utilities	P Doyle		✓	✓	✓	✓	✓					✓	✓	✓		✓			✓	✓	✓	✓
Roads	D Herlihy		✓	✓	✓							✓	✓	✓		✓			✓	✓		✓
Stop Box	H Phillips		✓	✓	✓		✓	✓	✓		✓	✓	✓	✓	✓	✓	✓		✓	✓		✓
Tunnelling (TBM Breakthrough only)	S Carley		✓	✓				✓	✓		✓		✓	✓		✓	✓		✓			✓
Systems (inc Heavy E&M)	K Grabauskas		✓	✓	✓	✓		✓				✓		✓	✓	✓				✓	✓	✓
Ventilation	K Grabauskas		✓	✓	✓	✓		✓				✓		✓	✓	✓			✓	✓	✓	✓
Domestic E & M	K Grabauskas		✓	✓	✓	✓		✓				✓			✓	✓			✓	✓	✓	✓
Fire	K Grabauskas		✓	✓	✓	✓						✓		✓	✓	✓					✓	✓
Architecture	C Bennie		✓	✓								✓	✓	✓	✓	✓				✓	✓	✓
Civil Structures	Incorporated in Stop Box																					
Track	N/A																					
Operations	N/A																					
Rolling Stock	N/A																					
Traction Power	N/A																					
Surveys	N/A																					
Construction	Incorporated in other																					

The risk numbers in the above table reference the project specific list of risks on the previous sheet

Notes:

1. The discipline leads should sign a hardcopy of this sheet prior to each compilation of the project risk register. The hardcopy should be retained.

Declaration (Read before signing in the table above):

This designer has reviewed the **NON EXHAUSTIVE** list of the particular risks present in the design and the residual risk at the completion of this stage of the design. The risks are presented on subsequent pages. This designer has taken account of the General Principals of Prevention as contained in Schedule 3 to the Safety, Health and Welfare at Work Act 2005 and any relevant Safety and Health Plan or Safety File. This designer has provided the PSDP as appropriate with all relevant information required by the regulations. This designer has cooperated with the PSDP as appropriate and with other designers as necessary.

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Reference	Discipline	Element	Location (state as station, section between two stations, or a standard Global Description)	Activity & Population Exposed					Project Specific Risk Number	Potential Hazard	Initial Risk Rating			Mitigation to be incorporated in Design	Action During Initial & Scheme Design	Outstanding Action for Tender Design	Residual Risk Rating			Mitigation or Residual Risk to be incorporated into (state deliverable or S&H plan as appropriate)	Designer Closed Out? (i.e. confirm included in document)	Last Revised	
				C	M	D	O	GP			PP	L	S				R	L	S				R
1	Utilities	Settlement damage to known services	Site Wide	C					GP	6, 7, 18	Damage to utilities serving adjacent structures (e.g. damaged resulting from settlement caused by box excavation)	3	4	12	Obtain relevant utility information. Undertake settlement assessment and assess potential damage to utilities. Provide protection measures to utilities where required. Liaise with relevant utility companies.	Identified temporary replacement /diversion of utilities. Some utilities to be replaced prior to construction. Settlement of utilities assessed based on Attewell et al (1986). Details included in Existing Building & Structures Protection Report	Refine conclusions (if necessary) of Stage 2 assessment following receipt of Slit Trench and CCTV investigations.	2	4	8	Preliminary Safety & Health Plan Utility Drawings Existing Buildings & Structures Protection Report	No	12/02/2009
2	Utilities	Contact with buried services	Site Wide	C		D				3, 6, 18	Injury from live conductors, escape of gas leading to fire/explosion, ingress of water under pressure, ingress of foul water leading to disease.	3	5	15	Desk stop investigation to be undertaken to identify location of existing assets. If necessary, undertake site investigation (e.g. trial holes, slit trenches) to improve understanding of distribution of utilities.	Desk study and site walkover undertaken to inform the mapping of utilities.	RPA has commissioned CCTV and Slit Trench surveys to assist with improving understanding of buries services. Results of surveys to be reviewed and (if necessary), drawings of existing services to be revised to suit.	2	5	10	Preliminary Safety & Health Plan Utility Drawings	No	12/02/2009
3	Utilities	Contact with unforeseen services	Site Wide	C		D			GP	3, 6, 18	Striking existing (unforeseen) services	3	4	12	Desk stop investigation to be undertaken to identify location of existing assets. If necessary, undertake site investigation (e.g. trial holes, slit trenches) to improve understanding of distribution of utilities.	Desk study and site walkover undertaken to inform the mapping of utilities not recorded by utility companies.	RPA has commissioned CCTV and Slit Trench surveys to assist with improving understanding of buries services. Results of surveys to be reviewed and (if necessary), drawings of existing services to be revised to suit.	2	4	8	Preliminary Safety & Health Plan Utility Drawings	No	12/02/2009
4	Utilities	Working adjacent to live roads	Site Wide	C		D	O			12	Struck by highway and construction traffic	2	5	10	None	None	None	2	5	10	Preliminary Safety & Health Plan	Yes	12/02/2009
5	Utilities	Drainage & Ducting Access Points	Site Wide	C	M	D	O			12	Struck by highway and construction traffic	2	5	10	Location of rodding eyes and inspection chambers to be designed to minimise the risk of maintenance operatives being exposed to traffic.	None. Mitigation to be incorporated into Stage 3 (tender Design)	Yes - see Column P	2	3	6	Preliminary Safety & Health Plan	No	12/02/2009
6	Utilities	Diversions & Excavations	Site and surrounding streets	C	M	D			GP	1,2,7	Collapse of excavations or personnel falling in. Material/ objects falling onto personnel below.	2	3	6	None	None	None	2	3	6	Preliminary Safety & Health Plan	Yes	12/02/2009
7	Utilities	Diversions & Excavations	Site and surrounding streets	C	M	D				3	Leptospirosis - Exposure to infected rat urine	3	3	9	None	None	None	3	3	9	Preliminary Safety & Health Plan	Yes	12/02/2009
8	Utilities	Groundwater Filter Drains	Site and surrounding streets	C	M		O			3	Ground water penetration. Impact on electrics, health respiratory system, breeding of vermin.	3	4	12	Design to include ground water filter drains along the perimeter with accessible / visible outlets and grilles	None	Yes - see Column P	2	2	4	Drawings	No	12/02/2009
9	Utilities	Pipe assembly	Site and surrounding streets	C						11	Manual handling, staff struck by objects being transported by cranes / etc.	2	4	8	None	None	None	2	4	8	Preliminary Safety & Health Plan	Yes	12/02/2009

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Reference	Discipline	Element	Location (state as station, section between two stations, or a standard Global Description)	Activity & Population Exposed						Project Specific Risk Number	Potential Hazard	Initial Risk Rating			Mitigation to be incorporated in Design	Action During Initial & Scheme Design	Outstanding Action for Tender Design	Residual Risk Rating			Mitigation or Residual Risk to be incorporated into (state deliverable or S&H plan as appropriate)	Designer Closed Out? (i.e. confirm included in document)	Last Revised
				C	M	D	O	GP	PP			L	S	R				L	S	R			
1	Roads	Public Rights of Way - Access & Egress	North Circular Road & Leo Street	C					GP	12	Diaphragm wall works in close proximity to public highways / footpath	5	5	25	Consider closure of footpath on North Circular Road and Leo Street during construction period. Draft Traffic Management measures to be discussed with DCC.	Current proposal is to not close footpaths, but to provide covered walkway adjacent to site. Agreement with DCC documented in Interface Requirements Report (SD2.1).	Show permanent works in relation to site constraints and DCC footpath & highway boundaries on Drawings	2	5	10	Preliminary Safety & Health Plan D&B Tender Documentation (Drawings & Particular Specification)	No	12/02/2009
2	Roads	Emergency Vehicle Site Access	Site Wide	C					GP	12	Access constraints access to adjacent car park used by hospitals.	3	3	9	None	None	None	3	3	9	Preliminary Safety & Health Plan	NA	12/02/2009
3	Roads	Mud/debris on footpaths and highway	Site Wide	C					GP	12	Slips, trips and falls. Nuisance and potential for road traffic accident.	3	5	15	None	None	None	3	5	15	Preliminary Safety & Health Plan	NA	12/02/2009

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				C	M	D	O	GP	PP			L	S	R				L	S	R							
1	Civil	Site Clearance & Demolition	Site Wide	C		D					GP	3			Dust, allergens & contaminants (e.g. aspergillus and other airborne bacteria)	4	2	8	Carry out additional ground investigation to determine site-specific contaminants.	Additional Geotechnical Investigation completed in December 2009. Records of contamination recorded in Geotechnical Reports (SD2.6). Potential environmental risk to human beings considered in Environmental Description (SD2.3)	Complete Environmental Risk Assessment and Mitigation Strategy	4	2	8	Preliminary Safety & Health Plan Construction Report Geotechnical Reports Environmental Description (and Risk Assessment)	No	12/02/2009
2	Civil	Site Clearance & Demolition	Site Wide	C		D					GP	19			Noise	4	2	8	None	None	None	4	2	8	Preliminary Safety & Health Plan	NA	12/02/2009
3	Civil	Site Clearance & Demolition	Leo Street and North Circular Road	C		D					GP	16			Damage to adjacent properties during demolition of 24-26 Leo Street and 398 to 400 North Circular Road	3	2	6	None	None	None	3	2	6	Preliminary Safety & Health Plan	NA	12/02/2009
4	Civil	Site Clearance & Demolition	Leo Street and North Circular Road	C		D					GP	3			Asbestos encountered during demolition of buildings.	3	4	12	Asbestos surveys required prior to demolition.	RPA have procured an Asbestos Survey. Results of survey expected mid / end March 2009.	Include results of Asbestos Survey in tender documentation for an Enabling Works package (ahead of engagement of a D&B Contractor)	3	4	12	Preliminary Safety & Health Plan Works Information for Enabling Works Contract	No	12/02/2009
5	Civil & Structural	D-wall Construction	Mater Hospital & MCHD	C							GP	7			Damage to sensitive equipment in Mater Hospital and Mater Private Hospital.	3	3	9	Undertake vibration analysis to assess levels generated during construction.	Vibration analysis for construction of box completed.	Vibration constraints to be included in Particular Specification of D&B Tender Documentation	2	3	6	Preliminary Safety & Health Plan D&B Tender Documentation (Particular Specification)	No	12/02/2009
6	Civil & Structural	D-wall Construction	Leo Street	C							GP	7, 16			Damage to foundations of adjacent buildings during construction of D-wall.	3	3	9	Research building and foundation records of Leo Street houses. Assess risk of damage.	1.5m clearance allowed for between D-wall outer face and gable ends Leo Street Nos. 1 & 23. Settlement study undertaken, classification of potential damage identified and included in Existing Buildings & Structures Protection Report (SD2.6E). Proceeding with design on assumed foundation details. Request for trial pits made to RPA (mid March 2009) to verify (or otherwise) design.	Review findings of trial pit investigations. Amend (if necessary) position of D-wall or revise protection measures for Leo Street houses Nos. 1 & 23.	3	3	9	Preliminary Safety & Health Plan	No	12/02/2009
7	Civil & Structural	D-wall Construction	Site Wide	C								2, 11			Large and / or heavy component sizes.	5	2	10	Consider options to reduce size / weight of large / heavy components	Not practicable to break reinforcement cages into small segments that are coupled together. Single lift of total cage anticipated.	None	5	2	10	Preliminary Safety & Health Plan Construction Report	Yes	12/02/2009
8	Civil & Structural	D-wall Construction	Site Wide	C								7, 16			Over break during D-wall construction (e.g. adverse affect on MCHD secant piled wall).	3	4	12	Sequencing of MCHD works prevents design mitigation e.g. MCHD wall will be built before Stop Box	See Reference 9 (below)	See Reference 9 (below)	3	4	12	Preliminary Safety & Health Plan	No	12/02/2009
9	Civil & Structural	D-wall Construction	Stop Box	C								1, 7			Over excavation leading to structural failure or movement in excess of allowable tolerances	3	5	15	Allow for 0.5m accidental over excavation in design calculations at each excavation level (as per industry design standards and guidance.) Allow for clay softening in cohesive soil layers beneath excavations.	Accidental over-excavation and clay softening allowed for (refer Civil & Structural Design Statement, SD2.8)	Movement of D-wall during construction to be monitored against trigger levels. Details to be developed in Geotechnical Instrumentation Report (monitoring details)	2	5	10	Preliminary Safety & Health Plan Geotechnical Instrumentation Report	No	12/02/2009
10	Geotechnical	Excavation	Stop Box	C								3, 7			Contaminated land / groundwater encountered during excavation	3	3	9	Obtain and review relevant ground data. Supplement as necessary with additional ground investigation.	Additional Ground Investigation completed in December 2008. Refer content of Geotechnical Reports (SD2.6) and Environmental Description (SD2.3). No significant contamination	None	2	3	6	Preliminary Safety & Health Plan Geotechnical Reports Environmental Description (and Risk Assessment)	Yes	12/02/2009

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11	Geotechnica I	Excavation	Stop Box	C						7	Artificial obstructions (excluding utilities - covered under Utilities Tab) encountered during excavation.	3	2	6	Search records of previous construction in vicinity of Mater Stop site and examine Ground Penetrating Radar surveys undertaken by the MCHD.	Desk study done including EIS and Archaeological Report. GPR reviewed (although limited penetration owing to underground obstructions).	None	3	2	6	Preliminary Safety & Health Plan	Yes	12/02/2009
12	Geotechnica I	Excavation	Stop Box	C					GP	7	Unexploded ordnance encountered during excavation	2	5	10	Search records of bomb drops on Dublin and Garda records of arms caches. Assess if construction site likely to be affected.	Preliminary Unexploded Ordnance assessment completed. No significant risk identified.	None	1	5	5	NA	Yes	12/02/2009
13	Geotechnica I	Excavation	Stop Box	C						7, 16	Soil conditions differ from design assumptions	4	5	20	Carry out Additional Ground Investigation to obtain more ground information to inform design ground model.	Additional Ground Investigation completed in December 2008. Refer content of Geotechnical Reports (SD2.6) and Environmental Description (SD2.3). Core recovery was however poor. Scheme Design undertaken based on Stage 1 - Initial Design ground conditions and parameters. Comparison of Stage 1 design assumptions and geotechnical data from Additional Ground Investigation to be completed. If revised ground model shows design to be on the safe side then no design change is to be made.	Include in Particular Specification, D&B Contractor to keep records of excavated material and alert Designer to any variations to the ground model on which the Stop Box design is based.	2	5	10	Preliminary Safety & Health Plan Geotechnical Reports D&B Tender Documentation (Particular Specification)	No	12/02/2009
14	Geotechnica I	Excavation	Stop Box	C						7	Actual rock level varies from design assumptions.	4	5	20	Carry out Additional Ground Investigation to provide an improved understanding of rock level across the Mater Stop site.	Additional ground investigation completed December 2008. Rock head proved to be higher in central section of site and lower in south-western corner (when compared to Stage 1 design assumption). Rock head level (from additional ground investigation) shown on Scheme Design (Stage 2) Drawings. Toe of D-wall revised to suit revised rock head profile.	None	2	5	10	Preliminary Safety & Health Plan Geotechnical Reports	Yes	12/02/2009
15	Geotechnica I	Excavation	Stop Box	C						7, 16, 17	Cavities or voids encountered in rock	3	4	12	Review all ground investigation and case history information to establish possibility of cavities and / or voids in rock.	A further six boreholes were drilled during the additional ground investigation to determine rock head levels and the quality of rock at depth. Cavities or voids were not encountered.	None	2	4	8	Preliminary Safety & Health Plan Geotechnical Reports	Yes	12/02/2009

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				C	M	D	O	GP	PP			L	S	R				L	S	R			
16	Geotechnica I	Excavation	Stop Box							6, 7	Ingress of groundwater	3	5	15	Carry out groundwater monitoring and permeability testing in Additional Ground Investigation.	Permeability testing including packer tests and rising/falling head tests were undertaken during the additional ground investigation. The groundwater model and parameters measured in Stage 1 have been reviewed and SEEPW models have been reanalysed. A range of probable groundwater ingress has been estimated (similar range to that estimated during Stage 1) although the range / span of values is relatively large. May be unable to discharge all of water into DCC sewers. May	Specify pumping in Particular Specification, following construction of D-walls to provide an early indication of actual quantities that will require discharge. Further liaison with DCC required to establish allowable discharge to their assets.	2	5	10	Preliminary Safety & Health Plan Geotechnical Reports D&B Tender Documentation (Particular Specification)	No	12/02/2009
17	Geotechnica I	Excavation	Stop Box							7	Excessive hard material / core stones in Boulder Clay	3	3	9	Carry out Additional Ground Investigation	None	None	3	3	9	Preliminary Safety & Health Plan Geotechnical Reports	Yes	12/02/2009
18	Geotechnica I	Excavation	Stop Box							7, 16	Uncontrolled drawdown of water table leading to settlement and destabilising of adjacent structures.	3	5	15	Obtain ground permeability data for seepage modelling. Ensure adequate D-wall toe penetration and / or grouted zone beneath D-wall to reduce water flow.	From grouting below toe of D-wall specified in Initial Design. During Scheme Design grouting was entered into SEEPW models. Results indicated no significant benefit therefore it will not be specified in Tender Stage Design. An additional 0.5m depth to D-wall (below base slab) has been incorporated into the design (based on experience of similar projects / site conditions). The option for employing grouting as a construction control technique will remain with the D&B.	None	2	5	10	Preliminary Safety & Health Plan Geotechnical Reports D&B Tender Documentation (Drawings)	Yes	12/02/2009
19	Geotechnica I	Excavation	Stop Box							6, 7, 16	Blow out of base during construction due to high water pressures in rock.	2	5	10	Review results from additional ground investigation.	Additional ground investigation completed December 2008 and result reviewed. No significant risk of hazard	None	1	5	5	NA	Yes	12/02/2009
20	Civil & Structural	Excavation	Stop Box							7	Deep excavation / confined space (e.g. lack of oxygen, excessive dust and fumes)	2	5	10	Design of temporary construction deck, roof and concourse to allow Contractor to provide temporary openings, to maximise air flow.	Slab and beam arrangement for superstructure allows Contractor flexibility during top-down construction.	None	1	5	5	Drawings	Yes	12/02/2009
21	Geotechnica I	Excavation	Stop Box							7, 16	Excessive settlement due to box excavation resulting in damage to adjacent properties, structures & Underground assets	4	3	12	Carry out settlement analysis including potential damage assessment of adjacent buildings	Some characterisation surveys of existing buildings were carried out and damage classifications made during initial Design (Stage 1). Additional surveys requested during Scheme Design (Stage 2). No additional information has been forthcoming. Settlement contours reanalysed during Scheme Design. Existing Buildings and Structures Protection Report updated in Scheme Design. D-Wall designed to limit deflections.	Settlement contours included in CAT3 assessment. Define ground movement monitoring to provide early warning of movements exceeding trigger levels.	2	3	6	Preliminary Safety & Health Plan Existing Buildings & Structures Report Geotechnical Instrumentation Report D&B Tender Documentation (Particular Specification)	No	12/02/2009

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22	Civil & Structural	Excavation	Stop Box																				
				C																			

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30	Civil & Structural	Heavy plant loading during construction	Stop Box	C						7, 11	Excessive deflection or collapse of structural elements			0	Design to take into account potential construction loading and construction sequence (assumptions and loading plans to be shown on drawings).	Sizing of structural components has been undertaken to accommodate construction sequence and plant loading assumptions detailed in Construction Report (SD2.6)	None	1	5	5	Construction Report Civil & Structural Design Statement	Yes	12/02/2009
31	Civil & Structural	MCHD Crane Operation	Stop Box	C							Structural overloading and collapse	3	5	15	Design of temporary deck to take into account of construction loading Design of roof slab to take into account construction loading and crane loading.	Temporary deck designed to accommodate 25kPa (live load) Crane loading on completed roof (including soil) is within 25kPa (live load) allowed. Retaining wall around lightwell and entrances (main entrance, north and south vent shafts) have been designed to resist lateral loads imposed by a crane. Refer Civil & Structural Design Statement (SD2.8) and Construction Sequence	None	2	5	10	Preliminary Safety & Health Plan Construction Sequence Drawings	Yes	12/02/2009
32	Civil & Structural	Permanent Works	Stop Box	C						7	Removal or failure of key structural elements	3	5	15	Consider whether structural redundancy can be incorporated into structural design.	Key elements designed for blast loading only (not removal i.e. no redundancy).	None	3	5	15	Preliminary Health & Safety Plan Civil & Structural Design Statement	Yes	12/02/2009
33	Civil & Structural	Temporary & Permanent Works	Stop Box	C	M					2	Falling through penetrations (e.g. service openings) in floor slabs and walls	4	4	16	Include within design, measures to prevent falls through temporary and permanent opening in slabs and walls.	Major temporary and permanent penetrations through slabs and walls identified.	Include within design of penetrations, a layer of mesh capable of resisting impact or falling persons.	1	3	3	Drawings (D&B Contractor & PPPCo)	No	12/02/2009
34	Civil & Structural	All Construction Activities	Stop Box	C						2	Falls from height	3	5	15	No design action. Top-down construction reduces frequencies of working at height.	None	None	2	5	10	Preliminary Safety & Health Plan	Yes	12/02/2009
35	Civil & Structural	Temporary & Permanent Works	Stop Box	C	M					11	Manual handling of plant & materials	5	4	20	Lifting beams to be provided for large / heavy plant & equipment.	Refer to Delivery Route Drawings which identify routes and loadings (and referenced to plant & equipment schedule) and Maintenance & Access Report (SD2.50). Shortest practicable route has been adopted should plant & equipment need removal from within Stop (either through tunnels, firemans lift). OTE fans and attenuators positioned as close as possible to street level.	Position and identify allowable loading for lifting beams (including lifting requirements in Vent Buildings)	2	4	8	Preliminary Safety & Health Plan Drawings Maintenance & Access Report	No	12/02/2009
36	Civil & Structural	Scabbling & Break Out	D-Wall / Slab Interface	C						13	Hand arm vibration syndrome	2	3	6	Minimise area of scabbling or breakout between D-wall and slabs	None	Consider use of corrugated steel formwork if appropriate.	2	3	6	Preliminary Safety & Health Plan	No	12/02/2009
37	Civil & Structural	Permanent Structure	Stop Box							O GP PP 7, 20	Future development adjacent to Stop box involving deep excavations	3	5	15	Allow for a surcharge on any one side of the Stop Box for adjacent future development. Appropriate load cases to be developed to allow for unequal surcharges on either side of box structure.	75kPa allowed. Refer Civil and Structural Design Statement, SD2.8B. Railway Protection Interface Report, SD-2.2 details restrictions on adjacent development and any mitigation to be undertaken should future developments cause uneven loading on D-walls	None	3	5	15	Preliminary Safety & Health Plan Civil & Structural Design Statement Railway Protection Interface Report	Yes	12/02/2009

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38	Civil & Structural	Future Development	Stop Box Entrance				O	GP	PP	12, 20	Overloading and structural collapse	3	5	15	Liaise with MCHD to agree allowable loads and column positions in vicinity of Mater Stop entrance	Allowable loads onto beam / slab, column arrangement discussed with MCHD. Confirmed by RFI 88A, dated 5th March 2009.	None	1	5	5	Civil & Structural Design Statement	Yes	12/02/2009
39	Civil & Structural	Equipment Installation	Stop Box	C	M		O		PP	14, 20	Overloading and structural collapse	3	5	15	Assess plant & equipment loads & clearances. Identify delivery routes (for installation and maintenance). Incorporate in structural design of floor slabs, beams and columns.	Assessment of plant & equipment (loadings and clearances) undertaken. Routes for delivery and maintenance identified. Delivery routes referenced to plant & equipment schedule (including loadings). Capacity of slabs and beams assessed against delivery route drawings (including clearances).	None	1	5	5	Drawings (D&B Contractor & PPPCo) Maintenance Access Report	Yes	12/02/2009
40	Civil & Structural	Permanent Structure	Stop Box		M		O		PP	7, 20	D-wall water ingress	3	2	6	Provide measures to minimise (and manage) water ingress.	Blockwork cavity wall provided throughout Stop. Seepage through D-wall will be contained in a gully within cavity wall and drained to trackside drainage. Since no system wide trackside drainage solution between Stop box completion and TBM passage, a sump in the base slab has been provided in the public health layouts.	Detailed design of public health drainage and sump.	2	2	4	Drawings (PPPCo)	No	12/02/2009
41	Civil & Structural	TBM Transit	Platform				O		PP	12, 20	Impact loading from TBM or Tram	2	5	10	Design column to take impact loading. Design to consider progressive collapse.	Columns at platform level positioned as far back from platform edge as possible. Columns are designed as key elements (no redundancy).	None	2	5	10	Preliminary Safety & Health Plan Civil & Structural Design Statement	Yes	12/02/2009
42	Civil & Structural	All Construction Activities	Stop Box	C						7	Vibration impacts on adjacent receptors (in particular sensitive hospital equipment)	5	3	15	Consider options for minimising vibrations during construction, in particular adjacent to sensitive receptors (e.g. Mater Private Hospital)	Vibration study undertaken. Use of hydrofraise recommended for D-Wall construction adjacent to hospital boundaries.	None	3	3	9	Preliminary Safety & Health Plan Noise & Vibration Report	Yes	12/02/2009
43	Civil & Structural	Explosion	Stop Box	C	M	D	O	GP	PP		Blast/Progressive Collapse	3	5	15	Key elements to be designed for blast load.	34kPa blast load allowed for in design of structural elements. All key elements (beams and columns) to be designed for 2-hour fire rating (not train fire). Design has assumed that areas potentially exposed to 18MW train fire will be protected using board or spray.	None	2	5	10	Preliminary Safety & Health Plan Civil & Structural Design Statement	Yes	12/02/2009
44	Civil & Structural	General	Stop Box		M		O	GP	PP	14, 20	Fire	3	5	15	Structural members to be designed to appropriate fire rating	Structural members to be designed to appropriate fire rating	None	2	5	10	Preliminary Safety & Health Plan Civil & Structural Design Statement	Yes	12/02/2009
45	Civil & Structural	General	Stop Box	C						7	Fire	3	5	15	Structural members to be designed to appropriate fire rating	Steel plunge columns and beams designed for 2-hour fire resistance.	None	2	5	10	Preliminary Safety & Health Plan Civil & Structural Design Statement	Yes	12/02/2009
46	Geotechnical	Excavation	Stop Box	C			O	GP		7	Basal heave during excavation or long term during operation.	1	2	2	Short term heave during excavation to be considered	Stop is founded on rock or on boulder clay just above the rock. No long term basal heave likely.	None	1	1	1	NA	Yes	12/02/2009
47	Civil	General	Stop Box	C			O			6, 12	Confined space working: Post construction - Pre station fit out	3	5	15	Design for vent shafts and slab openings for ventilation	None. Adequate ventilation system to prevent foul air built up, etc is a temporary works matter for the Contractor.	None	3	3	9	Preliminary Safety & Health Plan Civil & Structural Design Statement	Yes	30/03/2009
48	Civil	General	Stop Box	C			O			6, 12	Inadequate/restricted safe access within Stop box	3	5	15	Design for sufficient and strategic locations of accesses such as stairs, for safe ingress/egress to work area	Design of temporary construction deck or platforms, to allow Contractor to provide temporary safe accesses to work area	None	3	3	9	Preliminary Safety & Health Plan Civil & Structural Design Statement	Yes	30/03/2009

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1	Tunnelling	TBM Break-in/ Out	Stop Box	C						7	Uncontrolled flow of water when breaking through soft eyes or blind panel at either end of Stop Box	3	4	12	Grout block or chemical treatment of ground. Selection of TBM and sealing of the rings. Possible grout injection from tunnels.	None	None	3	4	12	Preliminary Safety & Health Plan TBM Break In / Out Report	Yes	12/02/2009
2	Tunnelling	TBM Transit	Stop Box	C						7	Clash between TBM and permanent / temporary column locations	3	5	15	Ensure that columns are positioned to provide a clear path for TBM. Structure to be designed to allow TBM maximum passage. Assumed that TBM will be relaunched at southern end of box therefore path does not need to follow the alignment.	Columns at platform level positioned as far back from platform edge as possible. Columns are designed as key elements (no redundancy).	None	2	5	10	Preliminary Safety & Health Plan Drawings	Yes	12/02/2009
3	Tunnelling	TBM Transit	Stop Box	C						7	Clash between TBM and stop structure (if oversized TBM is adopted by PPPCo)	3	5	15	Over sizing of clearances to TBM through box to allow for larger TBM machine than allowed for in Reference Design	7.5m dia TBM allowed for in design, plus clearances.	None	1	5	5	TBM Break In / Out Report	Yes	12/02/2009
4	Tunnelling	Alignment	Stop Box				O		PP	7	Inadequate platform width at location of escalators due to skew of alignment within Stop Box.	4	3	12	Maintain a 3m platform at either side of escalators - alignment to be reviewed and revised.	Alignment revised to ensure compliance with RPA standards	None	1	3	3	Alignment Drawings & Report	Yes	12/02/2009
5	Tunnelling	Structure	Stop Box	C			O			6, 15	Structural Instability of diaphragm wall during Tunnel break through	3	5	15	Design Diaphragm wall for stability. Initial design concept was to provide 'tunnel soft eye'	Soft eye' concept rejected, blind panels will be installed outside the Stop Box	None	1	3	3	Preliminary Safety and Health Plan and Diaphragm wall Drawings	Yes	30/03/2009

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1	Ventilation	Fans	Stop Box		M		O		PP	20	Failure of smoke fan	3	4	12	Provision of standby facility.	Provision of standby facility.	None	2	2	4	NA	Yes	27/03/2009
2	Ventilation	Smoke Infiltration	Stop Box		M		O		PP	20	Uncontrolled smoke infiltration into fully enclosed / underground area of the Stop Box	3	2	6	All spaces to have provision for ventilation to prevent the build up of heat/pollutants and to purge the space of smoke	Provision of ventilation systems to provide cooled or fresh air and extract/smoke clearance	None	2	2	4	NA	Yes	27/03/2009
3	Ventilation	Overheating	Stop Box		M		O		PP	20	No Cooling to Electrical Spaces, electrical equipment overheating and failure to operate	3	2	6	Potential for heat build up in spaces to be identified during detailed design.	Provision of ventilation systems to provide cooled or fresh air and extract/smoke clearance	None	2	2	4	NA	Yes	27/03/2009

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1	Fire	Electrical building services	Stop Box	C	M	D	O			20	Electrical Fire	5	5	25	Electrical room will be compartmentalised to prevent fire and smoke spread. Material used in the station will comply with UK Fire Precautions (Sub-surface Railway Stations) Fire Services Act 1989	Scheme design includes fire compartmentation and ventilation ducts are provided with Fire/Smoke motorised dampers	None	2	2	4	NA	Yes	27/03/2009
2	Fire	Fire Safety Management	Stop Box	C	M	D	O	GP	PP	20	Inadequate emergency plan/response	3	5	15	Fire safety management will comply with Regulations	Fire Safety Management applied during Scheme Design	None	1	3	3	NA	Yes	27/03/2009
3	Fire	Street hydrant	Stop Box				O			20	Water for fire fighting at street level not available.	2	4	8	Availability to be assessed during the Scheme Design Stage for adequacy against the requirements of TGB. If not adequate, alternative water source to be provided.	Scheme design calls for adequate diverse water supplies	Tender Design to confirm diverse water supplies	1	3	3	NA	No	27/03/2009
4	Fire	Fire suppression	Stop Box		M		O	GP	PP	20	Fire suppression not provided for store and offices in Mater Stop.	4	4	16	Fire risk assessment to be carried out in Scheme Design stage on the impact. Fire compartmentation will be provided in accordance with (UK Fire Precautions (Sub-surface Railway Stations) Regulations 1989). Fire detection will also be provided for early warning.	Scheme design includes fire compartmentation and ventilation ducts are provided with Fire/Smoke motorised dampers	None	2	2	4	NA	Yes	27/03/2009

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1	Electrical	Electrical building services	Stop Box	C	M	D	O			3	Exposure to hazardous materials, e.g. battery or transformer leak	2	2	4	Sealed batteries specified	Scheme design recommends sealed battery units	Tender Design to highly recommend sealed battery units	1	2	2	NA	Yes	26/03/2009
2	Electrical	Electrical building services	Stop Box		M		O			2	Luminaire maintainability, especially at height	3	2	6	Ensure all luminaire types and locations are suitably maintainable	Scheme design recommends easily accessible Luminaires	Tender design to detail locations and maintainability of Luminaires	2	2	4	Maintenance Strategy Report	Yes	26/03/2009
3	Electrical	Electrical building services	Stop Box	C	M	D	O			18	Possible electrocution to Operatives and Public safety from electrical points	1	5	5	Ensure all electrical points in public areas are suitably protected (e.g. lockable)	Scheme design recommends suitably protected electrical points	Tender Design to highly recommend protected electrical points	1	4	4	NA	Yes	26/03/2009
4	Electrical	Electrical building services	Stop Box	C	M	D	O			13	Working in confined space. Getting equipment to a reduced working space Possible head Injury	2	2	4	Provide sufficient man access, working space and escape routes	Provide Scheme design Maintenance access report and drawings	Tender Design to detail locations and maintainability of equipment	2	1	2	Maintenance Strategy Report	Yes	26/03/2009
5	Electrical	Electrical building services	Stop Box	C	M	D	O			13	Working in confined space. Getting equipment to a reduced working space Possible suffocation	3	2	6	Provide sufficient ventilation.	Provide Scheme design Maintenance access report and drawings	Tender Design to show provision of ventilation	1	1	1	NA	Yes	26/03/2009
6	Electrical	Electrical building services	Stop Box	C	M	D	O			11	Injury during installation of large plant underground due to limited spaces	3	4	12	Sectionalise plant. Suitable housing facilities if appropriate. Train delivery rather than surface delivery	Scheme design designates appropriate positioning of plantrooms	Tender Design to ensure access for safe installation	1	2	2	Maintenance Strategy Report	Yes	26/03/2009
7	Electrical	Electrical building services	Stop Box	C	M	D	O			2	Risk of maintenance staff falling through open hatches, down service voids or similar.	3	5	15	Provide handrails / safety chains around open hatches. Appropriate use of signage. Harness points to be provided	Scheme Design describes requirements	Tender Design will detail all safety requirements	1	4	4	Maintenance Strategy Report	Yes	26/03/2009
8	Electrical	Electrical building services	Stop Box		M	D	O			20	Maintenance staff will conflict with passengers in an incident.	3	3	9	Maintenance staff to use intervention stair (separate from escape stair). Design to adopt maintenance access from intervention stair.	Scheme design designates appropriate positioning of plantrooms	Tender Design to ensure access and egress for safe installation	1	3	3	Maintenance Strategy Report	Yes	26/03/2009
9	Electrical	Electrical building services	Stop Box	C	M	D	O			11	Injury through lifting heavy load	3	4	12	Lifting beams and Maintenance Trolleys to be utilised.	Scheme Design appropriate positioning of lifting beams and use of maintenance trolleys	Tender Design to ensure access for safe installation	1	4	4	Maintenance Strategy Report	Yes	26/03/2009
10	Electrical	Electrical building services	Stop Box	C	M	D	O	GP	PP	20	Potential injury to operatives and public - tripping hazard	2	2	4	Design to avoid tripping hazard.	Scheme Design to avoid tripping hazard.	Tender Design to ensure access and egress for safe installation	2	2	4	Signage to be provided where necessary/Maintenance Strategy report	Yes	26/03/2009
11	Electrical	Electrical building services	Stop Box	C			O				Potential fire hazard or injury to operatives	3	4	12	Detail design to ensure that proposed materials will be of a low fire hazard. Maximising off site pre-fabrication is recommended.	Scheme Design recommends suitable materials	Tender Design will detail all safety requirements	2	2	4	Maintenance Strategy Report	Yes	26/03/2009
12	Electrical	Electrical building services	Stop Box	C						3, 19	Environmental problems (noise and fumes)	3	3	9	Detail design to ensure that proposed construction methods are sustainable and will minimise on site waste generation and post construction recycle/disposal issue. All plant to be on anti-vibration pads. All systems to be attenuated properly to reduce noise	Scheme design Environmental waste Management Report indicates methods for waste management and scheme design allows for attenuation and vibration control	Tender Design will detail all requirements	2	2	4	Environmental waste Management Report	Yes	26/03/2009
13	Electrical	Electrical building services	Stop Box	C	M					2	Working at Heights / roof - falls from height	4	5	20	Steel walkways and fall-protection fittings on the roof included in design.	Scheme Design describes requirements	Tender Design will detail all safety requirements	1	5	5	NA	Yes	26/03/2009
14	Electrical	Electrical building services	Stop Box	C	M	D	O		PP	3	Electrical Fire, gaseous portable fire suppression	5	5	25	Fire engineer/Dublin fire brigade to co-ordinate fire strategy, breathing apparatus to be utilised. Extract ventilation provided to all internalised spaces.	Scheme Design follows Fire Strategy in design of prevention systems and evacuation	None	2	2	4	Fire Strategy Report	Yes	26/03/2009

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15	Electrical	Electrical building services	Stop Box		M		O		PP	20	Damage to cabling in the event of a fire in the stop/tunnel causing essential systems to fail	3	3	9	No electrical cabling to be routed through the smoke plenums, where unavoidable this cabling to be fire/heat rated, all cabling at platform to be fire rated or concealed in fire/heat rated enclosures	Scheme design calls for appropriate cable protection and routing	Detailed design to examine and establish suitable cable routes throughout the stop/tunnel to minimise any foreseeable fire damage	2	2	4	NA	Yes	27/03/2009
16	Electrical	Electrical building services	Stop Box	C	M		O	GP	PP	20	Failure of stop lighting	3	3	9	Emergency Lighting to provide general illumination or escape route illumination as appropriate	Scheme Design calls for suitable emergency lighting	None	2	2	4	NA	Yes	27/03/2009
17	Electrical	Electrical building services	Stop Box		M		O		PP	20	Limited headroom beneath cable routes, constricting access	2	2	4	Cable routes to be co-ordinated with floor to beam/soffit heights to ensure that access below cables is adequate	Scheme Design co-ordination prevents this occurrence	Detailed design to examine and establish suitable cable routes throughout the stop to prevent this possibility	1	2	2	NA	Yes	27/03/2009
18	Electrical	Electrical building services	Stop Box	C	M					13	Limited Space within plant room	3	1	3	Co-ordinate the locations of the switchboards and transformers to ensure they are workable with the available floor to beam/soffit heights	Scheme Design co-ordination prevents this occurrence	None	2	1	2	NA	Yes	27/03/2009
19	Mechanical	Air Conditioning	Stop Box		M		O			3	Leak of Refrigerant	2	2	4	Refrigerant systems should be complete with a pressure regulation system which will detect a reduction in pressure and therefore a leak in the system, the refrigerant system should then be isolated to enable maintenance	Scheme design designs out internal refrigerant system. All refrigerant contained in external Air Cooled Chillers	None	1	2	2	NA	Yes	27/03/2009
20	Electrical	Lightning Protection					O				Lightning Strike	1	6	6	Lightning Protection system	Provision in Scheme design for Lightning Protection	Lightning Protection Design	1	3	3	NA	Yes	27/03/2009
21	Electrical	Earthing	Stop Box				O		PP	20	Electromagnetic radiation, earthing.	3	3	9	Design to allow for necessary measures for earthing and lightning protection.	Provision in Scheme Design for Earthing System	None	1	3	3	NA	Yes	27/03/2009
22	Electrical	Temporary Lighting	Stop Box	C			O			12	Inadequate lighting facilities causing accidents and injury to operatives	3	3	9	Design for adequate (temporary) lighting facilities during construction and post construction-pre station fit out	None	Scope building services required btween box completion and station fit out.	2	3	6	Preliminary Safety and Health Plan	Yes	30/03/2009

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Reference	Discipline	Element	Location (state as station, section between two stations, or a standard Global Description)	Activity & Population Exposed						Project Specific Risk Number	Potential Hazard	Initial Risk Rating			Mitigation to be incorporated in Design	Action During Initial & Scheme Design	Outstanding Action for Tender Design	Residual Risk Rating			Mitigation or Residual Risk to be incorporated into (state deliverable or S&H plan as appropriate)	Designer Closed Out? (i.e. confirm included in document)	Last Revised	
				C	M	D	O	GP	PP			L	S	R				L	S	R				
1	Architecture	Platform edge luminaires	Platforms		M		O				2	Relamping platform edge luminaires where located within exclusion zone	10	2	20	Luminaires will be specified to allow access from below for relamping and replacement of gear etc. This will take place in isolations.	None	Yes - see Column P	5	2	10	Preliminary Safety & Helath Plan Drawings (PPPCo)	No	12/02/2009
2	Architecture	Public area cladding panels	Public Areas	C	M		O	GP	PP		2	Working in confined spaces.	1	5	5	Where practicable containment to be located at low level and accessible via access panel. A simple, consistent detail for hanging/removal of panel should be developed. Panel weight limited to under 50kg (two person lift) where practical. Where in excess, design should allow for MEWP access or fixed scaffold.	Containment has generally been kept no higher than 3m above floor level.	Yes - see Column P	1	2	2	Drawings (PPPCo)	No	12/02/2009
3	Architecture	Glass at height	Mater Stop		M		O	GP	PP		11	Glass failure or damage resulting in falling glass	2	5	10	All overhead glazing shall be specified as toughened and laminated	None	Yes - see Column P. Plus, detailed design for fixings to consider retention in event of failure.	1	5	5	Drawings (PPPCo)	No	12/02/2009
4	Architecture	Confined spaces	Mater Stop	C	M		O				13	Working in confined spaces. Risk of operators getting trapped or asphyxiation	4	5	20	Confined spaces to be avoided where practicable. Access panels to be provided for all enclosed spaces with adequate ventilation. Panels to allow for exit by persons in emergency.	Co-ordinated space planning with Structural & Building Service disciplines has maximised use of available space within Stop and minimised small / awkward / confined spaces	None - space planning fixed at end of Scheme Design	1	5	5	Drawings (PPPCo)	Yes	12/02/2009
5	Architecture	Sharp edges to materials and fixtures	Public Areas and escape stairs				O	GP	PP		20	Bruising, induced falls and related injury	4	2	8	Exposed corners rounded and materials to be specified as polished to avoid injury	None	Yes - see Column P	1	1	1	Drawings (PPPCo)	No	12/02/2009
6	Architecture	Escalators	Concourse to Platform				O	GP	PP		20	Potential for passenger body part to become wedged between escalator handrail and ceiling soffit	2	4	8	Introduce a wedge guard from ceiling soffit to alert passenger to potential clash with close proximity ceiling	None	Yes - see Column P	1	1	1	Drawings (PPPCo)	No	12/02/2009
7	Architecture	Lifts	Lift Areas	C	M						13	Lack of clear space between back of lift car and any horizontal structural member	2	4	8	Introduce a 300mm clear zone between lift car and any protrusion to avoid maintenance worker getting body part trapped.	None	Yes - see Column P	1	2	2	Drawings (PPPCo)	No	12/02/2009
8	Architecture	Skylight	Street Level				O	GP			15	Potential for someone to jump on glazed skylight	4	5	20	Consider options for minimising 'trespass' on skylight	None	Incline glass of skylight and provide balustrade or elevate skylight to be above ~1100mm above ground level	1	5	5	Drawings (PPPCo)	No	12/02/2009
9	Architecture	Riser Ducts	Stop Wide		M		O				2	Uncovered duct openings	2	5	10	Provide a steel mesh grating in all duct penetrations	None	Yes - see Column P	1	5	5	Drawings (PPPCo)	No	12/02/2009
10	Architecture	Traction/Substation & Vent Fans	Station - Trackway		M						14	Deliver Route Access into Traction / Substation Room only possible from trackway	3	5	15	None - maintenance or replacement of technical equipment will need to be carried out in non-operational conditions	None	None	3	5	15	Preliminary Safety & Helath Plan	Yes	12/02/2009
11	Architecture	MEP Substation / Switchroom	Station - Trackway Ends		M						14	Deliver Route Access into Traction/ Substation Room only possible from trackway	3	5	15	None - maintenance or replacement of technical equipment will need to be carried out in non-operational conditions	None	None	3	5	15	Preliminary Safety & Helath Plan	Yes	12/02/2009
12	Architecture	Leading edge of glass	Public Areas	C	M			GP	PP		11, 20	Impact to leading edge will cause failure of glass	3	5	15	Leading edges including top edge of balustrade to be protected	None	Yes - see Column P. Particular Specification	1	5	5	Drawings (PPPCo)	No	12/02/2009

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				C	M	D	O	GP	PP			L	S	R				L	S	R			
13	Architecture	Flood Protection/ Storm Surge	Above Ground Penetrations				O		PP	7	1 in 100 year flood event as per CMR version 11	3	5	15	Incorporate upstands on all above ground openings	All above ground openings protected by a 450mm kerb overall	Detailed design for kerbs, etc - coordination with MCHD design	1	5	5	Drawings (PPPCo)	No	12/02/2009
14	Architecture	Balustrades	Stairs				O		PP	20	Crowd loading onto a handrail with consequent glass failure or impact damage	2	5	10	Handrail detail to be designed to transfer loads to balustrade structure. All glazed balustrade panels to be toughened and laminated.	None	Yes - see Column P	1	5	5	Drawings (PPPCo)	No	12/02/2009
15	Architecture	Cleaning	Stop Wide		M		O			2	Working at height	2	5	10	Materials to be specified low- maintenance. Detailing of spaces to avoid areas of potential dust collection	None	Yes - see Column P	1	5	5	Drawings (PPPCo)	No	12/02/2009
16	Architecture	Internal environment during	Stop Wide				O	GP	PP	2	Slips, trips and fall	4	4	16	Adequate slip resistance (R11)	None	Particular Specification	1	4	4	Drawings (PPPCo)	No	12/02/2009
17	Architecture	Inspections	OTE & Vent Structures	C	M					2	Working at height	2	5	10	Maintenance walkway and dedicated access to be provided	Allowance for walkways and emergency access allowed for in space planning of OTE, Fans and Vent Structures	Detailing of walkways and access panel.	1	5	5	Drawings (PPPCo)	No	12/02/2009
18	Architecture	Access to high ceilings or soffits	Stop Wide (in particular Public Areas, where ceiling height is at its maximum)		M					2	Working at height	3	3	9	Ceiling panels retained by chain and/or hinged	None	Yes - see Column P	1	1	1	Drawings (PPPCo)	No	12/02/2009
19	Architecture	Vermin	Stop Wide	C	M		O	GP	PP	20	Leptospirosis - Exposure to infected rat urine (or other infestation)	3	2	6	Design to avoid access points for vermin. Detailing to also avoid potential build up of nesting materials.	None	Yes - see Column P	2	2	4	Drawings (PPPCo)	No	12/02/2009
20	Architecture	Potential roosting sites for birds	Stop Wide	C	M		O	GP	PP	20	Psittacosis - exposure to guano / bird droppings	3	2	6	Design to avoid landing sites, shelves and perches. Bird- prevention measures (spikes and/or wires) detail to be incorporated into design where necessary	None	Yes - see Column P	2	2	4	Drawings (PPPCo)	No	12/02/2009
21	Architecture	Exposed Metalwork	Stop Wide	C				GP	PP	20	Potential charge build up on isolated members	2	4	8	Metalwork to be electrically bonded	None	Yes - see Column P	1	4	4	Drawings (PPPCo)	No	12/02/2009
22	Architecture	Access panels and drops behind walls to base slab	Stop Wide	C	M		O			2	Drop in level behind access panels including falls between levels	4	3	12	Grating to protect from drop where possible. Where drop exists, signage to face of access panels indicating drop. Where practical, cat ladder and lighting to be included in design	None	Yes - see Column P	2	1	2	Drawings (PPPCo)	No	12/02/2009

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