Design Manual
NR/GN/CIV/400/04

NetworkRail

Maintenance Delivery Units

Image 0.1
Anglia Route Maintenance
Loading equipment for site outing

Document verification

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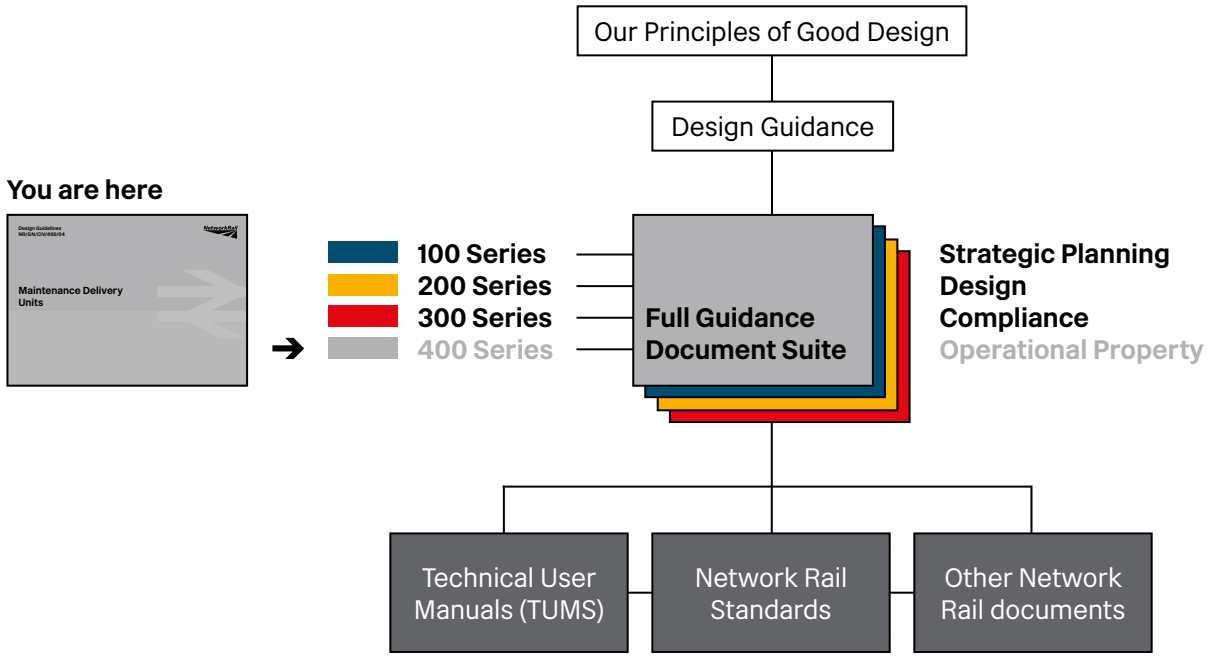
Revision Information

Version: 1.0
Publication Date: March 2021

Description of changes:
First Issue

How to use the guidance suite

The Network Rail Document Suite



References to other documents

- Code of Practice Guidance
- National Standard
- Network Rail document
- European Standard

Example:

European Standard

PRM TSI
Technical Specification for Interoperability: Accessibility for Persons with Reduced Mobility (2014)

This guidance has a Network Rail standards Green status, and does not require a derogation.

A full list of relevant documents, and guidance suite documents is contained in the appendix.

How to use this document

Purpose

Network Rail's role is to deliver a safe and reliable railway infrastructure. The company carefully manages and delivers thousands of projects every year.

MDU stands for Maintenance Delivery Unit. The purpose of an MDU is to provide a physical base for maintaining the railways. MDUs come in many forms and are design specific in nearly all situations. There are a great deal of similarities and good practice thatshould be shared between them that this guidance manual focusses on. This document should assist the project teams designing and delivering new MDUs, to achieve a high standard and to maintain consistent quality across the routes.

This guidance should be used to support new and existing MDU design across the Network Rail estate.

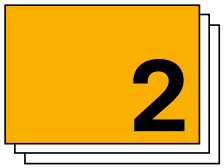
Scope

The intended audience for this Guidance is Designers, Project Managers, Contractors and others involved throughout the stages of MDU projects.

The guidance aims to identify and explain the areas that are unique to MDU buildings. There is an overlap between MDUs and Network Rail's Offices. Guidance on offices is provided in the Workplace DNA NR/GN/CIV/400/05.

Section 1
Project Initiation :

Captures the core elements which should be understood and considered on a project, before initiating the design.



Section 2
Space Planning :

Informs designers of the importance of space planning within an MDU and shows how to best utilise spaces.

Section 3
Design and Fit Out :

Describes key elements of design and how they can be applied correctly to provide longevity and integrity.

Section 4
Appendices :

Provides additional details, specifications, and Case Studies.

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Maintenance Delivery Units

Project Initiation

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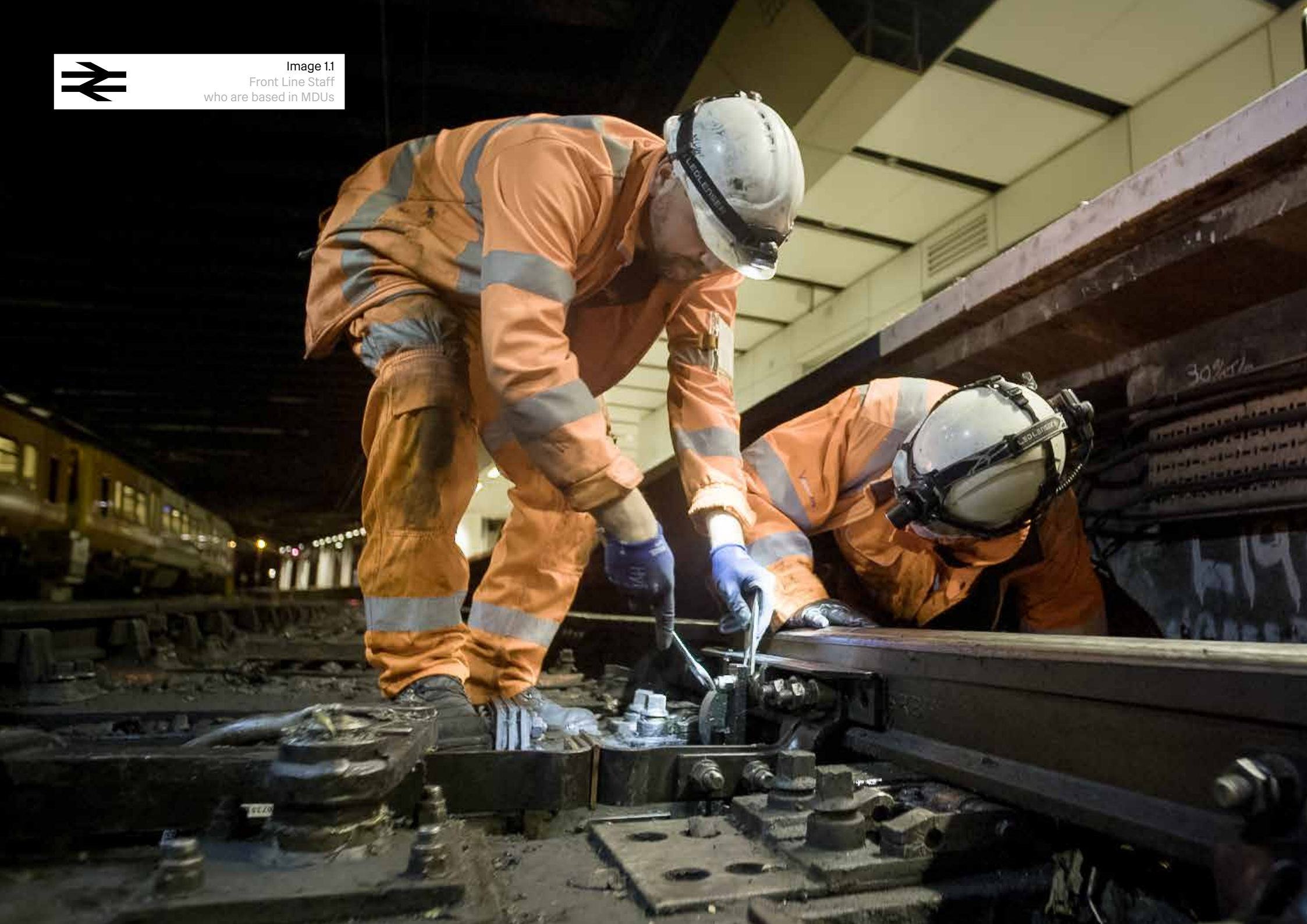

Image 1.1
Front Line Staff
who are based in MDUs

1.1 .1– Design Principles

Network Rail strives for design which is both functional and innovative. This guidance document aims to provide parameters for designers to meet Network Rail's design expectations. All workplaces should be well considered, putting the end users' requirements at the forefront of the design.

Network Rail prides itself on a number of values which should be represented throughout its workplaces, in order to enable staff to work together in a safe and comfortable environment.

The MDU design intent and concept should be retained as a guiding thread throughout the delivery stages . The facilities should be robust and designed to take the anticipated wear and tear. Spatial requirements should be given due diligence. There is no need for over design and all specification should be means tested against intended use

In sections 1.1.3 to 1.1.10, eight useful principles are highlighted as being key for the development of a robust design brief.

1.1.2 – Inclusive Design

The adoption of Inclusive Design principles helps people to use the new environment safely. Comfort, confidence and convenience should be incorporated into the design of the building to achieve an autonomous safe access to all buildings and car parks.

Diversity and Inclusion should be considered at the outset of every design process. It should also be considered throughout the delivery of projects that are affecting existing facilities. Inclusive Design should create places environments that are user friendly, high-quality, healthy and have a positive impact on all members of a community.

An inclusive approach to design often provides new insights into the way we interact with the environment and opens new opportunities by application of creative problem solving skills. As a public service provider, Network Rail's property should be designed, built and operated using Inclusive Design principles and in compliance with the Equality Act 2010. Access to the built environment is not simply a question of physical layout, it also relies on good information including signs, lighting,visual contrast and written communication. Applying these principles should enable inclusive environments for Persons with Reduced Mobility (PRM) including persons with hidden disabilities, such as colour blindness or cognitive impairments.

In order to provide inclusive workplace environments, a Diversity Impact Assessment (DIA) should be carried out for every project. This should demonstrate how duties within the Equalities Act 2010 were considered. The DIA process should highlight any specific requirements should be captured within the design.

A DIA should be carried out as soon as possible and no later than GRIP 2 as the information collated could inform additional design requirements.

It is the Project Managers responsibility to issue the client / end users with a DIA form for them to populate and update throughout the project. The completed form should then be reviewed and signed off by a Network Rail DIA super user.

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1.1.3 – Team specific

Every team has specific requirements, methodology and shift patterns that the design remit should capture. Many teams in Network Rail have a process driven role and understanding these processes should effect the design of the MDU's functionality and layout.

1.1.5 – Collaborative

The design should promote spaces in the building that encourage office and front line staff to share spaces and experiences during their daily routines. Provisions should be made for portable IT with charge points, white boards, notice boards and magnetic walls for pinning up notes.

1.1.7 – Safe Design

MDU Sites can be dangerous places with heavy plant machinery, dangerous substances and vehicular movements. The designer should eliminate, minimise or mitigate the inherent risks. Well thought out walking routes and safe separation of risky activities wherever possible.

1.1.9 – Efficient

Efficient use of space to reduce the footprint of new and existing buildings wherever possible is always encouraged. For example analysing shift patterns and holiday periods could reduce the size requirement for a mess area considerably.

1.1.4 – Inclusive

Network Rail support and promote Inclusive design and are committed to create an inclusive environment for staff and visitors in al workplaces. The Diversity Impact Assessment (DIA) process should be followed on all projects as explained in section 1.1.2

1.1.6 – Organised

The operation of the site requires rationalisation and planning. A one way system is preferred as a safe method of moving around the site. This approach should also extend to the internal design keeping activities clash free.

1.1.8 – Secure

The design for control of access to and from the site, the stores and the main building should be given thought from the outset. . A robust method of security control should be considered as part of the design input that should be validated by the building operator.

1.1.10 – Enhancing

Overall a new MDU should represent an improvement over the existing facilities that it is replacing. Ideally this should be achieved by the quality of the design. The designer should also feel comfortable to challenge the project aspirations if they seem to be too low.

1.2.1 – Classification by Size

MDUs can come in a range of sizes depending on their location and the services which operate out of them and are defined primarily on staff numbers, teams and overall operations. For simplicity, the document refers to them as small, medium and large.

1.2.2 – Small sized MDU

Small sites have basic facilities and can be on industrial land or adjacent to railway sidings land with minimal storage facilities. The number of staff is typically up to 45 persons.

There could sometimes be a requirement for external exposed storage of components. These sites tend to be secured with a palisade fence and can sometimes be operational 24 hours,. Notably these sites are usually more of a drop-in facility.

1.2.3 – Medium sized MDU

Medium sized sites have a larger number of staff, typically up to 150, utilising the site with their own separate facilities and storage areas, alongside multiple temporary accommodation units and sometimes permanent or more established stores.

These sites historically tend to be sporadic in layout as they have been adapted over many years with different team requirements changing as railway projects are started and completed.

In a medium size MDU there is often the need for office staff, as well as front line staff, who have different requirements. Rationalisation is a key priority when developing these sites to improve efficiencies and site safety.

There could also be an increased requirement for parking both for staff and site-based vehicles. These sites are typically operated 24 hours a day and receive deliveries to site, possibly by Heavy Goods Vehicles.

1.2.4– Large sized MDU

The number of differing activities at these sites can make them complicated. Typically, they demonstrate a permanent dedicated large store facility which is used to feed the Medium and Small sized MDUs. The store should be split between both external and internal stores and accommodate many different teams.

Individual teams are likely to have their own separate facilities with some shared areas i.e. mess rooms or break out areas. The size of rooms and facilities is determined by the number of staff the MDU should facilitate and the activities which could be undertaken.

Large MDUs can utilise a great range of vehicles for use with both deliveries and maintenance on the railway, therefore parking is a key consideration. Security is also a priority where palisade fencing and controlled access is in place.

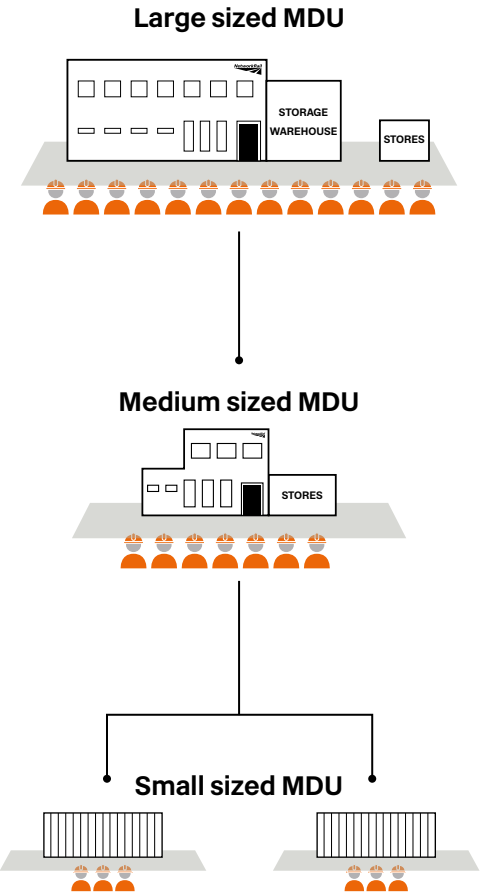


Figure 1.1.
MDU Classification

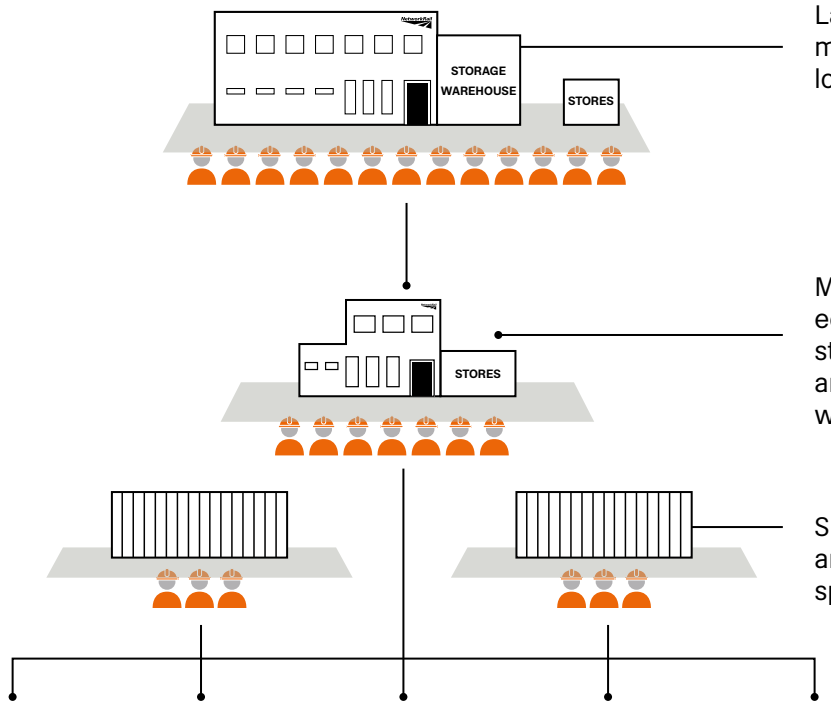
1.2.5 – MDU Operations

Network Rail MDUs have varying operational requirements. Running the railway means lots of teams and coordination is required across the route.

MDUs are typically structured as shown on figure 1.2. The teams operating from these locations could vary. Basic team profiles can be viewed in section 1.2.7. The purpose of these profiles are to demonstrate the depth of roles and jobs that work together to keep the railway operational for passengers and freight. In addition to the front line maintenance teams, each site could have office based administration teams who assist the teams in coordinating projects, incident response and maintenance. These may sit alongside the Route maintenance teams who are responsible for the management of railway assets.

Staff consultation should capture all the team and sub-team requirements to inform the final remit.

A number of potential questions and pointers have been identified in Appendix C, which should initiate the discussion. These should assist in making the design remit robust before designs are initiated.



Large MDU – Multiple teams and staff members. Both front line and office staff located here.

Medium MDU – Sometimes fed equipment and materials from the large store MDUs, act as satellite MDUs and are located sporadically to cover the whole network.

Small MDU – Used as satellite locations and sometimes based very remotely with specialist teams based there.

Figure 1.2.
MDU Operation

1.2.6 – Prefabricated Units

Although there is a history of using prefabricated units for MDUs in the past, they are generally not deemed to represent good value. The advantages and disadvantages of using prefabricated units should be determined at an early stage and can affect the choice of site.

The design life of a prefabricated unit is limited and this should be considered in the whole life cost analysis and also within the sustainability assessment. Network Rail prefers the use of permanent structures that have been whole life costed. Good quality staff accommodation and welfare facilities also demonstrate an investment in the workforce. However, there are situations where a prefabricated unit is necessary and a decision to go down this route could be justified if any of the following is a prime consideration :

- → The unit might be relocated between sites.
- → Severe site restrictions prohibit alternative construction methods.
- → A temporary building is required which would allow less stringent conditions (the Building Regulations definition of temporary is no more than 28 days).

The MDU should comply with Building Regulations Approved Document M (Access and Facilities for Disabled People) and the following sections of Approved Document B (Fire Safety of the Building Regulations):

- → B1 - Means of warning and escape (Network Rail Fire Engineer to advise)
- → B2 – Internal fire spread of linings
- → B3 – Internal fire spread of structure
- → B4 – External fire spread
- → B5 – Access facilities for the fire service (Network Rail Fire Engineer to advise)

Sections B2, B3 and B4 can be most easily demonstrated if they are British Board of Agreement certified. These specifications come at a cost and the notion that the prefabricated units are cheap is a misconception.

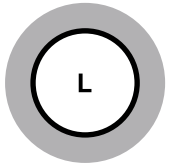
However prefabricated units can be the right solution for storage of materials and materials that are of a transitory nature.

Image 1.2
Compound in Mercier House, Derby
Example of prefabricated storage units

1.2.7 – Variety of Teams that might use MDUs

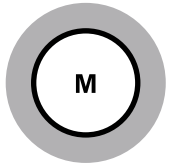
Electrification & Plant (E&P)

Look after substation plant rooms and high voltage supplies in various locations.



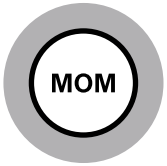
Lubricators

Use track-side machines to stop the rail from squealing, this decreases the wear on the rails.



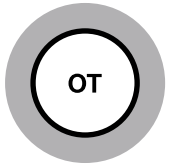
Maintenance

Maintain the infrastructure to run the trains on.



Mobile Operations Manager (MOM)

Operations function, like a first responder to all train delaying incidents from vandalism to suicides.

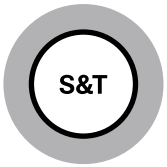


Off-track

Looks after all drainage, vegetation, level crossing and highway fencing.

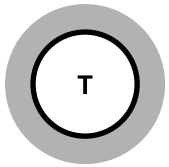
Overhead Lines Equipment (OLE)

Look after all of the overhead line electrical equipment to keep trains moving.



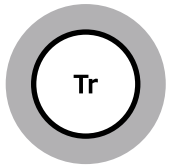
Signal & Telecoms (S&T)

Maintain all signalling equipment from the signal level to the red lights and point controls.



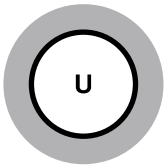
Telecoms

Maintain all telecoms equipment in the signalling centres and Rail Operating Centres, including all cabling.



Track

Maintain the rails, sleepers, ballast and earthworks.

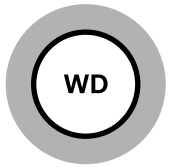


Ultrasonic

Check for flaws inside of the rails to enable rail to be maintained before it causes disruption to passengers.

Welding & Grinding (W&G)

Weld rail together and re-profile the rail including switches (points).



Works Delivery

Various disciplines, Buildings, E&P, Permanent Way, OLE, Off Track, renewals and services

1.2.8 – Toilet and Washing Facilities

Network Rail aims to provide excellent workplaces in order to obtain and retain staff long term. All MDUs should provide appropriate and adequate facilities for both males and females within the workplace, which also includes an allowance for future recruitment and expansion.

Figure 1.3 gives an example on how toilet and washing facilities can be split on the assumption (to be modified at every location) that Office and Site workers are equally split. 'Office staff' are permanently located in the building and 'Front Line staff' are generally maintenance and front line workers who could work across several sites.

The Male, Female and Accessible split for toilet facilities should also align with 'The workplace regulations 1992', published by HSE: www.hse.gov.uk.

Once the requirements for any particular MDU are agreed, the layout should be developed with flexibility in mind to allow for future staff ratio changes.

	Total Staff (100%)		**Office staff** (50%)		**Front Line staff** (50%)	
MDU size	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**
			50%	50%	80%	20%
Small MDU – *max 45*	31	14	11	11	18	5
Medium MDU – *max 150*	97	53	37	38	60	15
Large MDU – *315*	204	111	78	79	126	32

Showers	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**
40 % of Front line staff (Minimum 5 %Passive provision for Female Front Line staff)					40%	5%
	10	2	1	1	9	1
	33	7	3	3	30	4
	66	14	6	6	60	8

Figure 1.3.
Male and Female Toilet and Shower facilities

1.3.1 - Sustainable Development

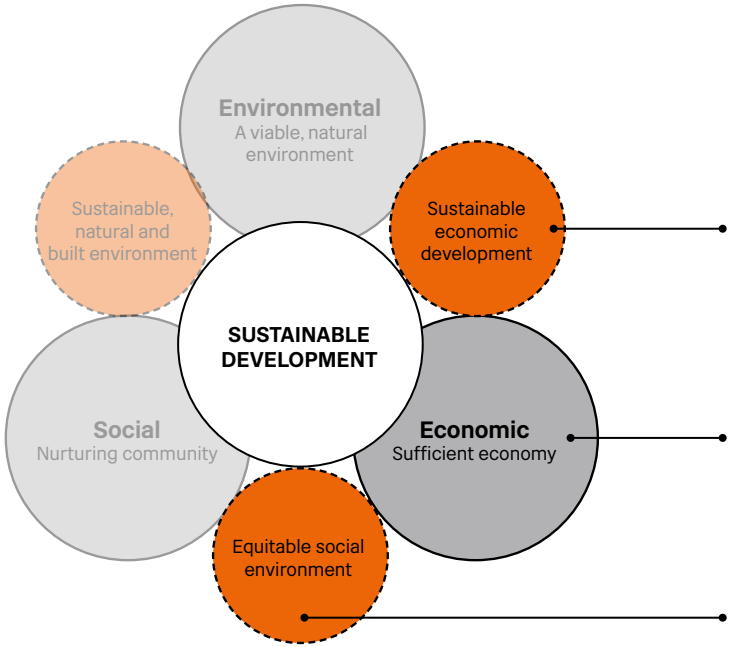
Sustainable construction aims to meet present day requirements without compromising the ability of future generations. It incorporates elements of Economic efficiency, Environmental performance and Social responsibility.

The importance of project sustainability can be directly correlated with the success of the overall scheme, both in the short and long term. Each of the three sustainable elements should be considered equally.

These three elements are Environment, Social and Economic sustainability. Figures 1.4, 1.5 and 1.6 give an indication of how these three elements can be interlinked and where overlapping areas can be highlighted. These links should all contribute towards the overall 'Sustainable development' on a scheme.

1.3.2 – Economic Sustainability

Economic sustainability goes beyond project costs, construction cost and even whole life costings. The main goal of economic sustainability is to analyse the value of every aspect of a project, maximising economic viability based on past, present and future aspirations. However, economic decisions should not hinder functionality, environmental sustainability and future operations of the business.



Economic / Environmental
- → Reduction in energy consumption and costs
- → Sustainable sources of energy generation
- → Re-use and re-purpose of existing site elements/structures.
- → Down-cycle, refurbish and re-use before purchasing new.

Economic
- → Project costs
- → Construction costs
- → Procurement routes

Economic / Social
- → Whole life costings
- → Maintenance costs
- → Staff productivity
- → Design for future expansion
- → Engage with local supply chains

Figure 1.4.
Economic Sustainability

Economic sustainability aspirations are:

- → Reduction in energy consumption
- → Enables business efficiencies through design
- → Whole life costed building
- → Reduce maintenance where possible
- → Future proof designs
- → Increased staff productivity
- → Engagement with supply chain
- → Procurement routes followed

1.3.3 – Social Sustainability

Putting Network Rail's employees at the forefront of every project is key to a successful project. However, it is not sufficient to only create an inclusive and safe environment. Network Rail's workers increasingly spend more of their time indoors which places increasing responsibility to design buildings which counteract the negative effect of such exposure, for example; Sick building syndrome.

By incorporating particular design strategies projects can counteract these negative effects. For example, re-linking to nature, fulfilling basic human requirements i.e. natural daylight and fresh air, manually controllable environments and reducing internal toxins, are best practise design principles expected from all projects.

Non-hierarchical open plan collaborative work environments enable better management and the design of separate offices for management within MDUs is discouraged, unless they are for justified for security reasons.

Social Sustainability aspirations are:

- → Staff retention and loyalty
- → Increased productivity
- → Access for all
- → Increased morale and well-being across staff
- → Reduction in sick days
- → Easier to manage and operate

Social / Environmental
- → Staff retention and loyalty
- → Improved staff mental well-being
- → Reduction in sick days

Social
- → Access for all
- → Improve safe systems of work

Social / Economic
- → Connections to local communities
- → Connections to local businesses
- → Reduction in operation management
- → Increased productivity
- → Retention of railway knowledge

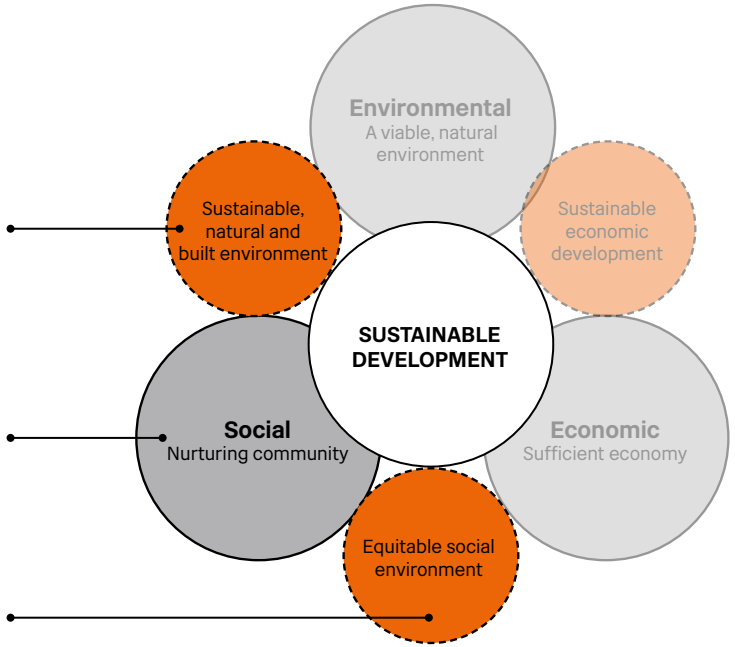


Figure 1.5.
Social Sustainability

1.3.4 – Environmental Sustainability

Network Rail had a regulated target to reduce CO^2 emissions by 11% over Control Period 5 (Network Rail's financial 5 year period) and now has the target of a further 25% by the end of Control Period 6. Emissions reduction will become increasingly important in following years as we strive to align with UK commitments under the Climate Change Act, which commits to an 80% reduction by 2050. Furthermore, the Government has set a challenge to the rail industry to eliminate the use of diesel and to fully de-carbonise UK rail.

Current data shows that MDUs are currently consuming 3 times the average energy consumption for office buildings. Network Rails Buildings and Architecture Control Period 7 policy aims to realign this with the national average.

BREEAM (Building Research Establishment Environmental Assessment Method) and/or CEEQUAL (Civil Engineering Environmental Quality Assessment and Award Scheme) assessments for Network Rail buildings should aim to achieve Excellent or Very Good rating for new construction in the context of minimising the whole life cost of asset management.

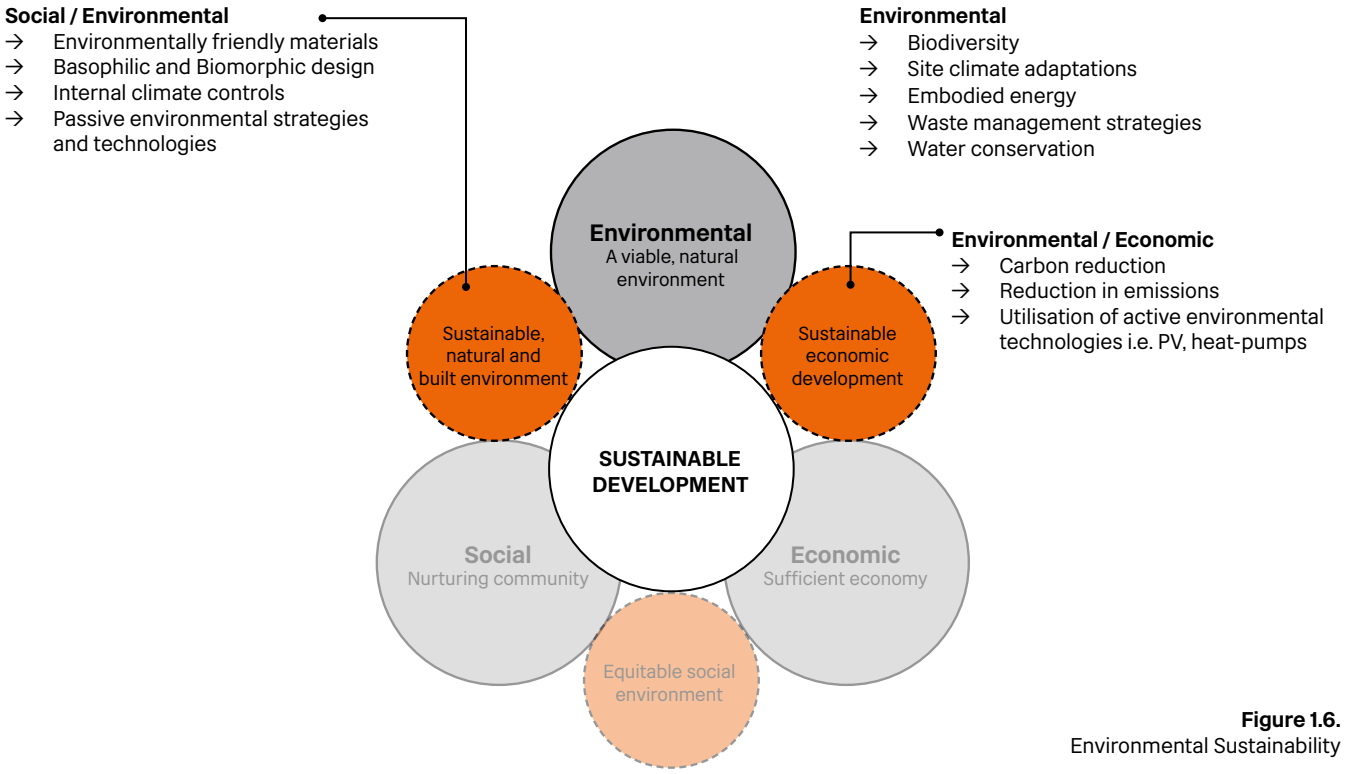


Figure 1.6.
Environmental Sustainability

Environmental Sustainability aspirations are:

→ Carbon, energy & CO^2 emissions reduction
→ Environmental management
→ Waste strategy, Water conservation
→ Environmentally friendly material specification
→ Biodiversity, Climate adaptation

1.3.5 – Sustainable Design

The current global trend of environmental design has been fixated on high-tech active technologies such as photovoltaic panels (PV), heat pumps, active façades, grey water harvesting and more. Design teams should not rely solely on active technologies to make a project sustainable but as an enhancement tool. Most active technologies have specific requirements, they are not always compatible with other active systems and many have negative side affects. In addition, active environmental systems can be expensive to maintain and install as they require specialist installation.

The RSSB (Rail Safety and Standards Board) has developed the Rail Carbon Tool to enable Calculation and analysis of the carbon footprints of UK rail projects and activities; This tool should assist in identifying and assessing alternative low carbon options and selecting low carbon solutions

All projects should, as a minimum, use passive environmental strategies derived from site analysis as a basis. This ethos should carry forward into the detailed design with materials, detailing and finalised designs reflecting Network Rail's sustainable design aspirations. As part of the Form NR/L2/CIV/003/F004 the designer should submit a sustainability statement to demonstrate that the aspirations listed above are addressed by the design.

Image 1.3
Internal plants to improve wellbeiing, Edinburgh MDU

1.3.6– Passive provisions

On a new build project preference should be given to passive provisions of environmental comfort that do not require energy input.

The potential for natural ventilation of the building should be maximised by providing windows and roof lights that can open.

Daylight utilisation should be maximised using the building form, glazing and light re-direction elements. Solar shading could be used to minimise overheating on south facing glazing.

Locating service and circulation areas on the north and east elevations helps to insulate the interior , freeing the south and west elevations to harvest solar energy.

Network Rail website

Further information:
networkrail.co.uk/who-we-are/sustainable-development/

1.4.1 – Environmental Impact Assessment

Environmental Impact Assessment (EIA) can be required by the local authority in cases where the MDU is subject to a planning application. Network Rail already has in place its own Assessment requirements for the environment and they could be used to inform the EIA in cases where it is required.

The EIA should demonstrate how the impact of the new MDU on the environment can be minimised. It allows the environmental knowledge to influence the design and delivery of the project. A good understanding of the site should inform the Environment Impact Assessment reports and Environment Management Plan to facilitate a sustainable development.

An EIA could be completed by the client team. Consultants can also be nominated to assist with this process if required. The assessment is a live document and should be updated throughout the project process.

1.4.1 – Network Rail's Assessments

The standard NR/L2/ENV/015 identifies Building Research Establishment Environmental Assessment Method (BREEAM) and Civil Engineering Environmental Quality Assessment and Award Scheme (CEEQUAL) as potential independent certifiable environmental assessment methodologies. However for MDU fit-out the Royal Institute of Chartered Surveyors SKA assessment tool also provides a suitable third party independent environmental assessment to evidence carbon reduction objectives.

Figure 1.7 provides the targets that should be achieved by Network Rail projects using the available assessment tools.

Points of reference could include :

- → Ecology
- → Water courses
- → Noise
- → Waste
- → Landscape
- → Biodiversity
- → Water
- → Energy
- → Traffic

BREEAM or CEEQUAL Targets	New Construction	Major Refurbishment / Enhancement	Renewal, Repair & Maintenance	Operational / In Use
Workplace Offices	Excellent or Very Good	Very Good	Good	Very Good
Signalling Centres	Excellent or Very Good	Very Good	Good	Very Good
SKA (RICS) Targets		**Major Refurbishment / Enhancement**	**Renewal, Repair and Maintenance**	
Workplace Offices	N/A	Gold	Gold	
Signalling Centres	N/A	Gold	Silver	

Figure 1.7.
Network Rail's Environmental Assessment Targets

1.5 Site Analysis

1.5.1 – Site constraints

An understanding of the site constraints should determine the design and establish the viability of the site for the project. The constraints should be highlighted in the risk register that is prepared for the feasibility study.

Key items to consider are:

- → Site boundaries
- → Vehicular Access
- → Site levels
- → Way leaves*
- → Surrounding context
- → Local highways
- → Planning constraints
- → Proximity to the railway
- → Water course
- → Flood risk
- → Historic land use and listings

* A way leave is a right of way granted by a landowner. One example could be a site which contains an electrical box, the Electrical company Engineers require 24/7 access to this in case of failure or any routine maintenance.

For every project, the project team should visit site in order to grasp the location that they are designing for. Sections 1.5.2 to 1.5.12 explain some key areas that should be considered, but the list is not exhaustive.

1.5.2 – Land ownership

In some situations, Network Rail does not own the land of a site which is being considered and may potentially be required to purchase This could have an impact on budget, programme and pose potential project risks which should be captured at early stages.

1.5.3 – History

Site history can provide relevant context to inform elements of the design. Additional provision could be generated as a result of the history of the site.
It is important to identify any heritage constraints or advantages of the site.

1.5.4 – Context

Although surrounding areas and streets, roads, alleys, walkways are typically not likely to change during the project, they should be studied and understood as a way of accessing the site during construction and in operation.

1.5.5 – Natural features

The building position and orientation should be considered as part of the site contours, drainage, flood risk areas, ground cover and texture, soil conditions and surrounding nature.

1.5.6 – Geotechnical Analysis

A significant percentage of construction cost and risk is determined by the ground conditions. A geotechnical survey of the site should be undertaken to identify risks prior to the feasibility study of the scheme.
Checks could include and are not limited to:

- → Coal board
- → Mine workings from Utility Services
- → Strata levels
- → Permeability
- → Services
- → Water courses
- → Water tables
- → Site levels

1.5.7 – Contamination

The characteristics of the land should be established early in the feasibility process. Much of Network Rail land has an industrial past with a high likelihood of contamination from harmful toxins and materials. Dealing with site contaminates can be a significant cost for projects and should be highlighted as early as possible so that it can be avoided if possible.

1.5.8 – Utilities

Information on utilities should be obtained as soon as possible to inform the feasibility study and the

1.5.9 – Security

The security of a site should be carefully considered. A full security statement strategy should be undertaken by a specialist consultant with consideration to the key elements of SIDOS (Security in the design of stations).

1.5.10 – Site Access

Selecting the correct site based on the available information is of prime importance. Factors such as surrounding area, transport links, major roads, nearby Network Rail facilities and other potential sites should be taken into account when selecting a site . Sites based away from city centres could improve incident response times. Sites placed near motorways and ring roads mean that maintenance staff can avoid inner city traffic congestion, when responding to incidents.

Figure 1.8 demonstrates how vehicle access to and whilst on the site should be analysed. It is vital to provide enough space for HGVs to manoeuvre on the site. A one-way system should be put in place where possible to improve safety.

Locations adjacent to track access points are advantageous for the maintenance teams, they can also load on Road Rail Vehicles (RRV).

Cycle routes and public transport commuting routes for staff should also be considered.

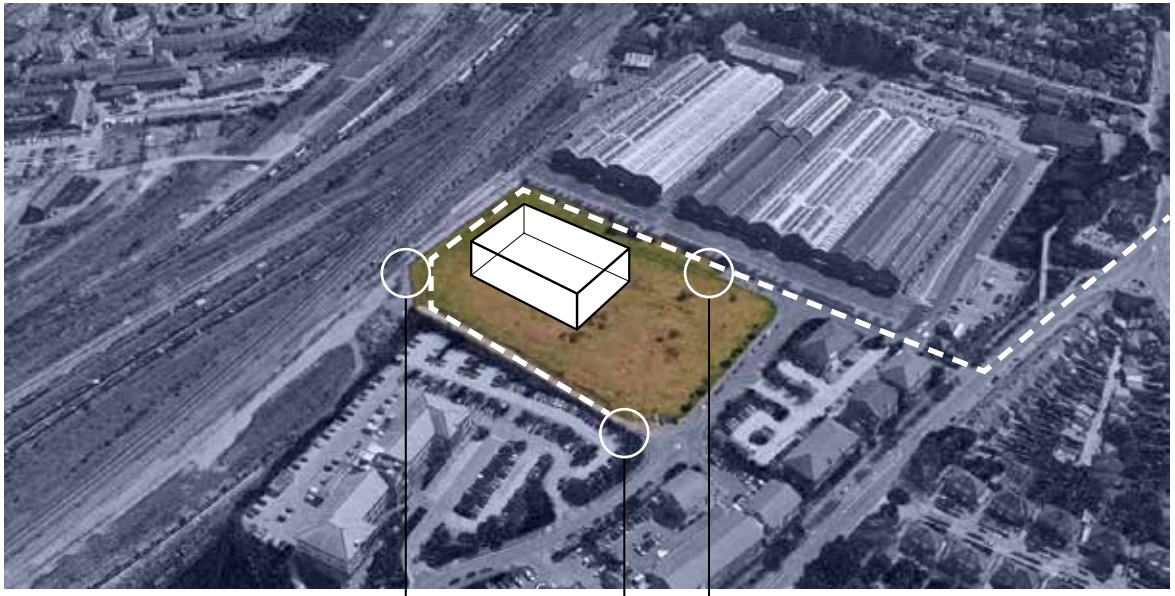


Figure 1.8.
Site Access

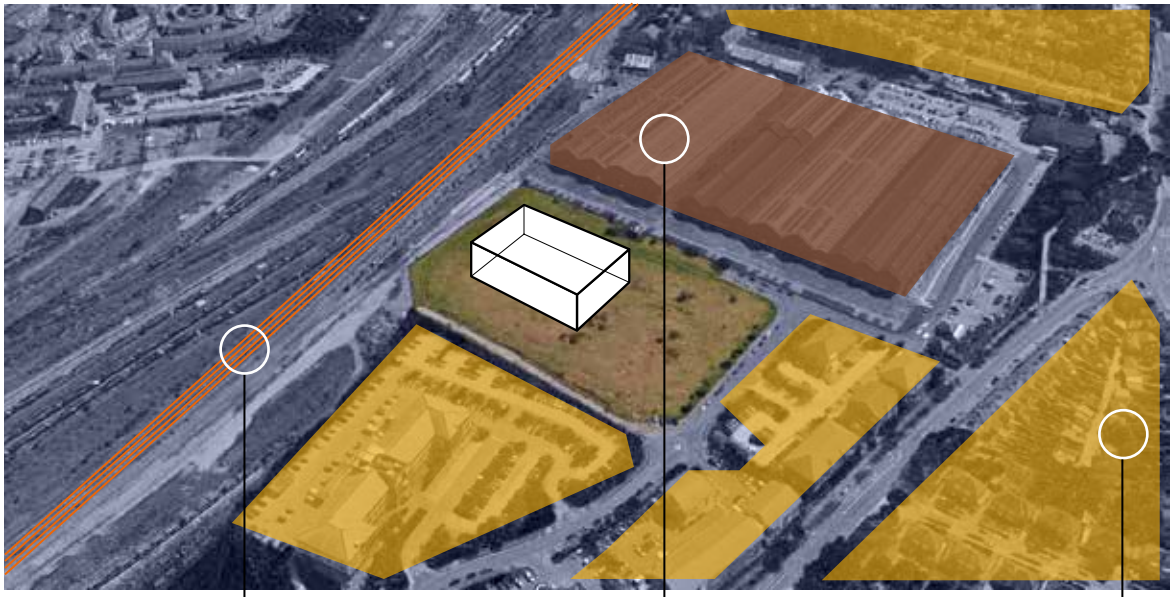
1.5.11 – Effect on Local Surroundings

As explained in Figure 1.9, context is a key factor in the design. Deliveries with HGV vehicles are common in MDUs. The effect of site noise and traffic on Network Rail's neighbours should be considered. The sites may be in a conservation area or have historic buildings on them with the possibility of heritage listings. The designer should always look beyond the boundary of the site and remit.

Background checks and thorough site research should eliminate the likelihood that problems will occur further into the project programme.

Key items to consider are:

- → Listed buildings
- → Heritage sites
- → Conservation areas
- → Future developments in this area
- → Site access (neighbours affected)
- → Other Network Rail sites within the area



Existing railway

- → If the site is vacant when all surroundings are developed it could suggest contamination or issues, therefore thorough research is required.

Existing MDU

- → Duplication of services in similar area could leave other areas with less available services.
- → Opportunity to share locations and facilities.

Residential areas

- → Noise from HGV
- → Interruptions and complaints likely
- → Smaller roads, not as wide for access

Figure 1.9.
Context and Impact

1.5.12 – Sun Path Analysis

Understanding the impact of natural light on architectural space is of prime importance for Architects. This understanding includes knowledge of the sun and its position relative to a geographic location.

Building orientation is vital in both the efficient heating and cooling of the building along with window positions and the location of any Solar panel positions. The orientation of the building should aim to maximise the potential for passive environmental measures, described in section 1.3.6.

Sun path analysis, as shown in Figure 10, should be considered as a way of increasing the energy efficiency of MDUs. Solar gains can benefit Network Rail in reducing overall carbon footprint due to using less energy to heat and cool the building. One way of implementing this is through the use of Solar Panels, therefore the positioning of the building is vital to enable solar gains.

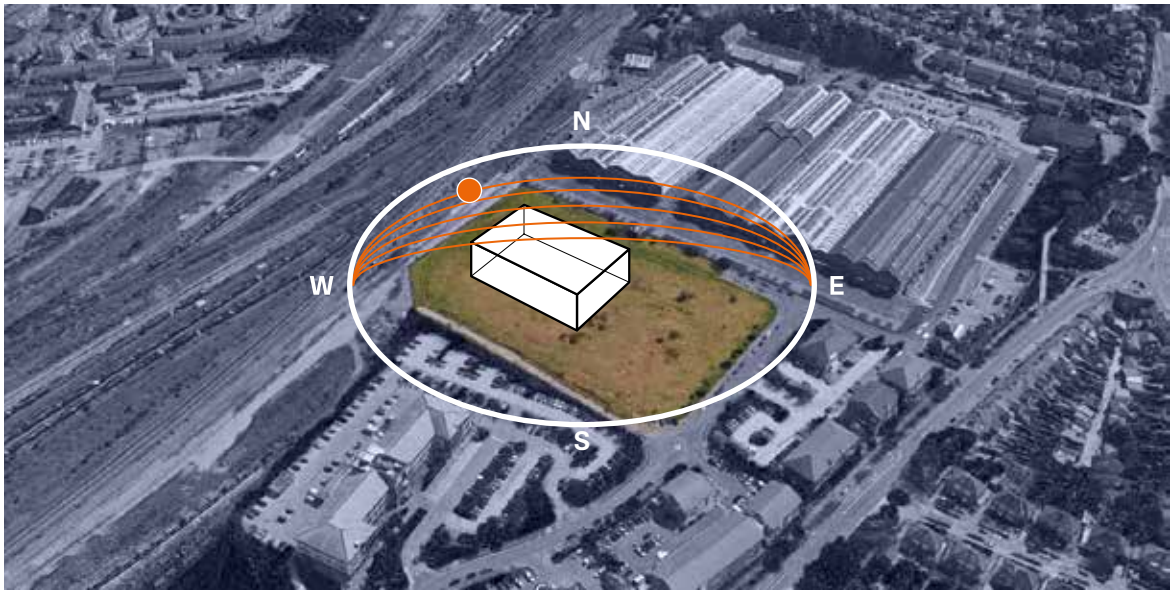


Figure 1.10.
Sun Path Analysis

1.6.1 GRIP Process

Network Rail has developed an approach to managing projects in order to minimise and mitigate the risks associated with delivering projects that enhance or renew the operational railway and projects in High Street environments. This is known as :

“Governance for Railway Investment Projects” (GRIP)

The GRIP process describes how Network Rail manages and controls projects that enhance or renew the national rail network and it is outlined in Figures 1.11 and 1.12.

Throughout all rail projects, there are minimum requirements and checkpoints that should be adhered to before advancing from one GRIP stage into the next. This is to provide consistency and assurance throughout the project process.

All Network Rail projects should be designed and delivered following the GRIP standard: NR/L1/INI/P3M/101.

1.6.2 Building Regulations

All projects in England and Wales should be designed to comply with Building Regulations. Projects in Scotland should comply with Scottish Building Regulations. All projects should comply with all appropriate Codes of Practice. In addition, liaison with the highway authorities is vital to coordinate with associated road works and any access constraints planned for the vicinity.

1.6.3 – Fire Regulation Assurance

All design for Network Rail should comply with British Standards to provide compliance with fire regulations.

The BS9999 > Fire safety in the design, management and use of buildings standard is applicable to the design of new buildings, alterations, extensions and changes of an existing building. They are in place to safe guard the lives of building occupants, visitors and if required in an emergency, fire-fighters.

A Network Rail fire officer should be consulted to verify that the proposed designs are fit for purpose, robust, compliant and fire safety compliant with BS9999.

1.6.4 – Development Rights

Although Network Rail benefits from various Permitted Development rights it is always best practice to liaise with the local authority. This should be done by first consulting Network Rail’s Town Planning Team regarding any development proposals. This team should advise on relevant planning matters, including advice on any consent required. In any event, liaison with the highway authorities is vital to coordinate with associated road works and any access constraints planned for the vicinity, at an early stage of the design.

Network Rail is obliged to protect some assets as designated by the Railway Heritage Designation Advisory Board on behalf of the Trustees of the Science Museum. This is a statutory protection and there are penalties if Network Rail fails to consult and agree before making any change or disposing in any way of a designated asset or record. See manual NR/GN/CIV/100/05 Heritage: Care & Development for further information.

1.6.5 – General Standards

In addition to the GRIP process, all design undertaken for Network Rail should follow all appropriate standards to provide compliance and assurance. A list of typical standards to be considered has been supplied in Appendix G. All design should be thoroughly checked to provide full compliance and safety.

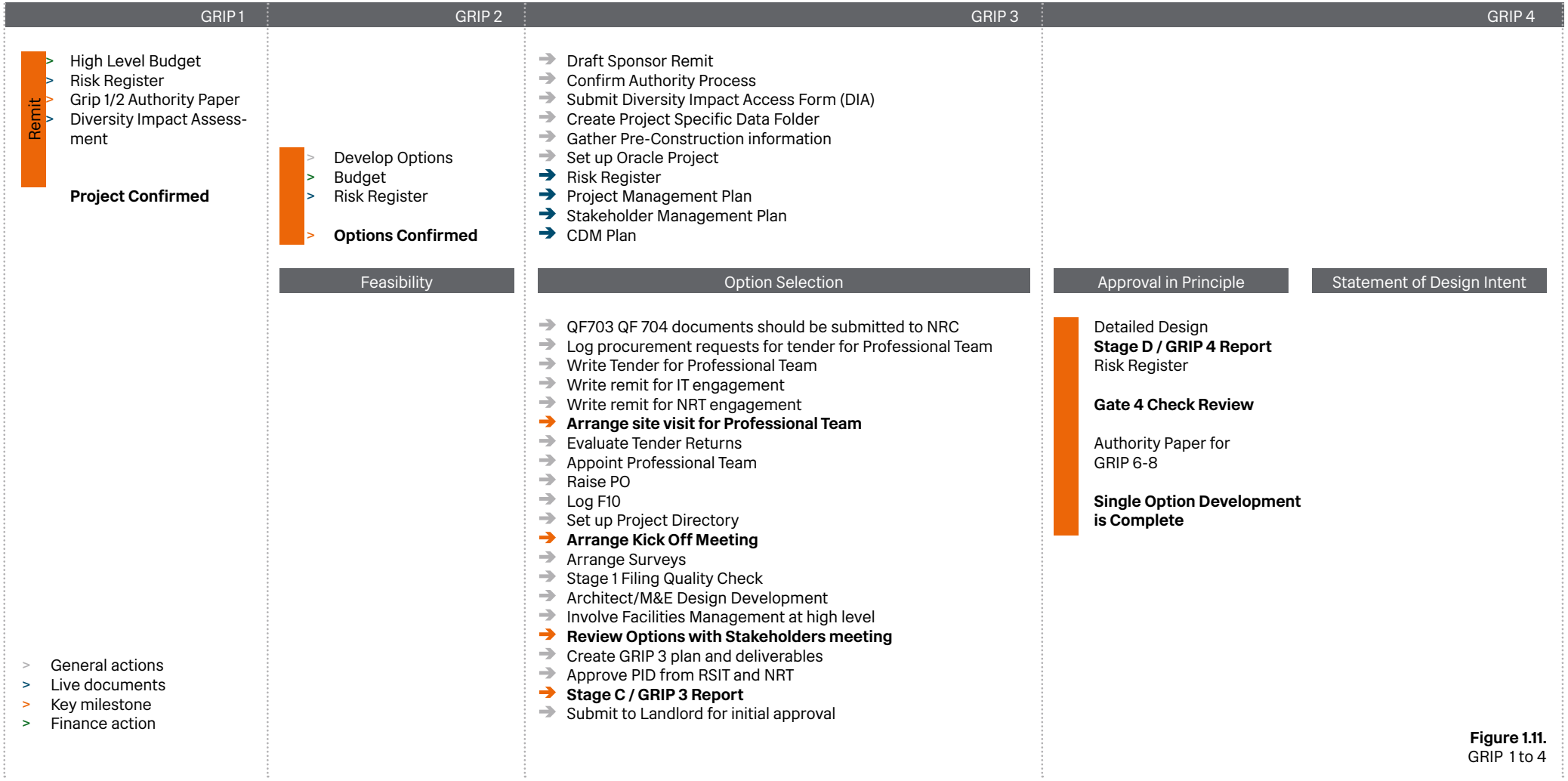


Figure 1.11.
GRIP 1 to 4

1.6 Compliance and Assurance

GRIP 5

- Detailed Design
- **Stage E / GRIP 5 Report**
- Finance Check

- **Final Project Scope Review Meeting with Sponsor / Stakeholder / FM Provider**

- Sponsor to sign off Stage E Report
- Approve PID from RSIT and NRT
- Apply for Landlord Approval/building warrant application

Detailed Design

- Confirm Authority for GRIP 06-08
- Arrange for quotes from furniture suppliers
- Log procurement requests for Tender Contractor
- Agree tender list with procurement / QS
- QS to complete Contractors Tender - Stage E Report
- Release Contractors Tender via e-business
- Deal with tender queries
- **Arrange site visit for prospective contractors**
- Tender response management (BRAVO)
- Tender Evaluation
- Tender Interview
- Possible VE as necessary
- Appoint Contractor
- Raise contract for Contractor
- Raise PO for Contractors
- Update Risk Register
- Update Project Management Plan
- Update CDM Plan
- Approve Construction Phase Plan

- **Stage Gate Meeting**

Design Check

GRIP 6

- **Pre Start Meeting**

- Approve Site Welfare Facilities
- Formal Construction Progress Meetings Review
- Risk Register
- Formal Change Control Process
- Migration Information
- Communication to end users / staff engagement

Construction

- 6-10 weeks before completion:

- Engage with FM Provider (RFM to create Data Sheets)
- Final File Audit
- Assess File Usage
- Sign off desk allocation by department
- Purchase orders for furniture (6-8 week lead time)
- Arrange quotes for move management, graphics/FM
- **FF&E coordination meeting**
- Draft O&M manuals for review by FM provider
- Move Champion meeting
- Lock down migration data
- Hand over migration details to move team
- **Arrange witnessing and testing meeting - FM Provider**
- **Arrange pre-occupation walk around with Union Rep**
- **Formal building / contractual handover - FM Provider**
- **Manage moves and building handover**

- **Day 1 Support**

GRIP 7

Entry into Service

Snagging
Final Contractor Account Agreement
Chase all outstanding POs / invoices
Arrange Lessons Learnt Meeting
Sponsor to complete Benefits Realisation

GRIP 8

Close out

Clear Oracle
Chase non invoices
Re-align task lines
Write close out report - submit for approval
Attend panel and present close out
Confirm Tax rebate money has been credited to budget Finance to close out Oracle Budget

Project Completion

Figure 1.12.
GRIP 5 to 8

1.6.6 – Form 004 submissions

The Form NR/L2/CIV/003/F004 is the mechanism to record the internal architectural assurance of the project at all design stages. All Network Rail MDU projects are subject to assurance of successive Form 004s that should be submitted prior to closure of the GRIP 3,4 and 5 stages to the Regional Design Team or to Technical Authority Buildings and Architecture Team. This is to provide independent checks and assurance for all projects. The Form 004 assurance reviewer should not be part of the design team for obvious reasons of impartiality.

The correspondence of the Form 004 submissions with the GRIP process are illustrated in Figure 1.13.

An additional Form 004 may be required prior to the submission of any planning application. Although Network Rail benefits from various Permitted Development rights, it is always best practice to check with Network Rail's Town Planning Team as explained in section 1.6.4.

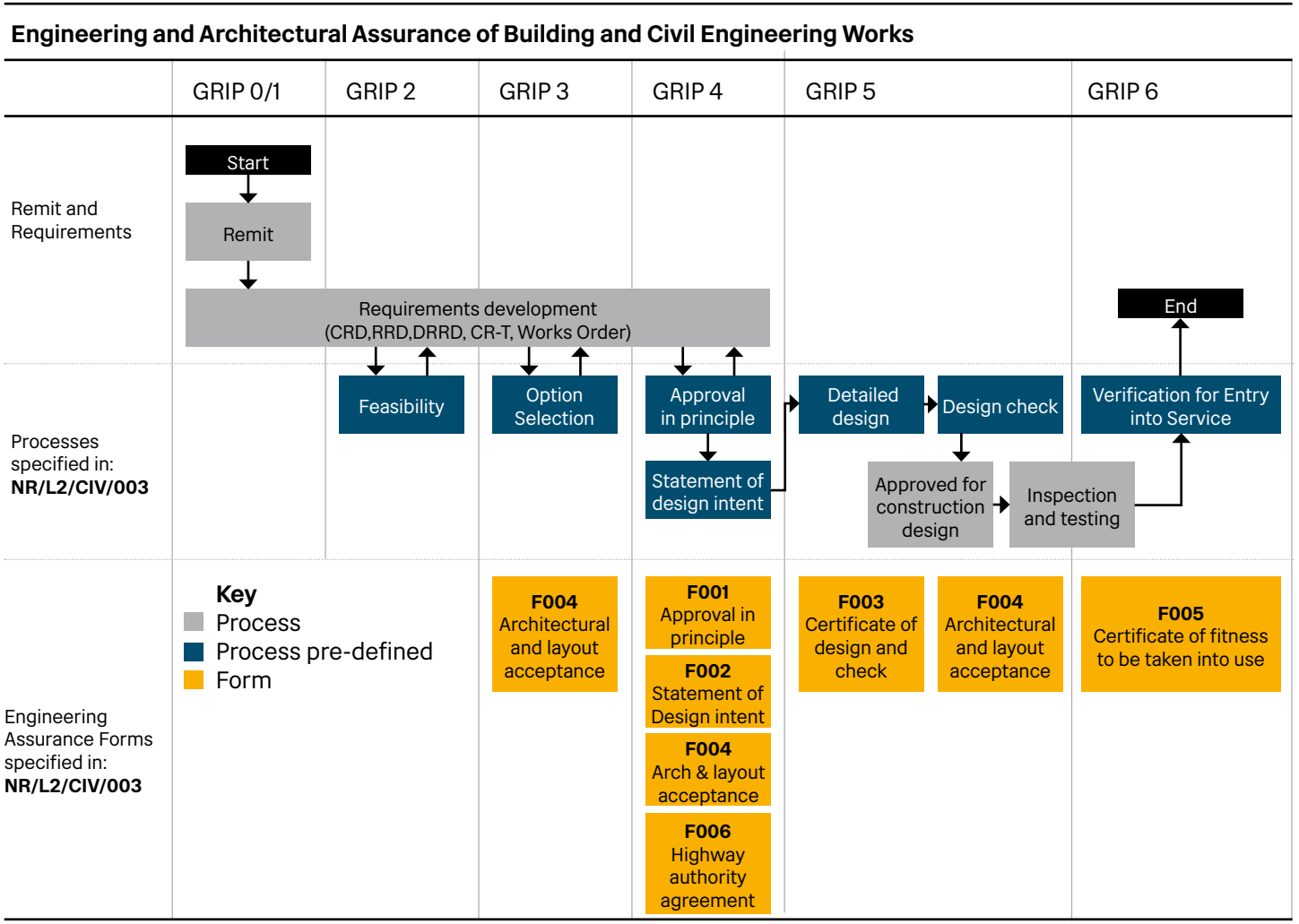


Figure 1.13.
Form4 submissions

1.6.7 – Construction Design Management (CDM)

CDM applies to all construction work undertaken by or on the behalf of Network Rail as a client and covers any asset owned, managed, or occupied by Network Rail.

All design should be considered under CDM both under constructibility and maintainability of the building in a safe manner. Designers should demonstrate compliance with CDM legislation from conception to completion of a project.

All tasks in Figure 1.14 should be captured at Corporate level, Business function level and Project level . All relevant standards listed should also be followed.

	Task	Standard or Legislation reference
Corporate level	Health and safety management system	
	Application of CDM	NR/L2/OHS/0047
	Health and Safety file	NR/L2/INF/02202
	Work Planning	NR/L2/OHS/0044
Business function level	CDM management	
	RACI charts	
	Contract strategy mapping tool	
Project level	CDM plan	
	Construction Phase Plan (CPP)	
	Work Package Plan (WPP)	
	Task Briefing Sheet (TBS)	
	GRIP deliverables	
	Contracts	

Figure 1.14.
Construction Design Management

1.7.1 – Planning for Construction

Constructibility review is an engineering project management activity, during the pre-construction phase, for reviewing in a critical manner the construction processes in order to identify obstacles before a project is built. It should reduce or prevent errors, delays and cost overruns.

Designers should undertake Constructability reviews at various stages of a project. The chosen stages may vary to suit complexity, design development, or changes to access or site conditions. Attendance at Constructability reviews should not be limited to the design team and the involvement of Contractors and/or other independent construction professionals or peers is encouraged.

Figure 1.15 shows how the process can identify opportunity for a robust, informed design avoiding costly late changes to the project.

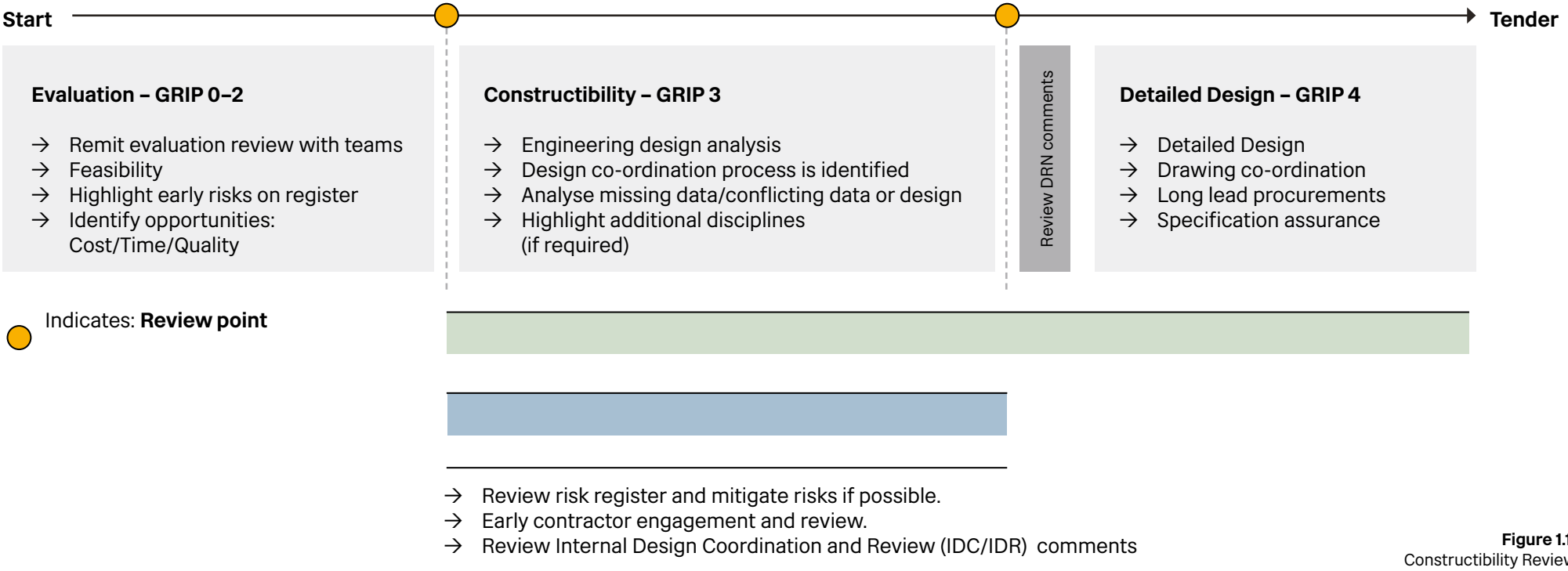


Figure 1.15.
Constructibility Reviews

Maintenance Delivery Unit

Space Planning

2

Image 2.1
Multifunctional area
Edinburgh

2.1.1 – Basic Space Requirements

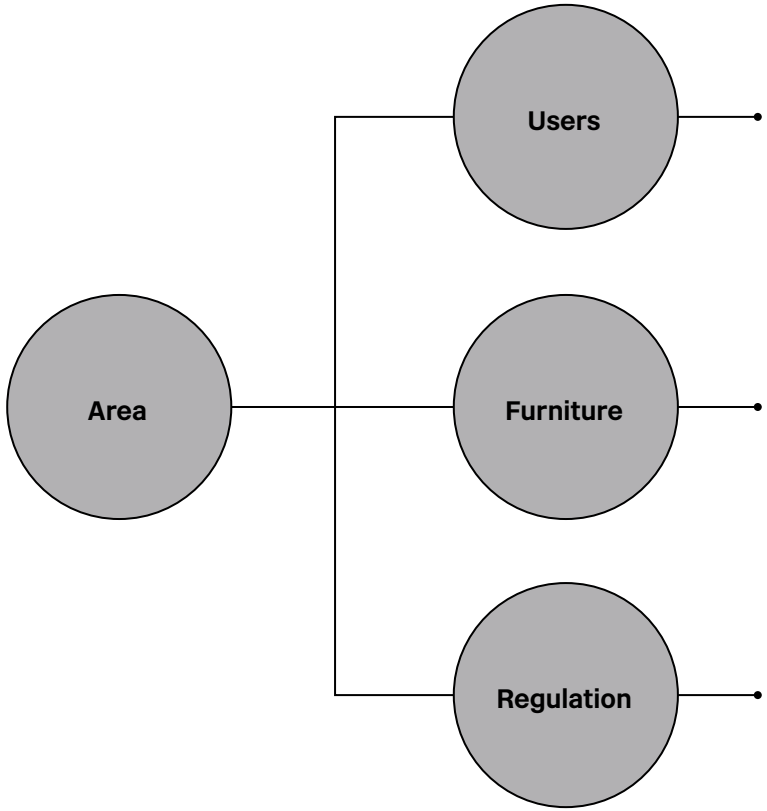
All areas within an MDU should be well considered and efficient in use, avoiding wasted space. An MDU should not contain areas which are too small, unsafe and not fit for purpose.

Figure 2.1 explains key considerations when allocating space for the areas that could be meeting rooms, office areas or warehouse storage space. The process and issues to consider should be the same across any design.

In order to provide the required space a list of occupiers should be established and their roles clarified considering also the time of day and the frequency that they will be using the facilities. Allowance should also be allowed for any envisaged variations in the occupancy patterns.

Areas should provide enough space for walkways and circulation without interruption. Additional consideration should be made for persons with reduced mobility.

Furniture provision should form an integral part of allocating room dimensions and layout.
(See section 2.5.1)



Users
The amount of people who are required to use the space should be defined within the remit.

Example
'8' person meeting room

Furniture
Area for fixed furniture and circulation space around this furniture, based on the number of people using the space.

Example
'8' chairs, adequate table space, circulation space around the furniture.

Regulation
When designing a room or facility, all regulations (stipulated in section 1.2 of this document) should be adhered to. These are in place for safe operation and design of all facilities.

Figure 2.1
Planning Key Consideration

2.1.2 – Interactions

Zone interaction should be facilitated within MDUs so that both office and maintenance staff have collaboration zones where they can meet and work together. These areas do not always have to be a formal meeting areas. As shown on the Figure 2.2 these interactions should form part of the design.

Hard wearing zones which display robust material choice for maintenance staff.

Soft furnished zones, such as offices and meeting rooms should be comfortably furnished to create an inviting working environment.

Highlights the key zones within an MDU.

Collaboration zones; where conversations can happen.

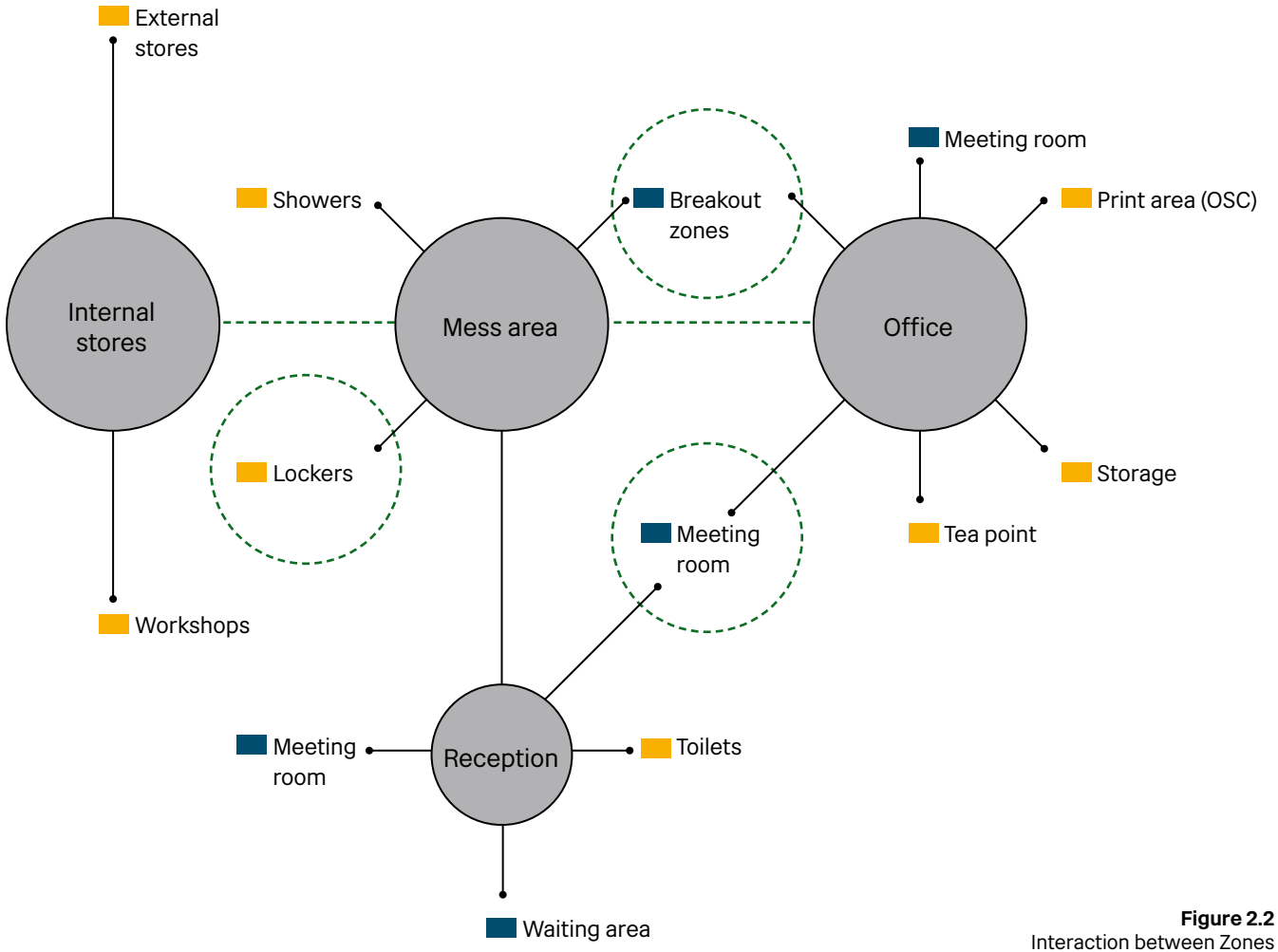


Figure 2.2
Interaction between Zones

2.2.1 – Work Routines

Although site operatives (to be distinguished from office staff) carry out different tasks there are still some common activities which take place in their daily routine and these are indicated in Figure 2.3 and below.

→ De-contaminate :

These areas should be hard-wearing, sufficiently heated and ventilated to avoid bad smells from any damp equipment or clothing.

→ Cleanse :

These areas should also be well heated and ventilated, hard-wearing and water-tight.

→ Refresh :

Staff entering this area should be free from dirt and oil, ready to change into clean clothes. Lockers should be allocated adequately, including a split for male and female spaces.

→ Recharge :

Time to recharge and refuel in a hard-wearing but comfortable environment. Interchangeable areas which can be used for eating and also large briefings.

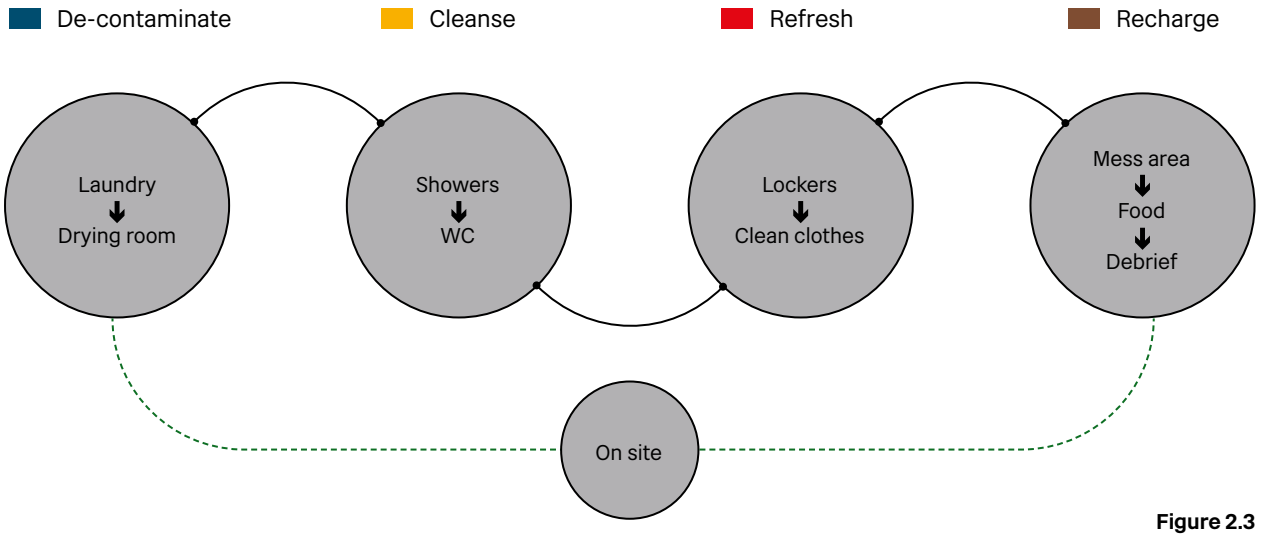


Figure 2.3
Site Operatives' Daily Pattern

Image 2.2
A MDU Drying Room

2.3.1 – Internal and External Areas

A list of typical internal and external areas is provided in Figure2.4. More detailed information can be found in Section 3 of this document.

All spaces allocated within an MDU should be discussed and captured in the remit.

Rooms have been categorised as follows:

→ **Mandatory**
These are expected to appear in most facilities, however they should still be confirmed by the client team within the Remit.

→ Optional
These types of facilities could be team or location specific, in some cases evidence of the design decision for including these rooms should be presented within the Form 004.

A DIA should still be completed on all schemes and provide evidence as to why specific rooms might not be required.

	Mandatory	Optional
INTERNAL	→ Accessible: WC, showers, changing → Breakout areas → Briefing areas → Cleaners storage → Comms / Server / Plant room * → Drying room → Equipment / material storage → Laundry space → Lift * → Main office area → Male / Female changing rooms → Male / Female showers → Male / Female WC → Medical or First aid area → Meeting space → Mess area → OSC (Office Service Centre) → Storage space or room → Tea point or Kitchen	→ Archive → Charging room → Control room → Drawing centre / layout space → Equipment quarantine area → Gym * → Hot desk area → Interview room → Library * → Post room * → Quiet room * → Reception / Entrance lobby * → Specific team offices → Warehouse *
EXTERNAL	→ Cycle storage → Entrance gate → Parking → Perimeter fencing → Safe walking routes → Smoking area → Waste area	→ Calibration area → COSH stores → External stores * → Forklift area * → Gas compound → HGV parking / turning zone · → Skip storage * → Van parking

→ General
→ Dependant on a DIA
→ Dependant on building size or function
* Indicates reasoning required

Figure 2.4
Room Schedule

2.4.1 – Circulation

Thought and care should be given to the operation and design of the external areas, that are just as important as internal spaces. Segregation, as illustrated in Figure 2.5, should be considered to provide safe operation throughout. Vehicle access, size, turning circles and weight are some of the many elements that should be considered during the design.

2.4.2 – Site entrance and compound

A compound should be secure, controlled with CCTV and surrounded my palisade fencing. Some sites could require a gate house for added security for the entrance. A site security strategy should be provided for safety and crime prevention.

2.4.2 – Safety

The layout should not endanger staff. Separation of areas should provide minimal clash points, example areas include; Staff car park, MDU parking, pick up zone and a separate route for MDU traffic to take before loading or unloading. A one-way route should be in place with safe walking routes highlighted for staff.

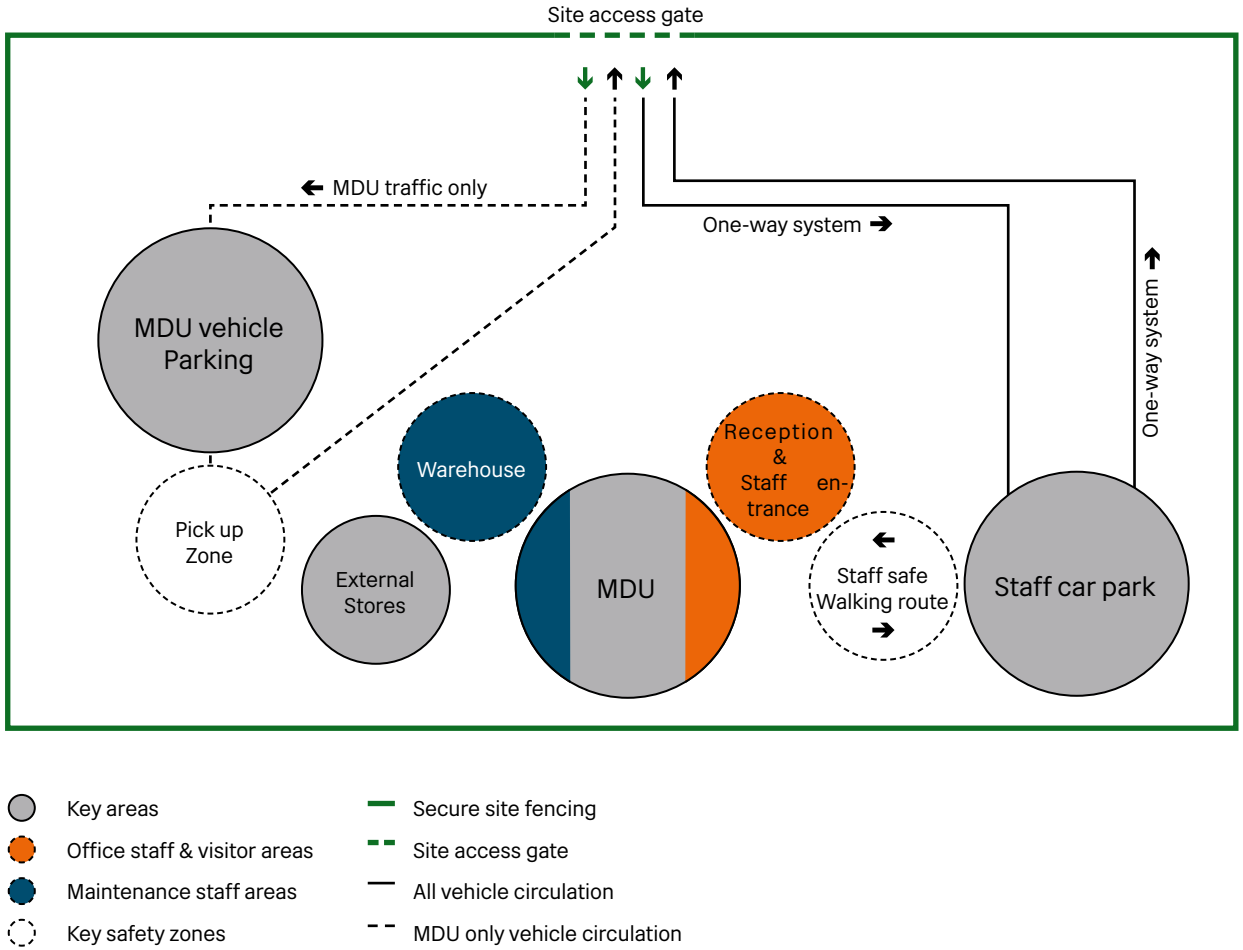


Figure 2.5
Site Activity Zones

2.5.1 – Anticipating Change

MDUs should be adaptable for the future. For example, a site could be used for a certain project over a three year period and then be required to adapt for different project or teams. To reduce overall cost, such factors should be considered throughout the initial design phase.

Even if no predictable changes are planned, the demographics and staffing levels of the MDU can be subject to natural change and it is sensible to allow some flexibility into the design. See section 1.2.8 for guidance on allowances for toilet and washing provisions and how they may need to be adapted for change.

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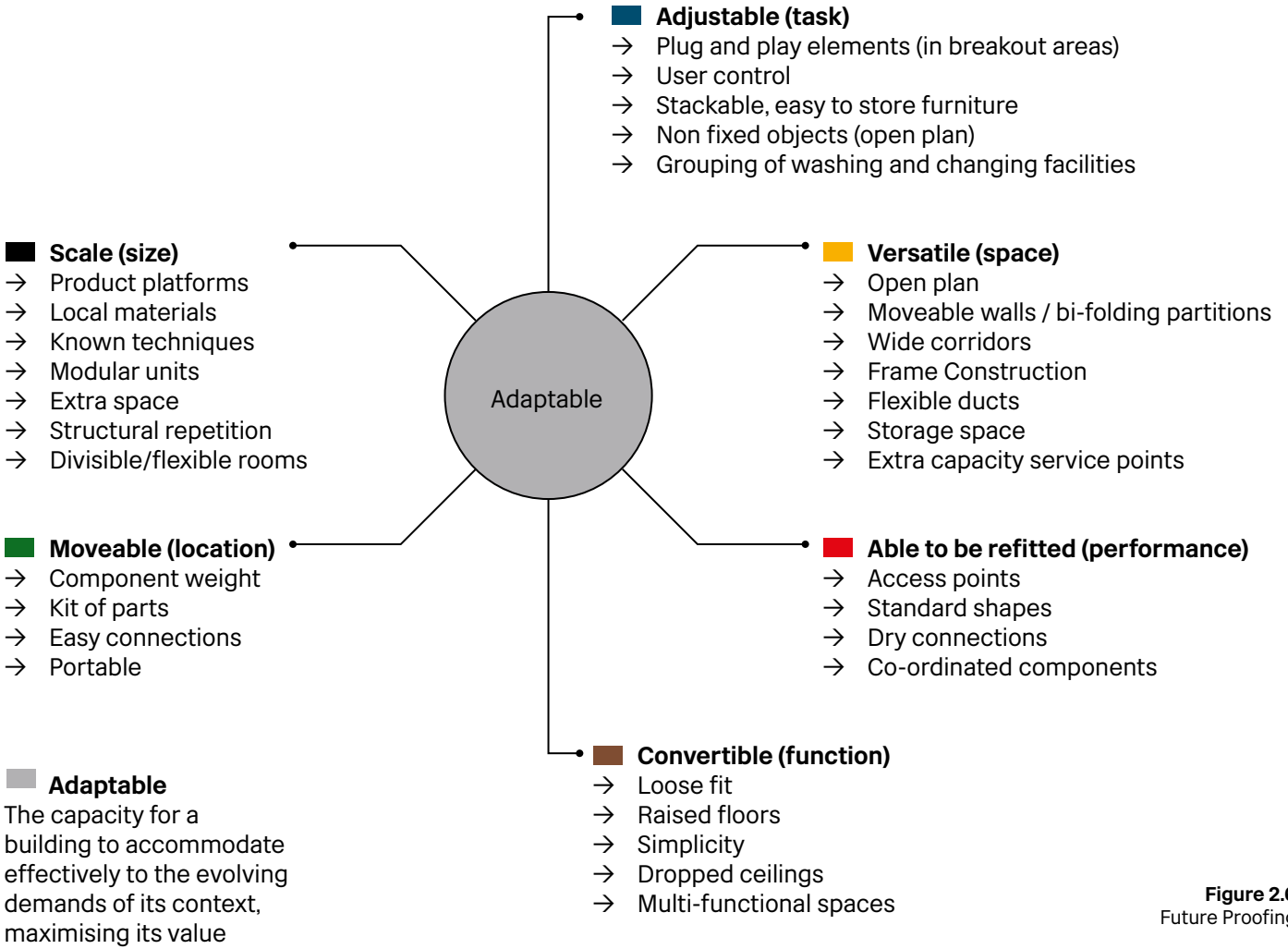


Figure 2.6
Future Proofing

3

Maintenance Delivery Units

Design and Fit Out

Image 3.1
New facility during construction
Middlesbrough MDU

3.1.1 – General Specification Approach

Quality should be viewed in terms of whole life cost. Value engineering should represent a real gain in value, which is not then lost in the long term due to poor quality. The option of 'buy cheap, buy twice' should be avoided. Not specifying items which are robust for their intended use is likely to increase maintenance costs due to product failure.

The design phase, is the appropriate time to be questioning whether the chosen products meet the requirements. For example, is tarmac the correct choice for an area which a HGV might continually use when concrete might be a better choice for the longevity of the scheme?

MDUs usually require a combination of hard wearing areas as well as softer office environments and this is a particular challenge for this type of building which could be resolved by judicious selection of materials. For example, the use of lever taps with stainless steel troughs in the hard-use areas of the building , when in the office zones standard taps and ceramic wash hand basins are usually sufficient.

Image 3.2
Edinburgh MDU

The specification of finishes should take a pragmatic and sensible approach so quality is met. Network Rail welcomes any innovative ideas from designers and lessons learnt from similar projects to facilitate innovation and improvement of future designs.

The ease of maintaining any specified item should be considered at the design stage. Hidden or difficult to access services are a common error and appropriate access arrangements should be designed with a view to future maintenance.

During the design stage, thought should be given to easy access for cleaning, maintenance and replacement. The ease of cleaning and wear can effect the whole life cost of a product.

3.2.1 – Internal Areas

All internal spaces should be well considered and be big enough to facilitate the number of users, space for furniture and circulation (including space for PRM). Sections 3.2.2 to 3.2.25 cover the typical areas listed in Section 2.3. Typical sizes are provided where possible but these should not be taken at face value and should be verified for the remit and also during initial design stages.

Image 3.3
Reception

Image 3.4
Breakout Area

3.2.2 – Entrance /Reception area :

- → Typically not less that 24sqm.
- → Preferably sliding doors should be provided. External canopy and entrance matt are required.
- → Access to WC including Accessible WC should be close by.
- → Signing in and monitoring systems.
- → Key way-finding information.
- → Proximity to vertical circulation if relevant.
- → Break out waiting area (Generally under visibility of reception staff and a controlled waiting zone for security requirements.).
- → Meeting rooms (Front of house) - For visitors meeting with Network Rail staff containing IT support (consultation with Network Rail Information Technology (NRIT) is required to understand the requirements of the room).
- → A separate staff entrance that is close to changing areas may be required.

3.2.3 – Break out areas:

- → Booths can be used for small ad-hoc meetings between staff. There are furniture options available that can facilitate this task.
- → Typically 9sqm per 15 desks.

3.2.4 – Hot desk area :

- → Seated area within the mess with standalone PC and screens.
- → Typically 5sqm per person.

3.2.5 – Mess area :

→ Understanding the rotas and frequency of use are required to establish a sensible size that is sufficient, based on shift patterns / holidays and not oversized.
→ Mess seating is typically moveable hard-wearing furniture for ease of cleaning and maintenance. Sufficient space should be allowed within the remit.
→ This area is usually the largest space and can often be used for safety briefs. See item 3.2.6.

3.2.6 – Briefing area :

→ Wall space should be allowed for appropriate technology to perform the task of briefing. This space should have wall boards or write on walls and usually require screens and laptop connectivity for staff briefings.

3.2.7 – Tea point or kitchen :

→ Requires an instant hot/cold water tap and commercial grade fridge for staff who bring food to the MDU please see Appendix E for generic drawings.
→ Some operational sites could require a full kitchen due to shift patterns or location of the site. These requirements should be captured within the remit and determined by the DIA.

3.2.8 – WCs :

→ See section 1.2.8 for advice on extent of provisions. Male and female facilities should be separated but adjacent to facilitate modification in case of demographic changes.
→ Number and location of Accessible Facilities should conform to Building Regulations Part M and is subject to the outcome of DIA and staff consultation.

Image 3.5
Mess Area

Image 3.6
Tea Point

3.2.9 – Control / planning area :

→ Rooms dedicated to project planning that typically contain layout space and white boards where information is manually written and displayed.
→ Storage of site drawing information and storage chests might also be required.
→ These facilities may also require specialist equipment that requires advice from NRIT specialists for the design integration.

3.2.10 – Charging equipment rooms :

→ Rooms dedicated for the charging of site equipment. Typically they have plenty of shelving and charge points. Rooms should also be lockable and monitored.
→ Could be combined with storage of surveying equipment.

3.2.11 – First aid Room :

→ A medical room should contain a treatment bed, surgical trolley, stainless steel bin, double wall cabinet, two chairs and a sink.

3.2.12 – Cleaners store :

→ The cleaners cupboard should have a cleaners sink with grating and shelving for cleaning products.

3.2.13 – Reflection room :

→ Quiet spaces should be allocated for staff to meditate, pray or relax. These areas should be neutral and welcoming for all. They should be well ventilated, sensitively lit and calm.
→ See Appendix E - Reflection room drawing for further information.

Image 3.7
Control and planning area

3.2.14 – Archive room :

→ A general storage room for archived projects and information may be required. Consultation with the end user should determine the type and amount of storage required.

3.2.15 – Drying rooms :

→ Allow typically 0.5sqm per font line staff member. Cage dimensions are typically 450x225mm.
→ The room should incorporate mesh style lockers and access to the laundry space for depositing of dirty PPE.
→ The ventilation and heating should be suitable for the purpose of drying wet PPE equipment.

3.2.16 – Showers :

→ See section 1.2.8 for advice on extent of provisions. Allow typically 4.5sqm per shower. Male and female facilities should be separated but adjacent to facilitate modification in case of demographic changes.
→ Isolated unisex showers for one person at a time require a door lockable from the inside.
→ Showers should be well ventilated and well drained,

3.2.17 – Changing rooms :

→ A locker for every member of staff incorporating benching is normally required.
→ Allow typically 0.7sqm per member of staff. Lockers are typically 500x500mm.

3.2.18 – Laundry room :

→ A storage space that allows for 200litre laundry roller trolleys.
→ The location of the laundry space should allow for easy access to collect and deliver laundry by the service company.

Note **:** The drying room, laundry, showers WC and locker room should work together as a system to facilitate a flow for staff going out or returning from external sites.

Image 3.8
Drying Room

Image 3.9
Changing Room

3.2.19 – Staff personal lockers :

→ Every member of staff should have a locker (other than changing) for personal items, using combination lock.

3.2.20 – Main Office Areas :

- → The office areas should be open plan to facilitate work, interaction and movement.
- → Typically allow 6sqm per desk, that should be well lit and serviced with IT.
- → A 1.5m planning grid is recommended as it is compatible with building components of 300 and 500mm.
- → The office area should be associated with sufficient Meeting Spaces and Service Centres.

3.2.21 – Meeting Spaces :

- → Depending on location, a range of meeting rooms varying in size: 4 person(9sqm), 12 person(27sqm), or 18 person (40sqm) may be required.
- → Typically all rooms would require audiovisual screens.
- → 4 person meeting areas could be allocated in the form of breakout booths.
- → For large meetings, the mess area could double up as a briefing space.

3.2.22 – Office Service Centre (OSC) :

- → Space for stationary, printers, waste management, storage cupboards and layout space should be provided.

3.2.23 – Cleaners' Storage :

- → Typically one room per floor level 3 to 5sqm,
- → Each room should have a cleaner's sink, an integral S-steel bucket stand and racking for storage of cleaning equipment.
- → Allow for 900mm x 900mm activity space and minimum of 1200mm circulation space for a trolley.

Image 3.10
Office Service Centre

3.2.24 – Gym :

- → For Health and Safety reasons the cost of staffing gyms is normally too onerous for Network Rail to justify the running expense. However, in cases where it is considered, it should be located at ground level due to the weight of the equipment.

3.2.25 – Comms Room :

- → NRIT should be consulted on every project at early stages (preferably GRIP0-GRIP 2) to advise on the cabinet numbers and access requirements.
- → Plant room should be in co-ordination with M&E. The IT room should be located near the lifts and deliveries for easy transport.
- → The access door openings should be double leafed and may be required to be large for transporting devices and deliveries.
- → Placement of the rooms should be so that the longest horizontal copper cable run is 90 metres form the Comms room to desk, AV equipment
- → The room should be hermetic, preferably without external windows and mechanically cooled.
- → It should be dust-free and likely to require a ceiling.
- → The floor should be raised, 600x600 with anti-static and robust tile finish.
- → The cabinets should be heavy duty and lockable.
- → Adequate lighting should be provided on Passive Infra-Red sensors.

Image 3.11
Comms Room

3.3.1 – Internal finishes

Different finishes specifications are required based on the intensity of use,and type of users. Three examples are given below of how finishes could differ for typical areas

Image 3.12 Office Area

SEMI PRIVATE AREA

These areas are subject to less wear and tear. Higher comfort should be the design objective, focusing on environmental control (acoustic, temperature, ambiance).

Examples include : Office areas, interview rooms, and meeting rooms.

Image 3.13 Mess Area

INTERMEDIATE AREA

Intermediate areas are spaces which are more public and require more durable materials that get cleaned more often but also maintain a high level of comfort for the users.

Examples include **:** Mess rooms, kitchenette, break out areas, receptions.

Image 3.14 Vertical Circulation

HIGH INTENSITY AREA

These high traffic areas should be designed with an emphasis on durability and longevity of the materials.

Examples include **:** Locker rooms, drying rooms, WCs, showers, entrances, corridors, stairwells.

3.3.2 –Colour Palette

The use of colour and graphics is encouraged to enliven workplaces and highlight or distinguish different areas of the office environment for variety and also for orientation.

The use of specific colours across the Network Rail workplace estate can help to establish a common look and feel. This comes with careful planning of spaces and specification of features and facilities alongside the creative use of colour and lighting.

Designers are asked to apply the Corporate Workplace Management DNA colour palette shown in section 3.3.3 as the basis for their colour schemes with a view of designing work environments with character.

Image 3.15
Colour Palette in Edinburgh

Image 3.16
Colour Palette in York

Image 3.17
Colour Palette in Birmingham

3.3.3 - How to use the Colour Palette

This colour matrix shown in Figure 3.1 aims to provide a choice of 5 consistent ambiances to the look and feel of the workplaces. Other colours could be added as long as they are complimentary to this colour scheme. This colour range is based upon the Dulux Trade system. Paint used can be Dulux or similar approved, providing that the colours are compatibly matched.

The combinations are assorted vertically into 5 pre-set colour palettes. However, the colours are not limited to the vertical palettes, for example a scheme could consist of colours 1.1, 2.2, 5.1 and 5.4 – This would be acceptable as they are all still from the same range. This is to allow some flexibility within the design parameters, as long as they are appropriate for the intended purpose.

Any proposed colour scheme should be agreed with the architectural reviewer of the Form 004.

1	2	3	4	5
1.1 **90RR 35/606***	2.1 **20YY 77/128***	3.1 **10YY 74/063***	4.1 **82YY 85/038***	5.1 **30YY 78/035***
1.2 **30YY 33/613***	2.2 **40YY 77/242***	3.2 **70RR 38/246***	4.2 **70YY 63/326***	5.2 **50BG 62/133***
1.3 **10YY 09/200***	2.3 **47RR 32/383***	3.3 **70YR 31/135***	4.3 **80YY 71/380***	5.3 **90GG 40/115***
1.4 **10YY 24/476***	2.4 **80YR 28/650***	3.4 **75RR 06/129***	4.4 **70YY 37/366***	5.4 **90GG 11/131***
1.5 **10RB 08/125***	**2.5 00NN 20/000***	**3.5 50RB 13/107***	**4.5 70YY 18/350***	**5.5 70BG 07/086***

Figure 3.1
The NR Workplace Colour Palette

Note: Colours could appear different on screen, please use the Dulux colour code (*) when specifying.

3.3.4 –Signs

MDUs should have sufficiently clear direction signs for the safe operation of the site. National and Route consistency across the MDUs should be aimed for. Specifications and fixings should be fit for purpose and all signs should be installed by a competent sign contractor.

Large scale graphics can be applied internally and could be used as a key element to enhance the Interior Design as shown in Image 3.19. Clear and easily understood graphics should be used throughout for communication and orientation.

Please note that some signs on a site my have to comply with specific Rail or Highway standards. An example of this could be track access gates onto the live Railway or site entry points where staff and MDU vehicles join the public highway.

Signs should be considered as a key design element and should not be picked up at a late design stage or after the site is operational.

Fire safety signs and refuge points , in line with the fire strategy for the building, should be included.

An electrical engineer should be consulted to verify that sufficient power is available for illuminated fire exit signs and any other sign related lighting.

Image 3.18
Orientation Sign printed onto wall

Image 3.19
Large Scale Graphics film applied onto glass

3.3.5 – Furniture

MDU furniture should be robust and fit for purpose. The furniture specification should be based on the teams and types of activities that take place within the area.

Hard wearing furniture should be used in public areas where it is likely to become dirty more quickly. Within mess areas for example, hard plastic (or similar) chairs offer an easy to clean surface.

Image 3.20
Hard Wearing Furniture

Soft furnishings should be used in areas subject to less intensive use and are more private . Soft furnishings should be avoided in food areas to prevent stains and spillages.

Image 3.21
Soft Furnishing

3.3.6 - Technology Integration:

The technology required for the final building should be driven by the number and role of users within the organisation. Is it therefore vital that these requirements are understood early in the design process.

Design teams should include representatives from Route Services IT (RSIT) and Network Rail Telecoms (NRT) to advise on all aspects for telephony, wired data connectivity, Wi-Fi, printing and technology for meeting rooms and break out spaces that should be incorporated into the MDU.

Consideration should also be given at early stages of the design to the services distribution and containment which are often added without proper integration of the overall structural and architectural design.

3.3.7 – Ceilings

Network Rail has a preference towards an exposed ceiling system where it is deemed practicable, There are nevertheless situations where suspended ceilings are more appropriate. The final strategy could be and should not exclude a mixed solution.

It should be noted that natural lighting via skylights is a healthy option for the well-being of the staff, and could also be used to reduce the building overheads.

The following points highlight both advantages and disadvantages of exposed soffits versus suspended ceilings, to assist the designer in making the correct choice,.

Exposed Soffits advantages are:
- → Extra Space – An exposed soffit maximises the size of the room giving a feeling of space. It is worth noting, some teams across the business could benefit from the extra height to display screens with information.
- → Maintenance – Exposed services allow for ease of maintenance and future adaptations. Services are more organised and easy to find.
- → Cooling -It allows hot air to rise and dissipate assisting the climate control system.
- → Cost and Time saving– cost of materials, labour and time required to fit a lowered ceiling.
- → Design Potential – allows more freedom with the lighting. Service distribution is visible and can be decorative.

Exposed Soffits disadvantages are:
- → Energy Consumption – Open ceilings provide a greater volume of space to heat and might increase energy consumption.
- → Acoustic control – This could pose an issue in open plan office but can be overcome by use of acoustic baffles and sound absorbing materials.
- → Humidity - In wet areas, it is not practical to expose the services and a ceiling is required.

Image 3.22
Partly Exposed Soffit with easily accessible services

Suspended Ceilings advantages are:
- → Concealed Services– Less attention required in routing and visual appearance of service routes.
- → Thermal performance – The ceiling can provide an extra thermal barrier.

Suspended Ceilings disadvantages are:
- → Deterioration – Suspended ceiling tiles discolour and degrade over time.
- → Hidden Services- Difficult access to services will further degrade and misplace ceiling tiles.

3.4.1 – Storage Areas :

The following list is a guide only and the designer should understand the users and team requirements which may include the following storage facilities:

- → Signalling Storage
- → Welding & Grinding Storage
- → Telecoms Storage
- → Emergency and Temporary Speed Restrictions Group storage
- → Plant Tools Telecoms
- → Off-track Storage
- → Works Delivery Storage
- → Forklift Charging Zone
- → Point Heating Elements Storage (can be very long boxes)
- → Hazardous Substances Store (Subject to Risk Assessment and Storage/Control Methodology)

Safe walking routes should be identified inside warehouses (as well as externally) where large vehicles are likely to be moving.

Please note : Prior to going to site pallets are likely to be wrapped ready with all the equipment for completing a task. A holding area should be provided for this purpose.

3.4.2 – Workshops for individual teams :

Individual teams are should be consulted directly for the correct requirements.

3.4.3 – Eye Wash Zone :

Generally located in the workshop areas , it should be provided with first-aid kits, eye washing unit (usually a trough sink with leaver taps) and a mirror.

Image 3.23
Equipment Collection Point

3.4.4 – Cable racking store :

Due to the variation of sizes associated with the cabling for the different teams, consultation should be undertaken to establish the exact requirements of the racking. Racking can be both internal and/or external. Security should be considered as cable theft is common on the railway environment.

3.4.5 – Rail testing area :

An area set aside for testing track layout and equipment prior to installation on sites. This space could also be used for training.

3.4.6 – Calibration room :

A space allocated for the calibration of equipment used on site. Each MDU may have slightly different requirements in terms of equipment used.

3.5.1 – Lighting

Lighting is a very effective means to express the desired character of a space. A lighting design should be integrated with the proposals at an early stage. Lighting enhances the perception of space and reinforces the activity within the space. Lighting by natural light (with blinds to reduce sun glare if necessary) should be utilised as much as possible. Roof-lights are also very effective.

All internal and external lighting systems should facilitate efficient performance of visual tasks and meet the following design parameters:

- → CIBSE (Chartered Institution of Building Services Engineers) Code for Interior Lighting
- → CIBSE LG7
- → Network Rail guide for office type building
- → Building Control Sections L and M
- → 17th Edition I.E.E. Regulations BS 7671
- → BS 5266 Emergency Lighting

Lighting installations should also meet the following :

- → Light fittings should be grouped and controlled to take advantage of natural light. Automatic controls with movement sensors should be used to minimise energy consumption.
- → The lighting should be energy efficient and cost-effective to maintain.

Image 3.24
Controlling ambiance with lighting

Recommended Luminance Levels (lux) are as follows:

- → Entrance & Reception 200
- → Corridors 200
- → Open Plan Offices 400 - 450
- → Small Offices 350 - 400
- → Welfare & Mess Rooms 300
- → Changing Rooms 300
- → Toilets & Showers 200
- → Comms Server Rooms 400
- → Plant & Switch Rooms 300
- → External Covered Stores 100 - 150
- → External Walkways 30 - 50

3.5.2 – Emergency lighting

The emergency lighting installation should be coordinated with the general lighting system.

- → Level of emergency escape illumination should comply with BS 5266 and NR/L2/ELP/27238.
- → Luminance levels should be a minimum 5 lux in rooms and 3 lux in workshops generally. However subject to Risk Assessment some workshop areas may need full luminance levels.
- → 3-Hour battery powered maintenance-free illumination should be specified along escape routes and above emergency exit doors.
- → Emergency fittings should have test switching containment and cabling in all areas. The testing of the emergency lights should be operated from a 20 amp key switch located within sight of the fitting, either as part of the lighting switch assembly or directly adjacent it.
- → The Office, Toilets, Welfare, Corridors and Stairs areas should have recessed fittings. The remaining areas can have surface fittings.

It is advisable to conduct an emergency lighting risk assessment at an early design stage to facilitate the approval of the proposals by the NR Fire Specialist.

3.6.1 - Small MDU buildings

Electric heating should be provided with thermostatic controls, designed to provide the space temperatures indicated under design parameters 3.6.5.

3.6.2 - Medium MDU buildings

Reverse cycle heat pumps should be specified where an all-electric installation is more effective than an Low Temperature Hot Water heating system, due to the large number of rooms requiring comfort cooling or where installing a gas supply would not be practical.

3.6.3 - Large MDU buildings

Heating system should be supplied from low temperature hot water boilers and supported where practically possible with low carbon offset initiatives.

3.6.4 - Low temperature hot water heating (LTHW)

A gas heating system should be designed so that the designated areas of the building are maintained at the required temperature and constant temperature heating water is provided to air handling unit heater batteries.

Heating and cooling controls systems should be designed to avoid simultaneous operation in heating and cooling modes.

3.6.5 - Design Parameters

The heating of MDUs should be designed to the following parameters:
- → CIBSE Guide B
- → UK Building Regulations Part L2
- → Low Temperature Hot Water Flow 82°C
- → Low Temperature Hot Water Return 71°C

3.6.6 - Boilers

High efficiency condensing gas fired boilers rated to suit the design heating load for winter conditions are usually preferred.

3.6.7 - Flues

Flues should comply with Gas Safe requirements

3.6.8 - Circuit Pumps:

All pumps should be in line twin head direct drive run/standby complete with anti-vibration mounts.

3.6.9 -Pressurisation Units

Cabinet type units with remote vessel are preferred.

3.6.10 - Pipe-work

All inter connecting pipe-work should be complete with all isolating/regulating valves, strainers, gauges and test points.

All pipe-work and valves should be fully insulated, colour coded and hydraulically tested before delivery.

3.7.1 - General Requirements

The potential for natural ventilation of the building should be maximised by providing windows that can open. A designed natural ventilation system should be considered with all new buildings.

A minimum outdoor air supply of 10 litres person per second should be provided. The specific fan power of the ventilation system should not exceed 2 W / litre/ second for general office installations.

The air handling unit should have intake and exhaust plenum's, connected to external, weather protected louvres that also suit the architectural specifications. The system should be provided with supply and extract fans, plate heat exchanger, panel filters, bag filter, heating and frost coil and duct mounted silencers. The air handling units should be of the constant volume type providing full fresh air, tempered to 20°C. The distributed fresh air ductwork should be thermally insulated.

If the MDU is likely to be unoccupied for long periods of the day, it is preferable to have an overhead distribution. However if the building is expected to have a regular full occupancy, distribution under a raised floor with floor extracts is a viable alternative.

The office supply and extract ventilation system should distribute through the building via ductwork that is evenly distributed. It has been noted that in a number of office environments delivered recently the ventilation outlets are not sufficiently distributed resulting in discomfort for the occupants who are either not close enough to an extract or too close to an extract that is blowing air too strongly.

3.9.2 - Design Parameters

The following design parameters are recommended:
- → CIBSE Guide A: Environmental design
- → CIBSE Guide B: Heating, ventilating, air-conditioning and refrigeration.
- → Noise criteria to meet the requirements of the room or area as previously stipulated.
- → CIBSE Guide F: Energy efficiency in buildings
- → Refrigerant R407c (or similar approved)

Internal Temperature to offices should be
- → Summer = 24°C ± 1°C
- → Winter = 21°C ± 1°C

Internal Temperature to Comms rooms should be
- → Summer = 24°C ± 1°C
- → Winter = 24°C ± 1°C

3.9.3 – Toilet Ventilation

WC supply and extract systems should comply with the same parameters as the general ventilation system, however the toilet system should be the full extract type for small toilets or have an overall negative pressure effect if an air-handling is required.

3.9.4 – Drying room Ventilation and Heating

An extract ventilation system should comply with the same parameters as the general ventilation system requirements. The system should have a speed control to allow settings between zero and full speed.

However the drying room system should be of the full extract type with the capacity to give 6 air changes per hour. It should have thermostatic electric heaters that are capable of maintaining the low level temperature at 20 °C. The extract system should induce warm air movement upwards through the clothing racks. Under-floor or low level heating should be provided to allow a flow of rising air to dry clothes. For small MDUs individual air drying lockers are recommended.

3.6.8 – Air conditioning Engineering services

All cooling systems should be specified as inverter-driven VRF type with R410A refrigerant. Heating and cooling controls systems should be designed to avoid simultaneous operation in heating and cooling modes. Rooms where cooling should be provided are:

- → All meeting and interview rooms
- → Main administration offices
- → Open-plan offices
- → Comms/Server room

3.8.1 – External Planning

MDUs are typically surrounded by open car parks,storage facilities, waste areas and workshop buildings (see section 3.4 for warehouse provisions). Wherever possible the position and orientation of buildings should have a clearly perceptible layout to facilitate entry and exit for staff, visitors and goods.

External car park and circulation areas include both operational and visitor zones. All walking routes should be segregated, clearly marked and adequately lit for visibility. Appropriate landscaping and drainage should also be considered throughout. Foul drainage may be required for vehicle and equipment washing. In other areas, permeable drainage should be considered to minimise the environmental impact.

Image 3.25
Approach to Mercier House, Derby

Image 3.26
View from Mercier House, Derby

3.8.2 – External stores :

The remit should capture the equipment storage requirements and this information should be used to determine the size of the external stores. Their location should be well considered so that it does not adversely affect the safety of the site. Adequate space for the pick up and drop off vehicles visiting these areas should be considered. All stores should have, where possible, well lit overhangs so that vans can load and unload in all conditions.

3.8.3 – Parking :

General car parking spaces should be allocated for staff and MDU vehicles, with potentially ever increasing requirements for vehicle charging points. Accessible parking should be located as near as possible to the building entrance and be compliant with the Equality Act 2010.
MDU vehicles such as vans and Heavy Goods Vehicles require larger spaces and turning circles. Typical vehicle requirements and numbers should be provided by the client. Provision for cycles and motorcycles should also be included.

3.8.4 – Smoking Areas

Out-door shelters should be provided where site staff and visitors can smoke comfortably and safely.

3.8.5 – Waste areas

Refuse storage and compactor areas should be located strategically in a way that facilitates safe waste collection and also minimises distances for staff disposing the rubbish.

3.8.6 – External finishes

Similar to Internal finishes, all external finishes are determined by the activities and types of traffic which frequent the area. All materials should be fit for purpose and can be categorised as follows :

Image 3.27

HEAVY DUTY AREAS

Areas related to intense work, utilising large loading equipment or storage of site equipment, including the road surfaces related to these areas.

Examples include : External storage, loading, HGV areas.

Image 3.28

INTERMEDIATE AREAS

These areas encompass all pedestrian and semi permeable spaces in which all staff can access. They can also be utilised for the inclusion of a Sustainable Drainage System to deal with site rain water run off.

Examples include : Safe walking routes, site landscaping, car parking and cycle storage areas.

Image 3.29

SOFT SURFACE AREAS

Natural landscaping shouldn't be viewed as a 'nice to have' as sites can benefit greatly from the drainage and improved permeability, not to mention the health and well-being of the staff.

Examples include : Soakaways, natural landscaping, grass verges and pedestrian walkways.

3.8.7 – Security

MDU sites should be controlled, safe and secure. Requirements should be risk assessed on a site by site basis and captured within the remit. A security strategy should be in place for all proposed schemes. The strategy should be agreed with the relevant Project Engineer and client team.

The building should be secure and monitored internally in common spaces. The external site should be controlled via a CCTV system.

Space for all recording equipment should be allocated within the LAN/Comms room (see section 3.2.24).

3.8.8– Perimeter fence

The perimeter should be fully enclosed with suitable fencing. Certain sites may have access gates direct to the rail tracks.

3.8.9 –Access control

Vehicle and pedestrian gates should be provided where necessary, either sliding or swing gates with relevant access controls, as required within the clients remit.

The MDU should be secured by an automatic access control system. This should be fob activated access and include a video intercom on the main entrance door and all access gates. Visibility from the site office to the entrance gates is preferred along with remote gate control security cameras.

An intercom receiver should be installed within the main office space and an additional location should be agreed for every site.

Image 3.30
External signs on walking route

4

Maintenance Delivery Units
Appendices

Image 4.1
Internal Warehouse area
Edinburgh

Appendix A
Reference Documents

Below are lists of the most relevant standards and guidance documents referenced. These documents are drawn from a range of sources.

For dated references, only the edition cited applies.

For undated references, the latest edition of the reference (including any amendments) applies.

These lists are not intended to be exhaustive.

British/European/Other Standards:

- → Building Regulations
- → CIBSE Guides and Publications
- → BS EN 81 – Construction and Installation of Passenger Lifts
- → Water Supply (Water Fittings) Regulations
- → Water Regulations Advisory Service (WRAS)
- → BS7671 17th Edition Wiring Regulations
- → BS5839 – Fire Detection and Alarm Systems in Buildings
- → BS EN 12464 - Lighting of Work Places
- → BS5489 – Lighting of Roads and Public Amenity Areas
- → BREEAM – Environmental Assessment Method
- → BS62305 Protection against Lightning
- → BS5395 – Stairs Ladders and Walkways
- → S8300 – Design of Buildings and their approaches to meet the requirements of disabled people
- → BS5266 – Emergency Lighting
- → BS EN 50131 – Alarm Systems

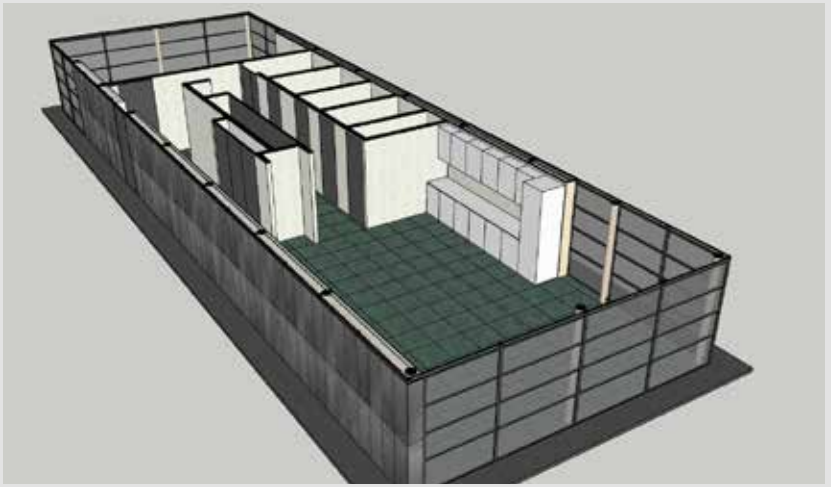
Relevant Network Rail Standards and Guidance / NR documents:

- → NR/L2/OHS/0047 Application of Construction Regulations to Network Rail Construction Projects
- → NR/L2/OHS/0044 Planning and Managing Construction Work
- → NR/L2/INF/02202 Records Management for Health and Safety
- → NR/L2/ENV/015 Environment and Social Minimum Requirements
- → NR/L1/INI/P3M/101 Governance for Railway investment Projects
- → NR/GN/CIV/400/05 Workplace DNA
- → NR/GN/CIV/300/01 Wayfinding
- → NR/GN/CIV/100/05 Heritage: Development and Care
- → The CP7 Buildings and Architecture Policy (2020)
- → NR/L2/ELP/27238 Maintenance Specifications for Fixed Plant Equipment

Legislation:

- → Building Regulations
- → Construction (Design & Management Regulations
- → Health & Safety at Works Act
- → Electricity at Work Regulations
- → Electricity Supply Regulations
- → ACoP L8 - Control of Legionella Bacteria in Water Systems
- → COSHH Regulations (Control of substances hazardous to health)
- → Water Supply (Water Fittings) Regulations
- → Groundwater Regulations
- → Pollution Prevention and Control Regulations
- → Regulatory Reform (Fire Safety) Order
- → Working at Height Regulations
- → Control of Asbestos Regulations
- → Equality Act 2010
- → F Gas Regulations

Appendix B – Case Study
Surbition MDU – Small



Surbiton MDU
England

Capacity
10 (per shift)

Network Rail
Design Delivery (NRDD)

Eco-build
First of its kind

The ethos of this project was to be a statement piece for environmental design. It challenged the idea of the typical Network Rail MDUs as we see these buildings across the network, all icons of our industrial past, that are built from concrete, brick, blocks, mass steelwork.

The current site at Surbiton consists of a new build, a yard with room for 4 vans and equipment storage containers. The current site houses 8 MOMs and 10 PWAY staff however due to shift working the existing facility is only occupied by 10 workers at one time.

Having established that the existing building would not be fit for a refurbishment, the challenge was to create a new facility, on an enclosed site, with a single access way into a public station car park.

The initial concept was a single storey building, made completely from modular components which had minimal groundwork and utilised passive environmental strategies. The building was efficiently designed so that it did not require a plant room, mechanical ventilation equipment or air-conditioning.
Temporary accommodation will be provided within close proximity during the demolition and construction phases of the new building.
The new design consists of an office area for management and control staff who are based there, quiet areas for Mobile Operation Managers and is complete with kitchenette, storage, changing, WC and shower facilities.

Surbiton MDU could be Network Rails first MDU based on minimal embodied energy and not using concrete, cement or brickwork.

Appendix B – Case Study
Hitchin MDU – Small Heritage Refurbishment

The existing building was partially in use for storage and had fallen into disrepair after years of neglect. Elements within the building were listed therefore the retention of these features was crucial to provide longevity and continued investment at this site.

This project challenged the designer to deliver a detailed conversion of the existing building (originally used as a grain store) into a modern, comfortable, working environment; which would meet the requirements of a dynamic team, whilst maintaining the sense of history and character of the building. This project was completed within a challenging programme, from disused to desirable building within 10 weeks. It was also completed under tough budget constraints and to a high standard overall. It was well received by the client and staff.

Hitchin MDU
Bedford, England

Capacity
30 people (per shift)

Network Rail
Building Design Group

Partially listed elements

Ground floor

First floor

Appendix B – Case Study
Middlesbrough MDU – Medium

Middlesbrough MDU
England

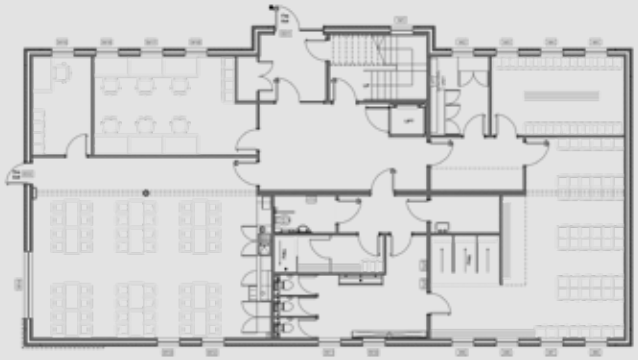
Capacity
30 office, 69 front line

Network Rail
Design Delivery (NRDD)

Re-utilised location
Enhance current site

The existing site at Middlesbrough consisted of containers with poor facilities for staff to work out of, and separate storage containers with a history of stolen equipment.

The new two-storey facility is composed of traditional masonry with feature cladding (containing an orange trim) fitted on strip foundations, complete with a large Network Rail logo to give the building identity. It is now the home to three separate teams and almost 100 members of staff. The new site layout looks to maximise the amount of parking and circulation space available, for HGV or similar. Through constructing single units as external stores it allows the teams to segregate their equipment and provide it is safely stored.



Ground floor

First floor

Appendix B – Case Study
Edinburgh MDU – Medium to Large

Edinburgh MDU
Scotland

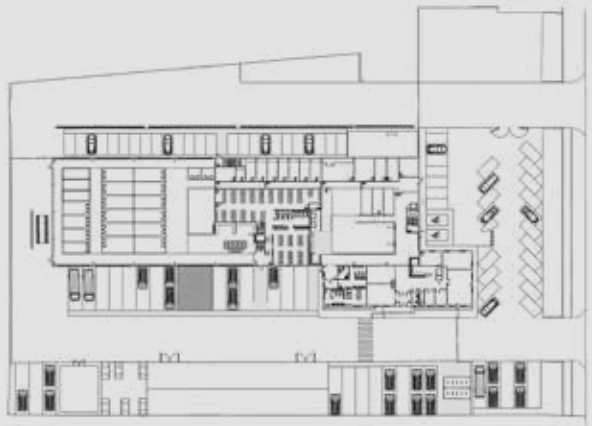
Project size
2611m²

Network Rail
Building Design Group

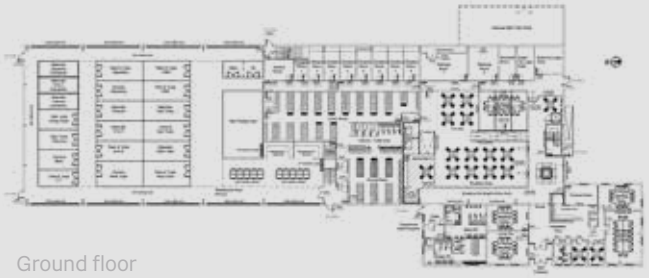
Award winner
BCO 2017

The inspiration for the design came from understanding the clients requirements; of creating one workspace to house teams which were previously located across Edinburgh, and to lift the spirit by encouraging cross-team collaboration. It is now an industrialised office environment consisting of up-graded containers. Introducing defined collaboration spaces forms deliberate areas for social mixing between both office and front line staff. These zones sow the seeds to build interactions and introduce a strong team mentality throughout, something which was missing from previous sites.

This scheme was awarded the British Council for Offices innovation Award, alongside a 'Best Practice' on the railway Award from ORR.



External



Ground floor

Mezzanine

Appendix B – Case Study
Ebbw Vale MDU – Large ecobuild

"The MDU shall reduce its carbon footprint and operational costs through the utilisation of modern construction materials, energy efficient technologies and on-site generation. The route energy and carbon reduction funds are to be utilised for these elements".
(Extract of the remit)

The new MDU should be a flagship facility for the Wales Route; bringing together various maintenance teams in a purpose-built facility which enhances the working environment of those based there, whilst reducing the energy consumption and carbon emissions. This is the first MDU redevelopment in CP6 and should form the blueprint for future schemes.

Consideration had to be given to the proximity of residential housing. The look and feel of the new depot was to have a less industrial feel in harmony with its vernacular. In addition, a Sustainable agenda gave the project features that included:

- → Green Roof
- → Suds car park drainage system
- → SIP Panel construction methodology for speed of construction and high thermal performance
- → Locally sourced materials if practical.
- → Solar panels
- → Glue laminated superstructure.

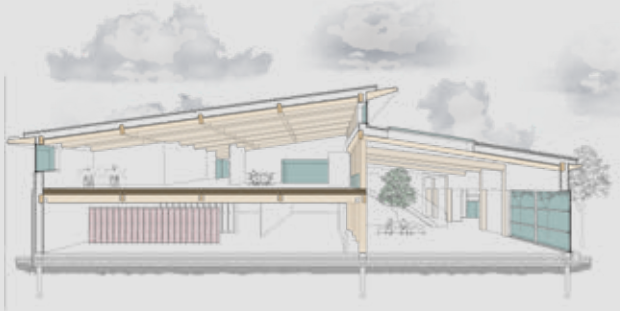
The building should have an embodied low carbon approach in line with the aspirations of Network Rail.

Ebervale MDU
Wales

Capacity
414 staff

Network Rail
Design Delivery (NRDD)

Project size
4056m²



Section

Ground floor

Mezzanine

Appendix C

Remit development questions

CLIENT INFORMATION

Q1. Why is this project being developed? This question should form the foundation to the whole project and a robust need for the business should be established.	
Q2. What sites should the client consider? Selection of the sites should be open to challenge and the feasibility for the intended use should be established with thought given to accessibility, contamination and the environment. Where possible, existing assets should be re-utilised.	
Q3. Who are the stakeholders? The requirements of all involved should be captured throughout the full project. As part of the Form004 process, evidence that a staff consultation has taken place should be provided.	
Q4. Have all the users of the building been consulted? This is of vital importance in getting the remit right and avoiding objections at later stages.	
Q5. Has the client provided any specific requirements to be captured within the design? The end user might have a very specific requirements for the MDU and establishing these from inception is key to the success of the project.	

Q6. Has the client worked with an Architect before? To help gain a good understanding early on it is good practice to share information on previous work undertaken on both parts. Case studies and lessons	
Q7. What are the time constraints of the project? Understanding the time frames can inform the remit towards a particular construction and procurement methodology. Informing the client and presenting the options should be discussed and evaluated.	
Q8. Are there any particular phasing requirements? Phasing can be an option to relieve the time constraints on a project and open up options which might give a better end result otherwise not available without phasing.	
Q9. What is the client budget? Budget is always a major factor that influences design. Having a good understanding at an early stage can influence site choice and construction methodology. The client should be informed of what can be achieved within the agreed assumptions. There is no benefit in proceeding with unrealistic expectations and challenging the remit against cost is vital from the offset.	

Remit development questions

BASIC DESIGN FACTORS

Q10. What is the client looking to achieve with this project? Scrutinise the Key Deliverables within the remit.	
Q11. Should any future construction be taken into account now or any infrastructure requirements ? Future proofing the design through awareness is very appropriate to Network Rail projects, as multiple projects could possibly be happening in relation to any site at any one time. The Client should be informed of Network Rails developments within the vicinity of the site.	
Q12. How does the proposed building integrate with the existing environment? Landscaping, trees, orientation and climate are some factors that should be considered. Context is vital to how the railway environment might affect the surrounding built environment. This should be demonstrated within the Form 004.	
Q13. Is the building listed or within a Conservation area? Will require Listed Building Consent if it is. Infrastructure on Railway land can have historical importance; and where possible and practicable, retention should be considered. There are funds available from the Railway Heritage Trust that can aid important refurbishment works.	

Q14. Are there any existing buildings on the proposed site, if so, do they set a precedent for material choice? This is key to how they could be either integrated into the design in a sustainable manner rather than be demolished or left empty.	
Q15.What type of materials would the client like to use? Thought should be given to robust and hard-wearing materials, with a view to easy replacement and standardisation if possible.	
Q16. Are there any specific design goals? For example, Sustainability targets. These requirements could act as aspirational within the scheme and could be value engineered at a later GRIP stage but should not be negated too early if the benefits are obvious to include within the scheme. Grants for sustainability are available within Network Rail and should be discussed with the project scheme as part of brief development.	
Q17. Would they like to include new technologies within the project? Network Rail welcome innovation and ways of improving the way we work, if a client team or a design team has experience or recommendations on how to improve daily working, this is encouraged.	

Appendix C
Remit development questions

OCCUPANTS

Q18. Who will use the building? There are numerous teams with varying requirements working out of Network Rail MDUs. A description can be found in section 1.2.7 and from asking the end user to identify the processes, work patterns and requirements associated with their teams.	
Q19. What are the end users requirements? Office staff have completely different requirements to the front line staff and a list of associated spaces should that should be collated, and where possible aligned between the requirements of the varying users. Shared spaces such as toilets, should not be duplicated, if possible.	
Q20 Any specific accessibility requirements? Accessibility requirement should be verified through the DIA process and should be compliant with the Equalities Act 2010.	

SPACES

Q21. What floors / rooms / spaces are required? Both indoor and outdoor. Look for efficiencies and co-dependencies. Highlight to the client any savings made within the design.	
Q22. How would the spaces connect? This is vital in terms of how an MDU functions. Please see section2.1.2.	
Q23. Are there specific spatial requirements? HGV turning circles, Forklift trucks, process drivers, manufacturing on site requirements.	
Q24. Are there any specific external landscaping requirements from the end users? There might be restrictions on use of certain materials or drainage methods, for example.	
Q27. Are there any specific Mechanical or Electrical requirements? Sites are sometimes quite remote with very specialised equipment. Knowledge of the proposed equipment should inform the remit development.	

Above is a non-exhaustive list of the questions that should be considered when developing the initial Architectural brief.

Services
The design should allow for easy access to all the electrical and mechanical services. Where maintenance of building elements (roof, wall, and glazing) may be required, access and security should be integrated into the design.

Plant rooms and services cupboards should be located in easily accessible positions. Such rooms should be dedicated for the equipment that is contained within the dedicated spaces; storage of other items should be prohibited.

Where equipment and services are installed at roof level adequate design and planning should allow that any remedial future maintenance and repairs to the roof fabric are feasible without having to remove the equipment. Removal of items should also be feasible with affecting the water tightness of the roof finishes.

Use CFCs (Chlorofluorocarbons) or HCFCs (Hydro-chlorofluorocarbons) is prohibited, nor any products whose production involves the use of these materials.

HEATING LEVELS:

Heating systems should comply with:

→ The Building Regulations; Approved Document L2A (latest amendment)
→ The Fuel and Electricity (Heating) (Control) order (1974) as amended

ENERGY EFFICIENCY

All proposed MDUs should meet the requirements of the Building Regulations 2000, Approved Documents L2A and L2B (2006 edition) or their equivalent in Building Standards (Scotland) Regulations, and any subsequent statutory amendments. The primary aim of the energy concept is to reduce the development's carbon footprint by achieving optimal environmental conditions with a minimal energy demand through:

→ Highly insulated and tightly sealed façades with operable windows,
→ Optimized daylight utilisation through building form, glazing and light re-direction elements,
→ Buffer zones - such as locating service and circulation areas on the North and east elevations to insulate the interior and harvest solar energy and solar shading

High-performance building-integrated systems, including:
→ Slab-embedded radiant heating / cooling.
→ Mechanical ventilation incorporating exhaust air heat recovery.
→ 100% outdoor air displacement ventilation.

Natural sources, including:

→ Natural ventilation for fresh air and/or cooling.
→ Façade-integrated photovoltaic systems that capture solar energy.
→ Wind power where feasible.

PLANT OPERATING CONDITIONS

All plant items should;
→ Be rated for operation in the environment in which they are to be located.
→ Conform with CIBSE recommendations.

LIFTS

The following references should be followed:

→ The Lifting Operations & Lifting Equipment Regulations 1998 (LOLER)
→ The Lift Regulations (95/16/EC)1997
→ EN81 suite of standards: Construction and Installation of Lifts
→ BS8300: Code of Practice for the Design of Buildings for Disabled Access
→ BS9999: Code of Practice for fire safety in the design, management and use of buildings.

Services Design Parameters

ACOUSTIC STANDARDS

The level of hearing is expressed in decibels from 0dB, (the threshold of hearing) to 140dB (the threshold of pain). . Ambient noise levels in spaces when they are unoccupied should not exceed the following:

→ Small consulting rooms = 50 dBA
→ Large Offices = 45/50 dBA
→ Private Offices = 40-45 dBA
→ Small Classrooms = 40 dBA
→ Large Lecture Rooms = 35 dBA
→ Canteen/Kitchen/Café Areas = 50 dBA
(Source; British Standards, BS 8233:1999)

Below are Maximum Background Noise Levels emanating from Plant / Building Services Equipment expressed in Noise Reduction levels (NR):

→ Small Offices (Up to 8-persons) NR 30
→ Offices (Over 8-persons) NR35
→ Reception Areas, corridors . NR40
→ Kitchens & computer rooms NR45
(These compliment the acoustic standard referenced above.)

TESTING, COMMISSIONING AND OPERATION OF THE BUILDING:

The building services systems and their associated controls should provide effective monitoring, control and performance of all the mechanical and electrical services.

Heating, cooling and ventilation systems should have controls systems that provide efficient and economical use of energy to achieve compliance with the building regulations. They should also be arranged so that their operations do not conflict in any way with each other.

The Design Parameters should be:
→ CIBSE Guide B – Heating, Ventilation, Air Conditioning and Refrigeration.
→ CIBSE Guide H – Building Control Systems.
→ CIBSE Commissioning Code C: Automatic Controls
→ Building Regulations Part L2

SYSTEMS SET-UP:

All heating, ventilation and cooling systems should be designed and specified to provide that building fabric protection and system frost protection is provided:

Building Protection Set Point for heating should always come on Internal temperature: 10°C
Systems Frost Protection Set Point for heating should always come on: Outside Air Temp: 3°C

OPERATION & MAINTENANCE OF THE FINISHED BUILDING RECORD DOCUMENTS:

To satisfy the provisions of the Health and Safety at Work Act the Employer should not accept handover of the installations until full and adequate information concerning the installations is in the possession of his operating and maintenance staff.

Record Documents should be provided as part of the Works. All manuals documentation and record drawings should be provided in both hard copy and electronic form.

FORMAT OF RECORD DOCUMENTS:

Manuals should be supplied in Microsoft Office Word 2003 format and CAD drawings format. System records and full documentation should include:

→ Record Drawings and Schedules
→ Plant room and switch room drawings, schedules and schematics.
→ Operating and Maintenance Manuals.
→ Blank maintenance logs
→ Building log book to comply with the Building Regulations Part L2, Conservation of
→ Fuel and Power 2000.

HAND OVER PROCESS: TRAINING OF EMPLOYER'S STAFF:

The specification should include a requirement for demonstration of the purpose, function and operation of the installations including all items and procedures listed in the Operation and Maintenance Manual. This training / demonstration should be given to the Employer's maintenance staff and operational staff.

HOT AND COLD WATER

Incoming water mains should be routed into the building via an external water meter and terminated at low level via an isolating valve in an accessible plant room. The mains cold water distribution system should be specified with thermally insulated copper pipe-work which should routed around the building to serve all appliances including the following, as applicable:

- → Heating system pressurisation equipment
- → Kitchen equipment
- → WCs
- → Urinals
- → Tea Point
- → First Aid Room
- → Hot water generators
- → Showers
- → Wash hand basins

Design Parameters should be
- → Design in accordance with BS6700.
- → All water fittings and materials should be specified as listed in the Water Fittings and Materials Directory published by WRAS.
- → Hot water storage/flow temperature = 60 °C
- → Hot water return temperature = 55 °C

WATER TREATMENT:

Water supply should have in-line electromagnetic water conditioner(s) on the mains water connections to all hot water heating equipment, including showers.

GAS SUPPLY

If required for heating system purposes, a natural gas supply system should be specified in accordance with the design parameters below, with a suitably sized meter contained in a purpose made and secure external gas meter housing.

The gas supply should be installed to serve the heating system boilers with a gas solenoid valve linked to the fire alarm system and an emergency knock-off button in the plant room.

Design Parameters should be:
- → **British Gas Technical Memorandum**
- → **CIBSE Guide B**

Gas distribution system should convey: natural gas at a nominal working pressure of 21 mBar at meter. Pressure drop to final connection should not be more than 100Pa. Working temperature should be ambient; and carbon steel pipes should comply with BS 1387.

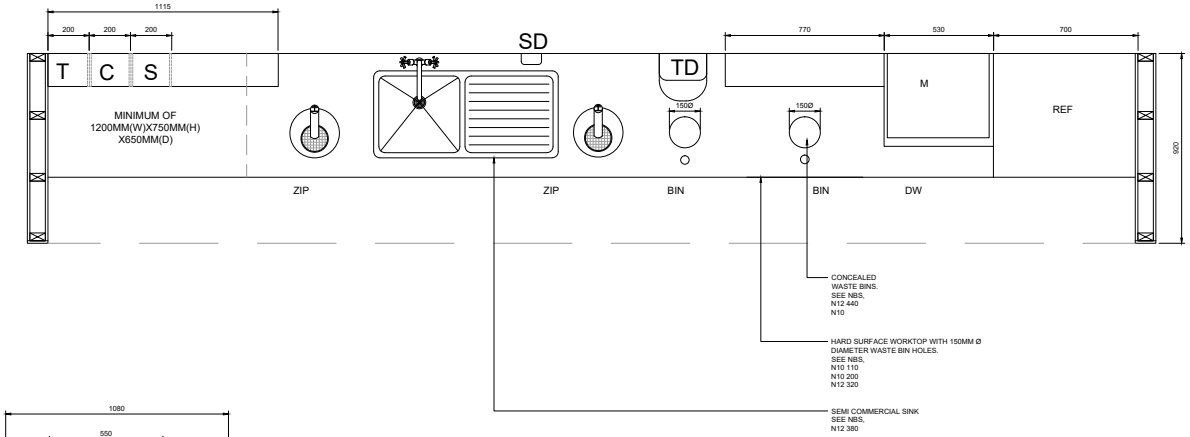
LIGHTNING PROTECTION

A risk assessment should be carried out to establish if lightning protection is required.

The lightning protection system should protect the building and comply with BS EN 62305 AND BS 7671. All metallic parts of the structure should be linked in accordance with BS EN 62305 to form a complete lightning protection network. Conductors should be with horizontal air terminations and earth electrodes for lightning protection. Air terminations should be self-supporting.

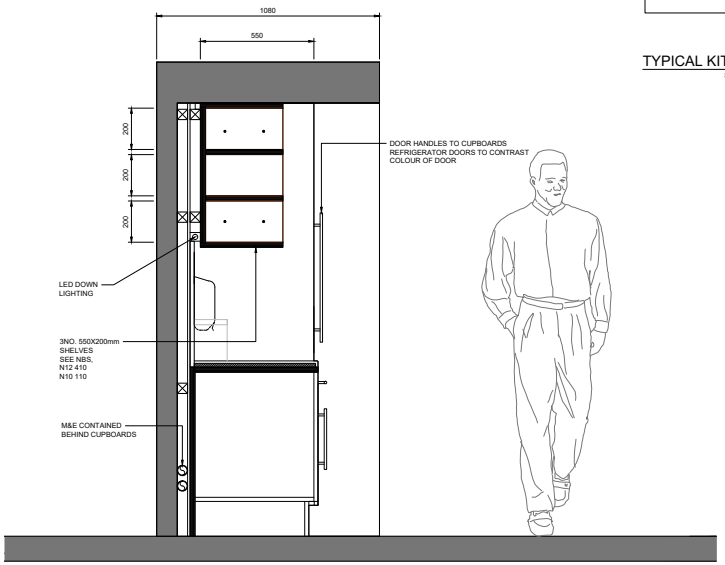
Conductor covering colour should match the building fabric cladding colour.

Appendix E
Typical Drawings: Kitchenette



TYPICAL KITCHENETTE PLAN

SCALE 1 :10



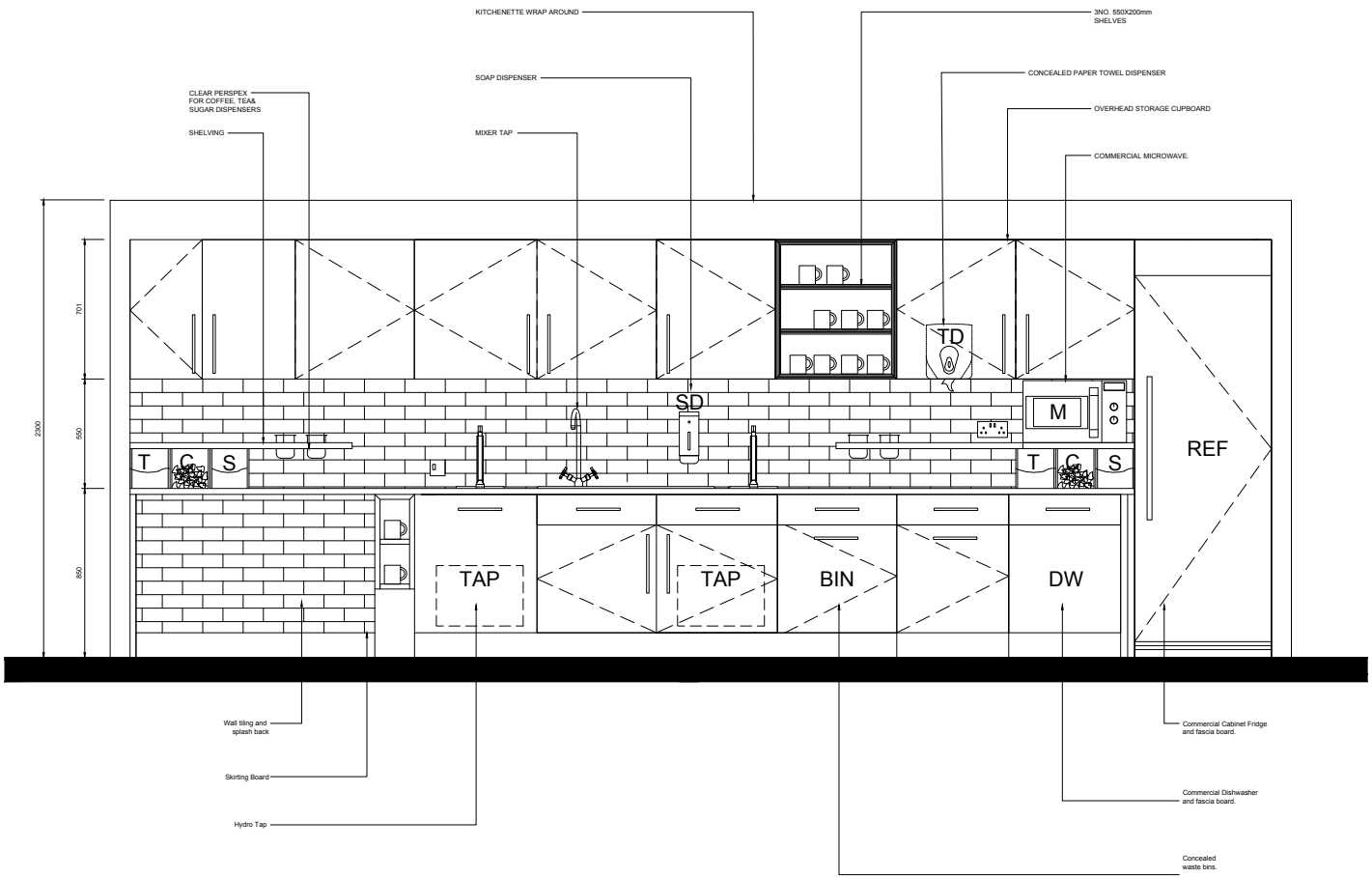
TYPICAL KITCHENETTE SECTION

Kitchenette
Equipment Checklist

Hydro tap — providing hot and cold water
Large format larder fridge
Integrated recycling
Supplied towel/soap dispensers
First aid box
Noticeboards
Storage for personal items
Semi commercial dishwasher
Sink with drainer and mixer tap
Storage for crockery and cutlery
Storage for supplied tea/coffee/sugar

Typical drawings are for illustrative reference only

Appendix E
Typical Drawings: Kitchenette



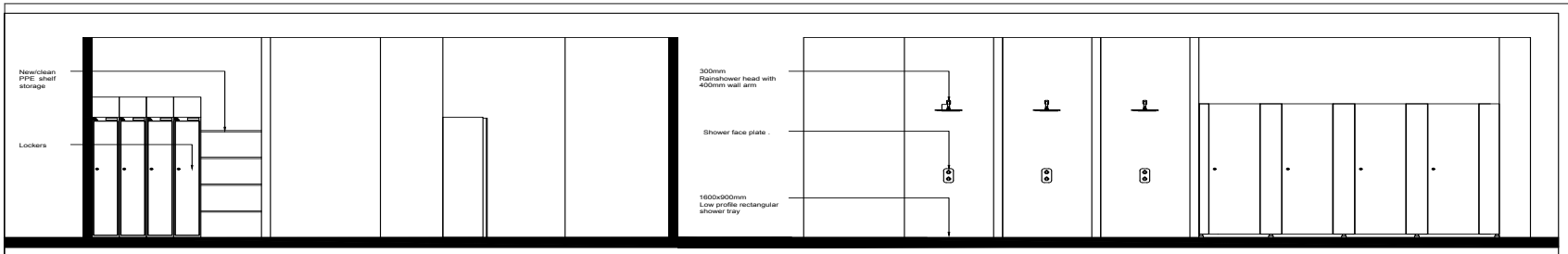
TYPICAL KITCHENETTE ELEVATION
SCALE 1 :10

Catering Facilities
Equipment Checklist

Crockery & cutlery storage
Hydro tap (high capacity) serving hot and cold water
Paper & Soap Dispenser
Recycling bins
Sinks & Taps
Storage for tea/coffee/sugar
Under Counter Fridge
2 x Fridge units
2 x Microwaves
Specialist equipment

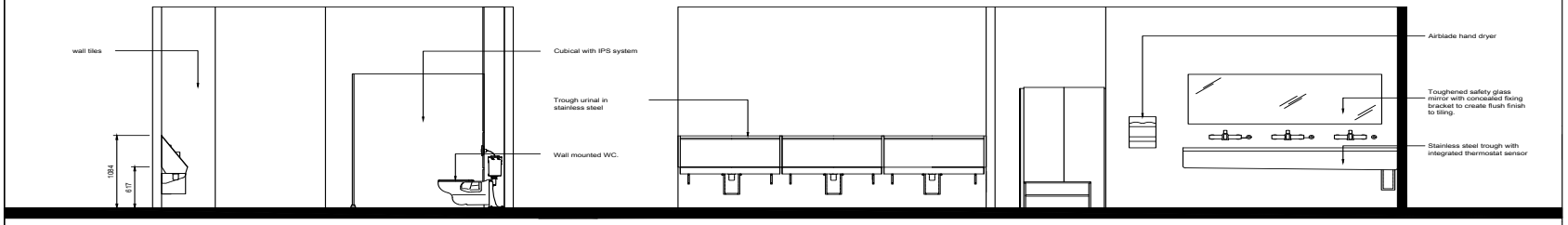
Typical drawings are for illustrative reference only

Appendix E
Typical Drawings: Shower & WC



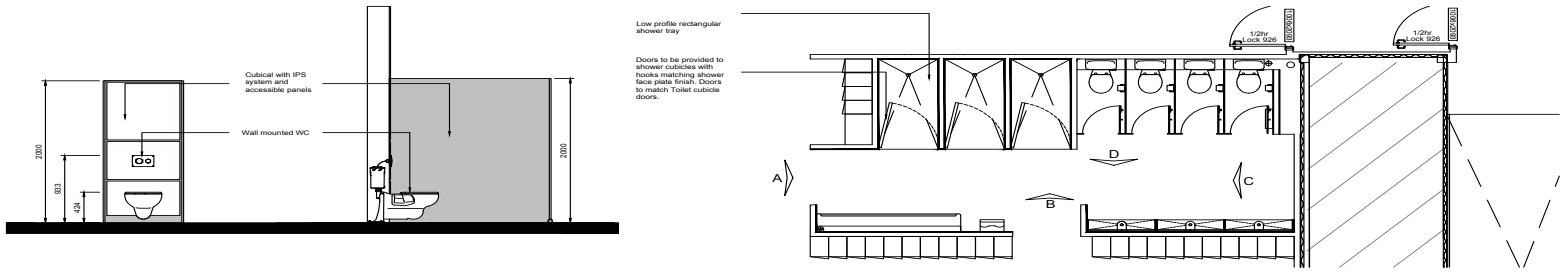
ELEVATION A

ELEVATION B



ELEVATION C

ELEVATION D



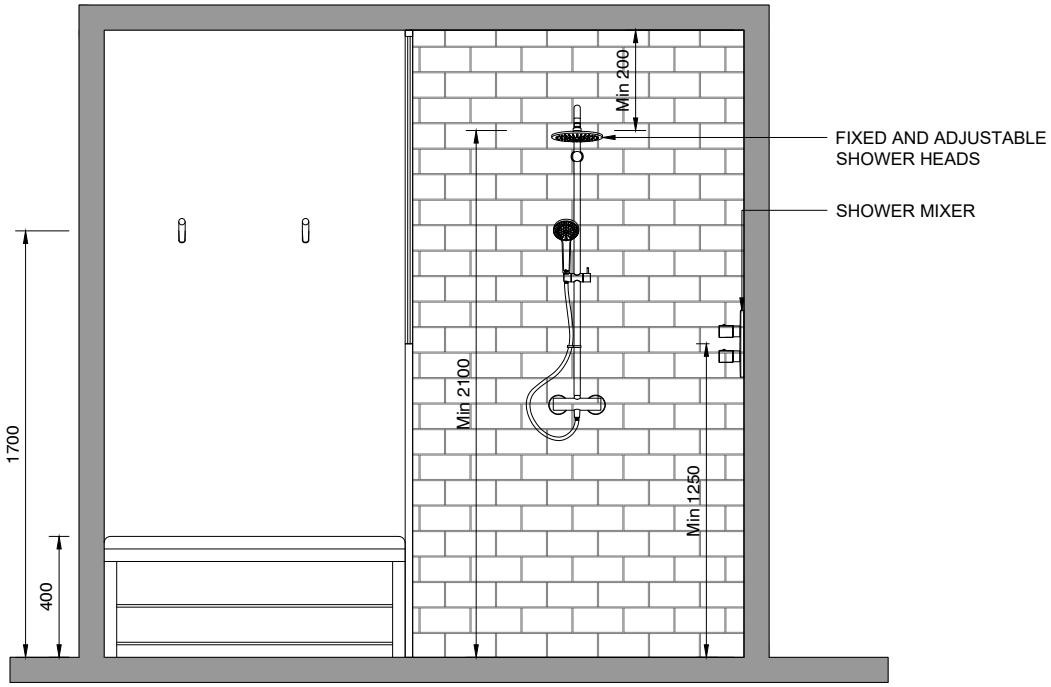
CUBICLE ELEVATION A

CUBICLE ELEVATION B

SHOWER AND TOILET AREA PLAN

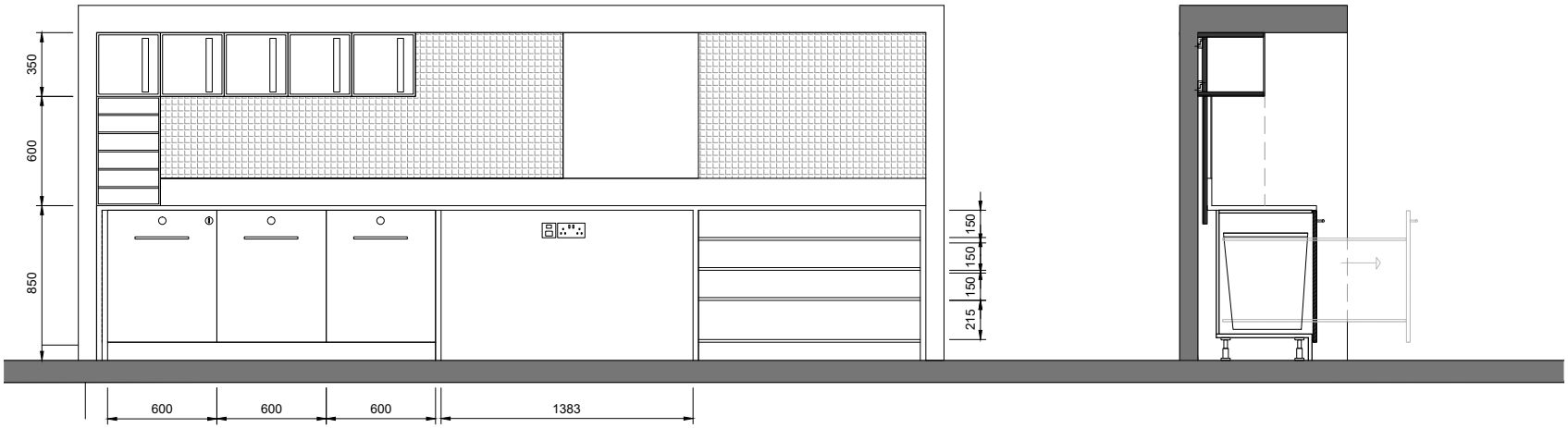
Typical drawings are for illustrative reference only

Appendix E
Typical Drawings: Shower



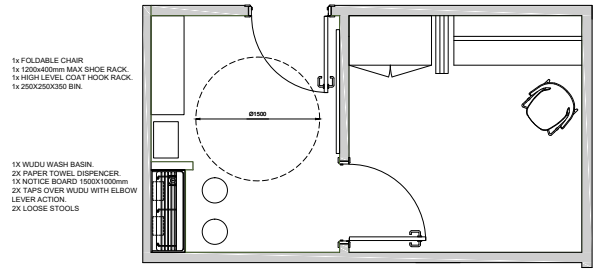
Typical drawings are for illustrative reference only

Appendix E
Typical Drawings: OSC

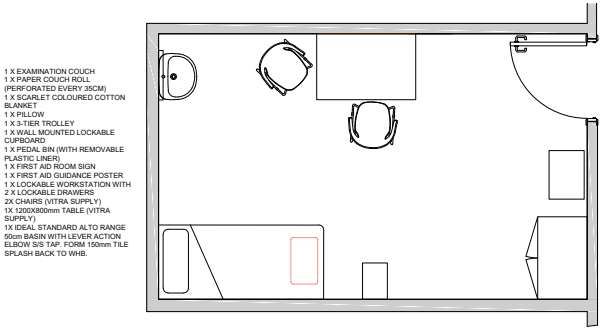


Typical drawings are for illustrative reference only

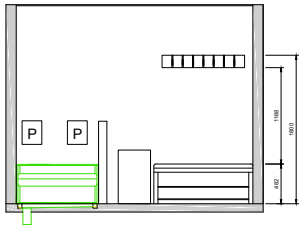
Appendix E
Typical Drawings: Relaxation & First Aid Room



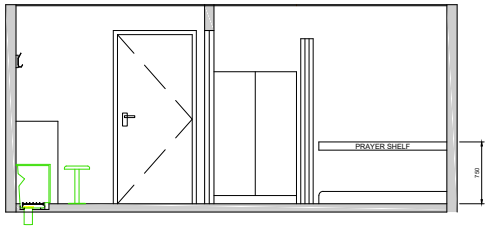
TYPICAL RELAXATION ROOM PLAN
SCALE 1:25



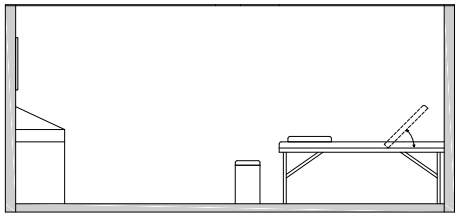
TYPICAL FIRST AID ROOM PLAN
SCALE 1:25



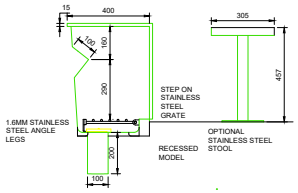
TYPICAL RELAXATION ROOM ELEVATION A
SCALE 1:25



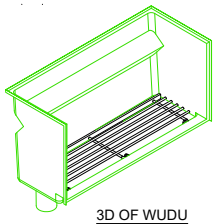
TYPICAL RELAXATION ROOM ELEVATION B
SCALE 1:25



TYPICAL FIRST AID ROOM ELEVATION
SCALE 1:25



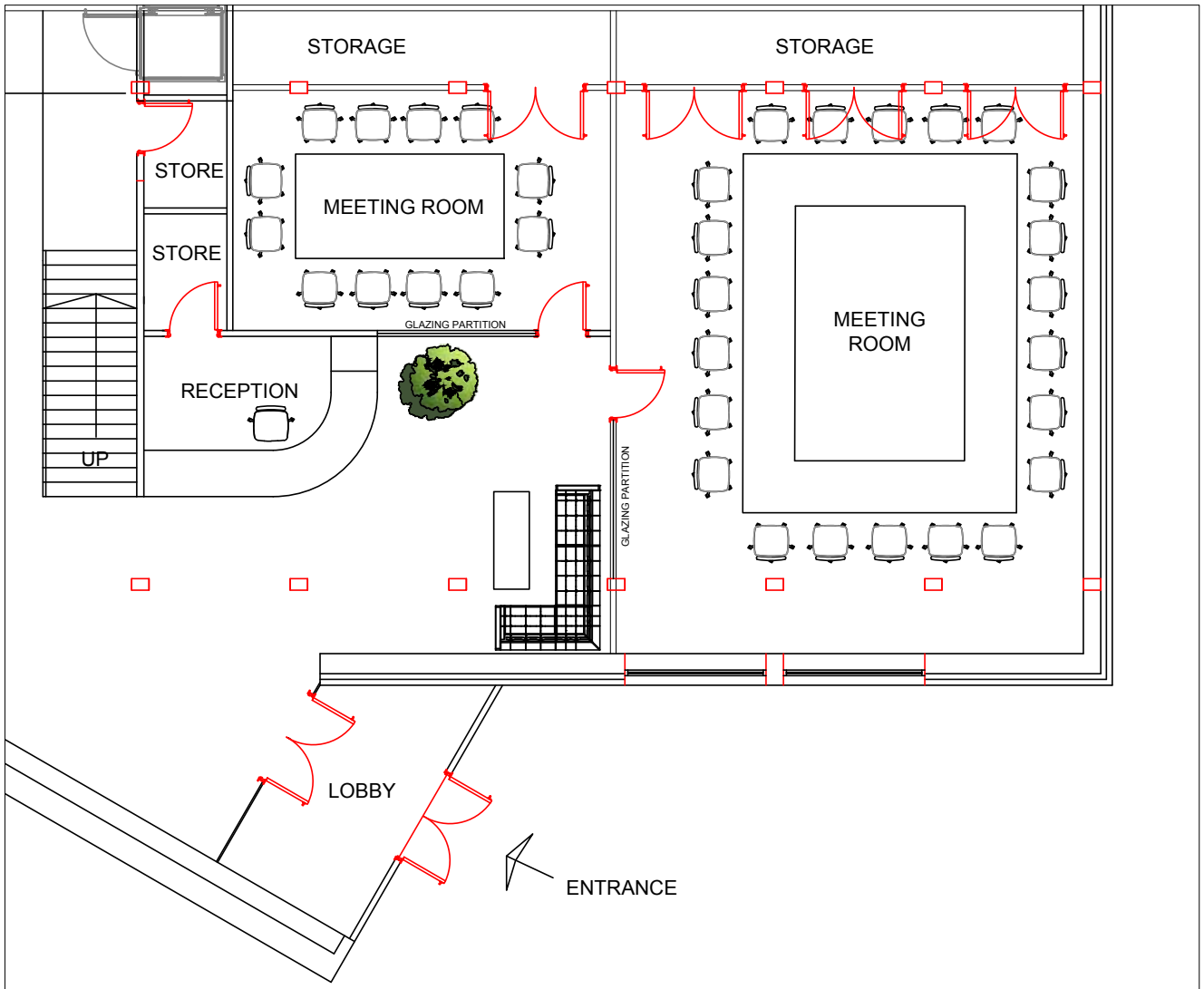
SECTION A-A THOUGH WUDU
SCALE 1:10



3D OF WUDU

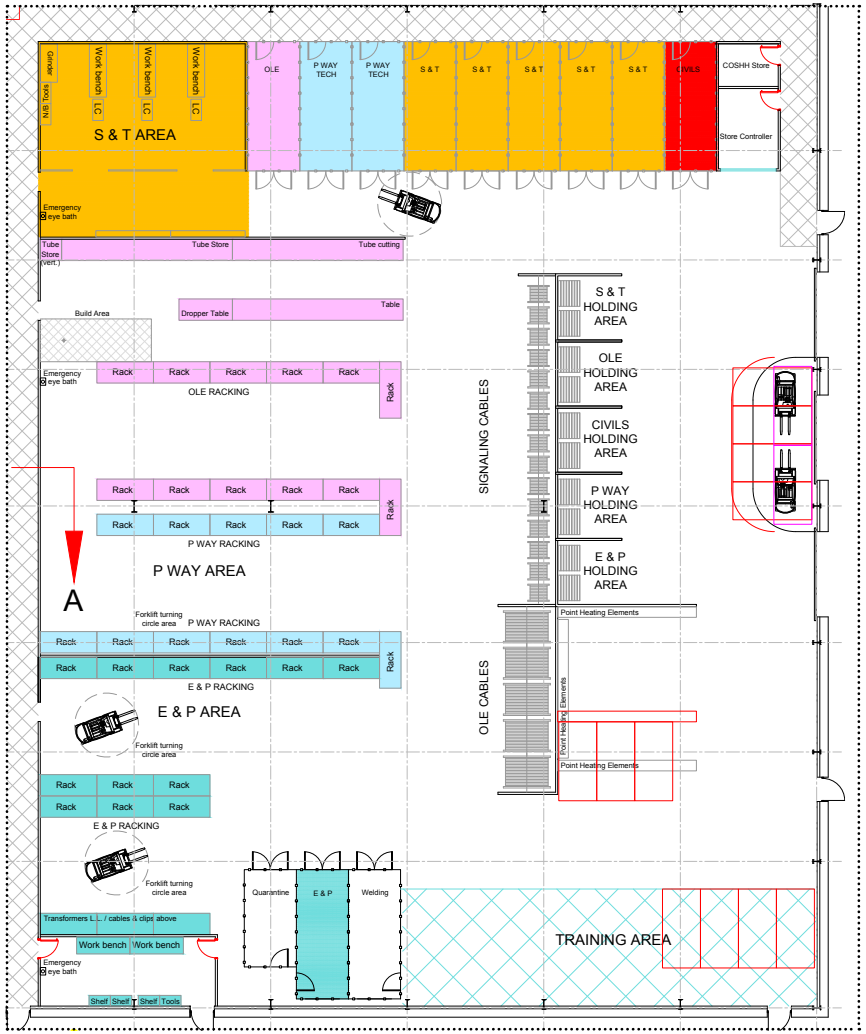
Typical drawings are for illustrative reference only

Typical drawings – Reception



* Typical drawings are for illustrative reference only

Typical drawings – Warehouse



Colours indicate different team storage areas

* Typical drawings are for illustrative reference only

Design Life Tables – Roof and roof drainage

ROOF AND ROOF DRAINAGE – FRAME	
DETAIL	**DESIGN LIFE (years)**
CAST IRON FRAME	100
INSITU CONCRETE	80
STEEL FRAME	100
STEEL TRUSS	25
TIMBER FRAME	60

ROOF AND ROOF DRAINAGE – ROOF COVERINGS	
DETAIL	**DESIGN LIFE (years)**
FIBRE CEMENT	25
GALVANISED CORRUGATED STEEL	35
GRP CLADDING	30
LEAD FLASHINGS/SOAKERS/ APRONS	35
LEAD SHEET COVERING	35
NATURAL SLATING	70
PATENT GLAZING	30
PLASTIC FASCIA/SOFFIT	20
PROFILES STAINLESS	35
PROFILED METAL - LEAD	35
PROFILED METAL - ZINC	30
PROFILED METAL - COPPER	35
TIMBER FASCIA	20
TIMBER SOFFIT	20
ZINC	60

ROOF AND ROOF DRAINAGE – ROOF COVERINGS (continued)	
DETAIL	**DESIGN LIFE (years)**
ARTIFICIAL SLATING	70
ASPHALT - PITCHED	35
ASPHALT - FLAT	35
BUILT-UP FELT ROOF (double)	20
BUILT-UP FELT ROOF (triple)	25
CLAY TILES	70
CONCRETE TILES	70
COPPER	60

Design Life Tables – Roof and roof drainage

ROOF AND ROOF DRAINAGE – ROOF DRAINAGE	
DETAIL	**DESIGN LIFE (years)**
ALUMINIUM	30
ASPHALT GUTTERS	35
BITUMEN FELT GUTTERS	15
CAST IRON DOWNPIPES	60
CAST IRON GUTTERS	60
CAST IRON GUTTERS & DOWNPIPES	60
FIBRE CEMENT GUTTERS	30
LEAD FLASHINGS/SOAKERS/ APRONS	35
LEAD SHEET GUTTERS	35
PRESSED METAL GUTTERS & DOWNPIPES	30
TIMBER GUTTERS	20
UPVC DOWNPIPES	20
UPVC GUTTERS	20

ROOF AND ROOF DRAINAGE – ROOF STRUCTURE	
DETAIL	**DESIGN LIFE (years)**
CONCRETE	80
METAL	40
PLASTIC	20
PROFILED METAL	100
STEEL	100
TIMBER	40
WOOD-WOOL SLATS	50

ROOF AND ROOF DRAINAGE – ROOF-LIGHTS	
DETAIL	**DESIGN LIFE (years)**
ALUMINIUM	30
CIRCULAR STEEL FRAME	30
CONCRETE	40
PROPRIETARY UNIT	25
PVC CORRUGATED	25
TIMBER	25
HARDWOOD LOUVRE	30
PATENT GLAZING	30

Design Life Tables – Walls and Frames

WALLS AND FRAMES – EXTERNAL WALLS	
DETAIL	**DESIGN LIFE (years)**
INSITU CONCRETE COPING	80
MELANIN FACED CLADDING	30
METAL CLADDING	30
NATURAL STONE	80
PATENT GLAZING	30
PRE-CAST CONCRETE COPINGS	25
RECONSTITUTED STONE	80
RENDERED BLOCK WALL	100
RENDERED PLYWOOD	40
SOLID BLOCK WALL	80
SOLID BRICK WALL	80
TIMBER CLADDING	30
UPVC CLADDING	40

WALLS AND FRAMES – INTERNAL WALLS AND PARTITIONS	
DETAIL	**DESIGN LIFE (years)**
BLOCK/BLOCK CAVITY WALL	80
BRICK	80
CONCRETE	80
CONCRETE SILL	80
DENSE BLOCK	80
GLASS BLOCK	50
METAL CLADDING	30
METAL STUD	50
NATURAL STONE	80
PATENT GLAZING	30
PROPRIETARY PARTITIONS	50
TIMBER CLADDING	40
TIMBER STUD	50

WALLS AND FRAMES – RETAINING WALLS	
DETAIL	**DESIGN LIFE (years)**
BRICK	80
CONCRETE	80
CONCRETE BLOCK	80
RENDERED BRICK	80
SHEET PILE	40
STONE	80
TIMBER SLEEPER	25
WALLS AND FRAMES – SUPERSTRUCTURE	
DETAIL	**DESIGN LIFE (years)**
CONCRETE FRAME	80
STEEL FRAME	100
TIMBER FRAME	60
CONCRETE	80

Appendix G

Glossary and Acknowledgements

BREEAM	Building Research Establishment Environmental Assessment Method
BS	British Standards
CEEQUAL	Civil Engineering Environmental Quality Assessment and Award Scheme
CCTV	Closed Circuit Television
CDM	Construction Design Management
CIBSE	Chartered Institution of Building Services Engineers
CRD	Client Requirements Document
DfT	Department for Transport
DIA	Diversity Impact Assessment
DRRD	Detailed Route Requirements Document
EIA	Environmental Impact Assessment
GRIP	Governance of Railway Investment Projects
HGV	Heavy Goods Vehicles
IDC	Interdisciplinary Design Check
IDR	Interdisciplinary Design Review
IT	Information Technology
MDU	Maintenance Delivery Unit
NR	Network Rail
NRDD	Network Rail Design Delivery
NRT	Network Rail Telecoms
NRIT	Network Rail IT
PE	Project Engineer
PRM	People with Reduced Mobility
PV	Photovoltaic panels
RRD	Route Requirements Document
RRV	Road - Rail Vehicle
RSSB	Rail Safety Standards Board
RICS	Royal Institute of Chartered Surveyors
RSIT	Route Services Information Technology
SIDOS	Security In the Design Of Stations
TfL	Transport for London TOC – Train Operating Company
TS	Transport Scotland
UPS	Uninterrupted Power Supply

Acknowledgements

This document was produced by
Network Rail Design Delivery (NRDD)
with the assistance of Network Rail Technical Authority

Photo credits

Network Rail and Network Rail Design Delivery
All photos

Drawings

Network Rail Design Delivery
Appendix E drawings

Image 42
Refurbishment of heritage
Hitchin

400/

04