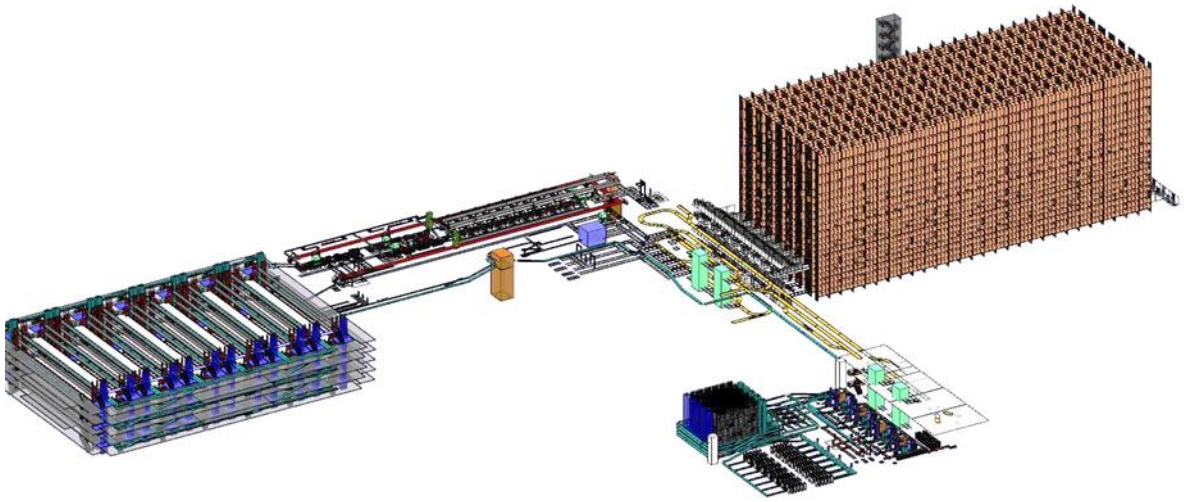
ROSSMANN



Project

Construction of an automated warehouse consisting of high bay, repacking, picking gallery, sequencer and connecting transfer installations in the Rossmann Distribution Center in Pyskowice

Tender document Logistcs Contractor

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1. Basic Terms and Conditions

1.1. Project explanation

1.1.1. Initial situation

Rossmann Supermarkety Drogerynje Polska SP.z o.o, hereinafter called Rossmann (ClientCLIENT), operates a distribution warehouse at its site in Pyskowice for the supply of defined shops within Poland. The existing warehouse is to be extended by a new extension, in which complex, fully automated storage and conveyor systems are to be integrated.



Figure 1-1: Aerial picture Rossmann warehouse, Pyskowice / Poland

Client will contract a building constructions general contractor to detail and construct the building and building technology for the new building of the logistics centre at the site. In this respect, the building constructions general contractor is basically the main contact for the Logistics Contractor at the construction / technical building equipment interface.

By building the planned expansion of the existing warehouse site, Client is creating the conditions to accommodate the planned growth in Poland and thus ensure the supply of the own drugstores.

By Q1 2027, an automated high-bay warehouse with approx. 27,000 pallet spaces in 8 aisles and a warehouse height of approx. 45 meters, a Picking Gallery with integrated automated shuttle warehouse with integrated picking zones with approx. 110,000 bin location with a height of approx. 20 metres as well as various workstations connected to the conveyor system and a connection to the existing warehouse building via a bridge between the buildings are to be built in the expansion area.

The current concept envisages the following components for the warehouse extension:

- 8-aisle high-bay warehouse with single-deep storage, 26,880 pallet spaces and a height of approx. 45 meters;

- Automated shuttle warehouse in the Picking Gallery with approx. 110,000 bin locations with integrated picking areas with approx. 9,000 pick locations over 3 levels at a height of the automated shuttle warehouse of approx. 20 meters;
- Extensive pallet conveyor technology in the form of pallet conveyor systems and an RGV system on 2 levels with connection to 36 manual workstations / 3 automated workstations with robots for repacking the pallets and for replenishing the shuttle warehouse in the Picking Gallery to supply the pick location;
- Extensive container conveyor technology for connecting the repacking workstations and the shuttle warehouse in the Picking Gallery with the pick locations on the 3 levels;
- Extensive platform constructions to ensure accessibility to the picking zones in the shuttle warehouse and the various locations for maintenance / servicing and fault processing by trained personnel;
- A connection to the existing building via a conveyor bridge between the existing and the new building and
- The integration or connection of one or more material flow computers for the automatic storage/conveyor systems to the Client WMS.

This invitation to tender is a functional invitation to tender for automated storage/conveyor technology and the associated control technology based on joint planning by Client and Metroplan.

With this tender, Client defines the currently planned scope of supply and services of a general contractor for the logistics systems and asks potential general contractors for corresponding offers with this tender.



Figure 1-2: Architeture picture Rossmann warehouse, Pyskowice / Poland

1.1.2. Goals and intentions of Client

The success of the project and thus the achievement of objectives is decisively determined by:

- the functional efficiency, operational safety and reliability of the material flow technology (storage / conveyor / control technology), the MFS from Logistics Contractor and the WMS from Client; as well as the construction systems / building technology delivered by Client;
- the fulfilment of the required capacities and total throughputs;
- the continuous availability of the technical systems with 3-shift performance operation for the automated systems; this in conjunction with the MFC and WMS;
- the education / training and instruction of the operator personnel in the operation and maintenance of the storage / conveyor and control technology and the MFS;
- the timely completion of all systems (storage / conveyor / control technology incl. MFS and interface to the WMS from Client for the start of trial operation.

Client decided, considering its objectives and intentions, the complexity of the planned measure and the execution of the new construction project within a defined schedule as well as the importance of this measure for the entrepreneurial success, to have the further planning and execution of the logistics systems carried out by an independent contractor within the scope of a contract for work and services.

The functional tender is therefore designed as a general contractor tender.

1.1.3. Time Schedule

The following is an overview of the time schedule:

Issue of the tender document	**01.07.2024**
Submission of the offer	23.08.2024
Commencement of Negotiation Rounds	**03.10.2024**
Contracting	**14.11.2024**
Start testing on site	06.08.2026
Go-Live and starting Ramp-up phase	**28.01.2027**
Final acceptance	12.04.2027

The tender procedure is split into two Stages:

Stage 1- Tender calculation period, finalised by issue of the offer by bidders. In the next steps offer analysis, comparison and scoring is carried out by Rossman and Metroplan. On this basis Bidders are invited to one meeting in order to discuss technical aspects of their offer. Date and place will be confirmed by the Client at a later stage however it is planned to take place between 03.10.2024 and 08.11.2024. Following the technical clarifications Rossmann will decide on inviting bidders to the second stage.

Stage 2- Understood as the second and final negotiation round. Only three bidders will be invited to this round, and the main focus of the meeting is commercial and financial negotiations. Stage 2 ends with signing of the contract.

Client reserves the right to change the procedure and the schedule shown in the tender process. Neither Client nor the companies employed by Client can be held liable for any resulting consequences.

1.1.4. Responsibility of the Logistics Contractor

Within the scope of his tender preparation and the contract for work and services, the contractor as supplier has the following responsibilities and duties for all parts of the tender or for selected major trades:

- The contractor shall plan and deliver the systems and installations in the most reliable and best quality, in accordance with the state of the art at the time the order is placed and in accordance with public law and the special regulations applicable in Poland. Changes in the state of the art and requirements which are already known or foreseeable at the time the order is placed must be considered by the contractor at its own expense. Should the state-of-the-art change during the performance of the contract without this being known or foreseeable at the time the order was placed, the contractor shall immediately upon becoming aware of the change inform the Client of this and evaluate the alternative execution together with the Client.
- As the Logistic Contractor of the overall task or for the selected major trades, he assumes sole responsibility and at his own risk for his scope of supply and services in addition to the planning and execution tasks of the warehouse / control technology required for the realization of the project, all coordination and implementation monitoring, start-up as well as test and training tasks.
- The contractor shall accept the order according to its scope of delivery in full knowledge of the consequences for the Client of the technology and systems to be delivered / installed by them and in full knowledge of the problems and tasks which it must solve, insofar as this is recognizable from the tender documents. However, this restriction does not release the contractor from his obligation to draw the necessary conclusions from the documents and the further process and to derive detailed plans from them.
- In the event of execution latitude or interpretation problems, the ideas and intentions from the Client shall have unrestricted priority, unless the contractor has brought about clarification during the preparation of the offer. If the ideas and intentions of the Client are not clearly recognizable to the contractor, the contractor shall immediately talk with the Client about clarification. Sentence 1 shall only apply to points which have not been clarified in the construction discussion, implementation planning, detailed planning etc.

Upon acceptance of the order, the contractor shall be responsible for compliance with the following objectives pursued by the Client, which shall be included in the contract for work and services as warranted characteristics for his scope of delivery and performance:

- The functionality of the entire storage / control technology and the interface to WMS from the Client;
- The selection of products, components etc. in solid, wear-resistant industrial quality that meet functional requirements;

- The fulfilment of the requirements and services specified in the tender in the sense of minimum performance in detail as well as the overall system throughput under the specified requirements;
- The mastery and independent regulation of the interfaces of all trades involved (technology, IT (especially WMS), structural / technical trades, ongoing operation (if applicable));
- The operational safety and reliability of the storage / control technology, MFS and the interface between MFS and WMS from the Client;
- as well as,
    - ease of operation and maintenance;
    - the low susceptibility to repairs;
    - ease of cleaning;
    - accident safety;
    - environmental compatibility;
    - high energy efficiency and
    - adherence to the milestone schedule for the turnkey completion of the tendered scope of supply and services.

The parties agree that this tender document, including its annexes, contains quality agreements, but no quality guarantees. However, the contractor shall be liable for the conduct of the suppliers and subcontractors contracted in by him in the performance of the duties assigned to them as for their own conduct. This also applies in particular to defects in the products and services of suppliers and subcontractors.

In order to achieve the named objectives and responsibilities before, the contractor shall assume the following risks and imponderables with the contract for work and services still to be concluded:

- Services which have not yet been defined based on the available planning depth on which the present call for tenders is based, but which are nevertheless required for the preparation of the contractual services;
- Weather conditions at the time of execution in connection with the delivery of materials etc.;
- Transport to and from the installation site;
- Restrictions that may arise as a result of coordination with building construction and technical building technology companies;
- Restrictions arising from the maintenance of ongoing operations (if applicable);
- All wage- and material price increases up to completion of the overall system and successful overall acceptance by the Client;
- Delays due to longer delivery times or wrong deliveries;
- Conditions imposed by official institutions (relevant institutions in Poland), insofar as these are related to the scope of the contractor's services and were foreseeable at the time the contract was awarded.

1.1.5. Planning status

Client has commissioned Metroplan Polska Sp.zo.o to carry out the planning of the logistics systems and to functionally tender the logistic systems, including the hardware and software for material flow control and interface to WMS from Client as well as the automated storage and conveyor technology. Metroplan's main contact throughout the tender proceedings is Agata Marciniak (contact details: mobile: +48 882 348 224, email: agata.marciniak@metroplan.com.pl), however all communication during offer calculation phase is handled via a designated email address: Rossmann.D2027@metroplan.com.pl . The planning status is documented in the form of the available functional tender documents.

The following documents shall be made available to the contractor in the form of a file for the purpose of preparing the offer. The contractor shall work through these in detail:

- Tender book as a complete document with the chapters:
    - Chapter 1: Basic terms and conditions;
    - Chapter 2: Introduction to the material flow concept;
    - Chapter 3: Processes in the warehouse;
    - Chapter 4: Scope of delivery automated systems
    - Chapter 5: Information Technology for new warehouse;
    - Chapter 6: Implementing conditions and miscellaneous;
    - Chapter 7: Appendix
- Appendix as individual documents with their components:
    - Drawings
    - Special norms of Rossmann
    - General Terms and conditions of Purchase Rossmann / draft of contract
    - Occupational health and safety requirements of Rossmann
    - Price list
    - …
    - …

1.1.6. Conditions for submitting an offer and submissions

1.1.6.1. General Remarks

Client does not incur any costs or other obligations for the preparation and submission of offers.

The contractor is obligated not to pass on the information obtained from the tender to third parties. The information may only be passed on to third parties with written consent of the Client.

1.1.6.2. Information obligation on site

The contractor shall visit the current warehouse location at Pyskowice as well as at Lodz and familiarise himself in detail with the requirements for the systems / load carriers / processes / strategies, etc. The knowledge gained in this way must be taken into account in the preparation of the quotation, the pricing as well as in the determination of the delivery and execution deadlines.

With his offer, the contractor shall indicate the prerequisites for the Client property in Pyskowice (e.g. access, accessibility) and the building for the connection with the production (door size for the insertion of parts) as well as the technical building equipment (electricity, lighting etc.).

By submitting an offer, the contractor has confirmed to the Client that he is aware of all information required for the manufacture, assembly and commissioning of the offered system. Later additional claims of the contractor due to ignorance of the local or technical conditions will not be accepted.

1.1.7. Obligation of the Logistics Contractor

The obligations of the Logistics Contractor in the course of the preparation of his offer are:

- The review of the tender documents for correctness and completeness as well as for deviations among each other and the conformity with the relevant public law regulations and the objectives / intentions of the Client; compensation for this review is not granted;
- Subsequent additional claims of the contractor due to ambiguities or contradictions in the tender documents will therefore not be accepted;
- If the Logistics Contractor discovers contradictory statements in the tender documents or if he is unable to assume warranty for intended constructions / plants / plant components or if he discovers possible performance gaps, the contractor shall document this at the latest when submitting the tender;
- The Logistics Contractor is also be obligated to notify in writing any concerns regarding selected technical designs and control / IT technical specifications upon submission of the offer;
- In the event of any gaps in execution / interpretation, the contractor shall clarify the matter before submitting his offer.

Without corresponding “notes” documented in separate letters / comments, the Client assumes that the services are presented and described fully and correctly in the sense of the intentions of the Client and that they have been offered or calculated accordingly by the Logistics Contractor.

1.1.8. Optional and alternative offers

At various points in the tender, optional offers regarding the technical design of components or functions are requested; these are to be calculated and documented according to the specifications.

Alternative offers that go beyond this are permissible and welcome so long as the required functions, strategies and qualities are not negatively influenced and there are no economic or time-related disadvantages for the Client.

Alternative offers must be shown, evaluated in terms of costs and documented separately as an additional offer. Any related subsidiary offers are possible under the following conditions:

- Alternative solutions must not impair or extend the execution and set deadlines;
- The required qualities, strategies, processes and functions must be fully guaranteed;
- The specifications on the part of the interface to the WMS cannot be changed;
- The Logistics Contractor must ensure that the algorithms and strategies, technical control processes and functions are at least equivalent to this tender;

- The alternative proposals submitted should reduce the maintenance and/or operating costs or significantly improve or simplify the functions.
- If the alternative solutions do not reduce the maintenance and/or operating cost, but reduce the investment cost, these should also be considered.

All system, dimensional and plan changes resulting from a change / an alternative offer and the resulting consequences for the other systems (warehouse management, buildings, building services engineering, etc.) as well as for the system functions must be pointed out with the submission of the offer.

All services in connection with the preparation and implementation of the alternatives are to be determined in advance; complete services are to be provided in the sense of this functional tender.

The prices must be calculated in such a way that all associated technical and commercial expenses and consequences related to e.g. function, availability, maintainability etc. are covered when the alternative is commissioned.

The contractor must expect that no, some or all alternatives will be ordered. The Logistics Contractor may not demand the commissioning of alternatives.

1.1.9. Form and Submission of the Offer

Date of the offer submission is the **07.10.2019; 12 o'clock**

Incomplete or late offers will not be considered; the same applies to offers where pricing / delivery and service conditions do not comply with the requirements / the form of the tender documents.

The offer must be submitted in English.

The later work contract is executed in **Polish and English**. The contracting party is Rossmann Supermarkety Drogerynje Polska Sp.z o.o

The offer shall be sent in a substantiated form to the email address you see in chapter 1.1.10

The documents to be submitted / completed with the offer are:

- Signed and scanned declaration of the contractor pursuant
- The contractor is requested to complete the required contractor information in accordance with the requirement;
- Rough timetable;
- Information on possible subcontractors of the contractor for individual subsystems;
- Special proposals, contractor alternatives, comments, supplementary planning documents as well as additionally request documents must be attached separately to the offer; the assignment to the tender must be clearly marked;
- Structures and function modules for the systems offered.

The offer must be signed in a legally binding manner.

1.1.10. Address and contact person

During the offer preparation by the contractor, the following contact email address is available:

Rossmann.D2027@metroplan.com.pl

During the offer processing all questions are in writing (by email) to this email address. The questions will be recorded and answered in writing in a document titled "Bidder's Questions". Contractor's comments and questions need to be presented in a structured and clear manner, referencing the chapter and page of the tender specification, name of attachment or drawing in question. Enquiries must be submitted once per week, on Fridays. The answers to the questions during the offer processing will be sent via the defined email address to all of the bidders. Last round of questions can be submitted one week before the deadline for offer submission, no later than 16.08.2024.

Bidders are encouraged to carry out a plot / location visit in Pyskowice, and also to visit the existing warehouse in Łódź, as a project reference, before submitting their bids. Questions clarified during on-site inspections will also be recorded in the above document. If the questions are relevant, the answers will be made available to all bidder's (anonymously).

The document "Bidder's Questions" is part of the tender document; the answers / specifications must form the basis of the bid. In case of deviations from the tender, the document created at a later date has the higher priority.

1.1.11. Project-Milestones

The following milestones are currently planned for the planning and execution of the logistics systems:

Nr.	Milestone	Date
1.	Handover of final static and dynamic loads for the HBWP1 baseplate	09/12/2024
2.	Handover of guidelines for the installation of anchor boxes in the area of HBWP1	12/02/2025
3.	Final requirements for the power supply for the logistic technology	15/01/2025
4.	Final coordinated layout for the HBWP1 racking	15/01/2025
5.	Signed and approved technical design for HBWP1	31/03/2025
6.	Final requirements for the power supply for the repacking HMP3 with Inbound	15/01/2025
	Final static and dynamic loads for ceilings, roof and walls	15/01/2025
7.	Final coordinated automation layout in repacking HMP3	15/01/2025
8.	Final signed and approved design for the entire repacking HMP3	31/03/2025
9	Final requirements for power supply for the transport gallery GT	12/01/2025
10	Final static and dynamic loads for ceiling, roof and walls	15/01/2025
11	Final coordinated automation layout in the transport gallery GT	12/01/2025
12	Final signed and approved design for the transport gallery GT	07/03/2025
13	Final requirements for power supply in HMP1	15/01/2025
14	Final static and dynamic loads for the slab in HMP1	09/12/2024
15	Signed and approved technical design for steel mezzanine in HMP1 and signed and approved executional design	31/03/2025
16	Final requirements for power supply for picking gallery AMDP1	12/01/2025
17	Final static and dynamic loads for the slab in AMDP1	09/12/2024
18	Submission of picking gallery structural design	12/01/2025
19	Signed and approved technical design for picking gallery AMDP1	07/03/2025
20	Signed and approved technical design for the steel mezzanine in existing warehouse HMP1	07/03/2025
21	Completion of installation of sequencer in existing warehouse HMP1	04/07/2026
22	Delivery of anchor boxes for HBWP1 to site	26/09/2025
23	Completion of installation of racking in HBWP1 (incl. Pre zones)	03/04/2026

24	Completion of installation of stacker cranes in HBWP1	15/05/2026
25	Completion of installation of conveyors in pre- zones	15/06/2026
26	Early access for installation of picking gallery	25/06/2026
26	Completion of installation of picking gallery (all systems)	28/10/2026
28	Completion of installation in transport gallery GT	15/06/2026
29	Finalisation of functional tests of HBW, repacking, GT & sequencer	19/08/2026
30	Finalisation of functional tests for conveyor technology incl. High level control system (HBW, Repacking, GT, sequencer, excluding picking gallery and tote conveyor)	09/09/2026
31	Finalisation of performance test stacker cranes and conveyor technology, incl. material flow computer (excluding AKL & tote conveyor)	23/09/2026
32	Interface test MFC and WMS	23/09/2026
33	Finalisation of functional tests incl. high level control system and material flow computer for picking gallery and tote conveyor	16/12/2026
34	Finalisation of integration test warehouse / conveyor technology / MFC with higher level WMS	16/12/2026
35	Performance test- all installations / MFC and WMS	21/01/2027
36	Pre acceptance tests (%Throughput / %Availability)	22/01/2027
37	Go-Live (X% throughput) / Start of Ramp-up phase	26/01/2027
38	Final Acceptance Test (100% Throughput / 98% availability)	01/04/2027
39	Final Acceptance & 100% Operation	12/04/2027

Table 1-1: Project-Milestones

In addition to the above, below is a list of milestones associated with payments:

No.	Milestone	Date	% Contract
001	Completion and approval of implementation planning, simulation, specifications	31.03.2025	5%
002	End of shelf assembly and mezzanine platforms HBW	10.04.2026	5%
003	End of shelf assembly and mezzanine platforms Picking Gallery	04.11.2026	5%
004	Successful completion of installation / put into operation for stacker cranes HBW	26.06.2026	5%
005	Successful completion of installation / put into operation for shuttle warehouse Picking Gallery	27.11.2026	10%
006	Successful completion of installation / put into operation for pallet conveyor and RGV	18.11.2026	12%
007	Successful completion of installation / put into operation for tote conveyor and robot station	27.11.2026	18%
008	Successful completion of installation / put into operation for logistics systems existing warehouse	21.08.2026	10
009	Successful completion of the Client tests, pre-acceptance / start Ramp-up phase	28.01.2027	10%

010	Successful completion of final proof of availability and performance	12.04.2027	20%

Table 1-2: Payment plan based on Project-Milestones

The milestones are also defined as quality gates. This means that if the milestone is not reached at the time mentioned above, the Client can postpone the release of the next project process at the contractor's expense.

The contractor is invited to comment on this milestone plan in the context of its bid, however all the outlined dates are binding.

1.2. Commercial Conditions

1.2.1. Principles

In the event of an order placement, the following conditions shall apply for the execution, invoicing and acceptance of deliveries and services in the order of priority indicated:

1) The order document or the separately created contract for work and services.

2) The scope of supply and services of this tender document, including the document "contractor's Questions".

3) The conditions / requirements set out in 1.3 of this tender document.

4) The contractor's technical offer.

Irrespective of the above contract documents, the contractor shall comply with the relevant laws of the European Union and Poland on the one hand and the relevant standards and directives of the EU and Poland on the other hand at the time of acceptance; in particular:

- all relevant accident prevention regulations of the employers' liability insurance associations;
- EU machinery directives with CE declaration of conformity (document) and CE mark on the system;
- EC Directive Electromagnetic Compatibility (EMC);
- Equipment and Product Safety Act;
- Workplace regulations and guidelines;
- Industrial code;
- Waste laws and regulations;
- DIN standards
- Emission control laws;
- Noise laws;
- VDI guidelines;
- VDE guidelines;
- FEM rules;
- Polish Office of Technical Inspection (UDT).

1.2.2. Offer and pricing structure

The offer shall contain the ready-for-occupancy, operational implementation of the material flow system in accordance with the tender, considering the requirements, conditions and instructions of the authorities and official institutions, including the extensive tests as well as the entire training, commissioning and documentation.

The following services - unless specifically mentioned in the tender documents - are to be provided for the implementation of the entire project and are included in the fixed price:

- Execution planning for the storage / conveyor / control technology, incl.
    - Elaboration of all necessary planning documents, calculations, assembly plans and line routing plans for coordination with the execution of the construction;
    - Conditions for building permission / other approval status;
    - Inclusion of changes in the planning which become necessary as a result of official requirements, alternative designs and on-site inventories as well as changes due to planning control by the Client or its representative.
- Creation of specifications / detailed specification for the subordinate control system and the MFS as well as the interface to the WMS of the Client (in coordination with the interface to WMS of the Client) as well as for the failure analysis system and the system visualisation; incl.
    - Preparation of all necessary documents, adaptation to the interface to the WMS of the Client and the failure analysis system;
    - Inclusion of changes that become necessary as a result of requirements from ongoing operations, implementation alternatives and changes due to control by the Client.
- Supervision and coordination of the planning, production and assembly process (on-site assembly management) including coordination with the construction execution and the realisation of the interface to the WMS from the Client, supplied by the Client as well as the services and fees for all necessary engineering services (statics / specialist engineers etc.). This includes the corresponding ancillary services and the necessary clarifications in this connection with the authorities and / or with the Client.
- Supervising and coordinating the creation of the requirement specification / the fine specification, the implementation of the subordinate control system, the MFS and the interface to the WMS from the Client (incl. PLC hardware installation / commissioning on site), including the exact coordination with the implementation of the storage / conveyor technology.
- Obtaining the necessary official and other operating approvals / acceptance certificates in connection with the construction of the systems as well as the assumption of the corresponding fees incurred during execution planning, implementation, commissioning and acceptance of the systems.
- Surveying and calibration work for faultless assembly prior to the actual assembly of the storage / conveyor / control technology (the contractor is obliged to record the structural and other dimensions on site prior to execution planning / assembly).
- Traffic safety and regulation within the construction area or in the building in connection with the parallel realisation of building construction and building technology and the operative operation.

- Introducing control procedure of emission (noise, vibrations, dust, dirt etc.) for the protection of the plant components, the other companies involved in the project and for the protection of the buildings as well as the customers of already realised technical facilities and inventories.
- Free removal of faults in all systems of the scope of delivery and services described, provided, if these cannot be remedied by the trained operating personnel during the warranty period after acceptance.
- Costs for the provision of the necessary spare and wear parts package to ensure the warranty / response time in the event of troubleshooting; the composition of the spare and wear parts package shall be agreed between the contractor and the Client on the basis of a proposal by the contractor; the agreed spare and wear parts package shall be taken over by the Client after expiry of the warranty period; after warranty expired a separate contract shall be concluded in this respect.
- Disposal or cleaning of the construction site or the areas affected by the installation of the new technologies during the entire assembly operation and before start-up.
- Participation in the coordination meetings of the Client or third parties contracted by the Client and the construction meetings in accordance with the requirements of the Client.

The later all-inclusive fixed price also includes the following contents:

- all packaging, freight, transport and storage costs;
- all costs for the disposal of packaging and residual materials on the construction site;
- cleaning costs;
- possible insurance costs (transport, theft etc.);
- costs for possible guarantees;
- the unloading and transport of all parts to the respective installation location as well as the provision of all necessary tools, aids and personnel as well as the safety measures for the assembly / disassembly of systems;
- incidental wage and salary costs such as allowances, tolls and travel expenses, etc.;
- the performance of the contractor's own tests and the support and supervision of the test performance of the Client and the trial operation in accordance with the described test and acceptance procedure;
- Wage and material price increases during the agreed implementation period.

The contractually agreed total price is an all-inclusive fixed price net for the turnkey, functional, operational installation of the material flow system described in the scope of the tender with interfaces to the WMS of the Client.

1.2.3. Payment plan / payment dates

The Payment Terms of Rossmann Supermarkety Drogeryjne Polska Sp.z o.o, apply. These must be taken into account when preparing the offer. Final payment terms and conditions will be agreed upon at the contract signing. All other clauses applicable to the payment terms are outlined in the draft contract which is attached to this specification.

1.2.4. Warranty

The Logistics Contractor ensures the Client the functional safety, the fulfilment of the performance requirements, the reliability of operation, the steadiness and availability, the reliable and best quality based on the actual state of technology according to the specific requirements of this document.

The Logistics Contractor ensures, that all deliverables and services correspond to all relevant legal regulations as well as governmental terms and other conditions, based on Polish law.

The period of warranty is a minimum of 3 years and starts at the end of the trial operation / the acceptance of all deliveries and services by the Client. Warranty commences after full handover information is delivered to the Client (including CE certification for all installations separately and CE certification for the whole system).

During the warranty period the contractor is obliged to pay for all appeared faults, troubles and failures of his deliveries and services; the Logistics Contractor must arrange the immediately elimination of the faults, troubles and failures, if these cannot be repaired by the trained technical staff from the Client; the period of warranty is blocked from the input of the written notice of a defect up to the moment of its elimination.

The contractor ensures warranty for defects and absence of properties as follows:

- Faulty items are corrected or retracted and replaced by faultless items;
- Defect services are corrected or new delivered; services within the scope of warranty will be adopted without costs for the Client by the Logistics Contractor, incl. spare parts and wear parts;
- If the Logistics Contractor falls behind with the rectification of a defect or delivery of a replacement part, the Client has the right to define a new deadline; if this deadline also elapses without result, the Client has the right to decline the rectification of the defect, the replacement or the new delivery without explanation to the contractor; than the Client has the right to request reduction of compensation or to require indemnity from the Logistics Contractor, if the Logistics Contractor caused the delay, If the remaining part of the contract is also unusable, the Client can order a third party to eliminate the faults and the costs and risk is completely borne by the contractor. These rights are also existing in other cases of failures, remediation of defects, replacement or new deliveries;
- For the rectification of defects, replacement or new deliveries the contractor ensures the same warranty as for the primary object of agreement. The period of warranty starts at the day of acceptance of the defect rectification, replacement or new delivery.

1.2.5. Consequences of delay in delivery and performance

Penalties for delays in the delivery of agreed milestones (affecting project critical path), as well as all other applicable penalties are outlined in the attached draft contract. Any delays, and cost arising from them, caused by the logistics contractor, which affect the overall delivery and execution of the project (therefore the Building General Contractor), shall be borne by the logistic contractor.

Other rights of the Client remain unaffected by the aforementioned contractual penalty provision.

1.2.6. Risk assumption / liability

The Logistics Contractor carries the risks based on the relevant regulations by Polish law, including and not restricted to damages caused by flood, supply water, storm, snow, ice and air traffic within the scope of his construction building and construction risks insurance.

For damages for the Client, which are generated during installation of the new systems or based on the reason of the deliveries or based on faults, the Logistics Contractor is liable according to relevant Polish law.

The Logistics Contractor is liable for all damages, which will arise based on omission of the necessary security and safety precautions or arise based on any execution of the work, to the full extent to the Client as well as third parties.

The same regulations apply to damages of properties and persons, which arise through carelessness or negligence of the personnel of the Logistics Contractor or his sub-contractor or in series insufficient security and safety measures at nearby standing machines and operating equipment.

Supplies and services are accepted by the Client after complete realisation of the deliverables without any damage. If any damage of all type occurs anywhere on site as well as on the streets, public drains, removal pipework etc., all cost shall be borne by the contractor.

All contractors are encouraged to make suitable allowance for safety precautions on site.

1.2.7. Financial guarantee

1.2.7.1. Cash before delivery against monetary bond

It is planned, that agreed payments before delivery (advanced payment) can only be done if the Logistics Contractor presents a refund advance payment guarantee document, based on the agreement between agreed reputable financial institution, the Client and the Logistics Contractor.

1.2.7.2. Performance security

The Client reserves the right to request a performance security. This performance security issued, by agreed reputable financial institution, serves as security for all obligation out of the contract between the Client and the Logistics Contractor. Amount and other details of the performance security will be defined in the contract.

1.2.7.3. Warranty of removal of defects and faults in a form of a guarantee

The Logistics Contractor provides a warranty of removal of defects and faults in a form of a guarantee. Amount and other details of the warranty stipulated in this provision will be defined in the contract.

1.2.8. Insurances

The Logistics Contractor is requested to give an information about their insurances in the offer.

1.2.9. Claims of third parties

The Logistics Contractor must indemnify the Client representatives from all legal claims of third parties in connection with property damages and damages to persons; this applies to all contractor´s deliveries and services which are in the connection with the subject of the contract.

The Logistics Contractor declares that no rights of third parties are existent against his services, products, machines etc.

The Logistics Contractor guarantee also that the services and deliveries violate no patent, brand or industrial property rights.

1.2.10. Copyright and right of use

The Logistics Contractor grant the Client the right to use all drawings and documents, which are generated for the services and deliveries; this is granted also if copyrights are existing for fields of use specified in the contract.

For the software applications of the MFS and the interface to the WMS from the Client and the visualisation of the technical systems the Client gets the right, to install / to implement and to use the software application in any order without additional costs, based on the payment of the price for the services and deliveries of the Logistics Contractor and the acceptance of the services and deliveries.

After the end of the period of warranty for the application software the Client has the right to implement changes at this application software and to use the application software in the Rossmann Group.

Possible license fees or other payable to the copyrights have to be paid by the Logistics Contractor.

The Logistics Contractor is engaged not to violate copyrights or patents of third parties.

The Client gets based on the delivery of the software the exclusive transferable right for the use of the software in the Rossmann group.

1.2.11. Increase / decrease of services

Increase or decrease of services must be agreed in writing between the Logistics Contractor and the Client as an written addendum (annex) to the contract.

1.2.12. Additional agreements

Supplementary agreements, additions or changes of commercial conditions and of the specified services in the tender book needs to be agreed in written addendum (annex) to the contract.

1.2.13. The subcontractors and prohibition of assignment

If services or deliveries are contracted with third parties by the Logistics Contractor (subcontractors), the Logistics Contractor declares with the third parties, that all the resulting claims cannot debit to the Client.

The Logistics Contractor is not entitled to transfer all or part of his rights and obligations under the contract without the prior written consent of the Client.

1.2.14. Place of fulfilment

The place of execution for all services and deliveries defined in the contract is Lodz / Poland.

1.2.15. Notice of termination

A termination of the contract can only be done based on an important reason.

1.2.16. Place of jurisdiction

The contract is based on Polish law. Place of jurisdiction is the Common Court competent for the registered office of the Client.

1.2.17. Severability clause

Should individual provisions of these Terms and Conditions be invalid or unenforceable, this shall not affect the validity of the Terms and Conditions as a whole. Rather, the contracting parties undertake to replace the invalid terms and conditions with terms and conditions that enable the economic purpose of the contract to be fulfilled in a legally permissible manner.

2. Introduction to the material flow concept

2.1. Planning triggers and basic considerations

The concept documented in this tender is based on the following basic considerations:

- to make full use of the potential of the newly planned HBW in terms of capacity and productivity;
- to make full use of the potential of the newly planned gallery storage / picking system in terms of capacity and productivity;
- to guarantee a very high availability of articles;
- to ensure the supply of the connected functions and areas at any time and in time;
- to make the articles optimally available for order picking according to their handling characteristics;
- to make the deployment of personnel as efficient as possible;
- to adhere to the specified investment framework;
- implementation of appropriate MFS with interface to Client WMS;

2.2. Introduction to logistics requirements

The Client is operating drugstore chains especially for health and beauty.

Apart from its headquarters in Łódź the Client is operating a central distribution centre for the south of Poland near the city of Pyskowice.

At this site in Pyskowice a new high-bay warehouse and a connected picking area with automation support will be built on a green field for the storage and picking of health and beauty products, connected to the already existing building operated manually.

2.3. Project requirements

The main project requirements are listed below. These apply to the entire scope of delivery and services of the Logistics Contractor and must be considered both in the design and dimensioning of the material flow technology and in the development and implementation of the control systems at all levels, including interface to WMS.

2.3.1. Layout

Within the framework of the project, the warehouse will be constructed as a new building on the above-mentioned site.

The following diagram provides an overview of the existing and the newly planned or to be realised buildings / parts of buildings at the Pyskowice site.

Of the buildings shown, the buildings HMP1 and HMP2 are existing buildings and the remaining buildings / parts of buildings (shown in grey) are newly constructed buildings as well as a connection between the new and existing buildings via bridges (GTP1 and GTP2). Of these two bridges, GTP1 is relevant for the scope of services tendered in this invitation to tender, as the bridge is used to establish the technical connection between the new building and the existing building.

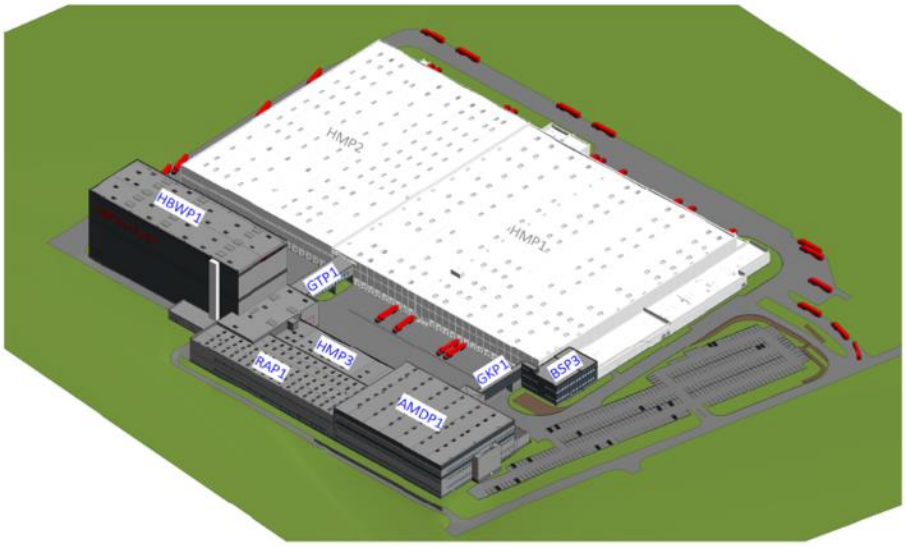


Figure 2-1 Overview of existing and new buildings at Pyskowice

The scope of supply and services for the various storage and conveyor systems specified in this tender are located in the buildings HBWP1 (HBW), HMP3 (Inbound), RAP1 (Repacking) and AMDP1 (Picking Gallery). The individual layouts in the relevant buildings are shown below.

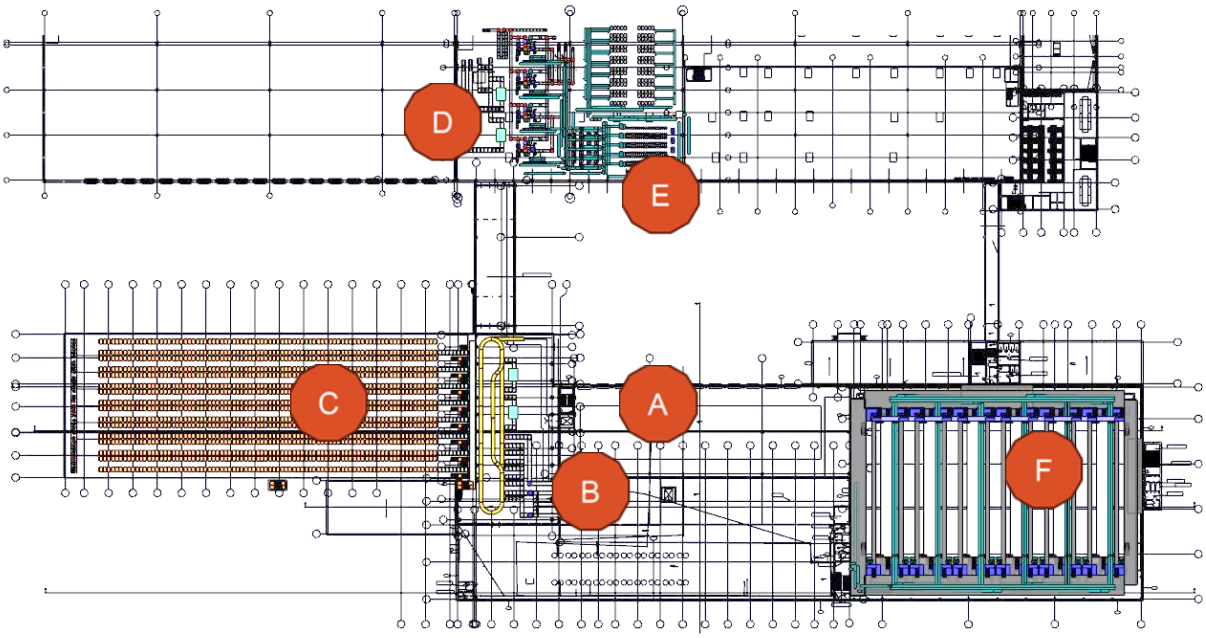


Figure 2-2 Overview Ground Floor of existing and new buildings at Pyskowice

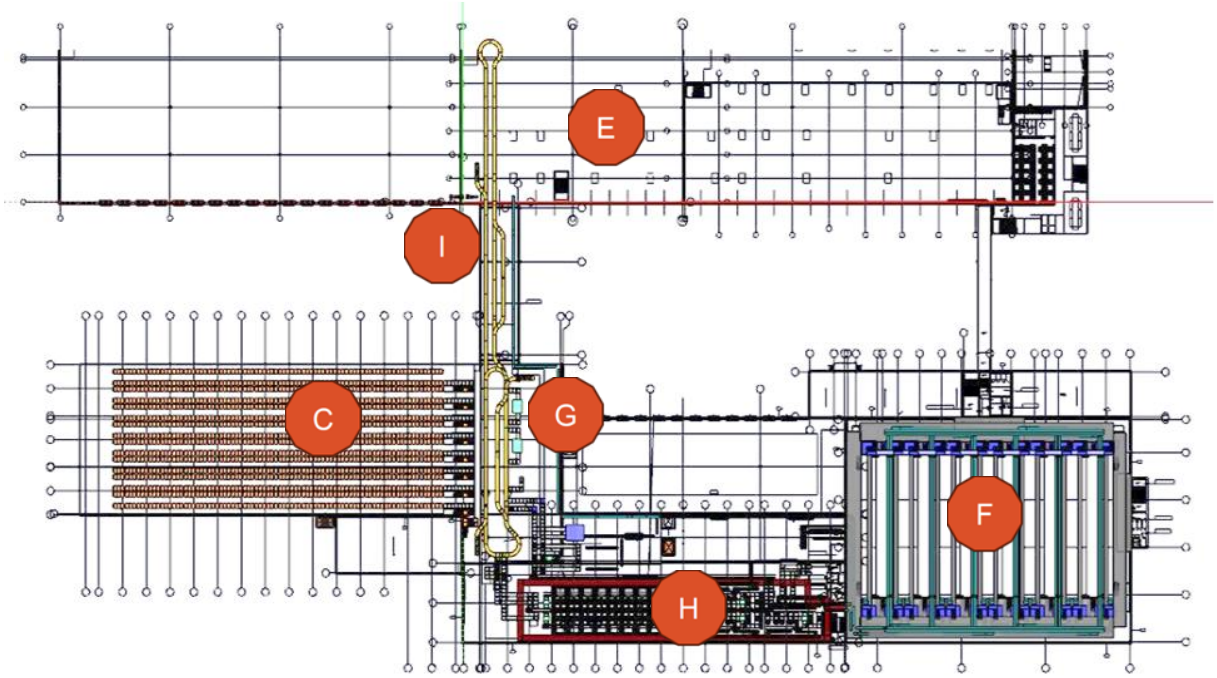


Figure 2-3 Overview 1st Floor of existing and new buildings at Pyskowice

The ground floor includes the following functional areas:

- **A)** Truck Gates and Inbound area
- **B)** Put into storage to HBW on Ground Floor
- **C)** High-Bay Warehouse (HBW)
- **D)** Pallet transfer points for connecting new buildings
- **E)** Shuttle and dispatch area outgoing goods in existing buildings (layout in progress)
- **F)** Picking Gallery
- **G)** Retrieval from HBW on 1st Floor
- **H)** Repacking area with manual workplaces and robots
- **I)** Bridge for connection old and new buildings with pallet and tote conveyor

The Ground Floor in front of the HBW includes the following functions and subsystems:

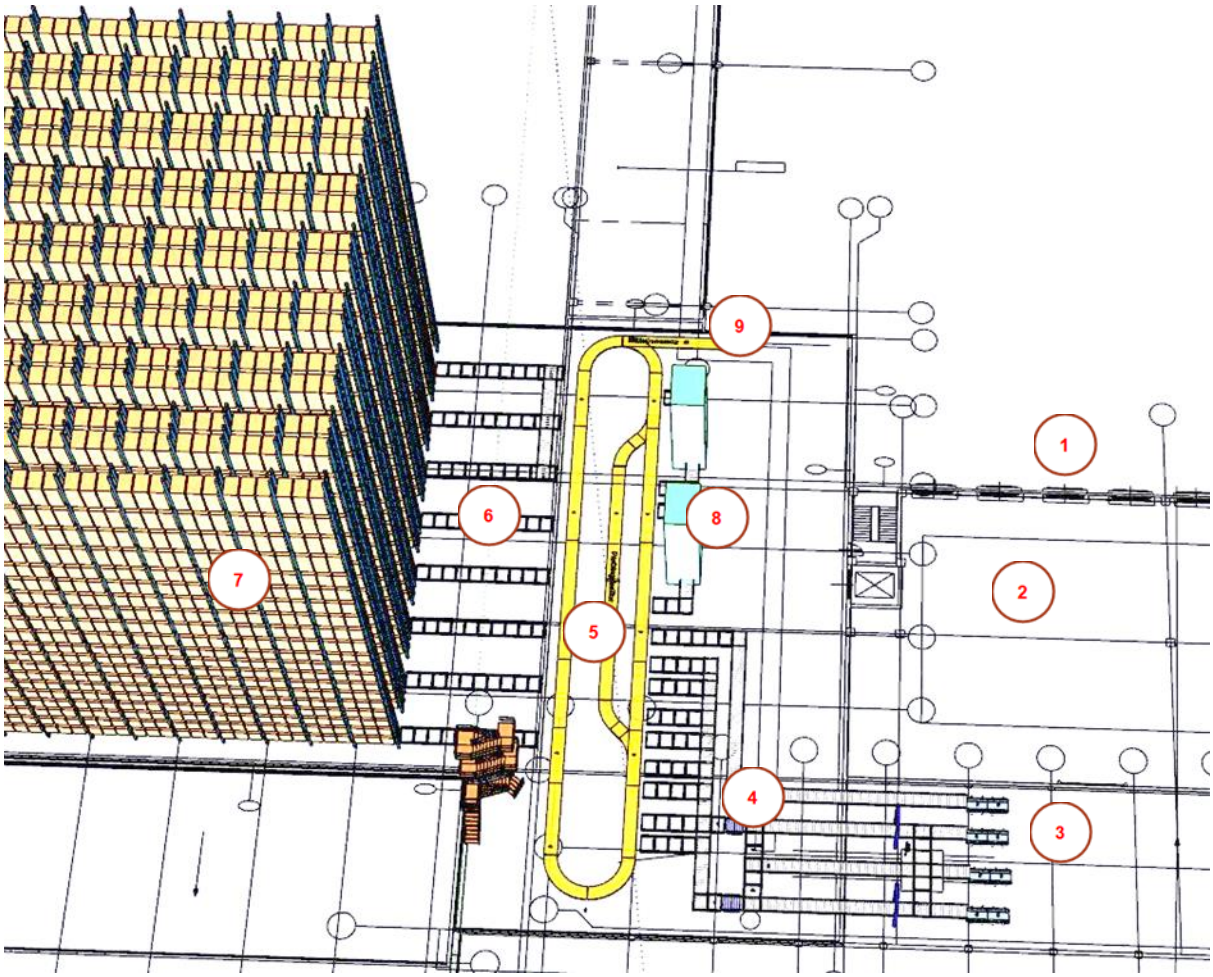


Figure 2-4: Layout Ground Floor Inbound HBW

1) Truck docking gates

2) Inbound Area

3) Inbound stitches, incl. Not-Okay stitch

4) Pallet conveyor system for connection to RGV system

5) RGV system to connect inbound conveyor with buffer conveyor in front of HBW

6) Buffer conveyor HBW for each aisle in the HBW

7) HBW

8) Vertical conveyors / lifts to connect the ground floor to the 1st floor

9) RGV system maintenance centre

The figure below shows the 3D layout of the Picking Gallery.

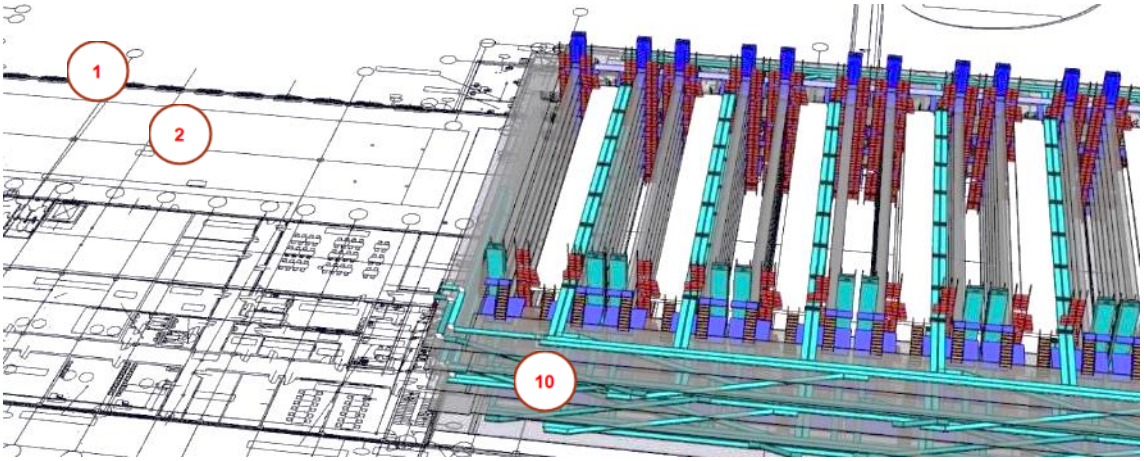


Figure 2-5: Layout Ground Floor Picking Gallery

1) Truck docking gates

2) Inbound Area

10) Picking Gallery with shuttle system for storage of totes and picking areas in 3 levels

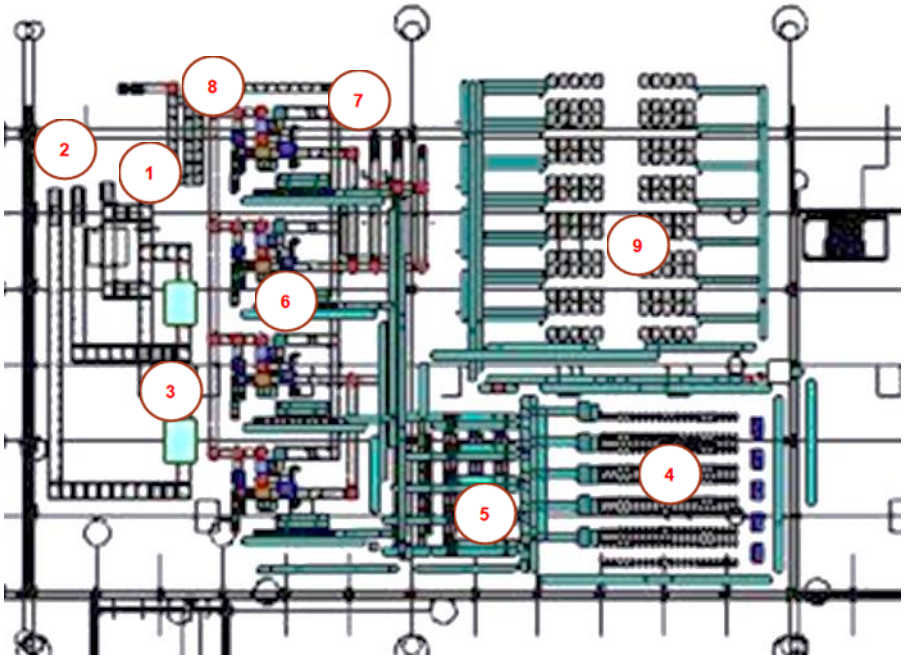


Figure 2-6: Layout Ground Floor existing building

1) Pallet feed line for transport to new buildings, incl. Not-Okay stitch

2) Outbound lines for pallets from the new HBW

3) Vertical conveyors / lifts to connect the ground floor to the 1st floor and the bridge

4) Sequencer for buffering shipping totes before stacking

5) Sorting area to sort the shipping totes by weight (heavy shipping totes on the dollies below)

6) Automatic dolly stacker to stack shipping totes on dollies

7) Outbound area for dollies, which are ready to be dispatched to the stores

8) Infeed area for stacked bases for dollies

9) Sorting area for manual filling of roll cages

The 1st Floor in front of the HBW includes the following functions and subsystems:

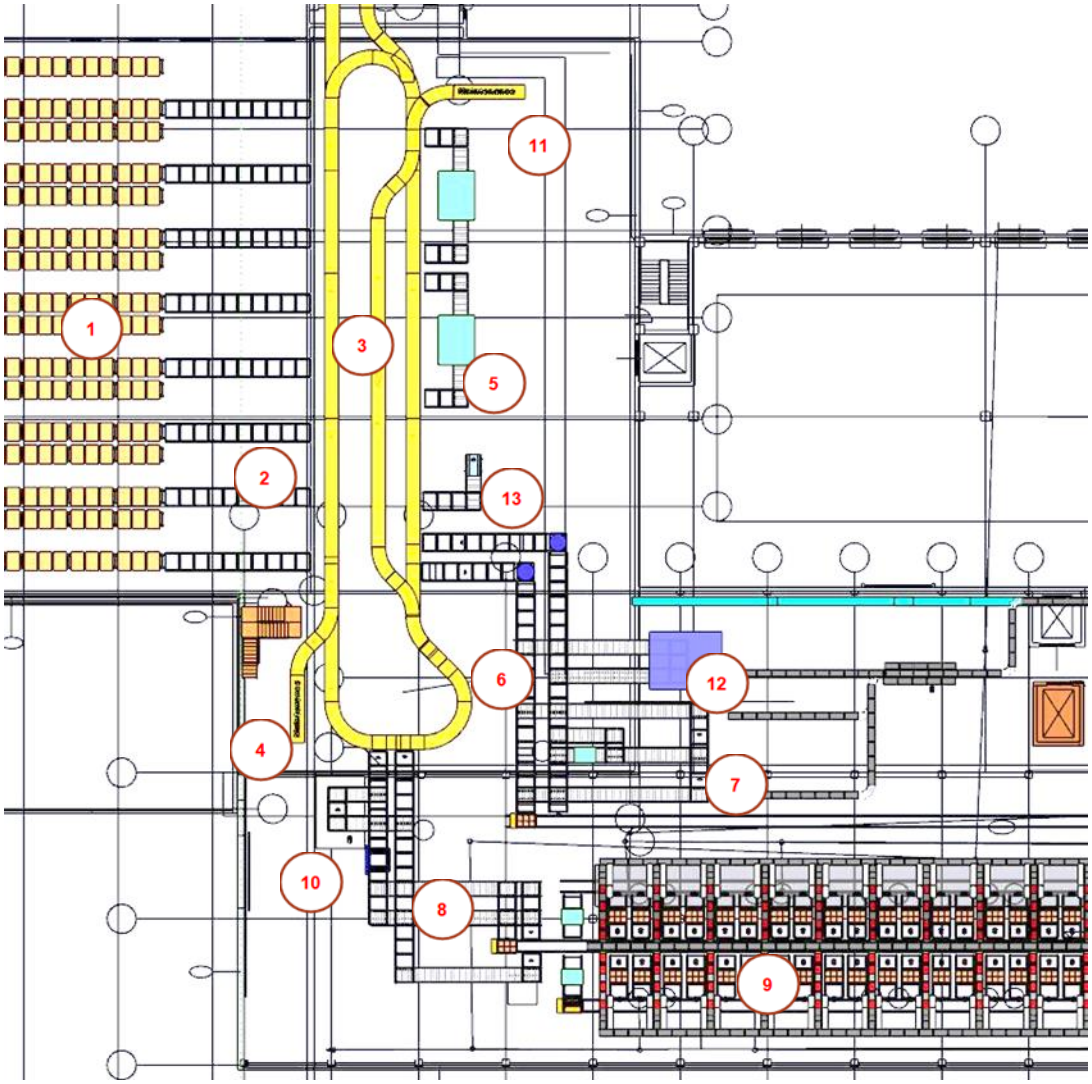


Figure 2-7: Layout 1st Floor in the area of HBW

1) High-Bay Warehouse with 8 Aisles
2) Retrieval stitches HBW
3) Pre-zone loop HBW (RGV system)
4) RGV system maintenance centre
5) Vertical conveyors / lifts to connect the 1st floor to the Ground Floor
6) Pallet conveyor to connect workplaces for destacking empty shipping totes with HBW
7) Workplaces for manual destacking of empty shipping totes
8) Pallet conveyor to connect workplaces in the repacking area with HBW
9) Workplaces for repacking of pallets to storage totes

10) Workplace for control station and inventory station
11) Feeding option for the introduction of RGV vehicles into the RGV system
12) Possible location of an automatic depalletising system for empty shipping totes
13) Pallet conveyor with removal option for non-eligible pallets with onward transport via combined passenger and goods lift to the Ground Floor

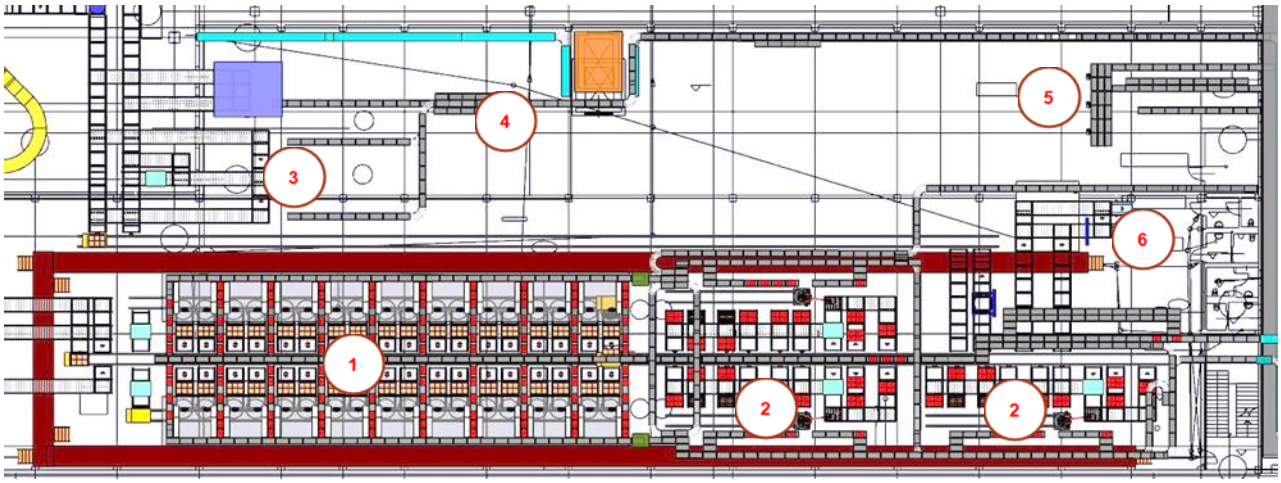


Figure 2-8: Layout 1st Floor in the Repacking area

1) Repacking area with 20 to 40 manual workplaces for repacking of articles from pallets into storage totes
2) 3 robots for automatic stacking or destacking from storage totes
3) Workplaces for manual destacking of empty shipping totes
4) Checking station for empty shipping totes before transportation to the Picking Gallery
5) 3 multi-functional workplaces for Not-Okay totes from the Picking Gallery area, inventory of storage totes in the Picking Gallery etc.
6) 1 multi-functional workplace for Not-Okay pallets in the Repacking area, removal of pallets from the system, manual loading of pallets into the system, etc.

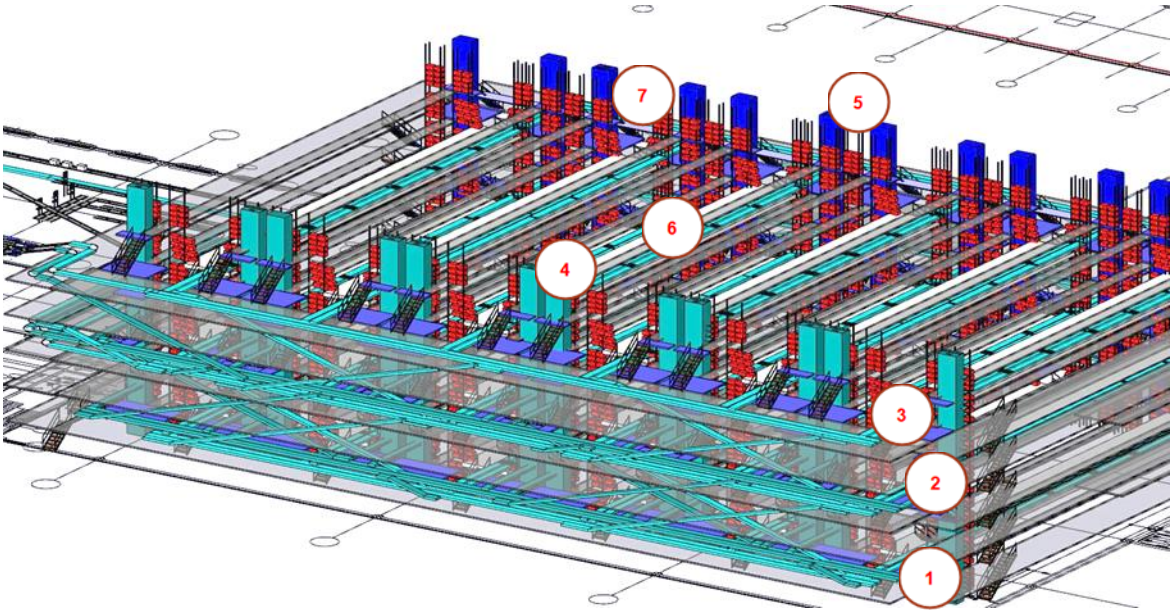


Figure 2-9: Layout Picking Gallery area

1) Lower level for order picking
2) Middle level for order picking
3) Top level for order picking
4) Lifts for storage totes from the Repacking area (12x) for connecting the shuttle warehouse with storage levels
5) Shuttle lifts (12x) for changing shuttle vehicles in the shuttle warehouse levels
6) Picking level (18x) for picking with pick-by-light
7) Conveyor section on the top level to connect the shuttle lifts with each other to enable a shuttle vehicle to be moved from one aisle to another

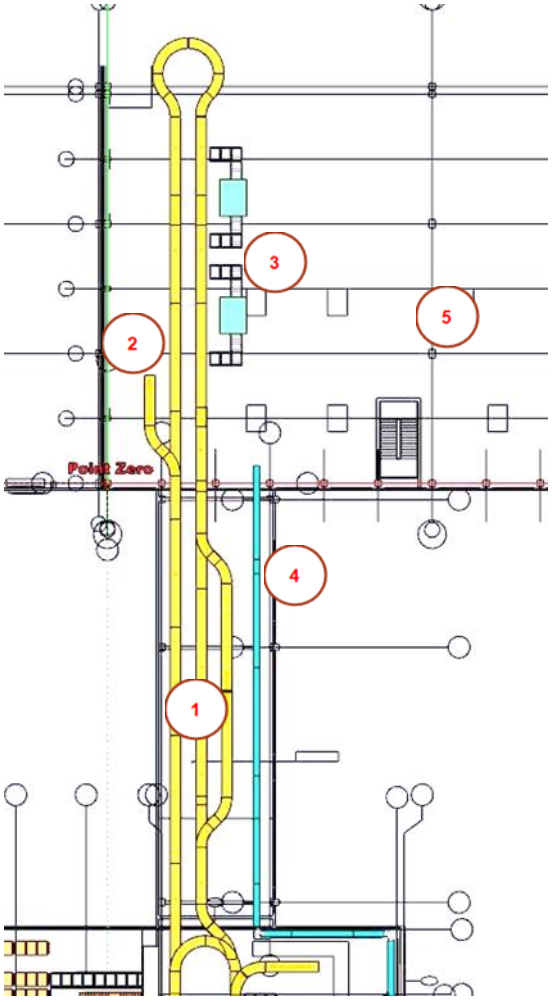


Figure 2-10: Layout connection existing building via bridge

1) RGV system in the bridge between new and existing building, including a waiting area for empty vehicles
2) RGV system maintenance centre (on a mezzanine in the existing building)
3) Vertical conveyors / lifts to connect the 1st floor to the Ground Floor in the existing building
4) Conveyor for filled shipping totes from the Picking Gallery in the bridge for transport to the shuttle and dispatch area in the existing building
5) Shuttle and dispatch area outgoing goods in existing buildings (layout in progress)

2.3.2. Logistical processing within new building

From the inbound area (see figure 4, point “2”) an industrial truck transports the provided load carriers (EURO, CHEP EPAL Plastic Pallets) to the inbound stitches (see figure 4, point “3”); for this transport, the industrial truck can pick up 2 pallets on a long fork and also transfer them simultaneously to the transfer stations of the pallet conveyor system.

From the inbound stitches the pallets will be transported to the RGV-system on the Ground Floor (see figure 4, point “5”).

Via the RGV system, the pallets are fed to the storage sections for storage in the HBW; after transfer from the RGV system, the pallets are stored in the individual aisles of the HBW (see figure 4, point “7”).

The two lifts (see figure 4, point "8") are supplied and removed by the RGV system and connect the 1st Floor. Pallets from the incoming goods area can be fed directly to the outgoing goods area in the existing building via these lifts with subsequent transport over the bridge.

In addition, the pallets from the repacking area, which are to be stored back in the HBW, are transported via the lifts from the 1st Floor to the Ground Floor to the storage level.

Pallet stacks with empty pallets after repacking are transported via the lifts from the 1st Floor to the ground floor and then removed from storage via the top conveyor section in the pallet feed area (see figure 4, point "3"), taken off by an industrial truck and fed to a buffer for empty pallets. There is also the option of transporting the pallet stacks on the first floor via the bridge between the new and existing building. In this case, the pallets on the ground floor in the existing building are removed from the pallet conveyor system by industrial trucks and transported to a defined area.

Pallets with empty shipping totes are placed in the existing building to be stored in the HBW (see figure 6, point "1"). From there, the pallets are fed to the first floor via the lifts (see figure 6, point "3"), taken over by the RGV system, transported to the new building via the RGV system, transferred to the vertical conveyors in the new building (see figure 7, point "5"), transported to the ground floor in the new building via the vertical conveyors, taken over there by the RGV system on the ground floor and transported to the storage lines in front of the HBW, transferred there to the storage lines and then stored in the HBW.

To retrieve the pallets from the HBW, they are transferred from the storage and retrieval machines on the first floor to the retrieval lines (see figure 7, point "2"), from where they are fed to the following possible destinations via the RGV system (see figure 7, point "3"):

- the pallet conveyors for feeding the workstations for manual depalletising of the shipping totes (see figure 7, point "6"),
- the pallet conveyors for supplying the workstations in the repacking area (see figure 7, point "8"),
- the lifts (see figure 7, point "5") for transport to the Ground Floor or
- the lifts in the existing building (see figure 10, point "3") to be transported from there to the Ground Floor and made available for removal by the pallet conveyor system (see figure 6, point "2").

The pallets with the shipping totes to be depalletised are manually depalletised at the two workstations (see figure 7, point "7") and the empty pallets are fed to an automatic palletiser (turquoise in figure 7), automatically palletised and then fed via the pallet conveyors and the RGV system to the lifts (figure 7, point "5") for transport to the Ground Floor. In the future the process of depalletising is expected to be automated and located in the same area.

The pallets are retrieved from the HBW to supply the repacking area and fed to the following destinations via the pallet conveyor system and cross-distribution trolleys.

- the manual workstations for repacking the article quantities into storage totes (see figure 8, point "1" or

- the robots (see figure 8, point "2") for automatic depalletising of filled storage totes from the pallets for replenishment of the Picking Gallery.

When the pallets become empty after repacking, they are fed from the manual work stations and from the work areas of the robots via cross-distribution trolleys and pallet conveyors to automatic empty pallet stackers (turkish to the left of the manual work stations in figure 8), After automatic stacking, the empty pallet stacks are transported to the Ground Floor via pallet conveyors and the RGV system and lifts (see figure 7, point "5"). There is also the option of transporting the pallet stacks on the first floor via the bridge between the new and existing building. In this case, the pallets on the ground floor in the existing building are removed from the pallet conveyor system by industrial trucks and transported to a defined area.

At the manual workstations in repacking, the article quantities are repacked into storage totes; empty storage totes are fed to the workstations via tote conveyor technology; the filled storage totes are either palletised manually onto an empty pallet at the workstation or fed to the robots for automatic palletising via tote conveyor technology.

After manual or automatic palletising, pallets with filled storage totes are transported back to the HBW for storage via the pallet conveyor system and the RGV system.

If items from the HBW that have already been repacked into totes are required for replenishment in the Picking Gallery, these pallets with totes are removed from the HBW and fed to the robots for automatic depalletising.

If faulty pallets are detected in the repacking area, they are fed to the Not-Okay station for further processing via the pallet conveyor system (see figure 8, point "7").

The formed filled storage totes or depalletised filled storage totes are transported to the automatic shuttle warehouse in the Picking Gallery via tote conveyor technology and transferred to the different levels in the shuttle warehouse for storage on the shuttle vehicles via conveyor technology on 3 levels and lifts for totes.

The shipping totes manually depalletised and unfolded at the workstations (figure 8, point "3") are checked at the checking station (figure 8, point "4") (weight, unfolding, barcode, RFID chip, soiling) and then transported to the picking levels in the Picking Gallery via a tote conveyor system.

In the Picking Gallery area, the storage totes are buffered in 12 rows of shelves for replenishment of the picking locations and transferred to the picking location as required. The picking locations are each located on 3 levels (see figure 9, points "1-3") and in 6 aisles. The empty shipping totes are transported to the various picking zones using conveyor technology. In the picking zones, the pickers are instructed via pick-by-light technology which tote articles are to be picked in which quantities in the individual shipping tote.

Empty storage totes produced after picking are manually transferred to the tote conveyor system for the shipping totes in the picking zones and transported from there via the tote conveyor system for the shipping totes and the empty storage totes to buffer sections for empty storage totes in front of the workstations in repacking. If there are too many empty storage totes in the system, these can be fed to the robots in repacking for palletising onto pallets; these pallets are then stored in the HBW. If these pallets are needed again, they are transported back to the robots in repacking, the totes are automatically depalletised and the empty totes are made available again for the workstations in repacking on the buffer sections.

Storage totes from the shuttle warehouse in the Picking Gallery area that are subject to a special check or inventory are either removed from the storage positions or the picking locations in the shuttle warehouse and transported to the multifunctional workstations on the 1st floor in the Repacking area (see figure 8, point "6"). After processing, these totes can be transported back to the automatic shuttle warehouse in the Picking Gallery area.

The shipping totes completed after picking are transported from the picking zones via the tote conveyor system in the Picking Gallery area, the repacking area, the HBW pre-zone on the first floor and in the bridge between the new and existing building (see figure 10, point "4") to the shuttle warehouse in the existing building (see figure 10, "4"). A Not-Okay station is provided in the existing building for checking the shipping totes after commissioning.

From the shuttle warehouse in the existing building, the shipping totes are retrieved according to the stores for which they are intended and then automatically stacked in 6 or 10 totes on dollies and then prepared for dispatch and loading.

2.3.3. Load carriers

The storage and transport units used are specified below. Unless other requirements are explicitly stated, these specifications apply to the entire system. All transport units comply with the usual manufacturing and wear tolerances in form and condition.

The Logistic Contractor is obliged to inspect the conveyed and stored goods personally and in a sufficiently large random sample before submitting an offer and to obtain full information about its properties. The technology used must be optimally designed for its purpose.

The functionality of the storage and conveying technology is achieved when even goods of inferior quality can be transported, stored and removed in continuous operation without disruptions. In particular, it must be ensured that all load carriers accepted by the dimensions, size and weight control stations can be transported and stored error-free in the entire system.

2.3.3.1. Storage tote

Storage totes are used as a buffer for picking sources within Picking Gallery. They will be created / filled with goods in the Repacking area (repacking of goods from supplier pallets).

After creation they will be put / stacked onto pallets and then those pallets will be buffered within HBW or send to the Picking Gallery system (into storage buffer or directly into picking channels).

Storage totes onto pallets will be transported to repacking, destacked and send to Picking Gallery as well.

Basic dimensions (L x W x H)	600 x 400 mm x 280 mm (outer dimensions)
Tare Weight:	approx. 3 kg
Total Weight:	max. 30 kg

2.3.3.2. Shipping tote

Shipping totes are used as picking destination within Picking Gallery system.

They are buffered folded (empty) on pallets within HBW. At unfolding stations they will be unfolded manually, buffered stacked on a shipping totes buffer and after destacking send to picking stations in

the Picking Gallery. In the future the process is planned to be done automatically, however the flow remains as described.

Basic dimensions (L x W x H)	600 x 400 mm x 320 mm (approx. outer dimensions)
Tare Weight:	approx. 3 kg
Total Weight:	max. 30 kg

Refer to appendix document “09-FKE64313VB-Rossmann-Version1-d006.pdf” for a more detailed specification.

2.3.3.3. Euro-Pallet

The Euro-Pallet is the most used load carrier in the warehouse. It is used as a storage for supplier / original pallets and stacked storage totes. Different types of Euro pallets are used:

- ***Wooden Euro-Pallet***

Basic dimensions (L x W x H):	1,200 x 800 mm x 144 mm, with a maximum overhang of 50 mm on each side
Tare Weight:	25 kg
Total Weight:	max. 1,000 kg

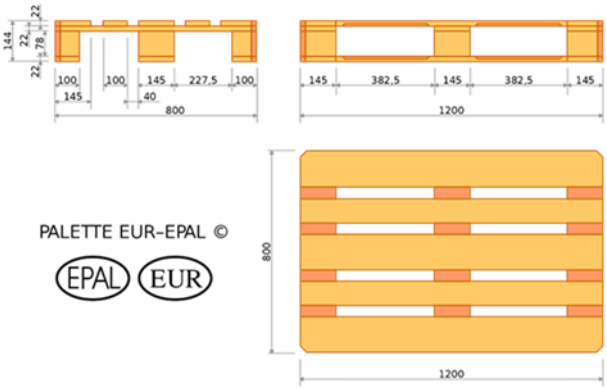


Figure 2-11: Load carrier wooden Euro-Pallet

- ***Plastic Euro-Pallet***

Basic dimensions (L x W x H):	1,200 x 800 mm x 144 mm, with a maximum overhang of 50 mm on each side
Tare Weight:	20 kg
Total Weight:	max. 1,000 kg

EPAL Euro Pallet

Max. size in the width 800 + 3 mm → 803 mm
Max. size in the length 1,200 + 3 mm → 1,203 mm

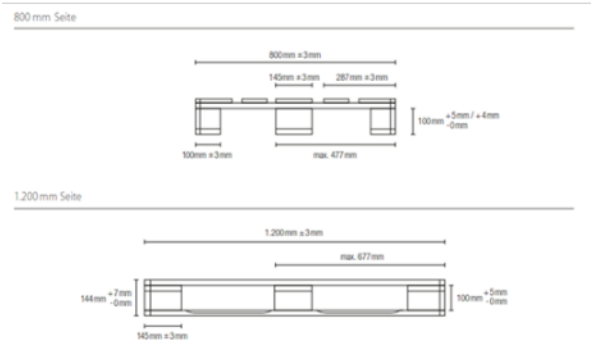


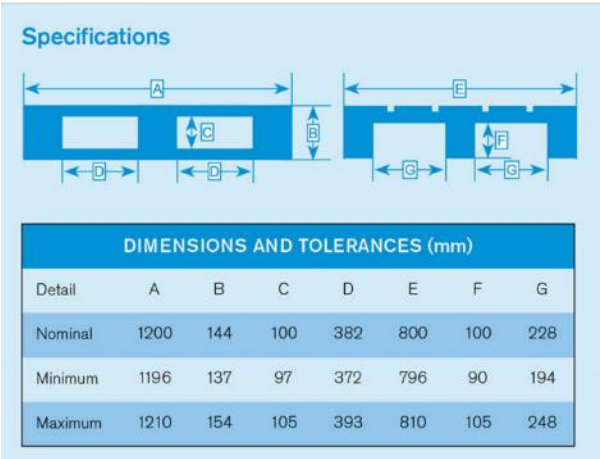
Figure 2-12: Load carrier EPAL Plastic Euro-Pallet

- ***Wooden Chep Euro-Pallet***

Basic dimensions (L x W x H):	1,200 x 800 mm x 144 mm, with a maximum overhang of 50 mm on each side
Tare Weight:	25 kg
Total Weight:	max. 1,000 kg

Chep Euro Pallet

Max. size in the width 800 + 10 mm → 810 mm
Max. size in the length 1,200 + 10 mm → 1,210 mm



DIMENSIONS AND TOLERANCES (mm)							
Detail	A	B	C	D	E	F	G
Nominal	1200	144	100	382	800	100	228
Minimum	1196	137	97	372	796	90	194
Maximum	1210	154	105	393	810	105	248

Figure 2-13: Load carrier Chep Euro-Pallet

The form and condition of the transport / storage equipment correspond to the usual manufacturing and usage tolerances.

The contractor is obliged to inspect the conveyed and stored goods personally before submitting an offer and to obtain full information about its properties.

2.3.3.4. Identification concept

The identification concept for new warehouse must be adapted to the above-mentioned Euro-Pallets.

Incoming pallets are labelled with a unique barcode label at goods receipt, which is printed from the WMS and then attached to the pallet during the goods receipt process on both of the long sides. This label is used to identify the pallet during transport on the automatic conveyor systems and at the work-stations and both labels need to be readable.

The storage and shipping totes used are labelled with a unique barcode and/or an RFID chip and are tracked and identified via the barcode or RFID chip during transport on the automatic transport systems and at the workstations.

2.3.4. Operational throughput and inventory requirement

The below functional diagram shows the arrangement of the functional areas to each other and the material flows between them. This is the base for the material flow concept planning.

The unloading of trucks in the inbound area is operated 22,5 hours a day (3 shifts) from Monday to Friday and 2 shifts on Saturday and Sunday. The HBW, incl. conveying technology and the picking area are operated up to 22,5 hours a day from Monday to Friday and 2 shifts on Saturday and Sunday.

All performance requirements per hour listed in the tables or in the descriptions of the individual functional groups for the various storage and conveying technologies must be verified over the course of the day in 3 shifts, i.e. over 22.5 hours, even if only specified as hourly performance.

The following from-to matrices show the main material flows without taking the layout into account. These material flows will be further detailed and broken down by the end of July (e.g. to the flows between manual and automatic repacking). These details have no influence on layout in this tender.

To / **From**	Unloading	Inbound	HBW	Ex. warehouse	Re-packing	De-stacking	Empty buffer	Sum from …
Unloading		182						**182**
Inbound			182					**182**
HBW				115	111	20		**246**
Existing warehouse			30					**30**
Repacking			53				58	**111**
Destacking							20	**20**
Sum to…		**182**	**265**	**115**	**111**	**20**	**78**	**771**

Figure 2-14: “From-to matrix” for pallets per max. h

To From	Re-pack-ing	De-stack-ing	Picking Gallery	Shuttle ex. Whs.	Dolly stacker	Consoli-dation	Empty buffer	Sum from …
Repacking			930					**930**
Destacking			1,005					**1,005**
Picking Gallery	930			1,005				**1,935**
Existing warehouse				1,050				**1,050**
Shuttle ex. warehouse					2,055	150		**2,205**
Consoli-dation				75			75	**150**
Empty buffer					75			**75**
Sum to…	**930**		**1,935**	**2,130**	**2,130**	**150**	**75**	**7,350**

Figure 2-15: "From-to matrix" for totes per max. h

In addition, the following material flows must be taken into account in conjunction with the automatic dolly stackers:

- Inflow of stacked bases for dolly stacking: 240 bases / 27 stacks of bases per max. h
- Inflow of stacked lids for dolly stacking: 240 lids / 10 stacks of lids per max. h
- Outflow from the dolly stacking machines: 240 dollies per max. h

2.3.5. System throughput

System throughput in the context of this tender is understood as the technical system performance that is defined as the interaction between the WMS and the material flow system (material flow technology + MFS) HBW + Repacking + Picking Gallery (storage and picking) to meet the requirements.

The operational throughput requirements listed in the Von-Nach matrices before represent the maximum values determined from a projection for the future. In order to ensure that these throughput requirements are met and reserves for future development are maintained, the technical performance parameters of the automatic systems must be designed at least in accordance with the current state of the art.

2.3.6. Capacity requirement pallets (HBW)

The aim is to create a maximum possible storage capacity and reserve capacity in the HBW, taking into account all applicable standards and regulations as well as existing areas, access possibilities and escape routes.

The minimum requirements for the storage configuration are summarised below (among others):

Load carriers	Storage	Storage level	Min. Spaces*
Euro-Pallet with a height of 1,200 mm	In length, single-deep	Lowest	13,440
Euro-Pallet with a height of 1,600 mm	In length, single -deep	Middle	8,064
Euro-Pallet with a height of 2,200 mm	In length, single-deep	Top	5,376
*incl. Utilisation rate of 90 %		Sum	26,880

Table 2-1: As Is status planning storage capacity HBW

2.3.7. Capacity requirements storage totes (Picking Gallery)

The aim is to create a maximum possible storage capacity and reserve capacity in the gallery picking, taking into account all applicable standards and regulations as well as existing areas, access possibilities and escape routes.

The minimum requirements for the storage configuration are summarised below (among others)

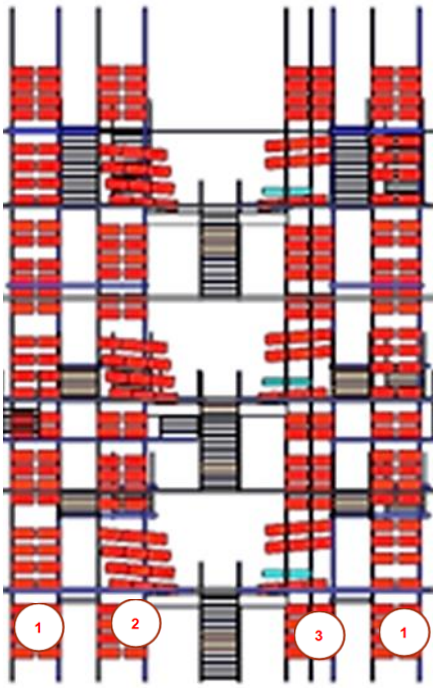


Figure 2-16 : Functional layout Picking Gallery – section view of one module

- Height parameters left / right shelf line of the module (see figure 2-16, point „1“)
    - Number of levels over the shelf height (reserve totes): 32
- Height parameters left shelf line with picking locations of the module (see figure 2-16, point „2“)
    - Number of levels over the shelf height (reserve totes): 20
    - Number of picking locations (flow rack) over shelf height: 12
- Height parameters right shelf line with picking locations of the module (see figure 2-16, point „3“)
    - Number of levels over the shelf height (reserve totes): 20
    - Number of picking locations (flow racks) over shelf height: 9
- Number of locations over the length of the shelf rack 72
- Depth of storage locations for reserve totes 2
- Depth of picking locations 3

Number of location per module	Picking locations per module	Storage locations per module	Min. Cap* for 6 modules
Levels per module	21	104	
Number of picking locations	21 x 72 = 1,512		9,072
Number of totes in picking locations	1,512 x 3 = 4,536		27,216
Number of reserve locations		104 x 72 = 7,488	44,928
Number of totes in reserve locations		7,488 x 2 = 14,976	89,856
*incl. Utilisation rate of 90 %	4,536 totes	14,976 totes	117,072 totes

Table 2-2: As Is status planning storage structure Picking Gallery

2.4. Operating strategy

For the material flow system, the following operating strategies for the optimisation of processes and control is basically planned. These strategies are to be implemented in the interaction of WMS / MFS and detailed in the requirement specification phase between the Logistic Contractor and the Client. In addition, the strategies are to be confirmed by a simulation.

2.4.1. Storage strategy

The following storage strategy is planned for the automatic HBW:

- The MFS carries out the orders strictly in that sequence determined by WMS, according to the WMS / MFS-IT specification

The following movement strategy is ensured by the MFS:

- To improve throughput performance, the storage and removal operations for an aisle are carried out in combined storage and removal operations (combined cycles).
- Stock removal orders with highest priority (time stamp age) are always carried out / combined first.

2.4.2. Material flow strategies and functions

The following material flow strategies are planned for the entry-zone of the HBW.

For storage in the HBW and in the shuttle warehouse of the Picking Gallery as well as for the connection of the HBW to the repacking area, the MFS has the basic task of transporting all load carriers awaiting transport in the sources to the respective transport destinations on time and as required. The Logistics Contractor must take the following influencing factors into account when developing suitable handling rules:

- Different priorities and time stamps of the transport orders;
- Source-To-Target relationship of the transfer orders;
- Filling level of physical sources and target locations;
- Occupancy rate of the loops of the RGV system and the loops in the pallet conveyor as well in the tote conveyor systems;
- Maximisation of double cycles for automated storage and retrieval vehicles (system-dependent), i.e. the maximum combination of storage and retrieval cycles;
- Minimisation of empty runs for automated storage and retrieval systems and transfer cars (system-dependent).

The above strategies are ensured by the MFS in connection with the WMS.

The operation of Repacking is controlled by WMS generally, but MFS will support it by keeping the following rules:

- WMS is determining the transport priority
- Transports with higher priority are served first
- Transfer cars combine transports if possible keeping priority
- Stacking of empty pallets is carried out autonomously within MFS; for full stacks MFS is requesting target from WMS
- MFS is carrying out transports as requested by WMS
- WMS is controlling user dialogs and overall movements within Repacking area

Inside the Repacking area all material flows have to be managed by MFS. After partial repacking of pallets into storage totes or filled storage totes from pallets WMS needs to take back control of pallets with goods or totes.

The operation in the Picking Gallery (storage and picking) is controlled by WMS generally, but MFS will support it by keeping the following rules:

- WMS is controlling the filling rate of picking channels and storage locations; WMS is creating transport orders based on that control status;
- WMS is determining the transport priority;
- Transports with higher priority are served first by MFS;
- WMS is determining picking orders and their priority;
- WMS is controlling picking dialogs;
- MFS is presenting picking orders sent from WMS and sending status (e.g. “picked” by pushing knob) back to WMS.

2.5. Emergency strategies

The following section describes the options to be provided in the event of short or long-term failure of technical (sub)systems. The functions described need to be based on Client requirements following a discussion and form a basis for the final solution.

In principle, all faults are immediately reported to the control system.

Short-term failure is a fault that occurs, for example, due to the tilting of a pallet, a disturbed light barrier etc. The fault is then immediately reported to the control system.

A long-term failure (that means a failure that could not be solved in defined time (this time has to be defined) is dealt with by the control system and described as, for example, a fault requiring longer repair of technical systems.

The system should be able to provide statistics of short and long-term failures.

Within the framework of the requirements specification phase, the contractor shall develop short-term and long-term strategies for minimising the effects of malfunctions and prove them by means of a simulation.

Possible failure scenarios need to be considered in detail per each installation and area of automation. Some examples could be as follows:

- Power failure;
- Failure stacker crane;
- Failure conveyor system;
- MFS failure;
- Conveyor for waste in case of failure with pressing machine located at the ground floor;

3. Processes in the new warehouse

3.1. Preliminary remarks

This section describes the processes from the perspective of the material flow system (MFS). The processes and functionalities that take place on the WMS are not part of these descriptions and can be found in the following appendices.

The file names appended are as follows:

1. WMS for Rossmann BluePrint 2024 04 19.docx
2. D2027 - Automated stocktaking process at HBW high storage warehouse.docx
3. D2027 - Change of picking location.docx
4. D2027 - Handling of shipping totes on the panel.docx
5. D2027 - Heavy totes at lower levels.docx
6. D2027 - New method of logging in.docx
7. D2027 - Picking visualization.docx
8. D2027 - Telegram 107.docx
9. D2027 - The concept of two workers on one picking stations.docx
10. D2027 - Visualization of the workload of aisles on the top of rack.docx

Remark: Descriptions of further functionalities will be provided by the client at the end of July.

Further details of the following descriptions and any other necessary additions will be provided by the Logistics Contractor (LC) as part of the specification process after the contract has been awarded.

The LC must take into account and integrate all measures required to implement the following descriptions of the processes and functionalities in its offer, also taking into account the systems mentioned.

3.2. Preparatory activities

For the preparation of the work in the HBW and the other functional areas in the new building and partwise in the existing building the following preparatory activities will be done:

- Receiving of goods receipt notes / delivery notes from WMS;
- Receiving of order data from WMS;
- Checking that the data received agrees with item master data, supplier data base, both data sets / quantities, etc. as to be specified in the interface document between WMS and the MFS;
- Acceptance of data into the new MFS if all data in order;
- Generation of data for the expected receipt of goods and planned orders in the new MFS.

In the event of mistakes in the data transferred between WMS to the new MFS, any issues are to be investigated and resolved by system users.

3.3. Receipt of goods

3.3.1. Unloading and acceptance of goods

Pallets with articles are delivered to the new warehouse. The driver shall hand the shipping documents over to the employees working in the unloading area.

3.3.1.1. Unloading of goods

The unloading process should be as follows:

- Unloading of the incoming vehicles (see figure 1, point “1”); the employee shall also check the delivered pallets against the shipping documents; this shall also include, in addition to the quantity control, an initial check for possible damage, based on visual inspection;
- Unloaded pallets shall be placed in a defined staging area in the incoming goods department (see figure 1, point “2”) and checked for possible damage for the second time.

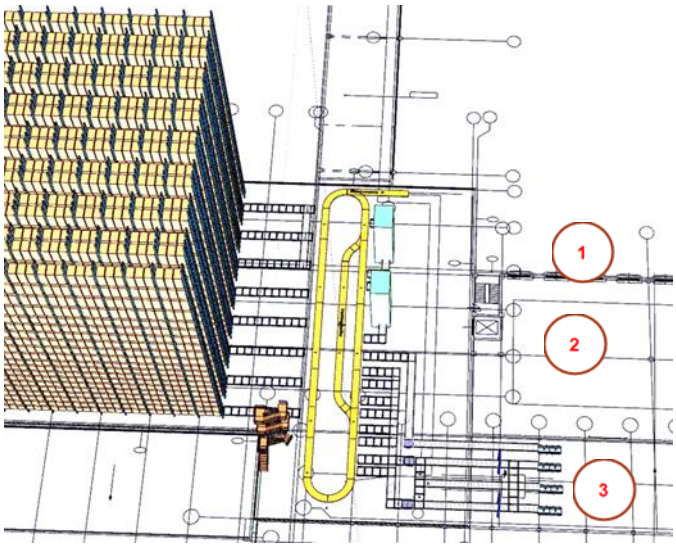


Figure 3-1: Layout new warehouse Ground Floor

3.3.1.2. Acceptance of goods

The major processes and steps for the incoming goods from external suppliers are as follows:

- To compare the data indicated on the delivery note of the article with the goods which are to be accepted (damages in transportation, SKU quantity, SKU number, origin, storage unit, load carrier type, packaging or expiration date (where applicable)).
- As part of the collection process, a label with plain text and barcode is printed out for each pallet via the WMS; this label is then attached to the pallet for further unique identification and tracking.
- When the label for the pallet is printed, the goods are received in the WMS.
- The pallets to be stored are placed in a defined area in the goods receiving area, from where the pallets are picked up for storage.

- For storage, the pallets are picked up from the staging area by an industrial truck (usually 2 pallets at a time via the long fork). The pallets are then transported to one of the two loading points for the pallet conveyor system on the Ground Floor level and then deposited in the loading station (see figure 1, point "3").

3.4. Incoming goods out of the existing warehouse

Pallets with empty shipping totes are to be transported from the existing warehouse building to the new HBW and stored or made available again for destacking via the two workstations on 1st Floor 1.

The pallets with the empty and folded shipping totes are placed on the loading station of the pallet conveyor system in the existing building (see figure 2, point "1").

After the pallet is loaded, it passes through an inspection station for contour, clearance control of the skids, weight and barcode reading (shown in blue in the following illustration).

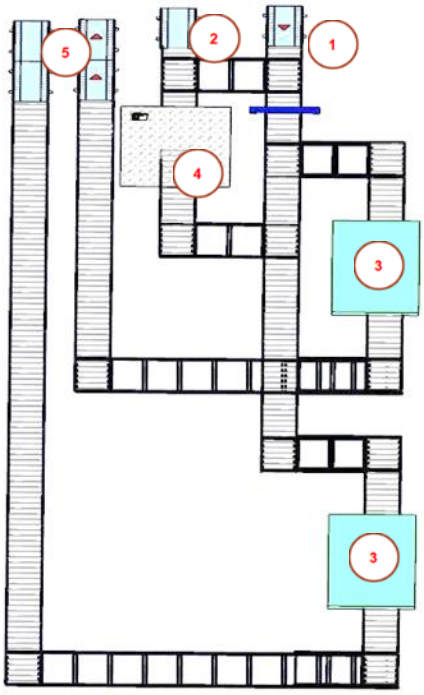


Figure 3-2: Layout existing warehouse Ground Floor

In addition to the pallets that are to be stored in the new HBW, pallets that are to be transported to specific destinations in the new building (pick-up point on the 1st Floor in the pre-zone for the HBW or pick-up point on the Ground Floor in the new building) are also delivered via the pick-up point.

Errors which might occur after the load carrier is placed on the conveying technology:

- Any shape defects of the load carrier shall be automatically detected at the identification-point (I-point) of pallet conveyor and the load carrier shall be transported by conveyor to the zone designated for defective load carriers (Not-Okay station, see figure 3-2, point “4”); this defect shall be subsequently fixed by an employee (e.g. adjustment of any protruding goods etc.).

- Any errors in reading the barcode at the I-point shall result in the transport of the pallet to the zone designated for defective pallets; the respective employee shall check the quality of the barcode and, if the barcode is found to be damaged, a label affixed to the load carrier shall be reprinted, the employee shall attach the newly printed label to the load carrier and the pallet is then conveyed via the cross-connection in the conveyor system direct back to the feed section to the pallet lift; if no damage to the barcode can be found, the pallet shall be loaded up again without having to undergo any further processing.
- Errors of weight, i.e. if the pallet exceeds the specified maximum weight, shall be detected automatically at the I-point and the pallet shall be transported to the zone designated for defective pallets by conveyor; subsequently, an employee must fix the error; if the pallet exceeds the specified maximum weight, the excess articles contained in the pallet must be reloaded to another new load carrier and the respective quantities of articles contained in both pallets must be adjusted in the new WMS with information to WMS via interface between MFS and WMS; subsequently, both pallets shall be placed on the conveying technology again.

If errors are detected on the pallet, it is conveyed to an error section (Not-Okay station) next to the infeed section. If the fault cannot be rectified on the pallet when it is on the conveyor system, it is removed from the conveyor system and replaced after the fault has been rectified (see figure 3-2, point “2”).

If the fault can be rectified while the pallet is on the conveyor system, the fault is rectified on the conveyor system; a workstation platform at the Not-Okay station is provided at the fault processing station for this purpose, which the employee can use to walk around the pallet (shown framed in the following illustration). After processing, the pallets are fed back into the infeed section in front of the inspection station via a cross connection.

If the pallet is unobjectionable, it is conveyed onto the mezzanine via the vertical conveyors (see figure 2, point "3") and then made available to the RGV system for acceptance. The RGV system then transports the pallet to the HBW for subsequent storage or to the workstations for destacking the empty shipping totes on the 1st Floor of the new building.

Pallets that are to be delivered from the new high-bay warehouse to the existing building are transported via the lifts (see figure 3-2, point "3") to the pick-up point (see figure 3-2, point "5"), where they are picked up by industrial trucks.

3.5. Placing of goods into storage in HBW

3.5.1. Storage in HBW

After the acceptance of goods, the various articles and load carriers will be assigned their respective storage location in the HBW in the new WMS. Load carriers are transported from the buffer areas in the inbound to the pallet conveyor system which transports the pallets to the HBW.

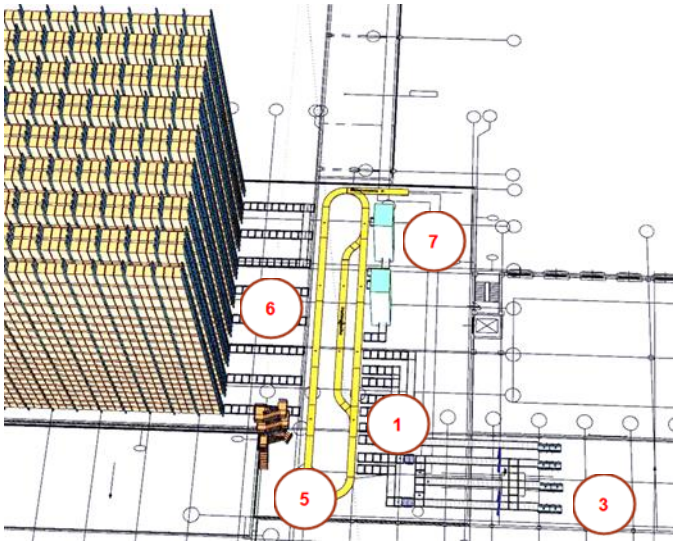


Figure 3-3: Layout new warehouse Ground Floor

The pallets to be stored are placed on the lower and 3rd finger from below for storage. Two pallets can be placed on each loading station at the same time.

The pallets then pass through a control station (I-point) to check the contour, the clearance of the runners, the weight and the legibility of the barcode on the label attached to the incoming goods. All faults need to be detected at the same time.

If errors occur, the pallets are transported to the next cross connection in the direction of the HBW, where they are transferred to the centre conveyor section between the two infeed points and then transported forwards again to the infeed station area for error processing.

A platform is provided at this error processing station so that the employee can walk around the pallet to inspect the error and, if necessary, rectify it at this point. If the fault cannot be rectified at this point, the pallet is transported to the removal station between the two loading stations and removed there for further processing.

If the fault can be rectified at the Not-Okay station, the pallet is then automatically transferred back to the infeed section and passes through the inspection station again.

If the pallets are free of defects, they are fed via the pallet conveyor system to accumulation sections for transfer to the RGV system (see figure 3, point "1"). After automatic identification at the I-point, the pallets receive the HBW transport destination.

From the transfer stations to the RGV system, the pallets are transported via the RGV system (see figure 3, point "5") to the individual aisles of the HBW and transferred to the pallet conveyor system (see figure 3, point "6") at the specified aisle (target specification from the WMS to the MFS) on the branch section in front of the HBW. When the pallets are transported on the respective accumulation section in front of the individual aisle to the two transfer points to the storage and retrieval machine in front of the rack, the pallets receive their final destination, the storage location in the rack, from the WMS, with transmission from the WMS to the MFS (an exemplary functionality would be even distribution of articles in the warehouse aisles).

At the end of the individual accumulation section in front of the respective aisle of the HBW, the pallets are taken over by the storage and retrieval machine at the two transfer points and then stored in the specified storage locations in the rack.

3.5.2. Errors which might occur in connection when placing goods into HBW

Any errors which might occur on the automated conveyor system and in the automated warehouse should be handled as follows:

- Errors which might occur after the load carrier is placed on the conveying technology:
    - Any shape defects of the load carrier shall be automatically detected at the identification-point (I-point) of pallet conveyor and the load carrier shall be transported by conveyor to the zone designated for defective load carriers. This defect shall be subsequently fixed by an employee (e.g. adjustment of any protruding goods etc.). If the fault can be rectified at the Not-Okay station, the pallet is automatically transported back to the storage area after the fault has been rectified; if the fault cannot be rectified at the Not-Okay station, the pallet is transported to the removal point via the pallet conveyor system, where it is removed and transported to a location for further processing.
    - Any errors in reading the barcode at the I-point shall result in the transport of the load carrier to the Not-Okay station; the respective employee shall check the quality of the barcode and, if the barcode is found to be damaged, a label affixed to the load carrier shall be reprinted, the employee shall attach the newly printed label to the load carrier and the load carrier shall be loaded up again; if no damage to the barcode can be found, the load carrier shall be loaded up again without having to undergo any further processing;
    - Errors of weight, i.e. if the load carrier exceeds the specified maximum weight, shall be detected automatically at the I-point and the load carrier shall be transported to the Not-Okay station; subsequently, an employee must fix the error. If the pallet exceeds the specified maximum weight, the excess articles contained in the load carrier must be reloaded to another new load carrier. To do this, the pallet must be transported to the end of the fault line, removed there and then transported to a workstation in the incoming goods area, where the pallet is partly unpacked and the excess quantity is repacked onto another pallet. Both pallets are then returned to the pallet conveyor system for storage.
- Storage bin is found to be occupied when putting goods into storage:
    - An error message has to be sent via MFS to the new WMS of the HBW; a new storage compartment for the load carrier which needs to be put into storage shall be looked up and the load carrier shall be put into storage in the newly looked up storage compartment in the same aisle.

      If there is no corresponding storage space available in the same aisle, the pallet is delivered to the retrieval section via the storage and retrieval machine on the 1st Floor, transported via the pallet conveyor system to the transfer to the RGV system on the 1st Floor, taken over by the RGV system and transported to one of the two lifts and transferred there, conveyed via the lifts to the ground floor, then transferred to the RGV system on the ground floor and fed to the new aisle in the HBW via the RGV system.

- The occupied storage compartment must be blocked in the new WMS for the HBW and the located pallet will be checked by a responsible employee:
  - If the blocked pallet has to be stored in the HBW and the pallet has been stored only on a wrong location, the further planned location for the wrong pallet has to be checked. If this further planned location is empty, the wrong located pallet has to be transported to the further planned location, based on an automatically generated transport order in the WMS and its forwarding to the MFS or
  - The pallet which is incorrectly placed is withdrawn from the HBW and checked on the mezzanine (1st Floor). Therefore a new transport order for the incorrectly placed pallet shall be automatically generated in the WMS and forwarded to the MFS.

3.6. Removal from the HBW

Various pallets (original pallets from the supplier, pallets with filled storage totes, pallets with folded empty shipping totes and possibly pallets with empty storage totes) are retrieved from the HBW and transported to the various destinations using various conveyor techniques. These different possible retrievals are described in more detail in the following chapters.

3.6.1. Removals to the existing building

The replenishment stocks of defined articles for order picking in the existing building are stored in the HBW. Pallets are retrieved from the HBW via the retrieval level on the 1st Floor of the new building.

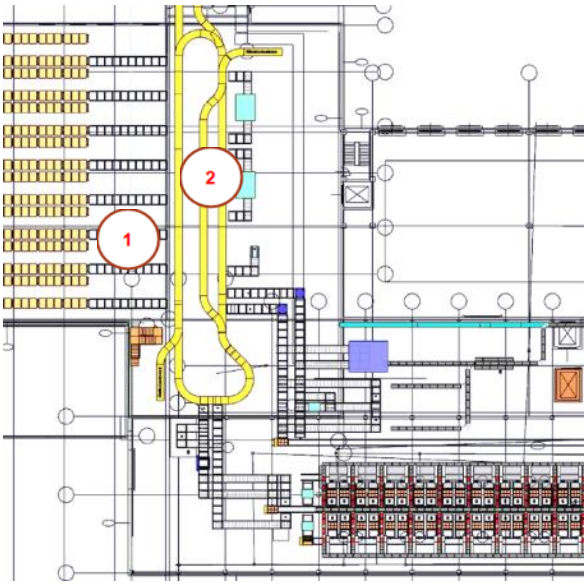


Figure 3-4: Layout new warehouse 1st Floor

The pallets to be retrieved are always full original pallets from the suppliers. The pallets to be retrieved are specified to the MFS via the WMS; the specification is made on the basis of a specification of the storage location in the rack from which the pallet is to be removed and the specification of the destination in the form of the removal station from the pallet conveyor system on the ground floor of the existing building.

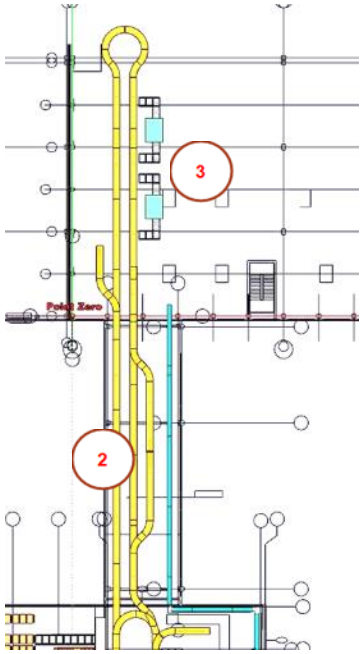


Figure 3-5: Layout Bridge and 1st Floor existing building

The pallets to be retrieved are transferred from the storage and retrieval machines in front of the racking to 2 transfer points on the pallet conveyor system (see figure 3-4, point "1").

At the end of the pallet conveyor sections in front of the racks, the pallets are taken over by the RGV system (see figure 3-4, point “2”) and transported over the bridge between the new and existing building to the transfer points for the pallet lifts in the existing building (see figure 3-5, point "3").

The pallet lifts are used to lower the pallets from the 1st Floor to the Ground Floor, where they are prepared for removal by industrial trucks at the end of the pallet conveyor lines (see figure 3-2, point "5"). One pick-up line per pallet lift is provided on the ground floor of the existing building.

3.6.2. Removals for destacking empty shipping totes

The HBW stores pallets of folded and stacked empty shipping totes that come from the existing building.

The pallets to be retrieved are specified to the MFS via the WMS; the specification is made on the basis of a specification of the storage location in the rack from which the pallet is to be removed and the specification of the destination in the form of the stations for destacking the empty totes on the 1st Floor of the new building (see figure 3-6, point “4”).

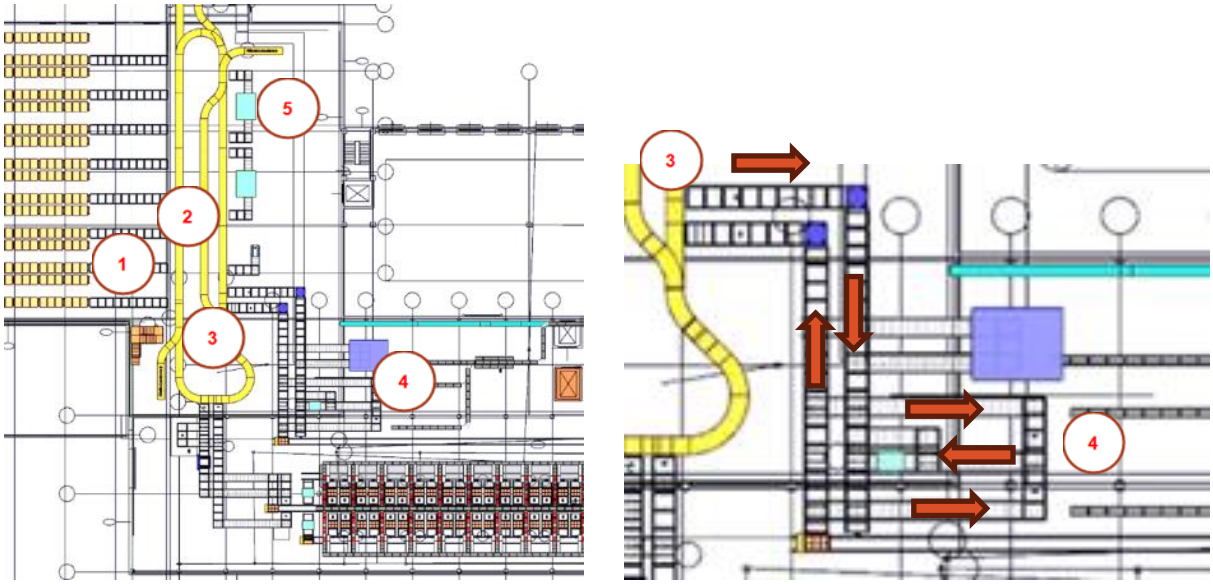


Figure 3-6: Layout 1st Floor and destacking workstations in new building

The pallets to be retrieved are transferred from the storage and retrieval machines in front of the racking to 2 transfer points on the pallet conveyor system (see figure 3-6, point "1").

At the end of the pallet conveyor sections in front of the racks, the pallets are taken over by the RGV system and transported to the transfer point in pallet conveyor technology (see figure 3-6, point “3”).

At the upper transfer point, the pallets are transferred from the RGV system to the pallet conveyor system; the pallet conveyor system then transports the pallets to the two workstations for destacking (see figure3- 6, point "4").

At the two workstations, the shipping totes are removed from the pallets, unfolded manually and then placed on the dead conveyor.

The empty pallets are transported away centrally between the two workstations via the pallet conveyor system, automatically palletised in this section (area shown in turquoise) and the stack of empty pallets formed is returned to the RGV system via the lower of the transfer stations (see figure 3-6, point "3").

The empty pallet stack is transported to the pallet lifts via the RGV system (see figure 3-5, point "3"), and transported to the existing building, where it is sorted and stored. Second flow for empty pallet stack being transported to the pallet lifts via the RGV system (see figure 3-6, point "5"), then lowered to the Ground Floor via the pallet lifts and transported there via a pallet conveyor system to a removal point next to the loading points on the ground floor; this is for removal of the stack by an industrial truck and subsequent transport to an empty pallet buffer.

3.6.3. Removals for replenishment of the repacking zone

Original pallets from suppliers and pallets with filled storage totes are stored in the HBW.

The original pallets and the pallets with the filled storage totes are intended for supplying the workstations for manual repacking and the automated stations with robots in the repacking.

The WMS informs the MFS which pallets are to be retrieved for supplying the workstations in repacking by specifying the corresponding storage locations in the HBW.

The pallets are then retrieved by the storage and retrieval machines and transferred to the pallet conveyor system in front of the racking at the two transfer points. The pallets are transported to the transfer points of the RGV system on the first floor of the new building via the pallet conveyor lines in front of the HBW (see figure 3-7, point “1”).

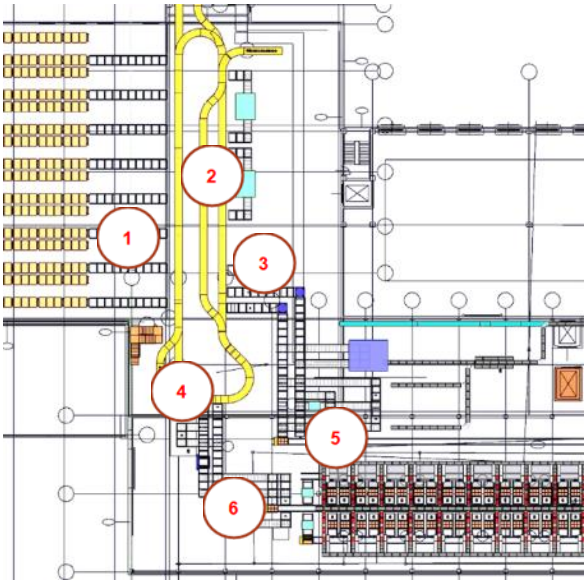


Figure 3-7: Layout 1st Floor and repacking in new building

After the RGV system picks up the provided pallets (see figure 3-7, point "2"), they are fed to the target points for the repacking area. The two target points for transferring the pallets to the pallet conveyor system feeding them to the repacking workstations are located in areas 3 and 4 (see figure 3-7, point "3" and point "4").

The pallets are fed to the manual workstations and the robots in the repacking area via these two transfer points from the north and south sides (distribution of the material flows to relieve the T-car in the direct area of the workstations by distributing the material flows to 2 T-cars).

The pallet conveyors transport the pallets from the transfer stations of the RGV system to the transfer stations of the T-cars in the repacking area (see figure 3-7, point "5" and point "6").

Pallets with filled storage totes, which are created after the repacking process, are fed via the two T-cars from the repacking area back to the two transfer stations (see figure 3-8, point "5" and point "6") and then transported via the pallet conveyor system to the transfer stations to the RGV system (see figure 3-7, point "3" and point "4").

Once the pallets have been taken over by the RGV system, they are transported to the two pallet lifts (see figure 3-7, point "2"); the pallets are then transported to the Ground Floor, then taken over by the RGV system on the ground floor and transported via the RGV system to the storage lines in the HBW.

3.6.4. Errors which might occur in connection when removal goods from HBW

Any errors which might occur on the automated conveyor system and in the automated warehouse should be handled as follows:

- Storage bin from which the pallet is to be removed is empty:

- An error message has to be sent via MFS to the new WMS of the HBW; A new storage bin for the retrieval of the same item must be determined via the WMS and a new retrieval order must be sent from the WMS to the MFS; the retrieval can take place from the same or a different rack aisle.
- The physically empty storage bin must be logically blocked in the WMS and MFS so that no pallets can be stored in this storage bin. The cause of the error must then be searched for in the WMS and MFS by tracing the booking processes for the storage bin in question and the error must be rectified by the system; the storage bin must then be released for new putaways once the cause of the error has been rectified.

- An original pallet from the supplier can be identified via the label affixed in the incoming goods department as long as the article quantities (total or partial quantity on the pallet) have not yet been repacked into storage totes. The storage totes can be identified via a barcode on the container / an RFID chip in the container. This means that a pallet with palletised storage totes can be identified via the storage totes. If a pallet has only been partially repacked, the label from the goods receipt may no longer be present, meaning that this pallet can only be identified by logical tracking on the various transport systems for the pallet. If a pallet cannot be identified, it must be transported to the error processing station for further processing.

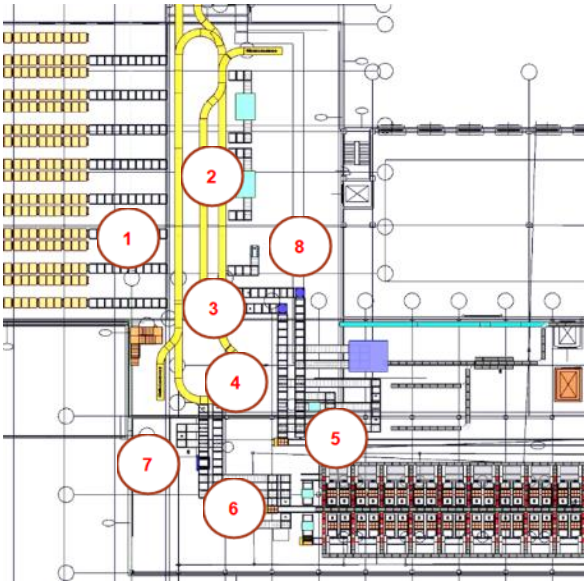


Figure 3-8: Layout check station near HBW station on 1st Floor

In this area of the first floor, the check station for stock take etc. is located in the area of point "7" (see figure 3-8, point "7"). If the unidentifiable pallet comes from the repacking area, it will be

- either via the T-car and transfer point "5" with subsequent transport with the RGV system from point "3" to point "4" and via the pallet conveyor system to the Check station or
- via the T-car and transfer point "6" and subsequent transport via the pallet conveyor system to the check station.

If the pallet cannot be processed at the check station and / or must be removed from the system, it is transported from the check station via the pallet conveyor system to transfer point "4", where it is then taken over by the RGV system and transported to retrieval section "8". The pallet can be removed via this retrieval section and, if necessary, transported to the Ground Floor for further processing via the combined and goods lift nearby (see figure 3-8 with the corresponding points listed above).

3.7. Repacking of goods

Various functions are performed in the "Repacking" area:

- full repacking of the article quantities from the supplier's original pallets into storage totes for replenishment of the shuttle warehouse in the "Picking Gallery" area; the storage totes formed either go to the shuttle warehouse in the "Picking Gallery" area or are palletised and then returned to the HBW;
- partial repacking of the article quantities from the supplier's original pallets into storage totes for replenishment of the shuttle warehouse in the "Picking Gallery" area; the original pallet with any remaining article quantities is then returned to the HBW; the storage totes created are either sent to the shuttle warehouse in the "Picking Gallery" area or are palletised and then returned to the HBW;
- the complete packing of storage totes from pallets that were previously created by full repacking or partial repacking and are transported from the HBW to the workstations; these storage totes are then transported to the shuttle warehouse in the "Picking Gallery" and stored there;
- the partial packing of storage totes from pallets that were previously created by full repacking or partial repacking and are transported to the workstations from the HBW; these storage totes are then transported to the shuttle warehouse in the "Picking Gallery" and stored there.

The repacking area is located on the 1st Floor and is connected to the HBW supply via 2 transfer points between a pallet conveyor system and T-cars (see figure 9, point "5" and point "6"; see also description for "removals for replenishment of the repacking zone").

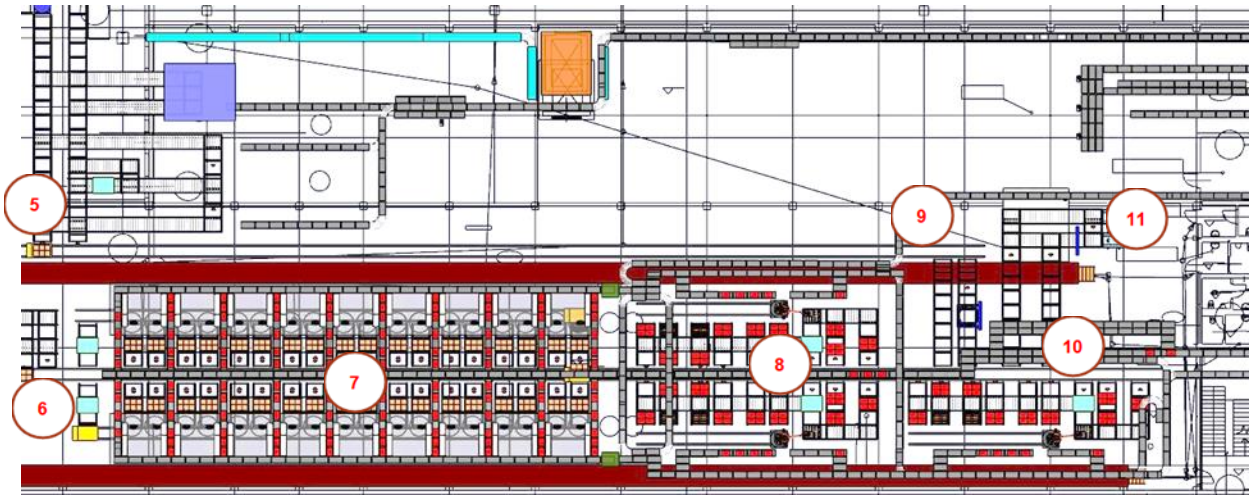


Figure 3-9: Layout Repacking area 1st Floor in new building

The repacking area consists of 2 different functional areas; in area "7" (see figure 3-9) there are manual workstations and in area "8" (see figure 3-9) there are robots for the automatic palletising and depalletising of storage totes.

The processes in the two repacking areas are described separately below.

3.7.1. Manual repacking

The pallets from the HBW are taken over by the T-cars at the transfer points (see figure 3-9, point "5" and point "6").

From transfer point "6", the pallets are taken directly to the workstations by the T-car. After transfer point "5", the pallets are transported to transfer point "9" (see figure 3-9), where they are transferred to the pallet conveyor system and prepared for transfer to another T-car. This other T-car travels on the same rail as the T-car to transfer point "6" and distributes the pallets to the manual workstations.

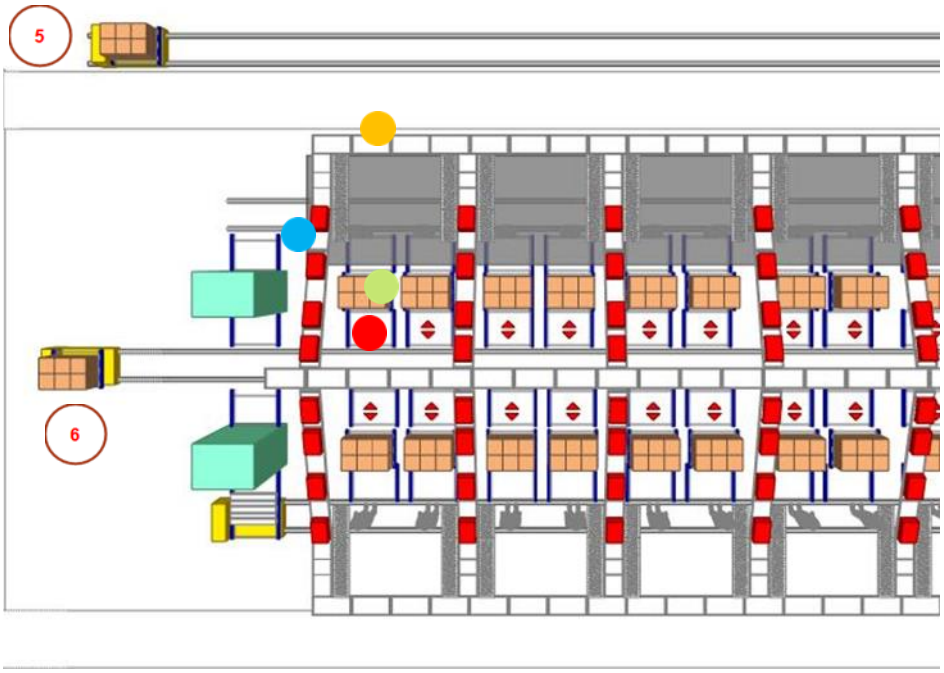


Figure 3-10: Layout manual repacking

In the area of manual repacking, either 40 workstations are available if full repacking is carried out at all workstations without palletising the storage totes at the workstation or 20 workstations are available if full repacking with manual palletising of the storage totes at the workstation or partial repacking (with/without manual palletising of the storage totes at the workstation) is carried out at all workstations.

The function to be performed by the workstation (full or partial repacking) will be defined by the WMS before, with a corresponding message from the WMS to the MFS.

The workstations are supplied with the pallets to be processed by the MFS, taking into account the defined function of the workstation and the capacity utilisation of the respective workstation. Which article is to be processed at which workstation is controlled by the MFS. This requires appropriate labelling when the order data is transferred from the WMS to the MFS as to whether an item is subject to full or partial repacking. Once the pallets have been transferred to a workstation by the T-cars, feedback is

sent from the MFS to the WMS so that the correct dialogue for the correct article can be displayed directly at the workstation on the WMS terminal.

Below is the process description using the example of T-car from transfer point "6" when carrying out a full repacking without manual palletising of the storage totes at the workstation:

- The T-car transports the pallet to the transfer point in front of the workstation (red dot in figure 3-10).
- From the transfer point, the pallet is moved one place forwards and then stands directly in front of the workstation (green dot in figure 3-10); a lifting table is integrated at this workstation, which can move the pallet to an ergonomic working height.
- The employee at the workstation stands on a work platform with a height of approx. 1,000 mm.
- An empty storage tote is made available to the employee via a conveyor section, which is located in the centre of the workstations above the T-car's travel path.
- The employee at the workstation identifies the pallet or the article on the pallet by scanning and receives the instruction for repacking at his terminal (scanner and terminal are directly connected to the WMS and are not part of this tender).
- The employee packs the article quantity from the pallet into several storage totes and links the storage tote with the article by scanning the respective storage tote.
- When a storage tote is full, the employee places it on a conveyor system in the back (orange dot); the storage tote is then fed to the shuttle warehouse in the "picking gallery" or palletised by the robots via this conveyor system.
- The empty pallet produced after repacking is lowered at the workstation and conveyed in the direction of the workstation under the work platform to a buffer area (under the grey area shown in the upper section of figure 3-10).
- A T-car moves underneath the work platform, which removes the empty pallets from the workstations and moves to the right in the illustration, where it transfers them to an automatic stacker for the empty pallets (shown in turquoise in figure 3-10). A stacking machine for the empty pallets is provided for each of the two rows of workstations.

In the event that the resulting storage totes, which are created when the original pallet is completely repacked and which are not required for replenishment of the shuttle warehouse in the "Picking Gallery" area, are to be manually placed on a pallet at the work station, the direct work station next to the work station described above is used to feed the empty pallet, onto which the filled storage totes are then manually palletised. The pallets with the palletised storage totes are then transported via the T-car to the transfer station "6", where they are fed back to the HBW via the various conveyor systems and then stored.

If partial repacking is to be carried out, 2 adjacent workstations are always required. The supply of the pallet from which a partial quantity is to be removed is provided at one workstation. The pallet provided can be an original pallet from the supplier or a pallet with filled storage totes. The required quantity of the article is then removed from the workstation and repacked into storage totes or the required number of storage totes is removed. The pallet with the remaining quantities (original pallet or pallet with filled storage totes) is then removed via the neighbouring workstation, made available to the T-car for takeover and returned to the HBW via transfer point "6". Connection between the workstations is required to

enable this movement. If it is an original pallet with a residual quantity on it, this pallet must first be fed to an automatic wrapping station and then stored in the HBW (see figure 3-9, near point „9“ (marked in blue), or figure 3-8, between point „6“ and point „7“ (marked in blue)).

3.7.2. Handling of errors which might occur in connection with manual repacking

Any errors which might occur from the perspective of the MFS should be handled as follows:

- Pallet with the wrong article in front of the employee at the workplace
    - The WMS dialogue shows the item to the employee and the employee notices that the item in front of him does not match the item specified on the terminal.
    - In this case, the employee enters at the WMS terminal that the article is not the right on. An error message has to be sent from WMS to MFS. The pallet must then be conveyed away from the workstation (reversible conveyor in front of the workstation), taken over by the T-car and then transported to either transfer point "10" (see figure 3-9) and transferred there. In case a transport is mistakenly deleted in the WMS there needs to be a possibility to manually send the pallet to a defined position via MFS (example-handling unit is in the system but has no identification). The pallet is then transported from transfer "10" to the Not-Okay station "11" for processing.

      Note: If the buffer space in front of the processing station is occupied by a pallet and the neighbouring workstation is also activated as a workstation, the front pallet from the T-car's point of view must be removed first and either fed to another free workstation or transported to transfer point "6". There is a small conveyor circuit in front of transfer point "6" so that the pallet can circle once and then be fed back to a workstation via transfer point "6" using the T-car. This is also possible via transfer point "10" if the pallet uses the circuit via the Not-Okay station "11" with return transfer into the material flow.
    - The processed pallets can be returned to the material flow at Not-Okay station. If it is necessary to remove the pallet from the MFS, this can only be done at Not-Okay station "11".
- Pallet with damaged article (cartons or storage totes) in front of the employee at the workplace
    - The employee establishes by visual contact that the packaging or totes on the pallet are damaged or soiled.
    - In this case, the employee enters at the WMS terminal that the packaging or totes are damaged or soiled. An error message has to be sent from WMS to MFS. The pallet must then be conveyed away from the workstation (reversible conveyor in front of the workstation), taken over by the T-car and then transported to transfer point "10" (see figure 3-9) and transferred there.

      Note: If the buffer space in front of the processing station is occupied see remark / note from before.
    - The pallet is then transported from the transfer point "10" to the Not-Okay station "11" (see figure 3-9) and processed there. If it is necessary to remove the pallet from the MFS, this can be done at Not-okay station "11".
- Original pallet or pallet with filled storage totes should be empty after repacking:

- The WMS dialogue shows the employee at the workstation that the repacking process is finished, and the pallet should be empty. The employee realises via a visual contact that the pallet is not empty. In this case, the employee enters at the WMS terminal that the pallet is not empty. An error message has to be sent from WMS to MFS. The pallet must then be conveyed away from the workstation (reversible conveyor in front of the workstation), taken over by the T-car and then transported to either transfer point "6" or transfer point "10" (see figure 3-9) and transferred there. From transfer point “6” to the checking station (see figure 3-8, point “7” and from transfer point “10” to Not-Okay station “11”.

  Note: If the buffer space in front of the processing station is occupied see remark / note from before.

- The pallet is then transported from transfer point "6" to Not-Okay station "7" (see figure 8) for further processing. From transfer point "10", the pallet is transported to Not-Okay "11" (see figure 9) for further processing.

- The processed pallets can be returned to the material flow at both Not-Okay stations. If it is necessary to remove the pallet from the MFS, this can only be done at Not-Okay station "11".

- The quantity on the original pallet or the number of storage totes on the pallet in front of the workstation is not sufficient for the required quantity to be repacked:

  - The employee notices this because the repacking process has not yet been completed according to the WMS specification on the terminal.

  - In this case, the employee enters at the WMS terminal that the pallet is empty. An error message has to be sent from WMS to MFS. The pallet must then be conveyed away from the workstation (reversible conveyor in front of the workstation), taken over by the T-car and then transported to transfer point "10" (see figure 9) and transferred there.

    Note: If the buffer space in front of the processing station is occupied see remark / note from before.

  - From transfer point "10", the pallet is transported to Not-Okay station "11" (see figure 3-9) for further processing and to remove the pallet out of the system.

3.7.3. Automated repacking via robots

The pallets from the HBW are taken over by the T-cars at the transfer points (see figure 3-9, point "5" and point "6").

From transfer point "6", the pallets are taken by the T-car directly to the transfer points for the robots. After transfer point "5", the pallets are transported to transfer point "9" (see figure 3-9), where they are transferred to the pallet conveyor system and prepared for pick-up by another T-car. This other T-car travels on the same rail as the T-car to transfer point "6" and distributes the pallets to the transfer points for the robots.

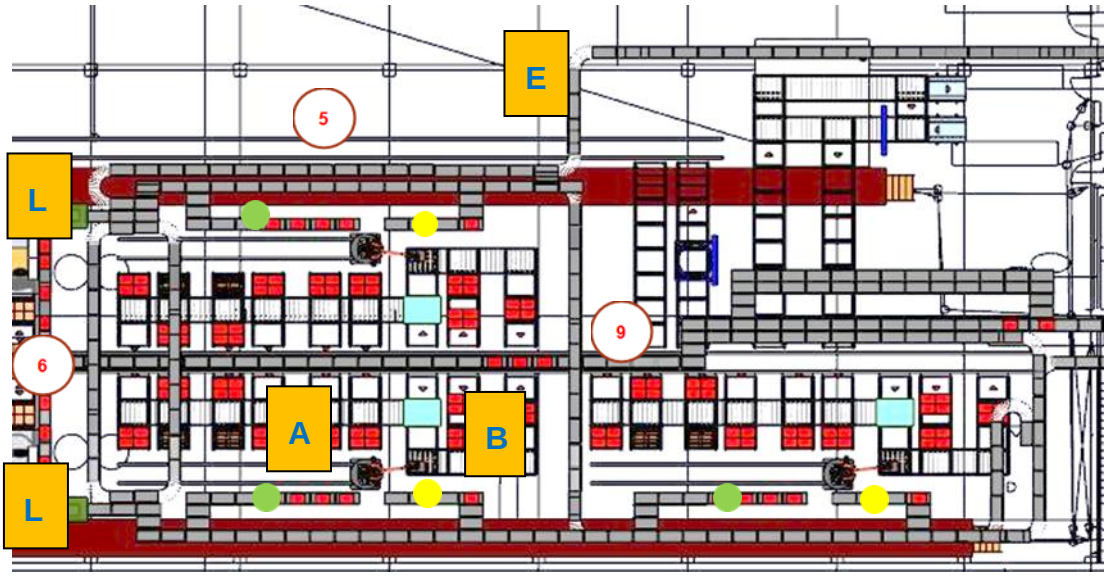


Figure 3-11: Layout automatic palletising with robots

In the area of automatic repacking, 3 robots are planned. These robots are used for the following functions:

- Palletising of filled storage totes from the manual workstations in the repacking area;
- Full repacking of filled storage totes from a pallet, i.e. complete emptying of a pallet;
- Partial repacking of filled storage totes from a pallet, i.e. the pallet is only partially depalletised and then returned to the HBW;
- Palletising of empty storage totes from the "Picking Gallery" area;
- Filling the layers with empty totes if the top layer of filled or empty storage totes is not complete;
- Secure the top layer of pallets with filled or empty storage totes with clips (example see figure 3-12).

The processes for palletising filled storage totes (aea “A” in figure 3-11) are described below using the example of a robot; further information can be found in the descriptions of the robot stations in chapter 4.6.5:

- The palletising of the filled storage totes from the manual workstations in repacking takes place in area "A" (see figure 3-11). Up to 5 different items can be palletised in parallel.
- A buffer place next to the robot's traversing area is provided for setting up a pallet with empty containers for replenishing incomplete layers.
- In preparation for palletising, empty pallets are automatically removed from the automatic stacker for empty pallets (automatic stacker in turquoise in the layout on the right-hand side of area "A" in the layout). These empty pallets are then distributed via the centre pallet conveyor to the left of the automatic stacking machine to the 5 storage locations along the robot's travel path and made available.

- The storage totes to be palletised come from the manual workstations in Repacking. The filled storage totes are transported towards the "Picking Gallery" on the discharge lines behind the workstations. At the points marked "L" in the layout (see figure 3-11), the storage totes are transported to a higher level via a lift. After exiting the lift, the storage totes are either conveyed to the shuttle warehouse in the "Picking Gallery" or discharged in the direction of the robots. It must be ensured that each robot can be approached by both lifts in the outfeed sections from the workstations. The storage totes to be palletised are then provided to the individual robots for palletising on the higher conveyor section marked with a green dot in the layout (see green dot in figure 3-11).
- The WMS logically assigns the empty pallets waiting in the robot station to an article. Before the storage tote is ejected onto the staging line for removal in the robot area, the storage tote is identified and ejected onto the staging line. Before the removal station at the end of the staging line, the storage tote is read again and a palletising order is sent to the robot for this storage tote so that the robot knows which pallet to palletise the picked storage tote on.
- The robot removes the storage tote from the higher conveyor section and places it on one of the 5 pallets provided for palletising. There can be up to 5 different items in the feed section, whose storage tote is then placed on the corresponding pallet by the robot.
- If there are no more storage totes to be palletised, but the last layer on the pallet is not yet filled, the robot removes the corresponding number of empty storage totes from the pallet provided and fills the layer. The robot then places a clip in the centre of the top layer to secure the layer. This clip is removed by the robot from a container provided from a position in the robot cell that has yet to be defined. If empty storage totes are available on the infeed section for palletising, the robot can also remove an empty storage tote from this section to fill the top layer.
- When a pallet is ready, it is transferred from the staging area via the centre pallet conveyor for the empty pallets to be fed to the transfer area for transfer by the T-car. A new empty pallet is then automatically fed from the automatic stacker to the vacated palletising location.
- The T-cars (from the direction of transfer location "6" or transfer location "9") take over the finished pallet and feed it to either transfer location "6" or "5" (see figure 3-9). The T-car for feeding to transfer location "5" can only be reached via the cross connection at transfer location "9". In the event that the pallet with the storage totes still needs to be secured, the option of automatic wrapping (blue in figure 3-11) is provided in the area of the cross-connection between the transfer location "9" and the feed to the T-car for transfer location "5".

The process for palletising empty storage totes runs in the same way as the previous description. The empty storage totes from the "Picking Gallery" arrive in the robot area via the conveyor section labelled "E" in figure 3-11.



Figure 3-12: Example for a clip to secure upper layer of totes

The processes for depalletising filled storage totes are described below using the example of a robot; further information can be found in the descriptions of the robot stations in chapter 4.6.5:

- The depalletising of the filled storage totes coming of pallets from HBW takes place in area "B" (see figure 3-13).
- The pallets with the filled storage totes come from the HBW and are transported via the T-cars from transfer points "5" and "6" (see figure 3-8) to the transfer stations in front of the robots (see green dot in figure 3-13). The pallet is then fed from transfer point "5" via the intermediate step of handing off the pallet at transfer point "9" (see figure 3-13) and short-circuiting the pallet conveyor system and transferring it to the T-car in the centre of the workstations.

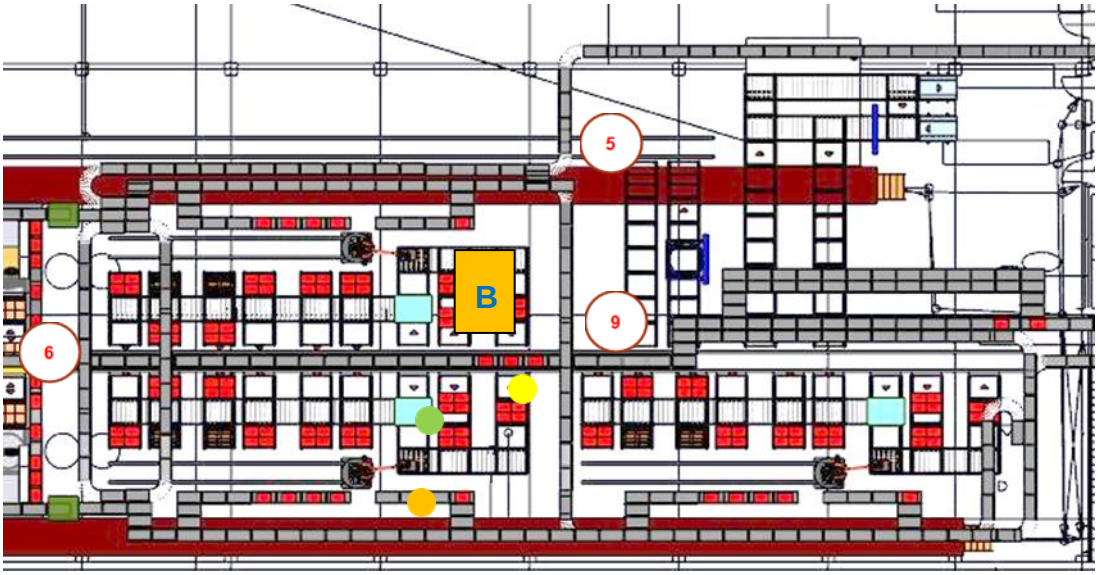


Figure 3-13: Layout automatic depalletising with robots

- The pallet with the storage totes to be depalletised moves forward on the pallet conveyor system after the transfer point and stops in the position in which the robot can access the pallet.

- The robot then removes the number of storage totes to be depalletised and places them on the conveyor system for the storage totes, which is higher up (see figure 3-13, orange dot). The number of storage totes to be depalletised is specified in the WMS with information to the MFS. After depalletising, the storage totes are fed to the shuttle warehouse in the "Picking Gallery" via the conveyor system.
- If the top layer of the storage totes is not filled after removal, the robot removes the missing number from the pallet provided in the buffer and fills the layer and sets the clip. If empty storage totes are available on the infeed section for palletising, the robot can also remove an empty storage tote from this section to fill the top layer.
- When the pallet becomes empty after depalletising, the empty pallet is automatically moved to the automatic stacker for empty pallets, from which the palletising stations are supplied with empty pallets (automatic stacker shown in turquoise in figure 3-13).
- After depalletising, pallets with remaining stock are transported from the depalletising position to the pick-up line for the T-cars (see figure 3-13, yellow dot). This transport also applies to empty pallets if the stacking machine for empty pallets is full.
- From the transfer point, the pallets are picked up via the T-cars and fed back to transfer points "5" and "6" (see figure 3-8); for point "5" via the short circuit between the T-cars at transfer point "9" (see figure 3-13).

3.7.4. Handling of errors which might occur in connection with automatic repacking

Any errors which might occur from the perspective of the MFS should be handled as follows:

- Storage tote with the wrong article in front of the robot during the automatic palletising
    - The robot receives a specification from the MFS, which the MFS has reached from WMS before as to which pallet it should palletise the picked storage tote on. During automatic scanning in front of the robot's picking station, a storage tote that is not planned for this robot is identified (the result of the scanning in the conveyor system is reported to the WMS and the WMS compares the scanned barcode of the storage tote with the planned items for this robot).
    - In this case, a fault message is sent from the WMS to the robot controller via the MFS. The WMS generates a transport order for the storage tote from the robot to the next Not-Okay station.
    - The robot places it on the delivery section for depalletising and then transports it via various conveyor sections to the Not-Okay workstation (see figure 3-14, point "1").

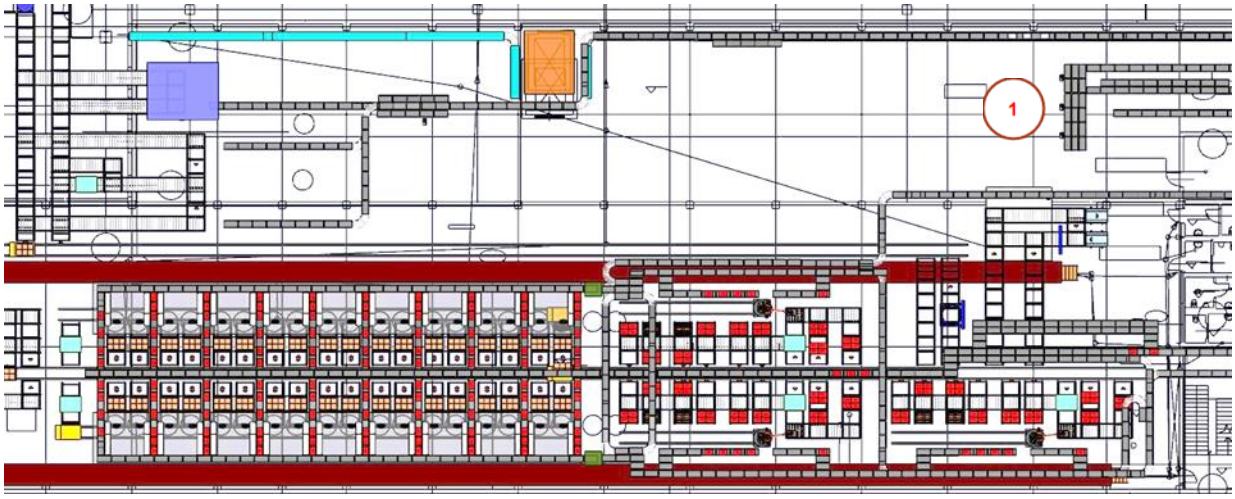


Figure 3-14: Layout Repacking area 1st Floor – Not Okay station for totes

- Pallet with damaged article (cartons or storage totes) in front of the robot
    - The robot uses its camera to detect that the storage tote is damaged or has started to become dirty.
    - In this case, a fault message is sent to the robot controller via the MFS with information to the WMS. An employee is informed of the fault via the MFS and goes on site to inspect the damage or soiling.
    - In consultation with the warehouse control centre, a decision is then made on what to do with the storage tote. If the storage tote is still transportable, the robot places it on the delivery section for depalletising and then transports it via various conveyor sections to the Not-Okay workstation (see figure 3-14, point "1").
- Pallet with filled storage totes should be empty after automatic repacking:
    - The robot uses its camera to identify storage totes on the pallet, even though it should be empty.
    - In this case, a fault message is sent to the robot controller via the MFS with information to the WMS. The WMS generates a transport order for the pallet in question from the depalletising point to the next Not-Okay station.
    - The pallet is then transferred from the depalletising position via the transfer point (yellow in figure 3-13) and the takeover by the T-car to the route to the Not-Okay station and transported to the Not-Okay station (see figure 3-9, point "11").
- The quantity of storage totes on the pallet in front of the robot is not sufficient for the required quantity to be repacked:
    - The robot wants to remove more storage totes from the pallet and realises via its camera that the pallet is empty.

- In this case, a fault message is sent to the robot controller via the MFS with information to the WMS. The WMS generate internally a correction and generates a transport order for the pallet in question from the depalletising point to the stacker for empty pallets in the system.
- The pallet is then transferred from the depalletising position via the transfer point (yellow in figure 3-13) and the takeover by the T-car to the route to the next automated pallet stacker and transported to the automated pallet stacker.
- If the pallet is not empty but should be empty, the WMS generate a transport order to the next Not-Okay station (see figure 3-9, point "11") and the T-car and the pallet conveyor will transport the pallet to the Not-Okay station.

3.8. Picking Gallery

The Picking Gallery area is a combination of the following areas and systems:

- automatic shuttle warehouse for buffering storage totes for the items to be picked, with the aim of enabling replenishment of the picking locations in the shortest possible time and
- 3 picking levels (see figure 3-15, points "1", "2" and "3") with 6 picking aisles per level and 5 picking stations over the length of the picking aisle (in total 90 picking stations).

Picking takes place in the 18 picking aisles, which are organised and structured in the same way. In each picking aisle, the pick locations are mapped on 7 levels (4 levels on one side of the picking aisle and 3 levels on the other side).

On the side with the 3 levels for the picking locations, a conveyor system is provided for the shipping totes, via which the shipping totes are transported to and from the picking stations.

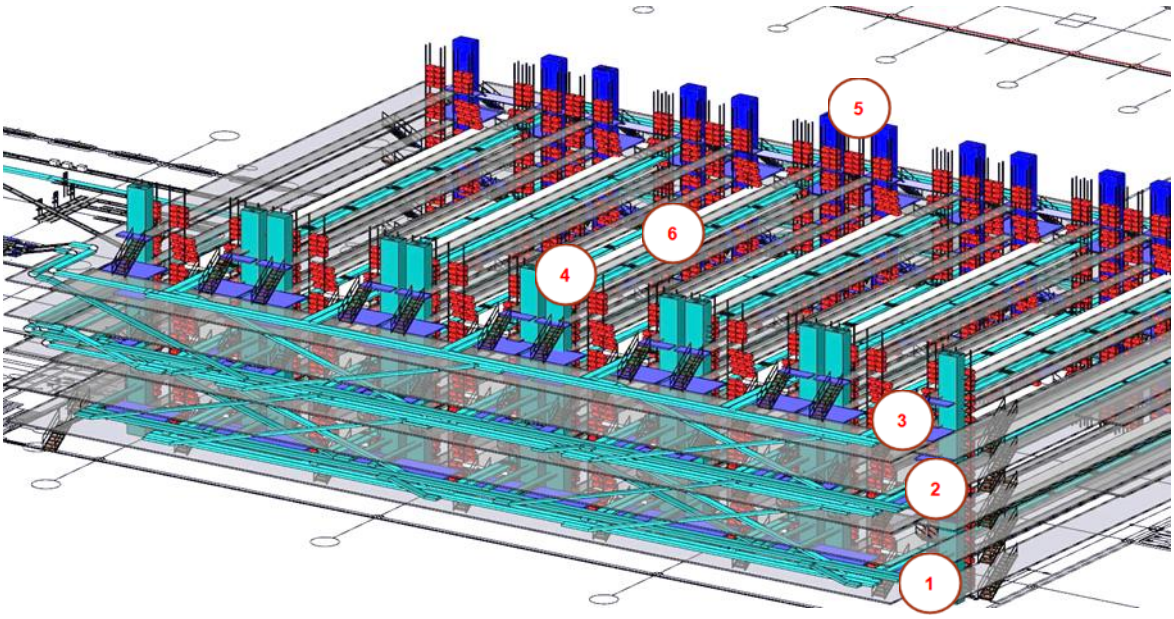


Figure 3-15: Layout Gallery Picking

3.8.1. Connection of shuttle warehouse to Repacking

After manual or automatic repacking, the storage totes are transported from the repacking area to the picking gallery area via a conveyor line. In front of the picking gallery, a conveyor circuit is provided for the storage totes on the western side of the building. The storage totes are fed to the individual aisles of the shuttle warehouse via this conveyor circuit and then fed to the respective level for storage via container lifts (see figure 3-15, point "4").

During transport to the conveyor circuit, the target specification for the aisle of the shuttle warehouse intended for storage is made by the WMS to the MFS; the planned level for storage is then specified by the WMS to the MFS when the totes are fed to the tote lift.

After leaving the container lift at the specified level of the shuttle warehouse, the storage totes are provided for storage by a shuttle vehicle.

The shuttle vehicle picks up the storage tote and stores it in the specified compartment; when the storage tote is delivered to the storage compartment, the MFS sends a storage notification to the WMS.

When storing and specifying the storage location for the storage tote, it must be taken into account that double-deep storage is provided in the shuttle warehouse.

In addition to the conveyor circuit for storing the storage totes in the shuttle warehouse, a further conveyor circuit is provided on another level on the western side of the building in front of the shuttle warehouse, via which the storage totes can be removed from the reserve area of the shuttle warehouse via the shuttle vehicles and the container lifts.

This in order to:

- transport storage totes via the conveyor circuit and various conveyor sections to the Not-Okay workstation and the additional stitch in the repacking area (see figure 3-14, point "1") in the event of faults;
- transporting storage totes from the reserve area of the shuttle warehouse to the workstations in the repacking area, where the storage totes are then placed on a pallet in clean condition and then put back into HBW;
- to enable storage totes to be transferred from one aisle of the shuttle warehouse to another aisle; for this purpose, the conveyor circuit for retrieval must be connected to the conveyor circuit for storage.
- to enable flow of full storage totes to the robot stations (f.e. outside of normal operating hours, or deliberate action).

3.8.2. Special processes in the shuttle warehouse in the Picking Gallery

The following special processes must be taken into account in the shuttle warehouse:

- Replenishment of the picking location in the individual picking aisles and picking levels of the Picking Gallery:

- The MFS receives a stock transfer order from the WMS for a storage tot from the storage bin in the warehouse to a picking location in the same aisle. The shuttle vehicle removes the storage from the storage bin and delivers it to the picking location. For a necessary change between the storage level and the level of the picking location of the aisle, the shuttle vehicles can be moved to the corresponding level of the picking location at the eastern end of the aisle via shuttle lifts (see figure 3-15, point "5").
- The MFS receives a transfer order from the WMS for a storage tote from the storage location in the warehouse to a picking location in another aisle. The storage tote is then removed from the aisle via the shuttle vehicle and a bin lift at the western end of the aisle (see figure 3-15, point "4"), brought to the level of the conveyor circuit for retrieval via the lift and transported to the conveyor circuit for putaway via the conveyor circuit for retrieval and then discharged to the specified aisle and delivered to the specified picking location via a shuttle vehicle.

- - Targeted stock removals and relocations of storage totes from resrve storage location:
  - Storage totes that have to be transferred from the reserve bins in the warehouse from one aisle to the reserve bins in another aisle due to a reorganisation of the picking area are transferred from one aisle to the other aisle as described above via the connection between the conveyor group for removal from storage and the conveyor group for storage of the storage totes.
  - Storage totes that are to be completely retrieved from the shuttle warehouse are picked up by shuttle vehicles in the racking and fed to the conveyor circuit for retrieval on the western side of the picking gallery via the container lifts. These storage totes are then discharged from the retrieval conveyor circuit in front of the picking gallery onto a conveyor section in the direction of repacking and either fed to the work stations in the repacking area on the eastern wall (see figure 3-14, point "1" for removal from the system or to the robots in the repacking area for automatic palletising, with subsequent transport of the pallet to the HBW or to a next removal point (e.g. Not-Okay station in the repacking area).
- Targeted removal or relocation of storage totes from the picking locations:
  - If a storage tote that is to be retrieved or transferred is already in the picking location, it is manually removed from the picking location and placed on the conveyor system for the shipping tote in the area of the picking station at a defined position and then scanned at this position. Once the storage tote has been identified, the MFS receives a transport order for this storage tote from the WMS (possible destinations can be another aisle / another picking level in the picking gallery, another picking location in the same picking aisle in the picking level or a retrieval point such as the workstations in the Not-Okay area in repacking (see figure 3-14, point "1") or the robots in the repacking area.
  - In any case, after being pushed onto the central infeed/outfeed section for the shipping totes in the area of the picking station, the storage tote is transported to the west side of the picking gallery via the conveyor circuits for the shipping totes via corresponding connections between these and the outfeed conveyor circuit for the storage totes and then, depending on the destination, is transported to the west side of the picking gallery

- via the connection between the conveyor circuit for retrieval and the conveyor circuit for putaway of another picking location in the same picking aisle, in another picking level or another aisle; putaway to the other picking location then takes place via the shuttle vehicles in the relevant aisles and picking levels or
- via an outfeed from the conveyor circuit for the retrieval of the storage totes on the western side of the picking gallery onto a discharge line in the direction of the Not-Okay work stations in repacking (see figure 3-14, point "1") or the robots in repacking.

3.8.3. Handling of errors which might occur in connection with storage of storage totes

Any errors which might occur from the perspective of the MFS should be handled as follows:

- Storage tote has contour / weight or barcode errors
  - After repacking and before the conveyor circuit for storing the storage totes in the shuttle warehouse, the contour of the storage totes, the weight of the storage totes and the readability of the barcode or RFID chip must be checked at a suitable point.
  - In the event of errors, this storage tote is then transported via various conveyor lines to the Not-Okay workstation in the repacking area (see figure 3-14, point "1") and further processed there.
- Storage bin is found to be occupied when putting goods into storage:
  - An error message has to be sent via MFS to the WMS; a new storage compartment for the storage tote which needs to be put into storage shall be looked up and the storage tote shall be put into storage in the newly looked up storage compartment in the same aisle or, if not possible, in the nearest aisle.

    If there is no corresponding storage compartment available in the same aisle, the storage tote is delivered to the front of the aisle, to then be removed from the aisle, with subsequent transport via the conveyor circuit for the retrievals and via the connection of this circuit to the storage circuit. When the storage tote is back on the storage circle, this storage tote can be given a new destination in another aisle of the shuttle warehouse by the WMS.
  - The storage tote from the occupied storage location must be removed from the shuttle warehouse and transported via the conveyor circuit for removal and other conveyor sections to the Not-Okay workstation in the repacking area (see figure 3-14, point "1") for further clarification.

3.8.4. Picking in the Picking Gallery

In preparation for picking, the shipping totes are removed from a pallet provided on the 1st Floor, unfolded and placed on the conveyor line; this is done at 2 manual workstations in the repacking area (see figure 3-16, point "1").

After feeding, the shipping totes are automatically checked to see whether they are unfolded and whether the barcodes on both side of the tote are the same and RFID chip is readable.

If errors occur, the shipping tote is transported to a workstation for clarification and inspection and processed there (see figure 3-16, point "2").

If no errors occur, the shipping tote is transported along the upper wall to the picking gallery area.



Figure 3-16: Preparation of shipping totes

The empty shipping totes are assigned to a picking area in the Picking Gallery by the WMS. This destination is communicated to the MFS and the MFS transports the shipping tote by the shortest route to the assigned picking area.

For this purpose, a conveyor circuit for the shipping totes is provided on the western and eastern side of the picking gallery on each picking level before the outfeeds to the picking aisles (see figure 3-15, point "1", "2" and "3", painted in turquoise).

From these conveyor circuits, the shipping totes are discharged onto the conveyor lines for the individual picking aisles and transported to the destination picking station and discharged there.

At the picking station, the shipping tote is scanned and the storage locations for picking in the area of the picking station are then displayed. This display is carried out via a pick-by-light display connected to a display to show the number of items to be picked at the pick location (see figure 3-17).

At the start of the picking station, several buffer spaces are provided in the powered conveyor system before the actual starting point for picking is reached, the number of buffer places has to be defined in the execution planning and under consideration of the results of the simulation.

To start picking, the shipping tote is automatically scanned and is then shown the items to be picked for this shipping tote (once on the central display in the overview and once via the lights of the pick-by-light system).

The employee then pushes the storage tote over a non-driven part of the conveyor system past the picking locations, removes the displayed quantity from the picking location and confirms the removal by pressing a button at the picking location.

When all the items to be picked for a shipping tote have been processed in the picking station, this shipping tote is pushed back onto the central infeed / outfeed line and the processing of the picked items is confirmed on the central display. The employee then takes the next shipping tote to be processed and the process starts again.



Figure 3-17: Principle of picking at picking station

This pick-by-light system, combined with the displays for the quantity display, is to be controlled via the MFS and is part of the scope of delivery and services of this tender.

An additional display must be installed at the start of the picking station, on which all picking positions to be taken from this picking station can be seen after scanning the shipping totes (the requirements from Appendix D2027 - Picking visualization apply). This display must be connected to the MFS.

Up to 2 people must be able to work simultaneously in a picking station, completing one order, i.e. they must be able to work on the same order at the same time. The WMS will split the order in two parts (for each people one part) and the picked positions for one part / on person will be shown with one colour. The pick-by-light system must therefore be equipped with 4 different colours for the visual display of the picking location in order to avoid mixing up the orders or order positions of neighbouring picking stations.

Once the shipping tote has been pushed onto the central infeed/outfeed lane, the MFS receives the next destination for this shipping tote via the WMS. The next destinations can be:

- Another picking station in the same picking aisle or in another picking aisle in the same lane or in another lane. If the destination is outside the current picking aisle in the current picking level, the shipping tote is transported to the conveyor circuit of the current picking level on the western or eastern side of the picking gallery. From this conveyor circuit, the shipping tote is then either discharged into another picking aisle on the same picking level or the shipping tote is transported to another picking level via a connection between the conveyor circuits in front of the picking levels and discharged into the specified picking aisle there. The process described above then begins again at the next picking station approached.
- The shuttle warehouse in the outgoing goods area before shipping in the existing building. In this case, the shipping tote is discharged from the conveyor circuit in front of the individual picking levels on the western side of the Picking Gallery onto the discharge route towards the existing building, with subsequent transport along the northern wall of the Picking Gallery and then along the eastern wall in the repacking area on the 1st Floor, past the HBW pre-zone on the 1st Floor and over the bridge between the new and existing building into the shuttle warehouse in the existing building.

3.8.5. Handling of errors which might occur in connection with picking

Any errors which might occur from the perspective of the MFS should be handled as follows:

- - Shipping tote not in the right picking station
    - If it is determined during scanning at the picking station that the scanned shipping tote is not assigned to this picking station, it is pushed back onto the central infeed and outfeed line for the shipping tote.
    - At the next scanner, the original destination for the shipping tote is confirmed again and the shipping tote is fed to the correct picking station via the conveyor system and its connections.
- Picking location is empty
    - If the picking location is empty/ reserve tote is empty, an error message (expected items inside) is sent to the WMS via the MFS (central display at the picking station) specified scenario is followed (description to be delivered end of July). The shipping tote is processed further and transported to its next destination (the system does not wait until the picking location is full again).
- Wrong article in the picking location
    - If it is determined during picking that an incorrect article is present in the picking location, an error message is sent to the WMS via the MFS (central display at the picking station) and the picking location is logically blocked.
    - The shipping tote is processed further and transported to its next destination (the system does not wait until the picking location for the article is found).
    - When the new picking location has been found or the actual picking location is refilled with the right article, an additional shipping tote is sent to this storage location for removal and the quantity is removed.
    - Consolidation of several shipping totes for a customer takes place in the shuttle warehouse area in the existing building if required.
    - The storage totes with the wrong article must be removed from the picking location, placed on the conveyor line at the picking station and pushed onto the central infeed/outfeed line for the shipping tote The storage totes with the wrong article are then transported via the various conveyor systems to the Not-Okay workstations in the repacking area (see figure 3-14, point "1") for further processing.
- Defect or damaged article in the picking location
    - Same process steps as for wrong articles have to be considered.

3.9. Sequencer in existing building

An automatic sequencer and additional automatic systems are planned in the existing building as a buffer and sequencer for the formation of the units to be loaded.

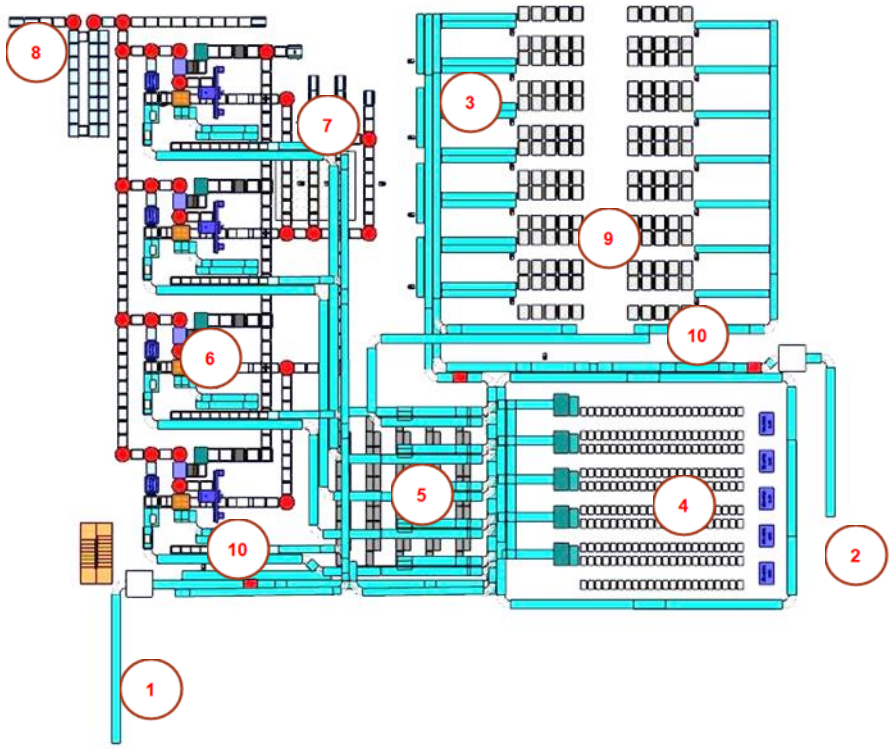


Figure 3-18: Layout existing warehouse Ground Floor

The filled shipping totes for dispatch enter the functional area via several points (see figure 3-18):

- Shipping totes from the new building enter the area via point "1"
- Shipping totes from a picking area on a mezzanine in the existing building enter the area via point "2"
- Further shipping totes from the existing building or as a forwarding from the warehouse in Lodz enter the area via the manual touchdown points or workstations (point "3").

All shipping totes usually go into the automatic sequencer (automatic shuttle warehouse, see point "4") to be buffered there for the compilation of deliveries to the various stores.

In the event that there are shipping totes for a store that are not completely filled, these can be fed either directly or from the sequencer to the manual workstations (see figure 3-18, point "3" for consolidation and then stored again in the sequencer.

The shipping totes to be retrieved for loading the dollies are fed to the 4 automatic dolly stackers (see figure 3-18, point "6") on a customer-specific basis after being retrieved from the sequencer, whereby the shipping totes are sorted by weight (see figure 3-18, point "5"). This weight-related sorting is intended to ensure that the heavy shipping totes are stacked on the lower levels of the dollies.

In the 4 automatic dolly stackers, the shipping totes are stacked on the dollies' roll bases and then covered with a lid. It must be ensured that the top layer of a dolly is always full. For this purpose, empty shipping totes are automatically fed to the automatic dolly stackers via an empty container buffer.

After the automatic formation of the dollies, different types are created with a different number of shipping totes on the dolly (see figure 3-19).

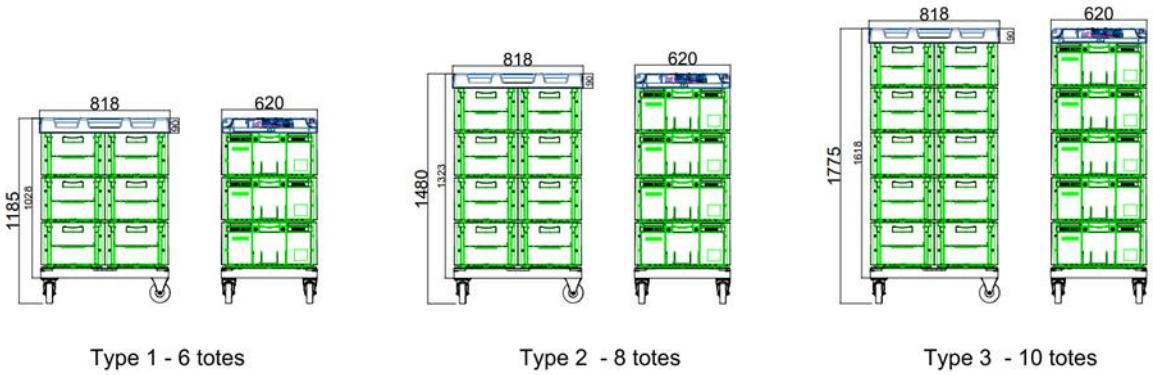


Figure 3-19: Types of dollies

After the shipping totes are automatically palletised onto the dollies' roll bases, the dollies are fed to downstream workstations where they are checked again and reworked if necessary. Once these have been completed, the dollies are transported to the retrieval lanes (see figure 3-18, point "7"). The dollies are automatically labelled on the way there.

Remark: The exact form of labelling (labelling of the dollies on both sides or labelling of each shipping totes) will be sent by the end of July with a subsequent delivery of the documentation for these requirements.

At the end of the retrieval section, the dollies are removed from the conveyor section using an industrial truck and fed to the goods issue area.

The automatic dolly stackers are automatically supplied with stacked roll bases and stacked lids from an automatic buffer (see figure 3-18, point "8").

In the event that the dolly stackers fail, the shipping totes are transported via the conveyor system to the manual palletising area (see figure 3-18, point "9"), where the shipping totes are sorted into several target locations and removed manually at the end of the target location, with subsequent placement in the roll cage for the store.

If faulty shipping totes are detected in the infeed from the other areas (contour errors, weight errors, unreadable barcode or RFID chip), these are fed to a Not-Okay station near the infeed points for further processing (see figure 3-18, point "10").

In the event that the automatic sequencer fails, the following options are provided in this area:

- Alternative 1: The shipping totes are transported past the automatic sequencer into a separate sorting system (see figure 3-18, point “5”) in front of the automatic stacker for the dollies, in which the shipping totes are pre-sorted according to the dolly formation and then transported to the corresponding automatic stacker for the dolly.
- Alternative 2: The shipping totes are transported past the automatic sequencer and fed to an area with 16 conveyor lines for sorting to different customers (see figure 3-18, point “9”). At the end of these sorting lines, the shipping totes are then repacked into customer-specific roll cages.

Further information can be found in the enclosed Blue Print for the WMS and the technical descriptions of the sequencer area under chapter 4.11.

3.10. Special processes

3.10.1. Stock-take

In the event that individual load carriers have to be removed from the storage areas in connection with the inventory in order to count their contents, corresponding removal orders for the pallets are sent to the MFS via the WMS.

The following destinations are possible for the removal of pallets from storage for checking or random sampling for counting as part of the inventory after the pallet has been removed from the HBW or from the existing distribution centre / existing building (max. 10 pallets / hour):

- Checking station for pallets on the 1st Floor (see figure 3-20, point "7" or
- Not-Okay station on the 1st Floor (see figure 3-21, point "11"; at this point, a pallet can be completely removed from the system)
- Removal of empty pallets on the ground floor (see figure 3-22, point "3"; a pallet can be completely removed from the system at this point).

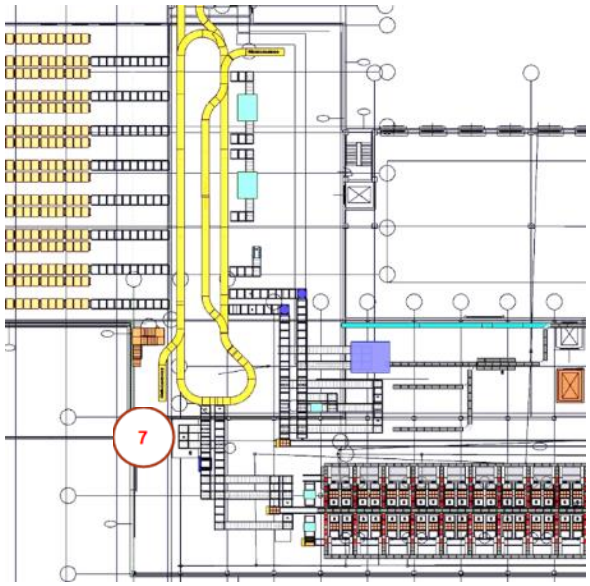


Figure 3-20: Layout Repacking area 1st Floor

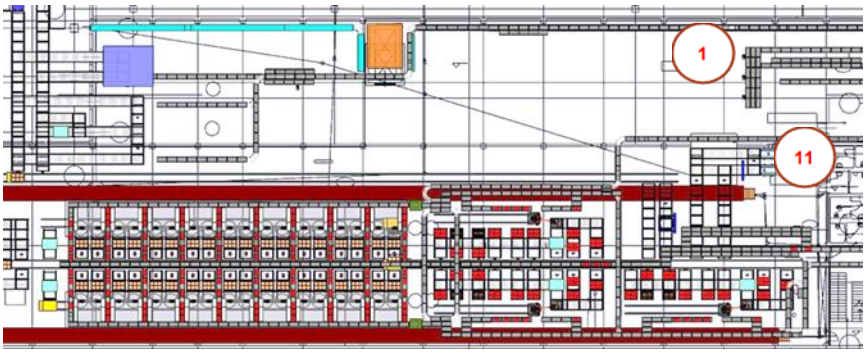


Figure 3-21: Layout Repacking area 1st Floor

The following destinations are possible for the removal of storage and shipping totes from storage for checking or random sampling for counting as part of the inventory after the pallet has been removed from the Picking Gallery (shuttle warehouse or picking location):

- Not-Okay station on the 1st Floor (see figure 3-21, point "1" or
- Not-Okay station on the 1st Floor (see figure 3-21, point "1", on a separate conveyor in this area.

For all transport processes, the relevant workstations must be accessible via different conveyor lines and levels of the conveyor lines (e.g. through appropriate cross-connections between the storage tote and shipping tote conveyor circuits and conveyor lines in the picking gallery).

After the respective counts, the pallets and storage/shipping totes can also be conveyed from the work-stations back to the HBW and the shuttle warehouse in the Picking Gallery as well as back to the Picking Gallery (with a corresponding target set by the WMS to the MFS and a corresponding routing via various conveyor lines and the MFS).

3.10.2. Liquidation

The goods which are to be liquidated shall be retrieved from the warehouse, packed and collected by relevant scrappage company.

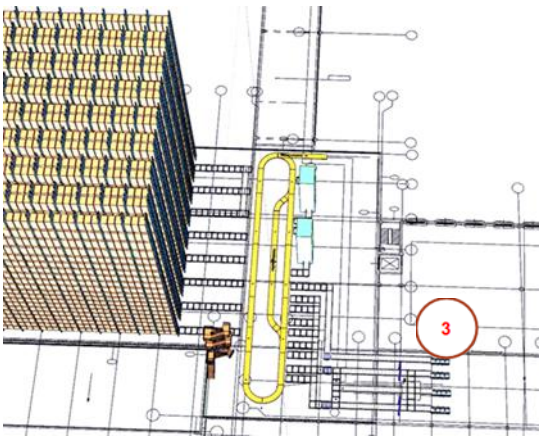


Figure 3-22: Layout Inbound Ground Floor – station for removal of pallets

In this regard, the WMS sends a transport order for a defined pallet / storage location or a defined storage or shipping tote to the MFS.

If the pallet or tote is removed directly from the system, the following destinations are possible, which can be reached via the conveyor lines:

- For the pallets Not-okay station on the 1st Floor (see figure 20, point "11") or removal station on the ground floor (see figure 3-22, point "3")
- For the dead Not-okay station on the 1st Floor (see figure 3-21, point "1").

4. Scope of delivery automated systems

4.1. Introduction

In the following, the scope of delivery and services of material flow technology is described. The framework requirements specified in this chapter as well as the general design requirements apply to all affected subsystems and must be taken into account by the Logistics Contractor when submitting a bid and later planning and execution. Also, the interfaces to the construction / TBE planning and the associated coordination obligations of the contractor must be adhered to and thoroughly controlled. Any resulting doubts need to be raised immediately to Client's attention. The subsystems already outlined in the previous chapters are specified more precisely with regard to their type and design in separate subchapters below. The subchapters on the subsystems are only complete in connection with the generally applicable requirements mentioned in chapters 4.2 to 4.3 and the references to other parts of this tender document mentioned in the relevant sections.

4.2. Framework requirements

4.2.1. Norms and Directives

All relevant norms and directives must be included/taken into account with their current status. The Logistics Contractor shall immediately notify the Client in writing of any intention to introduce any changes that may come into effect after the order has been placed. No changes are to be introduced without prior approval from the Client.

All work equipment and systems must comply with the relevant EU directives (e.g. Directive 2006/42/EC "on machinery", including compliance with relevant standards, in particular EN ISO 12100 "Safety of machinery - General principles for design - Risk assessment and risk reduction"), as well as EN528:2021 + A1:2022 “Rail dependent storage and retrieval equipment and Safety Requirements for Storage and Retrieval machines”.

The Logistics Contractor must prepare a hazard analysis for the material flow system and the workplaces contained therein both for operation and for maintenance and repair and hand it over to the Client. Within the scope of his offer, the Logistics Contractor shall already address particularly relevant points or sections in the material flow system and evaluate the points mentioned.

The Logistics Contractor shall prepare a CE mark as well as CE declaration of conformity for the entire plant (interlinked plant) prior to acceptance and hand it over to the client. The Logistics Contractor shall affix the CE mark for the entire plant to the "machine / plant" as a visible symbol. The declaration of conformity must not only be available for the individual components of the plant but must also cover the entire system and contain all applied norms.

The order is placed under the condition that the details and execution of the tendered scope of delivery and services, i.e. all plant components including the control system, are carried out by the Logistics Contractor correspond to

- the latest version of the recognised rules of technology, documented in EU directives and standards, such as PN, PN ISO, PN EN, PN EN ISO however FEM directives, DIN norms, VDI / VDE directives, etc., insofar as these apply or are recommended for use (drafts)
- the polish and EU regulations, ordinances and guidelines for accident prevention applicable at the time of delivery;
- the workplace guidelines / ordinances;

- the safety and health requirements applicable at the time of delivery;
- the EC Machinery Directive;
- as well as any country-specific regulations of public authorities and institutions similar to public authorities applicable to the scope of supply and services tendered for.

Maintenance areas at the entrances must always be equipped with self-closing doors or other types of limit switches. Access to the areas must only be possible with a special key (key switch), but it must be possible to open them at any time without a key in the escape direction.

An adequate number of warning signs must be provided on protective fences and the access doors to the maintenance areas.

The marking of any parts protruding into the clearance of work and transport areas as well as unavoidable danger spots must be carried out in accordance with the Regulation of the Minister of Labour and Social Policy of September 26, 1997 on general occupational health and safety regulations and PN EN ISO 7010:2020 “Graphic Symbols – Safety Colours and Safety Signs”.Switches and controls must be installed in a protected (concealed and recessed) position. For EMERGENCY STOP pushbuttons, latching pushbuttons must always be used. Details are provided in H&S specification from Rossmann as attachment,

The regulations and guidelines issued by the Client's specialist departments (e.g. plant security, fire protection, environmental protection, occupational safety) as well as project-specific regulations must be adhered to by the Logistics Contractor when designing and installing systems.

The costs for all safety and protective measures shall be included in the prices of the individual items of the investment of the Logistics Contractor. They cannot be charged separately.

The verifiable design drawings (construction drawings of the Logistics Contractor) shall be prepared in accordance with the applicable DIN standards as well as fulfil all the requirements outlined in the attached Architectural Specification and Construction Specification attached to this tender and approved by Metroplan and the Client prior to further use.

The Logistics Contractor undertakes to provide a technology model for coordination purposes. The technology model and its transfer process should meet the following points:

- The model provided for coordination should be at the appropriate coordinates. The starting point of the technology model should be aligned with the starting point of the coordination model. Uploading the technology model to the coordination model should be automatic. In order to ensure correct upload of models and establish a common starting point, the Logistics Contractor undertakes to participate in a coordination meeting. The meeting should take place before technology modeling begins. The meeting date will be proposed by GBPBP and agreed with the supplier
- The level of detail of the technology model should be sufficient to coordinate and detect collisions with other designed industries, it is expected the level of detail will be no less than LOD300. All technology elements crucial for coordination and correct arrangement should be modelled, in particular: shelves, lifts, mobile devices. The rack model should include structural elements such as columns, beams, bracing and platforms. There are no connecting elements such as sheets, screws, welds, etc. The model should ensure correct installation of the installation passing through the racks. The minimum level of detail for the shelf is below

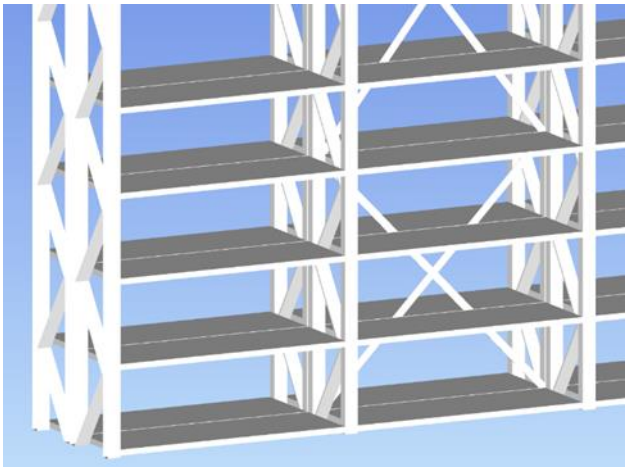


Figure 4-1: Technologie model – minimum level of detail for shelves

- The model of devices, machines, lifts, etc. should be no smaller than the shape occupying the entire operating range of the device and reserving the space of service and communication zones. An example of an acceptable model simplification below:

-

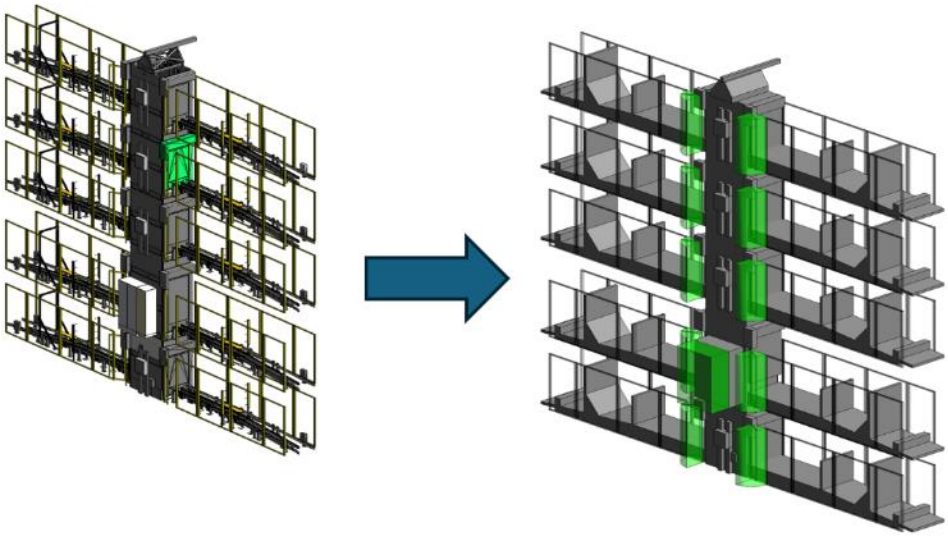


Figure 4-2: Technologie model – minimum level for devices, machines, lifts, etc.

- Technology elements requiring special coordination with other industries should be specified with the necessary details to support the element and connect it with designed installations. Critical places may be symbolically marked, but precisely located. The technology model should include all elements necessary to support the technology elements that are within the design scope of the technology. We are talking about supporting structures and suspensions, both system and designed. Each modeled element should have parameters defining: ID, Element name, Basic dimensions (size).
- The submitted technology model should be sent in IFC 2x3 or IFC 4 format.

- The name of the submitted model will be indicated by the GBPBP office after assigning a project number. The model should always have the same name. It is not allowed to add individual prefixes / suffixes to the file name, e.g. date, file version, program name or author. This rule only applies to holistic coordination models. All additional, auxiliary coordination models can have any names, e.g., suggesting the scope of the uploaded model.
- The technology provider undertakes to indicate the person responsible for the technology model. Comments regarding the model will be returned to this person.
- The current technology model should be made available before planned coordination meetings and after introducing significant changes that require coordination with other industries.

Installation layouts, as well as sectional views, need to be provided in .dwg and .pdf formats.

4.2.2. Operating time

The warehouse is operated as standard 6 days a week (Monday to Friday 3 shifts, Saturday 1 shift, Sunday 1 shift); operation must be possible 24 hours a day 7 days a week at peak times. The warranty requirements must be designed accordingly.

Truck dispatch is standardly done at 6 days a week 24 hours a day, whereby operation must be possible 24 hours a day 7 days a week at peak times. The warranty requirements must be designed accordingly.

If applicable, the system must be designed in such a way that for maintenance and service work requires minimum downtimes and only partial areas must be shut down so normal operation can be maintained. The specific zoning of the installation is to be presented in the design.

4.2.3. Lighting and climate

The main building with the ground and 1st Floor, the automatic shuttle system and the picking areas a is operated at a temperature of at least +18 °C and maximum of 25°C, and humidity between 55 % and 75 %. The HBW must be kept frost-free and dew point-free and maintain a temperature of at least +5°C

All components of the conveyor / storage technology to be supplied, including the control system, must be designed accordingly. In this context, the overall technical system must be agreed between the Logistics Contractor and -Rossmann in the course of execution planning.

Where possible, the workplaces shall be illuminated by daylight, among other things. Possible solar radiation through window areas must not lead to functional impairments of the technology.

The complete lighting will be provided by the Building Contractor, except for the maintenance lighting in the HBW, in the shuttle warehouse in the Picking Gallery and specific maintenance lighting in the shuttle systems. In both automatic systems one light strip per aisle must be provided on the lowest crossbeam or service level. The illuminance must be 200 lux. The general lighting in the functional areas and the lighting in the maintenance areas in the HBW and automated shuttle systems are designed for an illuminance of 300 lux. In addition, the lighting for the workstations described is designed for an illuminance of 500 lux. The general lighting and the lighting at the workstations will be realised by the Building Contractor.

All workplace lighting needs to be compliant with Polish standards PN-EN 12464-1:2022-01

4.2.4. Noise protection

Noise sources are to be avoided as far as possible; a low-noise designed system is to be provided.

Noise protection measures must be state-of-the-art and local legal requirements.

In order to be able to comply with the prescribed limit values for noise emission, necessary measures for noise avoidance or noise reduction must be provided in the design according to the state of the art (e.g. capsules of drives etc.).

The costs resulting from all necessary measures for noise avoidance or noise reduction in the technology must be considered in the offer.

The maximum value of 75 db(A) applies to the noise emission of all conveying systems including material to be conveyed, and the maximum value of 68 db(A) applies without material to be conveyed. The requirements from Health&Safety of the client in the system apply.

In the area of workplaces, the Logistics Contractor must ensure that the noise emission of the system (incl. conveyed material) is in accordance with PN-EN ISO 4871:2012 Acoustic- Declaring and verifying noise emission values of machines and devices and PN- EN ISO 11201:2012 Acoustic – Noise emitted by machines and devices., and is less than 65 dB(A), measured at the "operator ear".

High-frequency sounds, e.g. from frequency converters, should be avoided in workplaces below the threshold of 65dB(A).

Furthermore, the ordinance on the protection of employees against hazards from noise and vibration must be complied with.

The sound measurements are carried out in accordance with DIN 45635-1:1984-04 "Noise measurement on machines; airborne noise emission, enveloping surface method; framework method for 3 accuracy classes" and DIN EN ISO 11202:2010 "Acoustics - Noise radiation from machines and equipment - Determination of emission sound pressure levels at the workplace and at other specified locations using approximate environmental corrections" and the relevant subsequent parts, as well as PN EN ISO 4871:2012 Acoustic – Declaring and verifying noise regulation. .

The noise measurements shall be carried out at the Logistics Contractor's expense in accordance with the generally applicable rules of sound measurement technology in order to demonstrate compliance with the maximum value by the Logistics Contractor. For the measurements, measuring instruments of accuracy class 1 shall be used (operational measurements) with an error limit of +/- 1 dB (A) in accordance with DIN 45645-2:2012-09 Determination of assessment levels from measurements - Part 2: Determination of the assessment level at the workplace for activities below the level range of the hazard to hearing. An appropriate test report shall be submitted by the Logistcs Contractor.

Compliance with the maximum value in accordance with the above-mentioned values and the statutory provisions shall be demonstrated by the contractor without being requested to do so.

The Logistics Contractor shall prove compliance with the limit values without being requested to do so by the Client.

4.2.5. Fire protection

In the automated HBW and in the combined automated shuttle systems with the picking areas, the requirements are in accordance with VdS CEA 4001pl: 2024-01 (08).. Fire hazard is classified according to VdS to HHS4 & K1, K7 (KLT containers, sprays & aerosols). Specific requirements for sprinkler system in HBW and AKL are described in the attached MINIMAX-HRL_and_AKL_reck_req.for.sprinkler_system__ROSP_EN document, as well as concept attached to this specification.

The racking sprinkler system is installed by the Building Contractor. All structural elements and working platforms in the repacking area are also fire rated. For specific requirements please refer to the attached construction specification, as well as information indicated on the architectural layouts.

The required fastening options for the sprinkler pipes and sprinkler heads must be realised by the Logistics Contractor of the racking systems in a suitable manner and in coordination with the Building Contractor and the building technology.

The automated HBW and the automated shuttle systems with the picking areas is executed for fire protection class E based on §212 and §215 of the edict of the minister of infrastructure.

The storage volume is covered by volume of 3,8% of flammable goods (D category), 3,8% of flammable goods in 200 ml packages (perfumes) - W category, and up to 11% of volume as Spray category - S (with nets). Goods in HBW will be distributed equally, without special zones (low level).

S category must be divided by sections of maximum 250m2 zones, divided by steel nets installed inside rack construction (nets are protecting against further distribution of Spray parts after potential explosion).

There are also specific demands for dimensions and distances between top of pallets and sprinkler heads, distances between pallets, spreading of W and D category of goods inside the rack construction.

Spreading of the pallets inside the HB must be controlled by WMS or WCS/MFS system automatically

Demands for fire scenario between interface of the building and automation are described separately in the attached D2027_Fire scenario for Dispatch Warehouse, in attachment to this document.

Furthermore, fire walls also run between the automated systems and the other functional areas. Fire gates which are in the scope of delivery of the Logistics Contractor are indicated in the architectural layouts.

4.2.6. Ergonomics

The human/technology interface must be designed according to ergonomic aspects (e.g. workflow, handling, operability), especially at all workstations. This also applies regarding maintenance and repair. All designs must be compliant with Rossmann Health & Safety Specification, which forms Attachment to this document.

4.2.7. Power Supply

The Building Contractor will provide electrical power to the technological distribution cabinets in the place indicated at the design stage. The length of the connection cable will be increased by 10 m. The Logistics Contractor will connect the technological cabinets in the presence of the Building Contractor.

The possible connection points and their location for the power supply cabinets of the individual automatic logistical systems must be agreed between the Logistics Contractor and the Building Contractor of the construction and building technology.

The insertion, installation and sealing of the secondary lines of the various control cabinet groups from the feed points as well as the sub-distribution within the entire plant area is the scope of services of the Logistics Contractor fro distribution from the cabinet to the technology, and in the scope of Building Contractor where the main supply to the cabinets is concerned.

For the supply of the switch cabinets for logistics systems, decentralised supply points are provided which are made available by the Building Contractor. The exact location shall be coordinated by the

Logistics Contractor with the Client or the construction company within the scope of the bid phase and the execution planning.

The Logistics Contractor is obliged to coordinate power supply executive design with the General Planners (PP) the Client and construction. All planning should take into consideration the D2027 Architectural Guidelines attached to this tender specification.

The Logistics Contractor shall comment on the required power input values in his offer.

4.2.8. Network supply

Decentralised network connection points are provided by the Client for connecting the access automation switches. The exact location must be agreed by the Logistics Contractor with the Client or the construction company carrying out the work during the tender phase and the execution planning. A minimum of 2 network connection points must be assumed for the preparation of the offer. The access automation switches themselves are the responsibility of the Logistcs Contractor. Details of the network structure are specified in the IT Rossmann requirements in he attachement.

Scope of the network as part of automation is in the scope of Logistics Contractor. Client is responsible to connect main network connections outside automation, Details in the diagrams.

The connection of the access automation switches to the network connection points and the sub-distribution within the entire system area is the scope of services of the Logistics Contractor.

The Logistics Contractor must deliver the number and positioning of the required network connection points in the offer and coordinate and detail them during the offer phase and in the implementation planning.

4.2.9. Compressed air supply

It is not planned that any compressed air will be supplied; the drives and other technical elements from the scope of delivery and performance of the Logistics Contractor are preferred to be supplied without compressed air. Should the technical equipment provided by the Logistics Contractor nevertheless require a compressed air supply, this shall be designed and delivered with all necessary equipment and documentation (such as the UDT- Technical Inspection Authority documents) completely within the scope of delivery of the Logistica Contractor. Location of the compressed air plantroom is indicated on the attached architectural layouts.

4.2.10. Colour concept

All metal parts (including auxiliary and supporting structures) must be supplied with corrosion protection, primed and finished with paint, stove enamel, or galvanized. The required category of corrosivity for HBW is classed as C2, for all external structures C3 category is required.

Corrosivity category	Loss µ/year	Examples of environments typical of temperate climate (only for information)	
		Outside	Inside
C1 very small	≤ 0,1		heated buildings with a clean atmosphere, e.g. offices, shops, schools, hotels
C2 small	> 0,1 to 0,7	slightly polluted atmosphere, mainly rural areas	unheated buildings where condensation may occur, e.g. warehouses, sports halls
C3 average	> 0,7 to 2,1	urban and industrial atmospheres, medium pollution with sulfur oxide (IV), coastal areas with low salinity	production rooms with high humidity and some air pollution, e.g. food processing plants, laundries, breweries, dairies
C4 large	> 2,1 to 4,2	industrial and coastal areas with moderate salinity	chemical plants, swimming pools, ship and boat repair yards
C5 extra large	> 4,2 to 8,4	industrial areas with high humidity and aggressive atmosphere	buildings or areas with almost permanent condensation and high pollution
C5-M extra large (maritime)	> 4,2 to 8,4	coastal and offshore areas into the sea with high salinity	buildings or areas with almost permanent condensation and high pollution

Figure 4-3: Required category of corrosivity

The type of execution is to be approved by the Client during the execution planning. The Logistics Contractor is requested to document the execution offered by him in the offer.

The paints shall be free of cadmium and lead. Only RAL or NCS colours and full shades are to be used. The colour selection of the systems and system elements is incumbent on the Client. A colour concept is created and coordinated during the execution planning. All planning is to consider the D2027 Architectural Specification attached to this tender specification.

The costs for the colouring are to be included in the respective offer prices.

4.2.11. Labelling and marking

Parts of the conveyor / operating equipment at which there is an increased risk of accidents are to be permanently marked in black and yellow in accordance with the Technical Rules for Workplaces ASR A1.3 Safety and Health Protection Marking Section 5.2 Safety Markings for Obstacles and Places of Hazard (incl. Information Signs). If unavoidable constrictions occur in the head area, these must be secured with warning and protective profiles made of highly flexible polyurethane foam (temperature-resistant from - 40 °C to + 100 °C, and fire-tested in accordance with DIN 4102 B2).

Warning signs with the inscription "Unauthorized access strictly forbidden" and "Caution: danger of bruising" (in Polish and English language) are to be affixed to the protective fences and access doors of the maintenance areas in accordance with the existing hazard and/or corresponding safety signs. All signage and marking needs to be compliant with “PN-EN ISO 7010:2020 Safety Colors and Safety Signs” regulation. List of required warning signs is to be agreed with the Client and approved before printing and affixing. Logistics Contractor needs to assume this cost in their scope of delivery.

Rossmann warehouses use an individual marking system, which includes additional signs adapted to the processes and technologies employed. The list of symbols used is available in the Annex “Spis znaków”

There are also internally developed signs templates (attachment - Standardyzacja Informacji), the use of which must be agreed upon with the Client.

All system elements must be consistently labelled in drawings, maintenance plans, etc.

The labelling of the individual system elements or parts thereof (e.g. drive, light barriers, switches) must be permanent and not possible to be removed or affected by daily operation, traffic or frequent use.

The system elements and drives must each be labelled with an element number / type plate that corresponds to the number in the documentation for the conveyor technology (drawings, maintenance plans, spare parts lists etc.) and contains a QR code that represents the element name. A second type plate must be permanently and legibly affixed to the installation location of a drive. Precise system of labelling is to be agreed with the Client before installation.

The system elements must always be clearly legible and conveyor elements must be labelled on both sides.

The costs for colouring, lettering, warning and information signs in international or local design and other organisational aids must be included in the respective offer prices. They cannot ~~not~~ be remunerated separately.

Workplaces in the scope of delivery of the Logistics Contractor must be provided with signs.

Traffic routes in the area of the workstations and on the various steel platforms must be clearly labelled.

Signage and lettering must be closely coordinated with the Client and, if necessary, WMS suppliers (e.g. designation, barcode type, barcode design etc.) during execution planning.

Company logos and advertising signs may only be affixed in consultation with the Client / Rossmann and must be in accordance with Rossmann Brand Book (Księga Znaku) which will be made available after contract signing.

All rack lines of the HBW, stacker cranes, the automated shuttle system, repacking system, conveyors, RGV system same as Shuttle, stackers, robots and any other machines which are part of offer must be marked with two-digit numbers on both end-faces; font size at least 800 mm.

In the shuttle system within the Picking Gallery, the shelf rows on all levels must be labelled with two-digit numbers at both ends of the shelf rows; font size at least 800 mm.

Execution and design of the marking must be coordinated with the Client in the course of execution planning and executed in accordance with the Client's requirements (Rossmann Brand Book/Księga Znaku) which will be made available after the contract signing.

In the area of the escape routes, line numbering must also be applied, font size approx. 200 mm.

4.2.12. Accessibility

The Logistics Contractor's scope of supply and services includes an access concept for fault rectification, maintenance and repair of the entire system, which fulfils the following requirements, among others:

- The entire system is to be designed to be "maintenance-friendly", i.e. all storage and conveyor technology elements are to be made accessible to employees in the following manner (descending according to the required employee on-site frequency, to be agreed with the Client). All solutions need to be coordinated accordingly to the attached Guidelines for access stairs and platforms and D2027 Architectural Specification documents, attached to this specification.
    - Platform(s) with stair access (preferred);
    - Step over(s);
    - Platform(s) with access via ladder (only if stairs not possible);
    - Platform(s) with access via mobile ladder incl. fastening devices (only if stairs not possible);
    - Podiums with stair access;
    - Podiums with access via ladder(s) (only if stairs not possible);
    - Podiums with access via mobile ladder(s) incl. fastening devices (only if stairs not possible);
    - Access via mobile ladder incl. fastening devices (only if stairs not possible),
    - Mobile maintenance platforms (working platform);
- In the description of the access concept, a distinction must be made between the following activities:
    - Troubleshooting (especially in the case of critical system components, e.g. due to throughput or non-redundant system components);
    - Maintenance (periodic access required);
    - Repair (necessary access in case of unforeseen failure of plant components);
- In principle, easy access from storage and conveyor systems via platforms is required without additional personal safety equipment. The offer must include elements and positions / areas which for sensible reasons can only be accessed via mobile ladders. These positions / areas must be coordinated with Client / Rossmann;
- Aids for the visual inspection of disturbances must be included, e.g. webcam on stacker cranes,
- The possible introduction and transport of spare parts must be considered in the platform constructions and made possible, e.g. with openable railings, delivery of engines to the cranes, RGV vehicles out and to the system etc.;

- All aids required for the accessibility or insertion of spare parts (e.g. mobile ladders, mobile maintenance platforms, working platforms, safety harnesses, lifting equipment etc.) are included in adequate number in the scope of delivery and performance of the Logistics Contractor and in the offer. Logistics Contractor should also design and deliver additional hoist solution acting as a Fall Protection / Fall Arrest system in order to protect operatives working above the conveyor lines in outbound area of high bay warehouse
- Long-term "overhead work" is to be avoided (longer than has to be defined in execution planning);
- Heavy system components that cannot be transported manually by an employee to the point of delivery must be designed with appropriate supporting delivery options (e.g. hoists / lifts etc.);
- The concept for fault rectification, maintenance and repair shall be described in detail in the offer, approved by the Client in the execution planning and must be the subject of Client approval.

The Logistics Contractor must offer concept for mobile system control for maintenance and fast troubleshooting (e.g. visual access via notebook and WLAN (provided by employees of Client IT), PDA or similar). This must be detailed in the execution planning but without change of the offer price.

4.3. General design requirements

4.3.1. Elevations, suspensions and anchorages

Elevations and suspensions must be designed in such a way that any unevenness in the floor or existing steel structure (e.g. suspensions etc.) can be easily levelled out.

Each elevation or suspension must be fastened to the floor or building structure.

The Logistics Contractor is requested to specify the planned fixings to the building structures in his offer, together with the loads on the building structure caused by the fixings, so that these can be taken into account in the structural analysis of the building. Detailed information must be verified by all parties (Construction, Technology, Client, Planners all other project suppliers if applicable) as part of the execution planning. The planned thickness of concrete slabs in various parts of the building are stipulated in the attached architectural layouts and need to be considered before submitting the offer. All other applicable aspects are also covered in the attached D2027 Architectural Specification and need to be considered in the offer.

The exact design of the elevation and the arrangement of the supports in interaction with the functional areas must be agreed with the Client after the order has been placed and must be approved by the Client.

The fastenings are made by means of dowelling in the floor or screwing to stage or steel constructions (no welding). Protruding threaded rods must be shortened flush with the nut according to correct technical procedures. The uprights must be screwed together at least twice to prevent twisting.

The base construction of all elevations must be designed anti corrosive; magnesite screed is to be avoided in order to remove the risk of interaction with steel.

The position, type and manner of the anchorages and fastenings, particularly for suspensions, must be agreed in advance with the Client and approved.

The anchoring or fastening of the rack systems on the sole plate of the HBW and on the sole plate of the Picking Gallery with the shuttle warehouse and the sequencer must be coordinated according to a time schedule agreed with the Building Contractor and the activity itself will not cause any hinderance to other areas of the project ; this must also be done in order to define any load distribution measures on the part of the Logistics Contractor for the storage, conveyor and control technology. In particular, the following minimum influences must be considered when designing the load-bearing structure:

- Storage and retrieval pre-zone;
- Stored goods;
- Platforms;
- Personnel and equipment on the platforms;
- Storage and materials handling installations (especially stacker cranes);
- Building services installations (e.g. sprinkler systems, aisle lighting).

The Logistics Contractor must describe and document in detail the anchoring of the shelf stands (e.g. anchor boxes, anchor plates, corrugated pipes etc.), the track limiters and the earthing in the base plate selected by him (plan with specified dimensions as a guideline for the construction implementation). All details of planning steps and anticipated lead times must be presented in the offer.

Within the scope of his offer, the Logistics Contractor must show how the anchoring of the rack structure is planned (dowelling, anchor boxes, anchor plates etc.).

For steel structures (shelving, platforms etc.) it is mandatory to reduce the number of anchor boxes to a technically feasible minimum or, ideally, to completely dispense with anchor boxes and use alternative systems (anchor dowels etc.). If the Logistics Contractor cannot work without anchor boxes, the Logistics Contractor must indicate the number of anchor boxes (approximate number) and the approximate position when submitting his offer.

The Logistic Contractor must carefully check the dimensionally correct installation of the shelving systems prior to installation and final fastening of the shelves to the hall floor; this must be done by drawing up a separate levelling report.

The requirements for the floor slab must be agreed with the Client during the tender phase. The Logistics Contractor must document the requirements for the floor slab in detail in its offer and agree them with the Client during the offer phase.

For the design of the floor slab, the following step-by-step coordination procedure must be implemented during the execution planning with regard to the coordination of the contractor-contractor interface:

- The soil expert determines the soil characteristics of the subsoil, in particular the subgrade reaction coefficient.
- The Logistics Contractor provides an initial static and dynamic load estimate from all system elements for HBW, Picking Gallery, Repacking and Sequencer. Preliminary loads must, however, be provided as part of the Bidder Quotation.
- The structural engineer uses these values to design the reinforced concrete base and determine the deformations/deflections that occur.

- The rack statics are created by the contractor taking into account the determined values of the deformations / deflection, i.e. a "skewing" of the rack is to be calculated according to the specifications of the floor slab statics.
- The newly determined loads from the rack statics are used to check the original design of the floor slab.

The Logistics Contractor must liaise closely with the other trades (construction, building services, etc.) during the execution planning.

The execution of the anchoring must be planned and specified in detail by the Logistics Contractor during the execution planning (e.g. by means of a dowelling plan) and coordinated with the Client / the company carrying out the construction work.

Necessary core drillings due to missing or incorrect coordination of the bidder with the construction shall be at the expense of the Logistics Contractor. However, it is imperative to avoid any core drillings.

4.3.2. Platforms and steel construction

All steel structures, stairs, access platforms, railings as well as rack constructions must be designed and anchored in such a way that all occurring forces and moments are safely transferred into the foundations while ensuring the functional and performance safety of the storage operation and that the design of the base plate - in particular its reinforcement - can be carried out economically (e.g. drilling in zones with low reinforcement). Drilling zones must be coordinated with the Client / the general planner Projprzem.

In addition to the norms, directives and guidelines listed so far, the following guidelines in particular must be taken into account for rack construction:

- FEM 10.2.03 Recommendations for the safe provision of stationary steel shelving systems;
- FEM 10.3.01 Pallet racks with adjustable beams, tolerances, deformations, clearances;
- FEM 9.831Calculation basis for high-bay warehouse storage and retrieval machines,
- FEM 9.832 Calculation basis miniload system;
- DIN EN 15512 Fixed steel shelving systems. Adjustable pallet racking basic principles of static design;
- BGR 234 Guidelines for storage facilities and equipment;
- RAL RG 614 Quality assurance for warehouse and operating equipment.
- …. to check if there are any additional standards from the PL law requirements

All designs must be coordinated and compliant with the Guidelines for Access Stairs and Platforms document, see attachment to this specification.

The statics and anchoring of the shelving structures must be designed in such a way that in the event of an impact of the stacker crane under maximum speed and full load in the most unfavourable lifting truck position against the crane buffers, permanent deformations or damage to the steel structure do not occur.

The extent to which loads from building services engineering are to be considered in the design of the shelving systems shall be agreed in good time by the Logistics Contractor with the construction realisation within the framework of the detailed design.

If a static proof for the rack constructions is required, this must be provided by an approved type static or an approved test engineer unsolicited and free of charge 6 weeks after award of the contract.

For the static design of the shelving systems, an angular twist of the base plate of tan α = 8x10^-4 must be assumed. The actual torsion is determined and defined in the course of the dimensioning with the reinforced concrete sole. The additional costs compared to an angular twist of tan α = 4x10^-4 must be stated.

All constructions must be clean, with smooth surfaces, rounded edges, without protruding screw threads and corners as well as deburred.

Protruding edges on falsework should be avoided.

The structures to be supplied include all bracing, auxiliary structures, fastening screws, connecting straps, other small materials, fastening elements for the integration of sprinkler systems, fire alarm systems etc. and insulations against vibrations and structure-borne noise, as well as replacement for material damaged during assembly work etc.

The following requirements apply to other steel structures and are contained in the Health & Safety Specification document, which forms attachment to the specification:

- Supports, struts, traverses etc. must not impede the installation and maintenance of operational elements.
- The vertical stabilizers of the supporting structures must be designed in such a way that they do not interfere with the traffic routes next to or below them.
- Unless otherwise specified in the specifications, standard steel construction profiles are to be used for the steel structures.
- They must comply with the currently valid regulations / guidelines and support the static and dynamic loads occurring in the systems safely and steadily depending on their use or application.
- The preliminary work (planning, construction, cutting) must be carried out in such a way that as little welding work as possible is required during assembly.
- For the welding employees involved in the construction of the steel structures, proof of their corresponding welding skills must be submitted to the Client after the order has been placed / before execution, in accordance with the currently valid regulations / guidelines. The requirement to carry out welding work and the execution itself must be coordinated with the client in good time in advance.
- The constructions to be supplied include all bracings, auxiliary constructions, fastening screws, connecting straps, other small materials and insulations against vibrations and structure-borne noise, etc.
- All platform and walkway edges are provided with a sufficiently high foot bracket to provide protection against the release of tools etc. due to unintentional foot movements.
- For reasons of noise reduction, all floor fastenings and supports must be insulated.
- All platform entrances and walkways must be signposted to indicate their permissible load.

- Free platform constructions which are higher than 0,5 m above the floor must be secured by a 1.10 m high railing in accordance with the currently valid regulations / guideline (requirements see attached document for Health&Safety).
- All stairs, platforms and stepovers must be constructed in accordance with ASR 17/1.2. The exposed side must be provided with a railing and the concealed side with a handrail. Design of stairs must be coordinated with Guidelines for access stairs and platforms, which forms attachment for Health&Safety o this specification.
- The stairs have a tread height between 15 - 19 cm and non-slip steps (26 - 30 cm tread surface) in accordance with BGI 561.
- The individual railing must be able to absorb a horizontal force of at least 500 N/m.
- A suitable handrail is to be provided at the end of the railing, which is designed in such a way that it can be gripped safely.
- The ends of the handrails must be designed in such a way that they cannot get caught or slip.
- The accessible areas of the platform construction must comply with the ASR regulations for escape routes.
- The platform constructions or load-bearing shelf constructions must be verified with verifiable statics as well as the necessary approvals by the Logistics Contractor; the costs for these verifiable statics and the approvals must be integrated into the offer price, they are not paid separately.
- The Logistics Contractor shall provide the static proof for the entire plant as well as for the individual components. The costs for the proof shall be included in the offer price. They shall not be remunerated separately. The static proof shall be handed over to the Client no later than four weeks after release of the execution planning (test statics).

The aisle widths in the rack rows required for operation and the distance between the rack rows within the rack construction (for technical building equipment, in particular rack sprinklers) must be harmonised by the Logistics Contractor, i.e. the contractor must carry out early and detailed coordination with the trades concerned (e.g. fire protection; sprinklers; lighting; construction).

4.3.3. Identification of the system elements

All system elements are to be represented with the marking in drawings, maintenance plans, electric diagrams, visualisation software, PLC software, etc. consistently.

The marking of the individual system elements or parts thereof (e.g. drive, light barriers, switches) must be permanent.

The system elements must each be provided with an element number that corresponds to the number in the documentation for the conveyor technology (drawings, maintenance plans etc.).

All electrical cables must be marked on both sides.

The font size for marking the system elements must be at least 20 mm, that of the individual parts at least 4 mm.

The system elements must be readable clearly and the conveyor elements must be marked on both sides.

4.3.4. System control

The following basic requirements are placed on the material flow control system (MFS) of the conveyor systems and elements (subordinate controls):

- For the control system of the conveyor and storage systems described below, detailed functional specifications must be drawn up in which all illustrated strategies and functions such as level monitoring, bypass and reversal strategies, load distribution strategies, etc. as well as the interface to the higher-level WMS or other integrated IT systems are described in detail.
- The specifications must be coordinated with the WMS and the ERP-system.
- The higher IT hierarchy is leading in the design of the interface, i.e. at the interface WMS <-> MFS adapts e.g. the MFS to the WMS.
- The specifications must be submitted by the contractor and approved by the Client and Metroplan according to the attached time schedule.
- These specifications must describe and specify the performance requirements, the material / information and data flow requirements, the functional descriptions of the various storage and conveying technologies, as well as the interfaces of the storage and conveying technologies between each other and to the next higher control system.
- The overall control system of the respective subsystems shall be structured in such a way that future changes or adaptations are easily possible.
- Comments in the PLC program code (MFS) must be made in English and Polish.
- The data storage for all subsystems must be protected against (even longer-term) power failures. It must be designed in such a way that it can be restarted after a power failure without the involvement of the user and without data loss
- The data storage must be designed in such a way that failures and malfunctions of the main device do not alter or delete the data.
- The data or the program code must be kept backup-capable, i.e. it must be possible to back up and load data using simple means and methods
- The time period for data storage must be defined in the specifications according to the tender requirements.
- Malfunctions or failures due to data storage (e.g. too much data on one medium) must be prevented by suitable measures (e.g. by cyclic or periodic deletion of data) without the involvement of the user. In the case of cyclical or periodic deletion, only data that is no longer required is to be deleted. The measures are to be coordinated in the requirement specification phase but solution must be quoted in the offer as fixed price.
- The creation of the new system must be documented and coordinated with the client according to the functions / processes.
- On computer systems that allow manual entries, a password protection must be installed as protection against entries by unauthorized users. Passwords must be easily changeable by an authorized user (minimum 3 characters in password length and no limitation in maximum password length or permitted characters). They are user-specific and non-printable.
- System has to automatic logout after time of inactive user (time should be definable).

- Inputs / scan functions or data transferred from the lower-level controller to the higher-level controller must be checked for errors and plausibility. If faulty or implausible data are transmitted, error reactions (e.g. error texts) which are easily recognisable and readable for the user must be carried out.
- Faulty data must not lead to faulty reactions; these data must be logged.
- System or program errors when creating, changing or cancelling data records must not lead to data inconsistency (transaction backup or programmed undoing of all data changes).
- Error situations (malfunctions / failures) are reported to the user by error messages or error signals. Error messages/signals must be designed in such a way that the user must/can acknowledge them; at the same time, they are permanently stored for information (stored, fault list etc.).
- The visualisation of the error messages is defined in the specifications for the material flow control system in connection with the error analysis system of the MFS. Errors are to be displayed collectively in this regard but to be documented individually in a query-able form. The error messages for the PLC / material flow control are always sent to the assigned control cabinet or to the operating points on site (manual on-site boxes) or mobile operating units as well as to the central system visualisation. Error messages must be interpretable, understandable and in Polish and English. Referenceable error messages (e.g. error numbers) are not sufficient.
- In addition, at strategically important points of the conveyor systems, manual on-site boxes or plug-in connection options for mobile terminals or tablets must be provided for fault rectification as well as for maintenance and repair. At strategically less important points of the conveyor systems the operation via mobile terminals (wired) is to be made possible, manual on-site boxes are not to be provided there. The manual on-site boxes must be equipped with a key switch. The manual on-site boxes are equipped with the appropriate visualisation for the area to be operated from the console. The manual on-site box also contains the emergency stop button required for the plant section.
- All control consoles must be equipped with corresponding overview plans of the associated control area. Numbering and labels must correspond to the layout and signage.
- The Logistics Contractor shall describe the maintenance and repair concept proposed by him in detail in the offer.
- It must be ensured that fault rectification and maintenance of the conveyor system is possible without having to shut down adjacent plant components.
- The system sensors must function independently of artificial and natural light incidence. If system sensor components are exposed to daylight, for example, they must be protected accordingly.
- If laser sensors are used in the system, all laser sensors must be clearly marked as “hazardous for eyes”. Specific requirements are listed int he Health & Safety file in the attachment.
- Faults in the conveyor system are to be indicated after entering a password via the visualisation and on site.
- Faults on special machines (e.g. stacker cranes) as well as emergency stop faults must be confirmed on site.

- All emergency-stop elements (buttons, protective elements, light barrier, etc.) must be clearly identifiable in the visualisation system.
- Within the controls of the subsystems, self-test functions of the individual components must be provided, e.g. status of stacker cranes, occupied - detectors of the conveyor technology, scanners, light barriers etc.
- System maintenance and system service must also be possible during ongoing operation.
- Background programs of the transport control / administration of the respective subsystems must have secured start / intermediate and final states to be able to resume the state before the failure in the event of a failure.

The Logistics Contractor must ensure the transfer of the data for archiving, so that the operator is able to maintain the system (e.g. program listing, database / table structures, user/administrator manual, dialog descriptions etc.).

If the Logistics Contractor is unable to offer these technologies for technical reasons or reasons for which he is responsible, a plausible reason may also be given for the use of technology that has proven its performance capability through appropriate references.

The Logistics Contractor guarantees that he only uses proven products, preferably from well-known European manufacturers. A large number of identical parts and a concentration on a few suppliers is planned in order to keep the later maintenance and repair costs to a minimum. In principle, the Client prefers the use of decentralised technology, i.e. the use of Profinet and the use of decentralised control systems and frequency converters, etc.

Essential design features:

- The PLC hardware to be used corresponds to the state of the art and is designed as an industrial standard according to the Siemens or Rockwell catalogue (similar supplier accepted by the client). If software outside the basic Siemens or Rockwell catalogue is used, the corresponding software has to be included in the scope of delivery.
- RAM memories are buffered with accumulators. The buffer time is at least 2 years. Li-batteries are used as accumulators. The state of charge is monitored.
- Spare (not used) slots in the sub-rack are provided (20 %).
- Spare (not used) inputs/outputs in the sub-rack are provided (5%).
- The modules are easily exchangeable by means of plug connections.
- If necessary, individual input/output signals of the control logic are implemented potential-free.
- The control units have connection options and system programs for the connection of service and diagnostic units (programming unit - PU).
- At least one programming device must be included in the scope of supply and services.
- The controller is designed so that it can be checked, maintained, configured and, depending on the technical possibilities, reasonably repaired via remote maintenance by the controller supplier and the PLC.

Essential design features for the PLC software:

- The PLC software includes all programs required to achieve the performance and functions.

- The programs are created according to the rules of structured programming, i.e. the overall program is divided into individual, self-contained program sections (blocks).
- The following specifications are associated with the structuring:
    - Simple and clear programming;
    - Standardisation of program parts;
    - Simple program organisation;
    - Simple change option;
    - Simple program test;
    - After completion of installation there are no more test functions in the program
    - One I/O mapping table (module I/O address - data markers with symbolic names) must be defined. Inside, only symbolic names can be used in the PLC program.

All circuit diagrams, circuits, components etc. developed and implemented within the framework of the control system are made available to the client in digital (file) and paper form in a final documentation including proof of supplier before acceptance, so that their completeness can be checked.

The following additional requirements are fulfilled for the PLC:

- Cross-reference lists;
- Symbol lists and comments for all Inputs / Outputs, flags, data and program blocks;
- Description of the network;
- Annotated, executable programmes;
- All relevant manuals.

In addition, there is a documentation of all created programs (source codes) and the tools used for it digitally (file) and in paper form. The source codes are not required in paper.

Source code must be delivered in copy or at least guaranteed access to the source code in case if MHE contractor will not be able to provide SLA for the installation (Hotline, software service not available due to contract end or unavailability of the supplier

4.3.5. Electrical installations and control cabinets

Electrical equipment must comply with the latest regulations applicable at the time for mechanical systems, especially DIN EN 60204-1 (VDE 0113-1) and DGUV regulation 3, as well as all the requirements outlines in the Construction Specification attachment. The applicable EU EMC and low-voltage directives must also be complied with. It must be supplied in accordance with the latest regulations and ordinances.

The following must be observed by the Logistics Contractor in his planning and execution:

- The design and construction of the electrical equipment must be designed in such a way that it complies with the regulations of all authorities entitled to issue directives and with the relevant electrotechnical regulations, ordinances and directives - in each case in the latest valid version.
- Cable trays must be provided as a steel trays.

- Insofar as cabling is routed through fire walls, all fire protection requirements (e.g. design of cables, seals, etc.) shall be observed by the logistic contractor.
- The pushbuttons are coloured in accordance with ”PN-EN 61310-1 Safety of Machinery – Indication, marking and actuation – Part 1: Requirements for visual, acoustic and tactile standards” norm. All switches, pushbuttons and displays are labelled with functional information for operation (font height min. 5 mm). All switches, pushbuttons, displays etc. are labelled with function data for operation (engraved, font height min. 5 mm) and are designed in accordance with the technical and operational requirements of the Client.
- The switch cabinets of the storage / conveyor / control technology are set up decentral near the relevant conveyor technology section or area.

The final location of the stationary control cabinets is to be determined within the framework of the execution planning with the General Planner and the Client.

- Conveyor system areas, over which a function is carried out in normal operation, should, if reasonable and feasible, not be connected in the same control cabinet to which the conveyor system areas, over which the function may be carried out in an emergency (in the event of failure of the control system). Emergency and redundancy functions must be considered here.
- The scope of the control system order includes the delivery and installation of all controller boards, switching elements, protective elements, etc. required for the faultless operation of the system and their integration into the control system of the system, including cabling up to the control cabinet and the control station.
- Both the cable feed into the control cabinets and their discharge should always be from below.
- The control cabinets must be equipped with lighting and sufficiently fused sockets.
- The control cabinets must only be equipped with heat exchangers / air conditioners if necessary.
- Each control cabinet must be marked on the door in a generally understandable manner with regard to its contents and its assignment in accordance with the control cabinet documentation.
- The assignment of the control cabinets must be carried out in such a way that there is a free capacity of approx. 30% for all expandable functions within the control cabinet.
- The cabling of the individual control cabinets to the relevant systems or system parts for the higher-level control / fault visualisation of the MFS, including the laying of the cable ducts, the wall breakthroughs and any necessary fire protection bulkheading, is included in the scope of delivery of the Logistics Contractor. Each connection in the control cabinet must be individually numbered in accordance with VDI and Polish regulations.
- No plastic armoured conduit or steel armoured conduit is used for laying cables. If the cabling is not otherwise possible, this must be agreed in advance and accepted with the Client.
- The control cabinets must be equipped with a storage device for documents / notebooks integrated in the door.
- The control cabinets with PLC and I/O modules must be equipped with 240 V AC electrical sockets (EU-PL standard) to plugin programming device.
- All electrical equipment and its installation location must be marked with permanently readable labels. The designations must correspond to the circuit diagrams.

- All parts installed in control cabinets and their installation locations must be marked with permanently readable labels. The designations must correspond to the circuit diagrams.
- The devices installed in the control cabinet doors are additionally marked from the outside with engraved inscription labels indicating the respective function. These labels must be permanently readable.
- To ensure interference-free operation, the guidelines of the individual device manufacturers for interference-free installation, such as EMC-compliant installation and measures against interference voltages, must be observed when setting up the overall system.
- If frequency inverters or other high-frequency voltage devices are used for regulation and control tasks, the contractor shall provide written proof of EMC and usability in the environment of local radio networks and computer environments for all components used. These certificates shall be submitted at the time of acceptance.
- After electrical installation, at the latest at the time of acceptance, measurement protocols of the network bus systems installed by the supplier must be submitted.
- The scope of supply and services of the conveyor systems also includes all control cabinets, cabling and aids for cabling, all necessary battery buffers for data loss-free storage of the material flow image including control, even in the event of long-term (>72 hours) power failure. In particular, it must be ensured that, in interaction with the higher-level IT systems and associated data backup systems after a power failure or after an orderly shutdown of the system, the system automatically restarts its operation on the material flow image that was present before the system was switched off / voltage failure at any time when the system is switched back on.

The Logistics Contractor guarantees that he only uses proven products, preferably from well-known European manufacturers. A list of equipment/materials is submitted with the offer. In its award decision, the Client attaches importance to the fact that the Logistics Contractor provides for the largest possible number of identical parts and a concentration on a few suppliers in order to keep subsequent maintenance and repair costs to a minimum.

A standardisation of all components of e.g.

- Control cabinets;
- Subdivisions;
- Grids;
- Protection regulations etc.

are intended.

The following minimum degrees of protection are required:

- Regulated three-phase current IP 54;
- Servomotors IP 54;
- Geared motors IP 54;
- Terminal boxes IP 66 at HBW (sprinkler area) and other areas IP 65;
- Light barriers IP 65;

- Control cabinets IP 56 at HBW (sprinkler area) and other areas IP 54;
- Control panels IP 56 at HBW (sprinkler area) and other areas IP 54;
- Actual value encoder IP 65;
- Mechanical and switches IP 65.

Prior to commissioning, the client shall receive confirmation that all electrical systems and equipment are in accordance with the provisions of accident insurances.

After completion of the plant, an acceptance protocol will be submitted confirming that the electrical installations comply with the currently applicable regulations. The effectiveness of the protective measures used, except the above-mentioned types of protection, is verified.

4.3.6. Energy efficiency

4.3.6.1. General

The requirements listed below are to be considered in addition to the basic technical requirements of this document.

If applicable, the Client intends to commission the system with the highest possible and most economical energy efficiency using an energy management system (EMS). The Client aims to realise sensible energy saving potentials and to use synergies within the plant as well as at the interfaces.

The Logistics Contractor is therefore requested to point out potentials identified and not recognized / used in its implementation planning and to propose suitable measures.

The Logistics Contractor is requested to present the planning steps in the design of the system (implementation planning) to the client in a transparent manner. The Logistics Contractor must avoid linking safety margins within the planning chain, e.g. in the design of drives with the associated possible oversizing of drives. It must be possible for the Logistics Contractor to show safety margins and for the Client to clearly understand them.

The efficiency of the components used, such as drives (motor + gearbox), compressors, IT in the intended operating configuration, must be specified by the Logistics Contractor.

4.3.6.2. Components

The elements and components of the system must be precisely defined during the implementation planning and specified in the layout. The planned drive architecture of the conveyor technology must be presented to the Client and agreed with him.

The optimum combination of drive trains in the resulting operating modes must be selected. Kinetic energy recovery system is a must; all other possible systems enabling energy saving, operational optimisation and similar is to be presented as an option

4.3.6.3. Mechanics

The following energy efficiency requirements are placed on the system components:

- Dynamic conveyor technology components should correspond to an optimised lightweight design in order to reduce moving masses.

- Frictional resistance, e.g. in bearings and on sliding surfaces, must be minimised by selecting materials and configurations that meet the requirements (e.g. low-wear plastics, optimised lubricants, optimised ball bearings, optimised belt tension).
- Gearboxes and gear ratios must be used with the highest possible efficiency in accordance with the performance requirements; worm gears should be avoided due to their poor efficiency.

4.3.6.4. Electrics

The following energy efficiency requirements are placed on the system components:

- Precise dimensioning of the drives (e.g. speed control, rated load, operating range, gear ratio), i.e. optimum matching and design of motor and gearbox to the requirements.
- General use of energy-saving motors in accordance with the IEC 60034-30 classification; use of energy-saving motors of at least class IE2.
- Compliance with the legally required minimum efficiency levels IE3 for outputs from 7.5 kW to 375 kW or as an alternative IE2 motor plus frequency inverter.
- Use of frequency-controlled drives.
- Inverter design
- Application-oriented parameterisation of the inverters.
- Use of DC link couplings if possible.
- Installation of energy feedback from system components (stacker cranes, lifters with lifting height > 1.5 m, etc.)

4.3.6.5. Automation- IT

Automation IT components in the scope of delivery and services of the Contractor shall fulfil the following requirements:

- Use of "hot-running components", if possible, i.e. components that can be operated at elevated ambient temperatures to reduce the requirement for air conditioning. The service life of the components must not be impaired!
- Use of an uninterruptible power supply with high efficiency.
- Use of energy-efficient automation IT components, especially power supply units.
- Standby circuits for temporarily used peripherals (e.g. monitors, backup systems).

4.3.6.6. Energy management

The client requires tools to increase the energy efficiency of the plant in a continuous improvement process.

The basis for this should be a high level of transparency of energy consumption within and at the interfaces of the system.

Supplementary logging of the associated movement data (e.g. stacker crane movements) over time should allow control variables for increasing energy efficiency.

4.3.6.7. Transparency

4.3.6.7.1. Energy data

In agreement with the Client, the system must be divided into logical sections for which exact consumption point recording is carried out by means of energy measurement. Specifically, this means the use of energy meters at defined points, which in total must reflect the total consumption of the system (within the scope of delivery and performance). The energy consumption is measured directly at the point of consumption (e.g. at the control cabinet) and is to be integrated into the network via Ethernet or Modbus RTU/TCP in order to be called up.

The Client reserves the right to introduce a comprehensive EMS system in the future. The energy recording systems must be prepared for integration accordingly so that a connection to the future EMS is possible without restrictions. All associated costs need to be considered in the offer.

Peak loads of the consumption points must be recorded and output by the EMS in a simultaneity factor.

Recorded data must be archived in agreement with the Client and presented in a history in order to document changes.

4.3.6.7.2. Transaction data

In addition to the recording of energy data, the corresponding recording of movement data is required, e.g.

- Recording the switching cycles and travel distances of stacker cranes.
- Recording the conveyor speeds.
- Recording the number of conveyor starts and stops.
- Recording the operating hours of the system components.

The MFS must keep appropriate statistics for analysing the movements and make them available to the client for evaluation. Appropriate export functions must be agreed with the Client for this purpose.

4.3.6.8. Regulation

4.3.6.8.1. Realisation of energy-saving circuits

The MFS enables the automatic shutdown of defined system sections if certain adjustable requirements are met, e.g. shutdown of conveyor sections after a certain idle phase, shutdown of unused packing stations and associated conveyor technology. Within the system layout, system sections must be defined that can be switched off manually and/or automatically by the user.

4.3.6.8.2. Reduction of peak loads

Peak loads can be recognised by the MFS and reduced by the user through control measures, e.g. by setting delayed start-ups and connection sequences. The aim is to minimise the supply price of the Client's electricity supplier.

4.3.7. Synergies

The Logistics Contractor is requested to identify synergies within the system and to utilise them in coordination with the Client.

4.3.8. Grounding

The complete rack constructions as well as conveyor technology constructions are to be provided with a grounding in compliance with the relevant regulations (in detail the PL and VDE regulations). The Logistics Contractor shall describe the grounding design and document it in detail. Protruding grounding lugs shall be shortened in accordance with the requirements. The provision and realisation of the earthing lugs is carried out by the general contractor for the construction in coordination with the Logistics Contractor.

4.3.9. Conveyor system closures

All components of the conveyor system closures must comply with the relevant regulations, standards and provisions (EN norms, VDI, DIN, UVV, VBG, VDE, VDS, regulations and requirements of the employers' liability insurance association and the trade supervisory authority).

The dimensions of the conveyor system closures must be matched to the dimensions of the wall openings. The dimensions of the wall apertures are defined by the height and width of the conveying element including the material to be conveyed and the safety distances.

The specification of the wall openings and the installation of the conveyor system closures shall be agreed between the Logistics Contractor and the Client in good time.

The control of the conveyor system closures (or the system control of the conveyor technology) must ensure the following:

- To ensure the passage of the material to be conveyed through the wall opening, the conveyor system must be controlled in a safety section, the length of which depends on the length of the material to be conveyed, in such a way that the subsequent material to be conveyed cannot reach the safety section until the previous material to be conveyed has left it.
- It must be ensured that the conveyor system in the area of the conveyor system closures is not occupied for a longer period of time or that the conveyor system is automatically released before the conveyor system closures are closed.
- The conveyor system closures are closed after the conveyor sections have been completely cleared or after a specified reaction time.
- The restart of the conveyor section is prevented as long as the respective conveyor system closures is closed.
- The status ("open", "triggered", "closed" or similar) is reported to the control of the affected system control and the WMS.
- The closing of the conveyor system closures can be triggered both by the smoke detectors to be installed as well as by the fire alarm system on the building side.
- The closing and opening of the fire gates can be triggered by the operator by pressing a button or similar from the Logistics Contractor control station (e.g. start of service, end of service).
- The conveyor system terminations are to be integrated into a closed-hours circuit, i.e. closing of the conveyor system terminations at the end of the day and feedback of the closure via the Logistics Contractor's control technology (signal from / to control technology). The relevant conveyor sections for clearing the conveyor system closures areas must be integrated into the conveyor system closures' power supply (emergency power or battery buffer).

- Measures shall be provided to permit safe maintenance and cleaning work in the area of the conveyor system closures.
- Electric motor drives must be provided which enable the conveyor system closures to be opened and closed. It must also be possible to open the conveyor system closures manually (e.g. hand-wheel).

The Logistics Contractor must ensure that the conveyor system closures are fully functional even if the normal power supply fails. All necessary measures must be taken by the Logistics Contractor.

Only approved conveyor system closures are to be used. The Logistics Contractor must provide the Client with valid approval notices required according to Polish regulations outlined in the attached Construction Specification and containing all required certification and acceptance in accordance with local law, as well as the German Institute for Construction Technology (DIBt), if the conveyor system closures is situated in a fire wall. Type and proposed manufacturer of the closures need to be presented in the Logistic Contractor's offer.

The costs for the acceptance test shall be included by the Logistics Contractor in his offer. The acceptance report shall be handed over to the Client for the construction file.

All wall openings of the media lines and the conveyor technology shall be submitted by the Logistics Contractor to the construction at an early stage by means of a break-through plan.

The closing of wall openings in fire walls is the scope of the Logistics Contractor's order.

The wall openings shall be manufactured by the Building Contractor in accordance with the Logistics Contractor's specifications.

For the necessary conveyor system closures or passages between the HBW and the main building, the Logistics Contractor shall take suitable measures (e.g. high-speed doors) to ensure the avoidance of draughts and heat loss.

4.3.10. Ramming protection

By using a suitable collision protection, all components at risk of collision such as steel structures etc. in all shelving and handling areas in which industrial trucks operate are protected against possible collisions. This protection lies within the scope of delivery and performance of the Logistics Contractor.

The expected starting forces (caused by industrial trucks) must be considered in the design of the collision protection. The Logistics Contractor is requested to document the design and arrangement of the collision protection offered by him when submitting his offer.

The design of the collision protection (type, scope and anchoring) must be agreed with the Building Contractor, the general planner and the Client in good time as part of the execution planning.

4.3.11. Safety and service equipment

The automatic storage areas shall be equipped with safety and service facilities by the Logistics Contractor.

For all conveying technology elements as well as the workstations at the HMI interface (maintenance workstation, workplaces, feeding and pick-up stations in conveyor technology, etc.), the offer / corresponding layout must show the required protective equipment, e.g. housing, in a recognisable manner. The necessity of the protective measures results from the risk assessment according to EN ISO 12100.

In principle, non-contact protective devices should be avoided wherever possible due to the high testing effort and space requirements (safety distances). Design measures such as monitored minimum speed, step mats etc. should be preferred.

All barriers must comply with the relevant accident prevention regulations and the guidelines for equipment and systems for storagce and retrieval PN-EN ISO 13857:2020 Safety od Machinery; they must not fall below a minimum height of 2,200 mm; the Health&Safety regulation in the appendix are to be considered. To prevent unauthorised access to the rack aisles and the associated risk of accidents, the danger areas must be secured by barriers with electrically secured access / escape doors. When designing all lattice walls, it must be ensured that it is not possible to reach through. A minimum distance between the end limiters of the stacker cranes and the escape / access doors to the aisles must be provided as a safety space. Safety devices for repair and maintenance work on the equipment must be provided, such as safety ropes, steps and handrails.

The control unit aisles must be secured against the maintenance and escape aisles and against each other, so that if one aisle fails, the others can continue to be operated. Each access door must be fitted with a door contact in such a way that when the door is opened, the relevant lane is switched off (emergency stop). The doors can only be opened with the key with which the lane at the control panel itself is switched on and off (key switch), or different keys are inseparable at one collar. The keys of the individual lanes are not interchangeable. The doors must be designed as escape doors.

The detailed arrangement, execution and design of the escape and access doors as well as all safety devices must be coordinated in good time with the responsible authorities and offices (e.g. employers' liability insurance association).

Particular attention must be paid to the areas of the storage and retrieval stitches with the stacker cranes transfer points for the aforementioned requirements.

The maintenance area is to be designed in such a way that trouble-free work on the stacker cranes is possible without being hindered by the shelving. The maintenance areas must be equipped with suspension devices for hoists for maintenance and repair purposes. The maintenance area shall provide unrestricted access to the undercarriage of the stacker cranes and to any other parts of the stacker cranes required for maintenance. It must be ensured that repair and maintenance work can also be carried out on the upper mast structures and upper guide rails. The execution and equipment of the maintenance areas must be coordinated with the Client within the framework of the execution planning.

An ascending ladder with the necessary safety precautions shall run along the entire mast length of the crane, via which the ascent and descent to the lift truck for maintenance purposes or for fault rectification is possible. An officially approved ascent / descent safety device must be provided to secure the person.

The Loigistics Contractor's scope of delivery and services includes all equipment for the design of the maintenance areas and safety equipment (incl. 1 safety harness per device).

4.4. Interfaces to the building construction and the technical building equipment

The purpose of this chapter is to define and describe the interfaces and responsibilities of the Logistics Contractor (LC), the Building Contractor (BC), the General Planner Projprzem in the scope of construction (PP) as well as the Rossmann (Client) during the planning and implementation phase of the new warehouse at Pyskowice.

All coordination at the interface to the building construction / technical building equipment is the responsibility of the Logistics Contractor and the Building Contractor. They are to be included in the offer prices by both contractors, as they are not remunerated separately. The Contractors must closely coordinate the execution planning with the other trades, in particular the Building Contractor (BC) and the planners (PP), who is responsible for the delivery of executional design for the construction part.

The following catalogue summarises the basic responsibilities of the four different contracting parties- Client – Rossmann, Logistics Contractor, Building Contractor and General Planner- PP at the interface to the construction / technical building services. Notwithstanding the foregoing, the obligation to coordinate exists for all points listed for all parties.

The responsibilities on the part of Client, PP and the Building Contractor are further differentiated within the award phase and, if necessary, assigned to third parties; the Logistics Contractor's coordination obligation then also exists with these third parties.

Table 4-1: Interface catalogue for construction / TBE

Legend: R – responsible; S – support; I – information; (R) - option

A.	COORDINATION	LC	BC	Client	PP
1.	Creation of interface catalogue, incl. Dates for handing over specifications according to deadlines (milestones) described in the tender specification and attached time schedule	R			S
2.	Coordination with General Construction Contractor and the Client	R		I	I
3.	Safety and health coordinator throughout all project phases	S	R		
4.	Interface coordination between logistics and construction in all buildings and connection link / bridge between new and existing warehouse building	S	R	I	S
5.	Interface coordination between logistics and construction in existing warehouse	R	S	S	S
6.	Interface coordination between logistics and construction in new HBW and in area of Picking Gallery	R	S	S	S
7.	Construction site electricity (1 consumption point) during the building phase and associated meters	I	R	S	
8.	Construction site lighting during construction works in marshalling building		R		

9.	Construction site lighting during installation works of conveyor technics in marshalling building (ground floor and first floor) / in the bridge between the new and existing warehouse as well as in the existing warehouse, if needed	R			
10.	Construction site lighting during rack system installation and conveyor system installation in HBW	R			
11.	Construction site lighting during rack system and mezzanine installation as well as conveyor system installation in the area of the Picking Gallery	R			
12.	Construction site lighting during facade and roof installation in HBW	S	R		
13.	Communication connection (Telephone, Internet, etc.) in the construction phase	R			
14.	Preparation of construction site setup plan and scheduling reconciliation	S	R		
15.	Temporary on-site roads and site access	I	R		
16.	Scheduling of the stacker crane and other logistic systems installation, delivery, storage and implementation on site, taking into account available space and maneouvering capabilities.	R	S		S

B.	**FORMAL DECISSIONS**	LC	BC	Client	PP
1.	Preparation of building application and obtaining building permit	S			R
2.	Final acceptance by the Sanitary Epidomedical Station		R		
3.	Final acceptance by the State Fire Brigade	S	R		
4.	Final acceptance by the Construction Supervision	S	R		
5.	Final acceptance by the Network Owners		R		
6.	Fire safety instruction ensuring consistency with the existing instruction	S	R	S	S

C.	**TEMPORARY SITE FACILITIES**	LC	BC	Client	PP
1.	Site office for construction GC set up		R		

2.	Site office for logistics GC set up	R	S		
3.	Temporary site entrance set up		R		
4.	Site security during construction works, understood control of access to site, as well as safety during execution of construction works (securing excavations, exclusions zones, fencing, boarding etc.)		R		
5.	Site security during logistics works and coordination with safety requirements of BC	R	S		
6.	Construction site electricity (1 consumption point) and associated meters	I	R		
7.	Construction site lighting during construction works in marshalling building		R		
8.	Construction site lighting during installation works of conveyor technics in marshalling building (Ground Floor and First Floor) / in the bridge between the new and existing warehouse as well as in the existing warehouse, if needed	R			
9.	Construction site lighting during rack system installation and conveyour system installation in HBW	R			
10.	Construction site lighting during rack system and mezzanine installation as well as conveyor system installation in the area of the Picking Gallery	R			
11.	Construction site lighting during facade and roof installation in HBW	S	R		
12.	Communication connection (Telephone, Internet, etc.) in the construction phase	R			

D.	**STATICS**	LC	BC	Client	PP
1.	Providing complete design of the HBW slab, taking into account specific requirements handed over by LC	S			R
4.	Specification of static / dynamic loads, incl. foundations / foundation slab / rack upright loads for all installations, in line with the design milestones included in the time schedule attached to this specification	R			S

5.	Specific anchorage points (anchorage plan) for rack systems HBW and Picking Gallery as well as for rail system of stacker cranes, to be provided according to milestones included in the time schedule attached to this specification	R			S
6.	If due to any reason core drill holes are required due to lack of coordination all aspects (further, coordination, timeline and associated costs) are the responsibilitu of the LC.	R	I	I	I
7.	Static proof for complete system (HBW, Picking Gallery, steel construction for mezzanine) after award of contract, according to the time schedule attached to tender specification.	R			I
8.	Release of geodetic survey report and statement of completion for construction of base plate for HBW and area of Picking Gallery according to the attached time schedule		R		
9.	Load distribution measures for the storage / conveyor and control technology	R			

E.	**FIRE PROTECTION**	LC	BC	Client	PP
1.	Preparation of fire protection concept			S	R
2.	Preparation of fire protection strategy in HBW according to the requirements outlined in the attached fire strategy for existing warehouse in Łódź	R		S	S
3.	Obtain fire protection report		R		
4.	Provision of fire protection expertise for the inbstallation of picking gallery Input to be provided according to the attached time schedule	S			R
5.	Integration of the fire protection requirements into the implementation planning for logistics systems	R		I	S
6.	Constructional realization of main fire protection compartments / fire resisting walls		R		
7.	Implementation of fire protection gates in conveyor technology / for RGV system (conveyor system closures) according to brand guidelines	R	S	S	S
8.	Substructures of the steel construction for the installation of the sprinkler system	R			

9.	Realization of ceiling sprinklers / extinguishing system in all areas of the new building		R		
10.	Realization of rack sprinklers / extinguishing system and conveyor sprinkler	S	R		
9.	Execution of all external fire hydrant system		R		
10.	Execution of all external fire roads		R		
11.	Execution of SSP system in new building	S	R		

F.	**ESCAPE ROUTES**	LC	BC	Client	PP
1.	Specification of emergency and escape concept, incl. provision of expertise of the escape concept	S	R	I	
2.	Integration of the escape route concept requirements into the execution planning for HBW,Picking Gallery, RGV, repacking area, Sequencer, lifts etc.	R		I	
3.	Installation of the escape route signages in the HBW and the area of the Picking Gallery	R		I	

G.	**ELECTRICAL AND NETWORK SUPPLY in HBW**	LC	BC	Client	PP
1.	Specification position of connection points in the HBW	R			
2.	Realization of the connection points in the HBW to the main cabinet for LC		R		
3.	Electric- and network-installation for the main switchboards in the HBW (glass fibre cable)		R		
4.	Electric- and network-installation from the main switchboards to the components of the conveyor system, stacker cranes, etc.	R			
5.	Network components for workstations, building distributors which are not associated with the automation			R	
6.	Network components for workstations, building distributors which are part of the automation and according to separation of scope defined in the IT part	R			

7.	Network components for workstations, building distributors which are part of permanent building structure		R		

H.	ELECTRICAL AND NETWORK SUPPLY STORAGE SYSTEM AND CONVEYOR TECHNOLOGY	LC	BC	Client	PP
1.	Specification of required connected loads (kVA)	R			
2.	Realization of main connection point electric according to specification in the new building (HBW, Picking Gallery, marshalling building (ground floor and first floor), bridge between new and existing building (execution of the power supply and the cabling in coordination with the supplier of the logistics technology)	S	R		
3.	Realization of main connection point electric according to specification in the existing building	S		R	
4.	Electric-installation main access points until components of the logistics systems as stacker cranes, conveyor technology, etc. in the new and in the existing building (sub-distribution)	R			
5.	Specification of the positions of the automation switch	R			
6.	Realization network until automation switch according to the specification in the new building		R		
7.	Realization network until automation switch according to the specification in the existing building			R	
8.	Installation of automated switch as well as installation of LAN network until components of the automated logistics technology (sub-distribution)	R			

I.	ELECTRICAL AND NETWORK SUPPLY FOR PERMANENT WORKSTATIONS (part of automation)	LC	BC	Client	PP
1.	Detailed position of the connection points for work stations	I	R		
2.	Execution of all connection points for work stations	I	R		
3.	Electrical and network installation connection points to the end socket at the workstations	I	R		
4.	Network installation logistics systems	R	I		

5.	Provision and installation of logistics hardware which forms part of the automation system and is affecting it's operation (e.g. labeller, etc.)	R			
6.	Provision and installation of mobile hardware, which does not form part of the automation (e.g. printers, mobile RF scanners etc.)			R	
7.	Network components for workstations, building distributors etc.			R	

J.	**WLAN ACCESS POINTS**	LC	BC	Client	PP
1.	Implementation of area-wide WLAN (access points) in the new building		R		
2.	Specification position of connection points		R		
3.	Supply and commissioning of hardware		R		
4.	Channel planning through			R	

K.	**UPS (Uninterruptible Power Supply)**	LC	BC	Client	PP
1.	Supply, connection and commissioning UPS for PLC	R			
2.	Supply, connection and commissioning UPS for conveyor system closures	R			
3.	Supply, connection and commissioning of UPS for data centre			R	
4.	UPS for fire safety systems (fire gates)				

L.	**LIGHTING**	LC	BC	Client	PP
1.	Aisle lighting HBW		R		
2.	Specification for the lighting concept new building		R		
3.	General lighting in the new building		R		
4.	Lighting below stages within the HBW and the area of the Picking Gallery, incl. pre-zone / maintenance areas		R		
5.	Workstation lighting in Picking Gallery and Repacking		R		
6.	Emergency lighting		R		

7.	Lighting in the maintenance areas of shuttle and picking gallery (f.e. specific strip lighting designated for the areas)	R			

M.	HEATING, VENTILATION AND AIRCONDITION	LC	BC	Client	PP
1.	Heating / auxiliary system to prevent the temperature level in HBW, marshalling building, area of the Picking Gallery and bridge between new and existing building		R		
2.	Fresh air supply		R		
3.	Smoke extraction technology		R		
4.	Specification for planning	S			R
5.	Realization of the connection points at the building wall	I	R		

N.	GROUNDING / EXTERNAL LIGHTNING PROTECTION HBW-SILO	LC	BC	Client	PP
1.	Default earthing system (e.g. position of connection points, earthing vanes)	R	S		
2.	Realization of grounding system according to specifications		R		
3.	Electrical installation from electrical grounding system ensuring continuity.	R	S		
4.	Realization of outer lightning protection system		R		

O.	RAMMMING PROTECTION	LC	BC	Client	PP
1.	Realization of ramming protection on conveyor technology, workplacesand all associated areas which need to protect the automation	R		I	
2.	Implementation of ramming protection for building parts (e.g. gates, supports, walls, etc.)		R		

P.	CONSTRUCTION MEASURES	LC	BC	Client	PP
1.	Construction of the floor plate of the HBW and the area of the Picking Gallery	S	R		
2.	Construction ceiling, walls roof and facade of HBW		R		

3.	Construction ceiling and wall openings for the industrial fire doors and gates / closures for the conveyor systems		R		
4.	Closure and sealing of wall and ceiling openings with installation of conveyor systems closures (for fire walls only Hilti solution is acceptable).	R			I
5.	Production and installation of safety fencing, railing and kick-plates around automation systems, pallet lifts, conveyors, workplaces (if required due to positioning), maintenance platforms and stairs.	R		I	S
6.	Design, production and installation of all access/ egress platforms in and around the automation systems.	R		I	
7.	Design, production and installation of roof substructure along with substructure for all openings (f.e. smoke flaps, hatches etc).in the area of HBW	R			S
8.	Design, production and installation of all steel platforms and access stairs to equipment placed on the roof of HBW and pre-zone	R			S
9.	Design, production and installation of mezzanine structure in the low part of HBW pre-zone, along with the supporting structure and substructure for the roof, and substructure for the cladding panels	R			S

Q.	**Others**	LC	BC	RSM	PP
1.	Provision of all relevant execution drawings (building, technical building equipment for all areas of the new building				R
2.	Provision of restrictions from relevant authorities			S	R
3.	Provision of a drawing with measuring for North-South and East-West reference as well as 2 benchmark (height) as well as permanent marked measurement points sole plate new building (especially HBW and area of Picking Gallery)		R		
4.	Provision of fixed reference points for measuring network, incl. measurement report		R		
5.	Guarantee that there is no warfare material in the ground		R		

6.	Adjust position and function of grooves of the building in the area of the new building		R		

The requirements for the base plate of the HBW and in the area of the Picking Gallery must be agreed with the Client and PP during the bidding phase. In his offer, the contractor must document the requirements for the base plate in detail and coordinate them with the Client and PP during the offer calculation phase, and after award of contract during the executional design phase. All static and dynamic loads, which are the basis for the design of the base plates must be handed over according to the deadlines outlined in the attached time schedule. In case of any delays in the handing over of loads, the LC is obliged to cover all expenses associated with the resulting delays and any other repercussions.

For the design of the base plates, the following step-by-step coordination procedure must be followed during implementation planning with regard to the coordination of the LC – Client / PP interface:

- During bidding phase. the logistic contractor gives an initial load estimate from the shelving, the stacker cranes and steel construction platforms. The loads caused by the installation of the roof and façade are supplemented by the general planner PP.
- With these values, the structural engineer (PP) carries out the design of the reinforced concrete base and determines the deformations / deflections that occur.
- Taking into account the determined values of the deformations / deflection, the shelf or platform statics are created by the contractor, i.e. an "oblique position" of the shelf must be calculated according to the specifications of the sole statics.
- After contract signing, with the final loads from the shelf or platform statics, as well as dynamic loads from the stacker cranes the former dimensioning of the base plate is checked again by the construction GC, and the design is adjusted accordingly.
- DIN18202, Table 3, Line 3 must be used to determine the flatness of the sole.
- Flatness and stiffness of the floor slab / concrete floor under FEM 9.831.2012.

The logistic contractor is requested to specify in detail the requirements for the floor in the various areas in his offer. The information includes the stress group, surface grip, earth leakage resistance, ground interruptions, permissible inclination, limit values for flatness, waviness number, measurement method to be used, static / dynamic loads caused by movement / braking of the stacker cranes, etc.

For installation and mounting of the racks at defined positions anchor systems / anchor boxes are necessary, referring to this the following requirements must be considered:

- Delivery of the anchor systems / anchor boxes by the LC.
- Installation of the anchor systems / anchor boxes in the concrete floor has to be done by the logistic contractor by own resources. The necessary accuracy and fine tuning of the boxes shall be done by the LC. The result of the placement will be finally documented in a measurement report.
- All other positions on the concrete floor a mounting of the rack systems / rail systems of the stacker cranes has to be done with anchor bolts with a relevant permit; this anchor bolts don´t need special anchor systems, however any specific requirements need to be clearly communicated during the bidding phase and included in the offer.

The position and the installation of the anchor systems / anchor boxes have to be agreed between the general planner PP and the LC during the execution planning for the HBW in detail.

In the floor slab a system for the earthing of the racks has to be realized / installed by the BC (earthing incl. earthing rods). The planning and the installation of the earthing system has to be done by the BC. The connection between the earthing system with the racks will be done by the LC.

4.5. High-bay warehouse

4.5.1. Description of function

For the automatic high-bay warehouse (HBW) the following design is tendered.

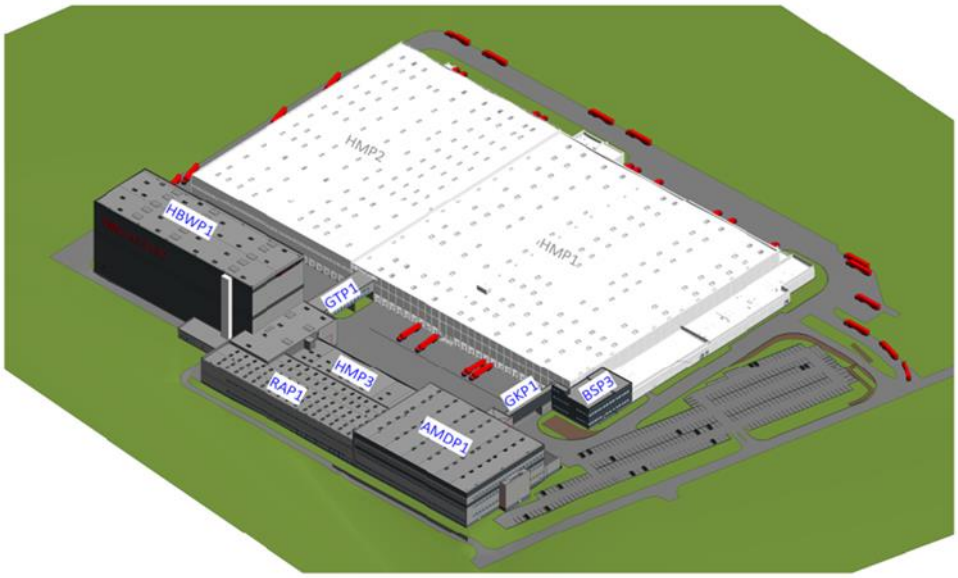


Figure 4-4 Overview of the building sections

The HBW (building section HBWP1) basically consists of an approx. 41 m high silo construction (incl. roof construction) with lowered pre-zone of approx. 18 m height, based on a steel construction and mezzanine and required substructure for cladding panels and roof. On the southern side / at the interface with the HMP3 building, the HBWP1 is lowered approx. 0.5 m in relation to the HMP3 building; on the northern side, the level of the base plate of the HBW and the ground is the same. The floor slab for the installation of the high-bay warehouse will be provided to the contractor on site.

The HBW has to be erected with 8 aisles and stacker cranes in a silo construction.

The scope of supply also includes the stacker cranes with moving and guide rails as well as the complete material flow technology of the pre-zone according to the functional material flow layout.

In the scoe of delivery of the Logistics Contractor is also the steel construction, including the substructure for the insallation of façade and roof construction of the HBW (defined in this chapter) and the pre-zone of HBW defined under chapter 4.14).

The HBW essentially has the following basic functions:

- Reception and storage of the pallets coming from the inbound area in HMP3;
- Reception and storage of the pallets coming from the existing building (HMP1, HMP2);
- Supply and disposal of the repacking area (RAP1);

- Retrieval of full pallets to the existing building (HMP1, HMP2).

The basic arrangement is described in the attached layouts and excerpts from the layouts in this section.

The load carriers to be stored are fed to the HBW from the incoming goods area in HMP3 or from the existing building (HMP1, HMP2) via a combination of standard pallet conveyor technology and an RGV system, with transfer of the load carriers to be stored to the branch lines in front of the racks; the load carriers are removed from the HBW in the same way.

The functional capability of the racking system and the stacker cranes is achieved when the pallets of today's quality can be stored, retrieved and stored in continuous operation without disturbances. The storage and warehouse operating technology must be designed accordingly.

4.5.2. Requirements for the HBW subsystem

4.5.2.1. Conveyed and stored goods

The racking system, stacker cranes and conveyor technology must be designed for the different pallet types described in chapter 2.3.4 (Euro pallets made of wood and plastic, Chep pallets with the dimensions of a Euro pallet).

4.5.2.2. Higher-level material flow | Interfaces

For the HBW, the information and comments in chapter 5 apply.

4.5.2.3. Capacity and throughput requirements

In the HBW racks with the 8 aisles, 26,880 pallet spaces can be realised at different heights and with single-deep storage.

The services listed below must be carried out by the complete HBW system across all aisles or stacker cranes. It cannot be assumed that the load will be equally distributed over all aisles. Unbalanced loads must be taken into account accordingly.

The required warehouse throughputs are:

- HBW-put-away max. 270 load carrier / hour;
- HBW-retrieval max. 226 load carrier / hour.

The required put-away performance results from the requirements of the put-away orders from the inbound area, from the existing building and the returns from the repacking area.

The required retrieval capacity results from the requirements for the retrieval for the replenishment of the picking areas in the existing building (HMP1, HMP2) as well as the retrieval for replenishment of the repacking area in building RAP1.

In addition, throughput reserves for additional movements, i.e. system- and process-related stock placements and removals must be taken into account (not included in the quantity structure).

The above requirements are based on a static evaluation of the throughput requirements on the base of the underlying put-away and picking strategies. This design must be verified by the Logistic Contractor by a dynamic analysis (simulation).

The contractor has to ensure the storage / retrieval hourly throughputs in 3-shift operation from Monday to Friday and 1-shift operation on Saturday and Sunday.

4.5.3. Functional system description

4.5.3.1. Layout

The HBW consists of 8 aisles (3 place system, single deep storage) and is to be offered in silo construction. Scope of delivery also includes the steel stair tower, which offers access to the roof of HBWP1, all steel platforms, stairs and stepovers to access any equipment located at the roof of HBWP1 and lower pre-zone.

The roof, walls and façade of the HBW are not part of the scope of services in this tender and will be realised by the Building Contractor.

The HBW or the pre-zone of the HBW is directly adjacent to the HMP3 / RAP1 building on the south side, in which the goods receipt and repacking area are located. The wall between the pre-zone of the HBW and the goods receipt and repacking area is a firewall.

The following illustrations show the plan view of the ground floor and an HBW section; see drawings in the appendix for further illustrations.

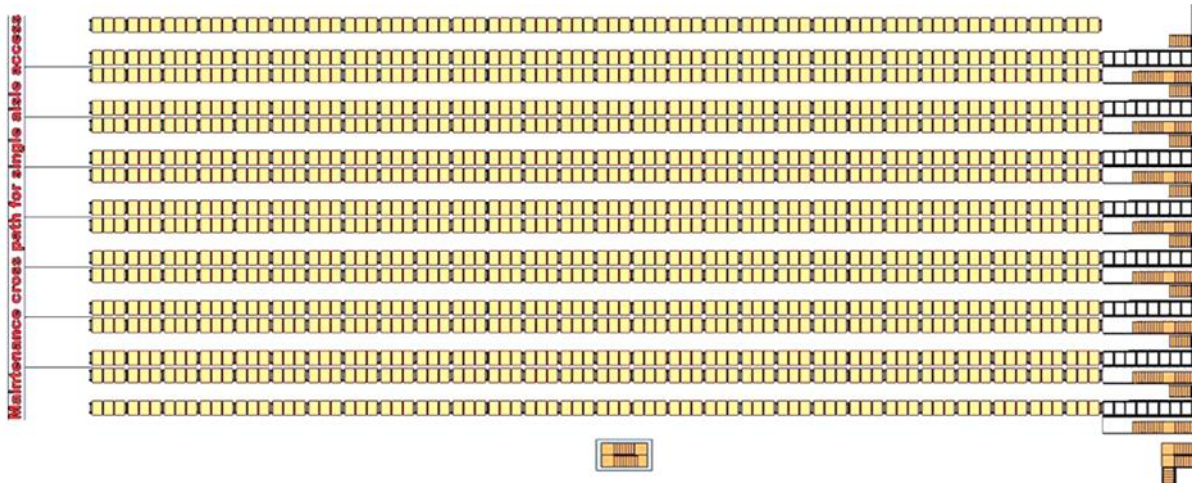


Figure 4-5: Functional layout HBW – top view

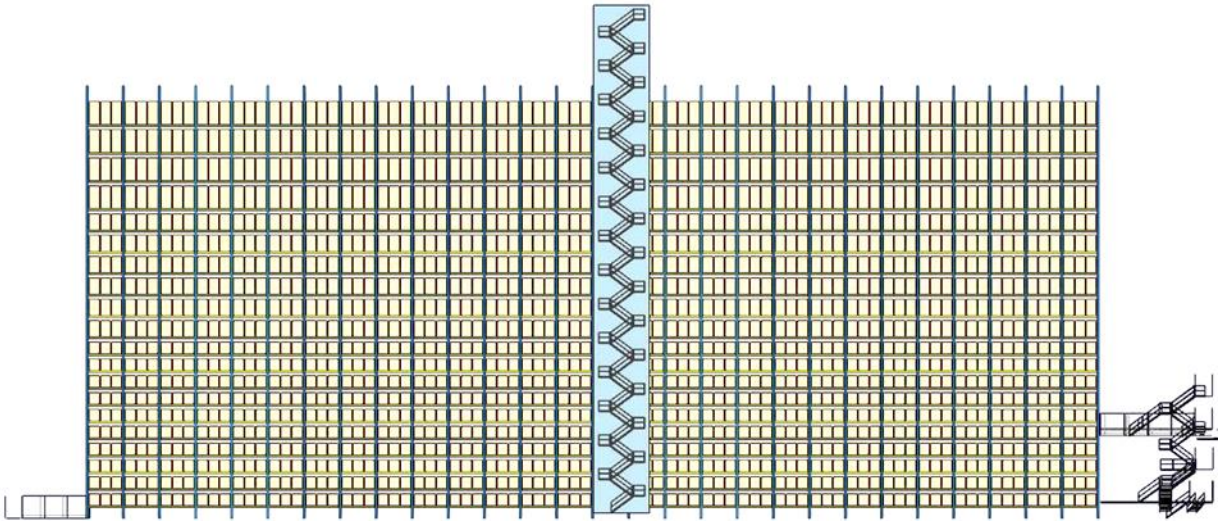


Figure 4-6 : Functional layout HBW - sectional view from western side

4.5.3.2. Description of the racking system

4.5.3.2.1. Modulation / Dimensioning / Structure

The functional structure of the shelving is described below, as it must be taken into account in the shelving design.

- Three-place system, storage depth (pallet with overhang on all sides of 50 mm) 1.300 mm
- Number of aisles: 8
- Number of levels per aisle total: 20
    - of which designed for pallet height 1,200 mm 10
    - of which designed for pallet height 1,600 m 6
    - of which designed for pallet height 2,200 mm 4
- Number of three-place fields over length of rack: 28
- Distance between the rows of a double rack row (generally between the load carriers, depending on fire protection requirement): 250 mm
- Distance between rack and wall / facade (clear distance.): 400 mm
- The shelf dimensioning is carried out for 100% shelf load and 100% bay load.
- At least 26,880 storage spaces must be realised in the HBW

The Logistics Contractor shall select all the detailed designs, such as the width of the columns, the height of the crossbeams and the distances between the load carriers - uprights and load carriers - load carriers, in accordance with the requirements and document them in his offer.

For information purposes, the following parameters were taken as a basis for the design, whereby these must be verified and determined manufacturer-specifically:

- Height parameters
  - Load carrier height 1,200 mm — in the lower 10 levels
  - Load carrier height 1,600 mm — in the 6 middle levels
  - Load carrier height 2,200 mm — in the 4 upper levels
  - Shelf construction base plate — - 500 mm
  - Lower approach dimension (measured from base plate) — 1,150 mm
  - Top support beam for storage (measured from base plate) — 35,100 mm
  - Height traverse / support beam — 150 mm
  - Distance top edge of stored goods bottom edge of sprinkler head (incl. lifting space load carrier) — 150 mm
  - Total rack height (without roof construction) — 39,000 mm
- Width parameters
  - Aisle width HBW (clear width between load carriers) — 1,600 mm
  - Shelf depth (pallet with overhang of 50 mm on each side) — 1,300 mm
  - Number of load carriers in depth — 1
  - Aisle width — 4,450 mm
  - Distance between shelf rows (clear distance between the back side of load carriers) — 250 mm
  - Clear distance between shelf rows / back side of the load carriers and the wall / façade — 400 mm
  - Width HBW 8 aisles (without façade) — 35.900 mm
- Length parameters
  - Number of fields — 28
  - Load carrier width (with overhand of 50 mm each side) — 900 mm
  - Distance between rack construction and load carrier — 80 mm
  - Distance load carrier - load carrier — 100 mm
  - Column / rack construction width — 160 mm
  - Field width (clear width) — 3,060 mm
  - Shelf length without drive-over dimensions — 90,000 mm
  - Rear drive-over dimension (distance rack to fence) — 5,500 mm
  - Front drive-over dimension (distance rack to distance of

1m to the stairs)	5,000 mm
○ Distance front-drive-over dimension to start of the stairs	
to get out of the pit of the level of -500 mm	1,000 mm

The dimensions given above depend on the technology used in coordination with the construction planning / realisation and are to be understood here as reference values only.

The Logistics Contractor is requested to configure and offer the shelving system according to his manufacturer-specific technology.

The Logistic Contractor must adapt his manufacturer-specific HBW configuration to the available HBW space in accordance with the building layout in the appendix, as well as the requirements for sprinkler system in HRL according to VdS (see attachment).

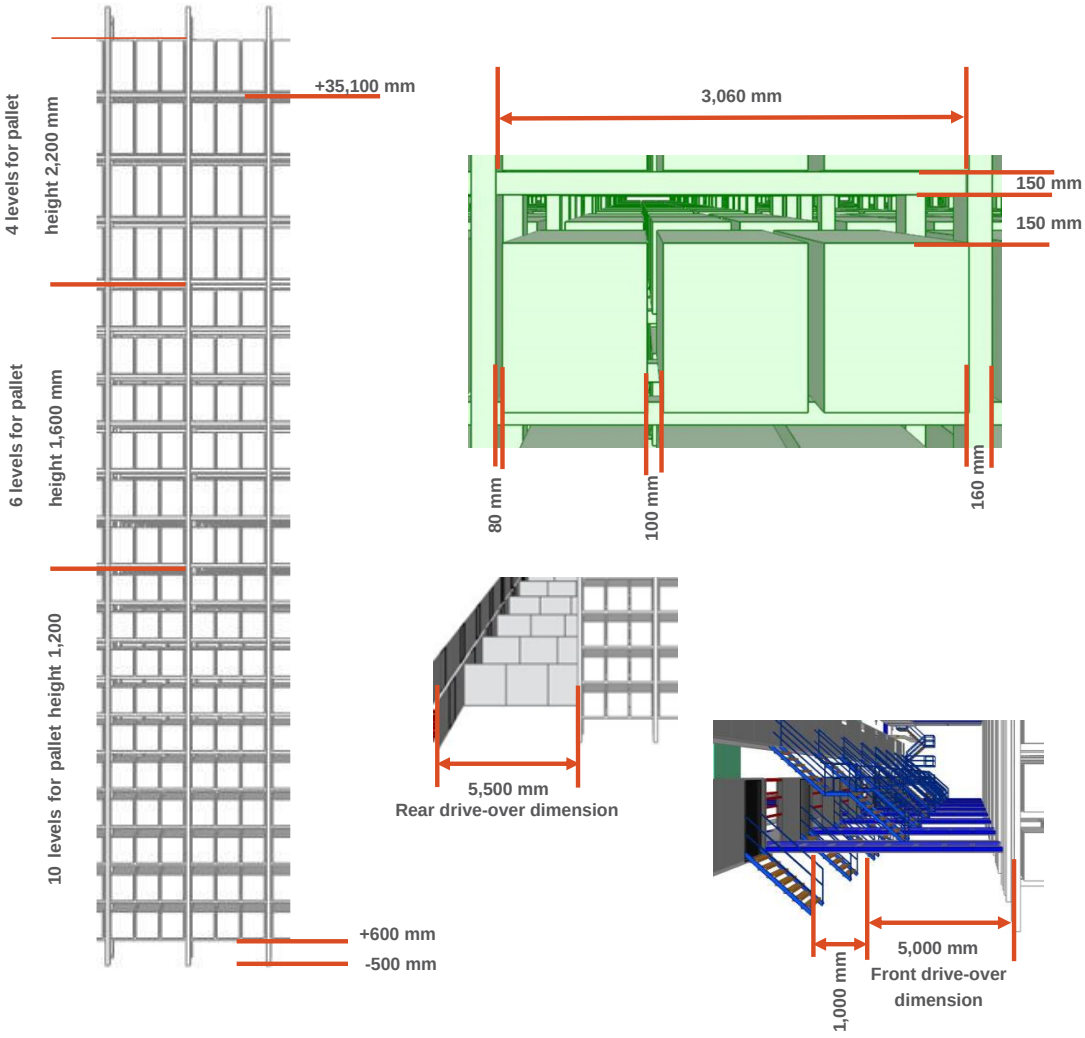


Figure 4-7: HBW longitudinal view

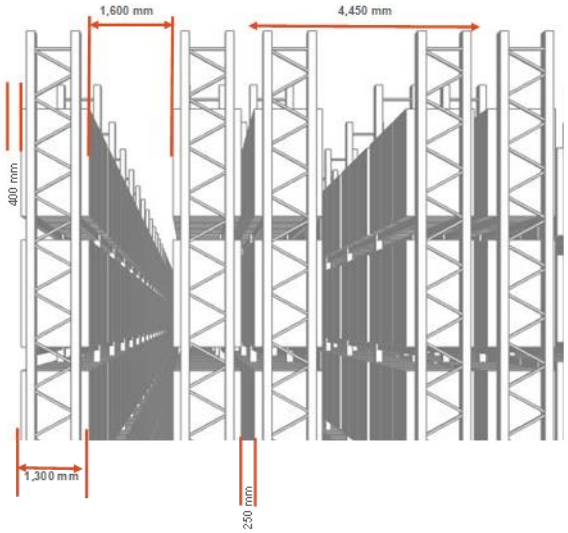


Figure 4-8: HBW sectional view

4.5.3.2.2. Safety and service facilities

In the HBW and the pre-zone maintenance and escape routes shall be provided (front and rear). The maintenance and escape routes should be designed in accordance with the relevant guidelines, depending on the drive-over dimensions of the stacker cranes, the design of the HBW pre-zone and the building concept. In the rail area of the HBW a maintenance area is to be realised. In the case of escape routes, the requirements of the fire protection and escape route concept must be considered.

For the required maintenance access to the aisles and to the conveyor technology in front of the aisles, the maintenance platforms in section 4.5.3.4 must also be taken into account. Platforms and their accessibility are described in chapter 4.5.3.4.

4.5.3.2.3. Other specific requirements

Rack construction

Each shelf compartment must be fitted with a push-through safety device.

Fire protection

A sprinkler systemin the HBW is assumed; therefore the classification to HHS3 / HHS4 in accordance with VdS CEA 4001 is currently assumed. It is assumed that sprinklers will be installed on each level of the rack construction.

The sprinkler system is installed by the Building Contractor and is not part of the tendered scope of supply and services of this invitation to tender.

The Logistics Contractor must coordinate this interface intensively with the Building Constractor.

Suitable fastening options for the sprinkler lines, sprinkler heads etc. must be taken into account and ensured by the supplier of the racking system in consultation with the Building Contractor when designing the racking.

Flammable goods (D category) 3,8%, flammable goods in 200 ml packages (perfumes, W category) 3,8% and sprays (S category) 11% are also stored in the HBW. The volumes to be stored are distributed across the rack aisles and no special requirements are currently expected for the storage of the products

or the creation of zones in which, for example, no lifting or travelling motors may be fitted to the storage and retrieval machines.

Only for the sprays to be stored is it assumed that nets must be installed as in the existing warehouse (see illustrations below).



Figure 4-9: Example of nets on the shelf for storing sprays

The delivery and attachment of the nets are not included in the scope of delivery and services of this tender, however an optional valuation for the delivery and installation of the nets is expected (based on affixing approx. 11% of locations). The Logistics Contractor must provide for the possibility of attaching these nets to the rack structures in accordance with the requirements, coordinate this independently and take it into account in the rack statics.

Fastening shelves and rails to the base plate

The lower rail is mounted on a smooth reinforced concrete plate. The appropriate aids for installation, for bridging tolerances, must be provided. The subdivisions (expansion joints) of the floor plate are to be considered according to the specifications of the building realisation. The further remarks on the stacker crane guidance in chapter 4.5.4.6 must be observed.

The offer also includes a detailed drawing (ground plan, side view, shelf modulation) of the racking system of the high-bay racking incl. the crossings, platforms, maintenance area, escape/maintenance corridors, aisle barriers, rail system etc.

The rack construction includes all elements, such as all columns, all traverses and all necessary screw and anchoring materials, including anchor bars, the substructure for the conveyor system, platforms and escape routes, fencing including doors, stairs and ladders, warning and information signs as well as all materials required for assembly.

The complete rack constructions must be grounded in accordance with chapter 4.3.8.

Façade and roof

The façade cladding and the cladding of the roof are not included in the scope of supply and services of this invitation to tender and are therefore not included in the scope of supply and services of the Logistics Contractor.

The Logistics Contractor's scope of supply and services in accordance with this invitation to tender includes the substructures for attaching the façade and the roof structure/roof to the racking structure of the high-bay warehouse silo, as well as all supporting structures per the attached architectural specification.

The Logistics Contractor must supply these substructures and install them on the racking structure in close coordination.

The Logistics Contractor is requested to integrate all necessary measures for the installation of the substructures for the attachment of the façade and the roof construction to the HBW silo into its offer and to take them into account in terms of price. This also includes the independent and intensive coordination at the interfaces for the realisation of the building, the façade and the roof for the HBW silo.

Stair tower on the west side of the HBW in front of the façade

On the western side of the HBW, a stair tower is planned on the outside to provide access from the ground to the roof of the HBW silo (area marked in red).

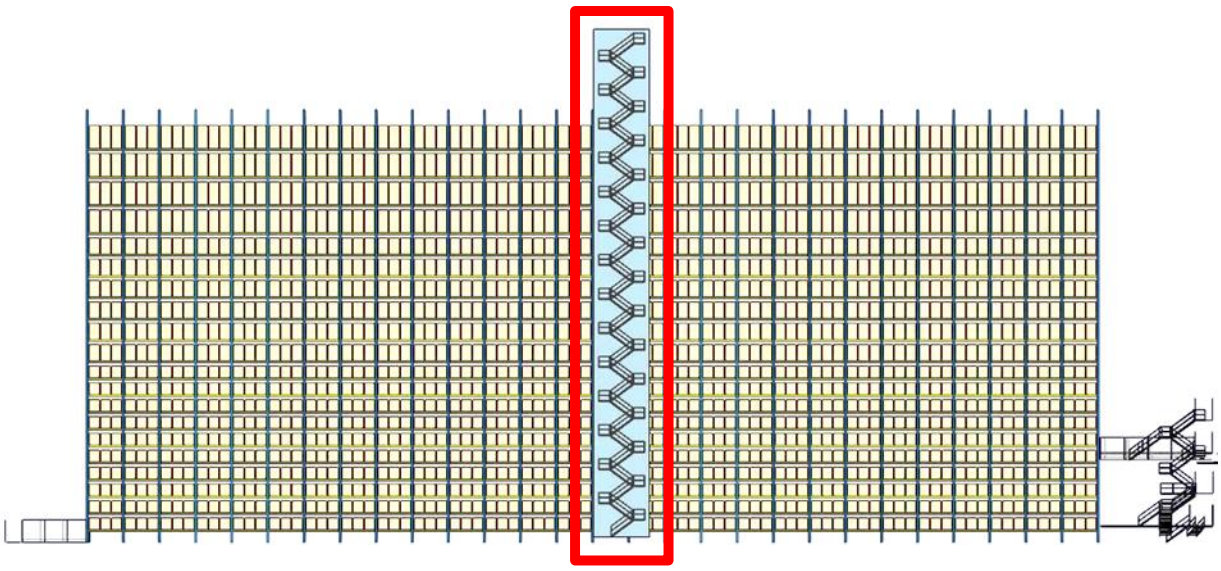


Figure 4-10: Staircase tower on the western side of HBW

This staircase tower is part of the scope of supply and services of this tender and is to be offered and realised by the Logistics Contractor.

The staircase tower is to be realised on the basis of a steel construction, whereby the steel construction is to be mounted on a provided base plate. The landings and steps are to be executed in non-slip bar grating.

In the construction of this staircase tower, the Polish guidelines and regulations regarding the design of the railings and fall protection for persons as well as for the design of the steps and the necessary rest platforms must be taken into account.

The staircase tower is not to be cladded for weather protection.

In the lower access area, the staircase tower must be secured against unauthorised access by means of a grille and a corresponding door with a key.

The top of the staircase tower is to be led over the parapet with a platform in order to reach the actual roof of the HBW with just a few steps, ensuring all relevant handrails, foot plated and safety systems are in place. The staircase tower must also be fitted with a roof at the top.

This staircase tower must be connected to the rack construction of the HBW silo in order to ensure the required rigidity and stability of the staircase tower. This connection must be made and realised by the Logistics Contractor and taken into account in the structural design of the racking structure.

As these fastenings and connections between the staircase tower and the racking structure pass through the façade of the HBW silo, the associated interfaces must be coordinated and implemented independently by the Logistics Contractor with the Building Contractor, in particular due to the fact that there is an overlap of scopes.

4.5.4. Description of the stacker cranes

4.5.4.1. Modulation / Configuration / Structure

Fully automatic, aisle-bound stacker cranes are used in the 8 aisles. The specific approach dimensions (bottom and top) and drive-over dimensions (front and rear) of the stacker cranes must be considered as specifications for the foundation plate of the HBW and the design of the rack system. Within the scope of the offer, the Logistics Contractor shall document the concrete approach and drive-over dimensions as well as the static and dynamic loads of the storage and retrieval systems.

The Logistics Contractor's scope of supply and services includes 8 stacker cranes with the above specifications, including the installation of all functional, performance and control elements and equipment required to fulfil the above requirements. Furthermore, the scope of delivery and performance of the Logistics Contractor shall include all equipment for the design of the maintenance areas and safety equipment (incl. 1 safety harness per stacker crane).

The following assumptions regarding the configuration and structure of the stacker cranes were taken as a basis for the planning and are to be considered by the Logistics Contractor:

- The design was based on a maximum working aisle width of 1,600 mm.
- The stacker cranes shall be equipped with a passenger cabin, which also travels upwards; if the storage and retrieval unit is designed as a 2-mast unit, this travelling cabin must be provided on both masts

- If designed as a 2-mast unit, a ladder with appropriate safety devices for attaching a safety rope must be provided on both masts
- max. payload per load handling device: 1,000 kg
- two telescopic forks / load handling devices for single-deep longitudinal storage of load carriers
- lower approach dimension (measured from base plate): 1,150 mm
- Restriction of the HBW incl. roof construction to approx. 44 m.

4.5.4.2. Safety and service equipment

The requirements according to chapter 4.3.11 must be observed**.**

4.5.4.3. Operating modes

The following operating modes must be provided:

- On-line operation:
  The stacker cranes are operated fully automatically (normal operation). This fully automatic operation refers to the execution of the motion task which the stacker crane control receives from the higher-level control of the MFS.
- Manual operation + semi-automatic:
  Storage and retrieval of the load carrier is carried out via the control panel on the switch cabinet and/or on the operator's platform of the crane. The fork cycle runs automatically after manual initiation.
- Maintenance / set-up mode:
  All movements of the crane are controlled using the camera both via the control panel on the control cabinet and at the access area of the respective crane aisle as well as from the operator's platform.

4.5.4.4. Cycle time calculation

The Logistics Contractor must prove that the performance requirements have been met by means of a cycle time calculation based on the FEM guideline and the required simulation (see Chapter 7.4).

4.5.4.5. Camera

IP cameras must be integrated into the stacker cranes in order to monitor and play back errors during the storage and retrieval operations of the stacker cranes. This is particularly important in order to be able to detect / identify errors that occur during storage / retrieval at height more quickly, without a person having to climb up the ladder on the mast of the storage and retrieval machine every time.

The camera shall be connected with the visualization of the system and the FAS. The offer price shall take consider any additional network expenses (take client requirements into account), camera per stacker crane, assembly, installation, software and recording storage.

4.5.4.6. Upper guide rail / approach buffer

The mounting construction of the upper guide rails must be taken into account in the design of the shelving (static proof of stability against vibrations from the dynamic behaviour of the stacker cranes). It must be mounted per aisle over the entire drive path of the stacker cranes at the upper shelf area of the

HBW. Depending on the design of the stacker cranes, upper approach buffers may be required for these to absorb the kinetic energy when braking at the end of the aisle.

At the end of each aisle, a mounting for the lower driveway limiters (buffers) must be integrated into the base plate / in the concrete of the base plate and the resulting requirements for the base plate must be specified by the Logistics Contractor.

In this respect, coordination must take place in good time at the interface between the Logistics Contractor and the construction / realisation of the base plate. Furthermore, the static, dynamic loads of the stacker cranes must be specified by the Logistics Contractor.

These approach buffers shall be designed at their attachment in such a way that they can absorb all occurring forces and moments while maintaining functional safety without permanent deformation of the rack/rail construction.

4.5.4.7. Maintenance platform stacker cranes

The maintenance platform for maintaining the technical parts of the stacker cranes in connection with the upper guide rail of the stacker cranes must be designed in such a way that work on the cranes can be carried out without any problems and without being obstructed by the shelving.

The maintenance platform must provide unobstructed access to the carriage of the crane and to all other parts of the crane required for maintenance.

It must be ensured that repair and maintenance work can also be carried out on the upper mast structures and upper guide rails.

The maintenance platform can be situated as separate platform at the end of the mast of the stacker crane (in the 2-mast version, a maintenance platform must be provided on each mast).

The execution and equipment of the maintenance areas must be coordinated with the Client within the framework of the execution planning.

The proposal for the arrangement of the maintenance platform has to be documented in the offer.

4.5.4.8. Other specific requirements

The control of all work movements must be carried out automatically, i.e. the stacker crane receives a transport order via the higher-level control of the MFS and executes it automatically.

The lower track is mounted on a reinforced concrete plate. The appropriate aids for installation and for bridging tolerances must be provided.

The subdivisions (expansion joints) of the floor plate are to be considered according to the specifications of the construction realisation.

The max. permissible tolerances according to FEM 9.831 must be observed.

The individual aisles in the HBW are designed as separate safety zones, so that maintenance of one crane is possible without also having to shut down the other equipment. For this purpose, the aisles are separated from each other by safety fences in the front and back zones. The following illustration shows the aisle barriers with fences for the individual aisles. A maintenance aisle is provided behind the fences, via which access to each rack aisle is possible. The outer wall of the HBW is shown to the left of the maintenance aisle and the fence to close off the rack aisle is shown to the right of the maintenance aisle.

Electrically secured access and escape doors must be integrated into this fence for each aisle. Each access door must be fitted with a door contact so that the relevant aisle is switched off when it is opened (emergency stop). The doors can only be opened with the key used to switch the aisle on and off at the control panel itself (key switch). The doors must be designed as escape doors.

The key can only be removed when the aisle is switched off. The keys of the individual aisles are not interchangeable. Access to the danger zone is only possible after the aisle has been switched off.

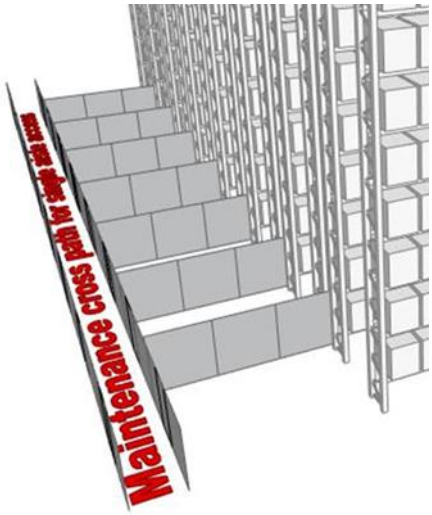


Figure 4-11: Rear aisle containment / safety zones with fences in the HBW

Furthermore, the following requirements must be considered:

- A refeed of the electrical energy must be provided;
- Correct conveying and material flow tracking of the storage units through appropriate control of the individual stacker cranes;
- Data exchange with the higher-level material flow computer (MFS);
- Information printout and visualisation of the material flow image - of the current plant status - in the control station (interface via MFS to WMS);
- Hierarchical and modular structure, thus easily comprehensible and expandable (modular principle);
- Great ease of maintenance and service;
- Switchover option in the event of system or subsystem failures and transfer of material flow information from a data backup memory;
- Network and control connection to the control cabinets.

4.5.5. Mezzanine construction in front of HBW

In the front of the HBW, a mezzanine construction must be considered and delivered. This mezzanine construction ensures, that the HBW and the technical systems as stacker cranes and pallet conveyor are accessible via different levels.

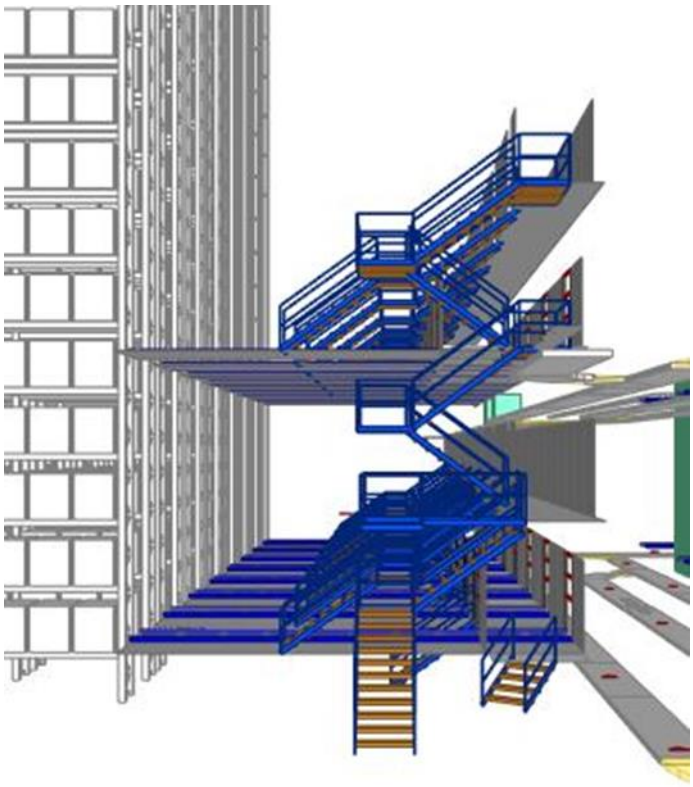


Figure 4-12: Section of mezzanine construction in front of HBW as principle

Description of the different levels for the mezzanines

- Floor plate on -500 mm for the access to aisles and the stacker cranes via a mezzanine construction on +1,000 mm.
- Mezzanine as a steel construction at +1,000 mm (top edge of pallet conveyor system), raised by -500 mm, with a depth of 2,000 mm across the entire width of the HBW. This mezzanine consists of a combination of platform and transfer plates to close the upper edge of the chain conveyors for the storage infeeds to the HBW. From this mezzanine, stairs are to be realised per aisle to the aisles of the HBW at -500 mm.
- Mezzanine as a steel construction at +4,000 mm and a depth of 1,500 mm across the entire width of the HBW above the infeed level for the HBW, incl. necessary ascents and descents. From this mezzanine, stairways are to be realised per aisle to the platforms next to the storage sections in the HBW at +1,000 mm.

- Mezzanine as a steel construction on +7,000 mm for the installation of the pallet conveyors for removing pallets from the HBW and for maintenance / troubleshooting in front of each aisle of the HBW.Mezzanine as a steel construction at +7,500 mm (top edge of pallet conveyor system), raised by 500 mm on the mezzanine at +7,000 mm and a depth of 1,500 mm across the entire width of the HBW, incl. necessary ascents and descents. This mezzanine consists of a combination of platform and transfer plates to close the upper edge of the chain conveyors for the retrieval of pallets from the HBW. From this mezzanine, stairs are to be realised per aisle to the mezzanine at +7,000 mm.
- Mezzanine as a steel construction at +10,500 mm and a depth of 1,500 mm across the entire width of the HBW above the retrieval level for the HBW, incl. necessary ascents and descents. From this mezzanine, stairways are to be realised per aisle to the platforms next to the storage sections in the HBW at +7,000 mm.

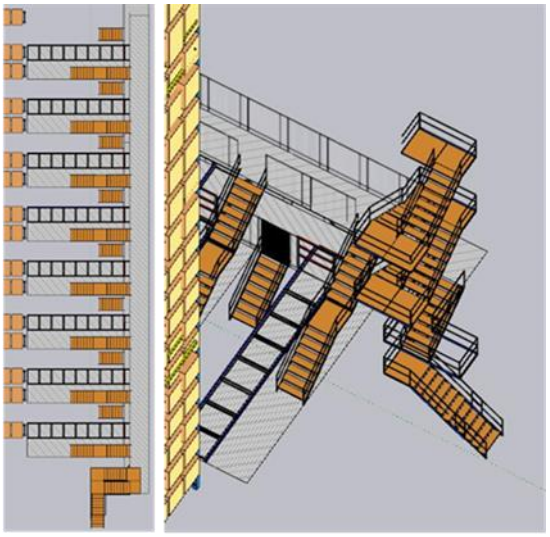


Figure 4-13: Accessibility of the mezzanines on the different levels

The mezzanines or maintenance platforms can be reached from the western side of the building via a staircase tower on the western side of the mezzanine construction (see right side of the Figure 4-13); the staircase tower must be integrated in the mezzanine construction in front of the HBW. These stairs have access to the mezzanines at +4,000 mm, at +7,500 mm and at 10,500 mm. Access to the mezzanine at +1,000 mm is via a separate small staircase in the same area.

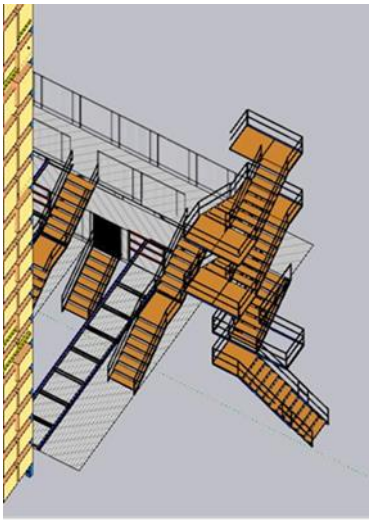


Figure 4-14: Accessibility of the aisle at +1,000 mm

Access to the individual shelf aisles at -500 mm is via the +1,000 mm level. For the mezzanine at +1,000 mm, a fence must be provided on both sides of the RGV system and the HBW aisles. Openings must be provided in this fence system for the transfer from the RGV system and for pallet transport to the HBW. These openings must be fitted with light grids to prevent unauthorised access to the RGV system or the pallet conveyor system. In the event that a person breaks through these light grids, the RGV system and/or the pallet conveyor system in this area is automatically switched off.

For access to -500 mm, a door must be integrated for each aisle of the HBW (see black illustration in Figure 4-14). Each access door must be fitted with a door contact so that the relevant aisle is switched off when it is opened (emergency stop and / or the stacker crane / the RGV vehicle is moving in a secure position). The doors can only be opened with the key used to switch the aisle on and off at the control panel itself (key switch). The doors must be designed as escape doors.

The key can only be removed when the aisle is switched off. The keys of the individual aisles are not interchangeable. Access to the danger zone is only possible after the aisle has been switched off.

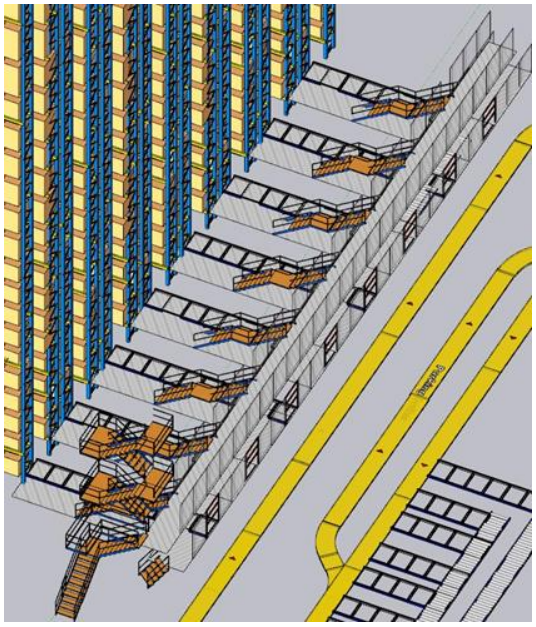


Figure 4-15: Overview of mezzanine construction in front of HBW as principle; level +1,000 mm and +4,000 mm

The previously described design of the mezzanine with the fences on both sides and the openings secured by light grids for the transfer areas of the RGV system and the pallet conveyor system applies accordingly to the mezzanine at a height of +7,500 mm across the width of the HBW (including the access points to the mezzanine at +7,000 mm via the door in the fence).

The platform constructions for maintenance, troubleshooting and the pallet conveyor system in front of the aisles of the HBW must be realised in the width of a double rack for each rack aisle (see red marked area in Figure 4-16). These platform constructions each have a width of approx. mm and a length of approx. mm up to the connection to the previously described platforms across the width of the HBW.

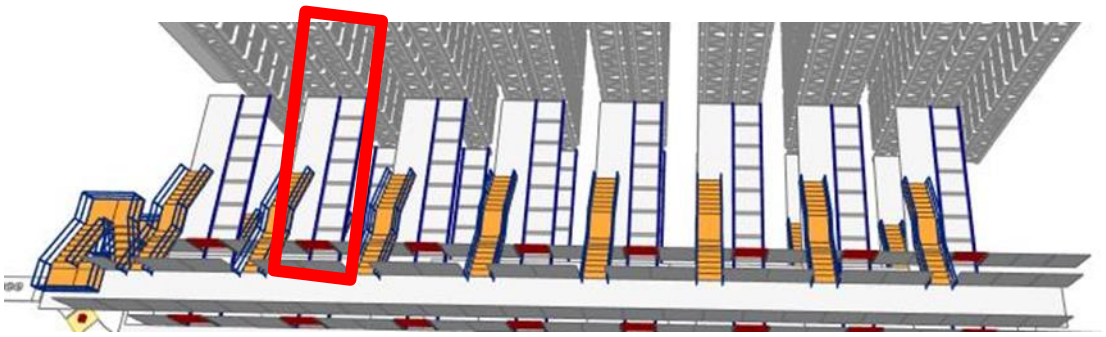


Figure 4-16: Overview of mezzanine construction in front of HBW as principle; level +10,500 mm and +7,000 mm

These platform constructions for pallet conveyor technology and maintenance / troubleshooting are located at a height of +1,000 mm and +7,000 mm for each rack aisle.

The following points must be taken into account for the design of the platforms in front of the individual shelf aisles:

- Fences must be provided on both sides of the platforms in the direction of the HBW so that no person can fall into the rack aisle or the travelling area of the storage and retrieval machine.
- On the side of the pallet conveyor system, this fence is only to be extended as far as the two transfer points for the pallets directly in front of the racking. The two transfer points in the direction of the storage and retrieval unit must be provided without a fence. A light grid must be installed for these two transfer points. As soon as a person enters this light grid, the storage and retrieval machine in the relevant aisle must be switched off automatically.
- In the area of the transfer points for the pallets, a structure must be provided where the person working in this area (maintenance or troubleshooting) can secure themselves using the safety harness.

For the stairway accesses from the platform constructions at +4,000 mm and 10,500 mm, there are currently no doors with key switches to switch off the storage and retrieval machines for the accesses to the platform constructions in front of the racks.

4.6. Pallet conveyor technology

4.6.1. Functional description

The pallet conveyor technology is used for the transport of load carriers from the inbound area of the new HBW to the HBW, from the new HBW to the repacking area, within the repacking area and at the workplaces / workstations as well as in the existing warehouse to connect the RGV system with the existing warehouse.

The pallet conveyor technology is to be assigned to the following functional groups for the offer:

- Functional Group 1: Inbound area new HBW
- Functional Group 2: Outbound area new HBW
- Functional Group 3: Repacking area
- Functional Group 4: Existing warehouse

The basic functionality, routing and other requirements are described below. The guidance of the pallet conveyor technology is only functionally given. The drawings / sketches in the document reflect a principle representation of the material flow. The Logistics Contractor must present his solution within the scope of the offer and prove that the solution selected meets the functional requirements for quality and performance.

4.6.2. Requirements for pallet conveyor technology

4.6.2.1. Conveyed and stored goods

The pallet conveyor technology must be designed for the load carriers with the specifications specified in chapter 2.3.3

4.6.2.2. Capacity and throughput requirements

The capacity and throughput requirements are defined below for each function group.

4.6.2.3. General requirements

In principle, the requirements according to chapters 4.2 and 4.3 are to be fulfilled.

The scope of delivery and services of the pallet conveyor technology includes:

- Conveying technology, according to description / drawing incl. the required infeed and outfeed elements, converters, turntables, other conveying technology elements and machines, controls, actuators and sensors. All required peripherals - even if not explicitly stated - must be included in the prices; this also includes scanners, light barriers, element control, rotating beacons etc.;
- Precise graphic representation (ground plan, side view etc.) of the pallet conveyor system;
- Stages / stands of conveyor technology, in areas where this is necessary, collision protection etc. (see requirements according to chapter 4.2 and 4.3);
- All conveyor crossings and platforms necessary for maintenance and repair of the conveyor lines (the position and number of conveyor crossings for reaching the maintenance points shall be specified by the Logistics Contractor within the scope of his offer);
- Connection to a failure analysis and system visualisation system including load level monitoring of the conveyor system in the control station. (see requirements according to chapter 6.4.2);
- Protective equipment, in detail in the transition area of the pre-zone loop and other areas as required;
- Control cabinet incl. wiring up to the control cabinet and from the control cabinet to the conveyor system; main connections are set up according to the client's specifications. The final location of the stationary switch cabinets shall be determined in the context of the execution planning with the Client. The cabling from the switch cabinets to the system components is part of the Logistics Contractor's scope of services and delivery and must be included in the offer price (see requirements in accordance with Chapter 4.3.5).
- The following functions must be ensured:
    - Ensuring maximum congestion capacity on the required routes;
    - When configuring the conveying elements and the control system, the specified throughput requirements must be taken into account.

The Logistics Contractor determines the number of scanners used in the pallet conveyor technology according to his "control philosophy" (scanning before branching - logical material flow tracking). It ensures trouble-free and offset-free transport. The number of scanners used must be documented in detail by the Logistics Contractor within the scope of his offer.

4.6.3. Functional system description FG 1 – Inbound area new HBW

4.6.3.1. Layout

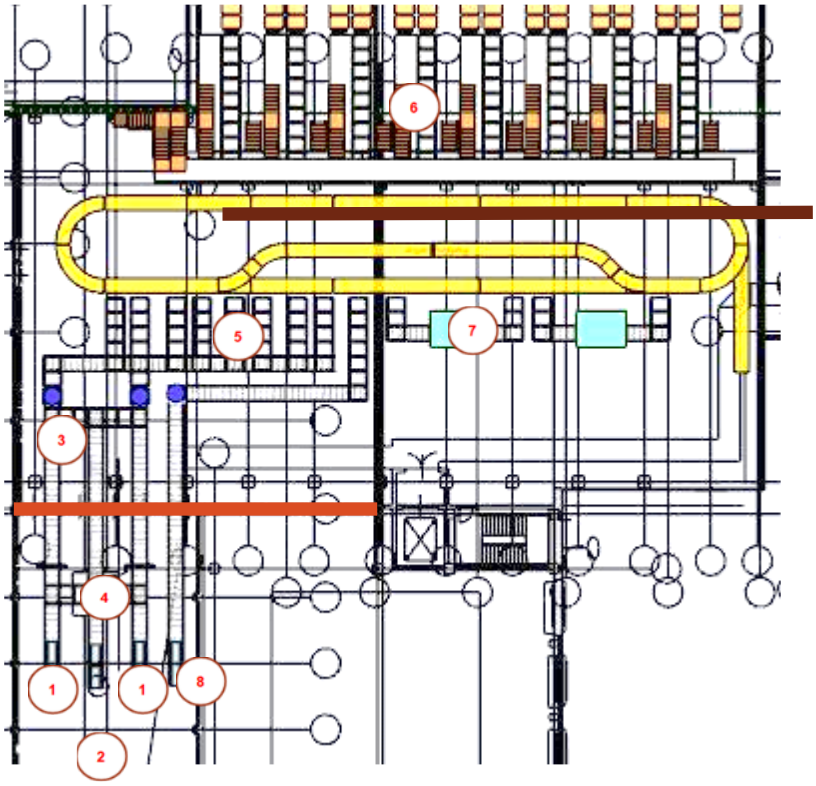


Figure 4-17: Layout Functional Group 1

4.6.3.2. Description of the functional processes

The load carriers are placed on the pallet conveyor system at points "1" by industrial trucks after they have been collected in the goods receiving area. The loading stations can be lowered to enable operation by industrial trucks without a lift. Furthermore, the loading station is designed in such a way that 2 pallets can be loaded simultaneously by an industrial truck with a long fork (see photo below for an example from today's processing).

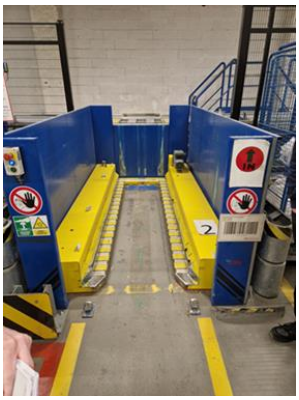


Figure 4-18: Example of a feeding station in today's processing

After positioning, the load carriers pass through an identification point (I-point) where the contour, skid clearance, weight and legibility of the barcode are checked.

If errors occur after the check, the pallets are transported to point "3" and transferred to the centre conveyor section; the centre conveyor section transports the pallet back towards the feed points to the Not-Okay workstation. This workstation is located on a platform (platforms at the different workstations are described in chapter 4.11) so that the employee can walk around the pallet. The spaces between the rollers of the pallet conveyor must be closed with tread plates (see photo below).



Figure 4-19: Example of a Not-Okay station in today's processing

If the detected fault can be rectified on the conveyor system, this is done at this workstation and the pallet is then transferred back to one of the two storage sections via the conveyor system after being released by a pushbutton. This pushbutton is a non-latching pushbutton and is designed according to ergonomic aspects and arranged in such a way that access to the load carrier and the necessary work processes are not hindered.

If the fault cannot be rectified on the conveyor system, the pallet is transported forwards to the removal station (see figure 4-17, point "2") via the conveyor system after being released using a pushbutton. The removal station is designed in exactly the same way as the loading station for storage.

Fault-free load carriers are then transported to the transfer points for the RGV system; 8 transfer stations are planned in the area of point "5" (see figure 4-17). In order to prepare the pallet according to the position in the storage compartment at the transfer points for the RGV system as required, 2 turntables are provided in the two storage sections after point "3" (see figure 4-17, marked in blue) to turn the pallets from longitudinal to transverse transport.

The RGV system vehicles take over the pallets from the transfer points for storage and transport the pallets to the storage sections in front of the individual aisles of the HBW and deliver the pallets to the storage sections in accordance with the target specification.

The pallets are fed to the transfer points for the storage and retrieval machines on the storage and retrieval sections. There are 2 parallel transfer points per storage and retrieval section, as the storage and retrieval machines have 2 load handling devices.

This function group also includes the 2 pallet lifts (see figure 4-17, point "7"), which connect the Ground Floor with the 1st Floor.

These pallet lifts are connected to the transfer points for storage (see figure 4-17, point "4") via the RGV system. Pallets that are not to be stored in the HBW after being recorded in the incoming goods department but are to be transported to the existing building are transported to the 1st Floor via these pallet lifts and then transported to the existing building via the bridge between the new and existing buildings. One of the conveyor lines on the lift is intended for feeding the pallets to the 1st Floor and the second conveyor line on the lift is intended for feeding pallets from the 1st Floor to the Ground Floor. However, MFS is to decide how to allocate the flow to the lifts.

The pallet lifts must be designed so that up to 2 pallets can be picked up and transported at the same time per transport operation.

Pallets to be transported from the 1st Floor to the ground floor are transported via the lifts to the conveyor lines for retrieval in front of the lifts and are made available for collection by the RGV system.

The RGV system picks up the pallets and transfers them to the retrieval conveyor line (see figure 4-17, point "8"); the pallets are then fed via the conveyor line to the pick-up point next to the loading points for storage. The removal point must be designed in the same way as the loading points.

All the conveyor elements required for this functional group and the distances between them must be designed in such a way that the conveyor functions to be performed are carried out without hindrance or disruption and a continuous material flow is ensured.

4.6.3.3. Capacity and throughput requirements

For the technical design of the various conveying components, the following throughput rates in the maximum hour must be taken into account:

- Storage feed sections HBW: max. 265 pallets / hour
- Storage error section (assumption 10%): max. 26 pallets / hour
- Pallet lifts for transport to the 1st Floor: max. 62 pallets / hour*
- Pallet lifts for transport to the Ground Floor max. 90 pallets / hour
- Removal section Ground Floor (assumption): max. 7 pallets / hour (stacks with empties)

*Remark: This is the maximum flow per hour if some of the pallets delivered to the new building are to be stored in the existing building; in this case, the number of pallets stored in the new HBW is reduced accordingly

The outfeed to the Not-Okay station must be technically designed for 100% of the throughput requirement for the storage sections.

The technical system performance of each storage lane after the pallet loading as well as each pallet lift and the retrieval lane must each be designed for 100% of the throughput requirement. Surcharges for the technical design to ensure fulfilment of the throughput performance must be taken into account by the Logistics Contractor on the basis of his experience.

The individual conveyor lines in this functional group must be equipped with sufficient accumulation capacities, taking the simulation into account.

4.6.3.4. Other specific requirements

The following special requirements must be taken into account for this function group.

- Infeed and outfeed stations:
    - The loading and unloading stations on and off the pallet conveyor system must be monitored with sensors that check the forks of the industrial truck are pulled out before the pick-up element for the 2 pallets simultaneously performs a lifting or lowering movement at the loading or unloading station.
    - The individual components of the loading and unloading stations must be easily accessible for maintenance.
    - The statics and anchoring of the conveyor system must be design or suitable safety measures taken in such a way that no permanent deformation or damage to the steel structure occurs when the conveyor is started by an industrial truck; see also Chapter 4.3.9.
- Check at the identification point in the storage lanes after pallet loading:
    - Integration of a pallet continuous scale with the following features:
        - Automatic and calibratable;
        - Weighing range up to 1,500 kg;
        - System accuracy 0.5 kg;
        - Display and control panel designed according to ergonomic aspects;
    - Length, width and height control, subsequently adjustable;
    - Fork clearance check, foot position check;
    - Barcode scanner to read label from incoming goods;
    - IT interface for transfer of all measured values;
    - Display panel at the “Not-Okay” workplace for “Not-Okay” faults from control station;
- Integration of turntables:
    - The turntables must be integrated into the conveyor lines in such a way that there is only a minimal gap between the turntable and the conveyor line, so that when the pallet changes direction, there is no interference when the pallets are transported from the turntable to the subsequent conveyor.
    - The turntables must either be closed or secured by a fence to prevent possible personal injury due to crushing or similar.
- Integration of conveyor system closures:
    - The storage and retrieval routes pass through a fire protection wall on the ground floor; in the wall marked orange in the layout (see figure 4-1), 4 conveyor system closures for pallets must be taken into account and supplied.
    - The maximum height of a pallet is 2,200 mm, including pallet; the required opening for the conveyor system closure must be determined accordingly and the required opening size, the possible technical design / arrangement of the conveyor system closure on the fire wall must be actively and independently agreed with the General Planner PP.

  - Only approved conveyor system closures are to be used. The Logistics Contractor must provide the Client with valid approval notices required according to Polish regulations outlined in the attached Construction Specification and containing all required certification and acceptance in accordance with local law, as well as the German Institute for Construction Technology (DIBt), if the conveyor system closures is situated in a fire wall. Type and proposed manufacturer of the closures need to be presented in the logistic contractor's offer.
  - The requirements of chapter 4.3.9 must be observed.
  - The possible or offered type of conveyor system closure must be documented by the Logistics Contractor in the offer.

- Storage lines in front of the HBW aisles:
  - The storage lines must be designed to be accessible, i.e. sheet steel plates must be arranged between the chain strands.
  - Maintenance platforms must be installed on the left-hand side of the storage sections in the layout.
  - Starting from the transfer points of the RGV system (brown line in layout figure 4-17), the storage sections must be mounted on a base plate at -500 mm, i.e. a higher elevation must be implemented.
  - The drives and other maintenance equipment must be provided on the left-hand side of the storage sections in the layout in order to ensure the easiest possible maintenance access from the rack aisle.
- Pallet lifts:
  - The pallet lifts must be equipped with all necessary safety devices and barriers; in particular, the client's health and safety requirements attached to the tender must be taken into account.
  - Depending where the drives are positioned, they must be easily accessible for maintenance, i.e. on the ground floor is drives are positioned low, or on top if drives are at the top.
  - The pallet lifts are to be integrated into a steel platform that forms the 1st Floor. In this respect, suitable measures must be taken to prevent the transmission of vibrations or oscillations caused by the movement of the lifting and lowering processes in the lift to the steel platform.
- The conveyor sections in the area where industrial trucks are travelling must be equipped with suitable collision protection. In this function group, in addition to the loading and unloading points, this applies to the retrieval section (see figure 4-17, point "8") and the conveyor sections for connecting the lifts as well as the lifts themselves (see figure 4-17, point "7").
- Transfer steps in conveyor technology: The Logistics Contractor must provide bridging steps over the conveyor system at suitable positions in the conveyor system, taking into account the requirements of escape routes and to realise easy access for maintenance. The Logistics Contractor is requested to document the location of the bridging steps in its offer by means of a corresponding drawing.

4.6.4. Functional system description FG 2 – Outbound area new HBW

4.6.4.1. Layout

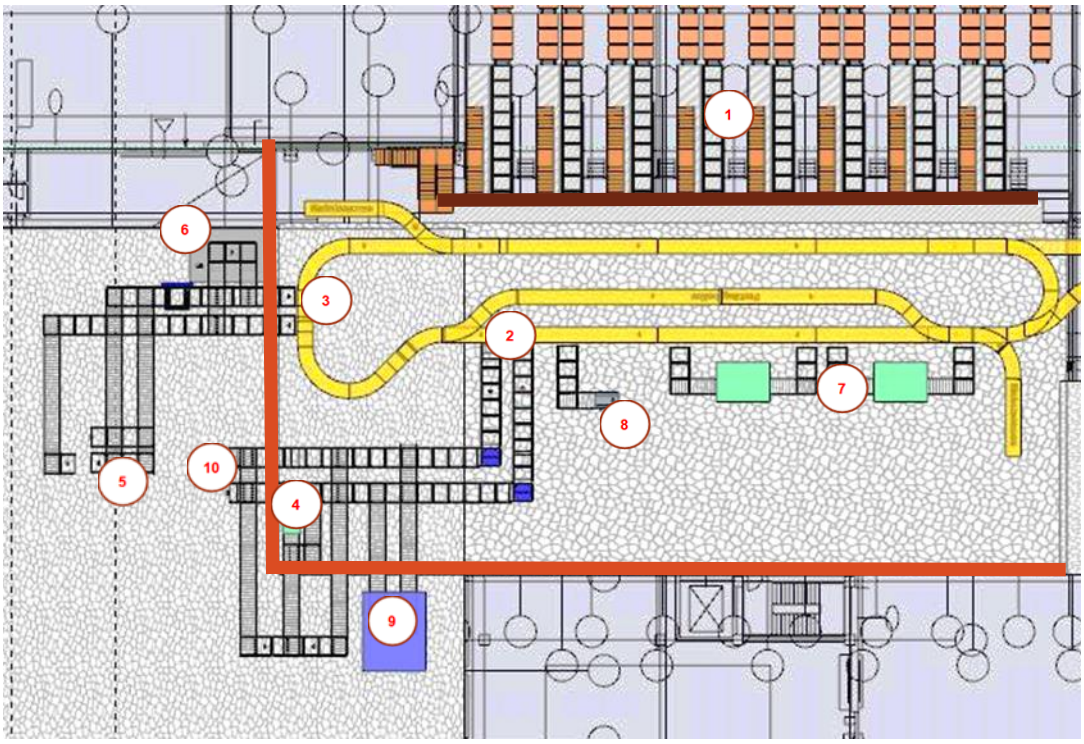


Figure 4-20: Layout Functional Group 2

4.6.4.2. Description of the functional processes

Functional Group 2 is located on the 1st Floor at a height of approx. +6,500 mm and contains the pallet conveyor technology for the retrieval level of the HBW. The entire conveyor technology is to be installed on a steel platform in front of the retrieval sections of the individual HBW aisles. The area of this steel platform is delimited by the fire protection walls shown in figure 4-4 (marked in red, on the left and lower side of the area in question).

The pallets are transported to the conveyor circuit of the RGV system at the end of the storage and retrieval tracks via the storage and retrieval tracks in front of the HBW (see figure 4-20, point "1").

The pallets are transported from the HBW via the RGV system to transfer points "2" and "3" (see figure 4-20); transfer point "2" is the feed point for connecting the workstations in repacking and destacking of empty shipping totes; transfer point "3" is the second feed point for connecting the workstations in repacking.

Another objective for the RGV system in the HBW pre-zone on the 1st Floor are the pallet lifts for connecting the ground floor (see figure 4-20, point "7"). This functional group includes the infeed section into the respective pallet lift and the outfeed section from the respective pallet lift; the lifts themselves are described and included in functional group 1.

In addition, a separate removal finger for the ejection of faulty or defective pallets (see figure 4-20, point "8") is a possible target for the RGV system. After removal from the separate removal finger, the pallets are transported to the combined passenger and goods lift next to the stairwell using a hand pallet truck and brought to the ground floor via this lift.

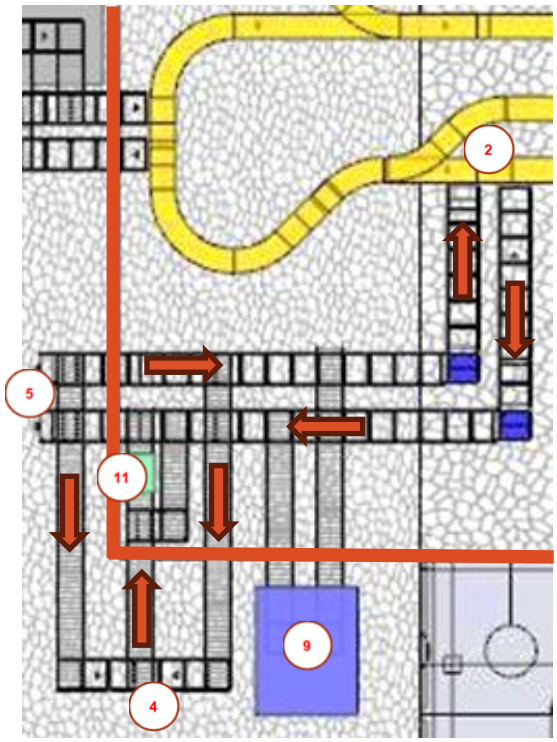


Figure 4-21: Connection Repacking 1 and Destacking shipping totes

After the pallets are delivered to transfer point "2", they are either transported to the workstations for destacking empty shipping totes (see figure 4-21, point "4") or to the transfer station at the T-car for connecting the workstations in repacking (see figure 4-21, point "10"). To provide the pallets at the repacking workstations with the long side in front of the employee, a turntable is provided in the corner of the infeed section (marked blue in figure 4-21).

Two workstations are provided for destacking the empty shipping totes (see figure 4-21, point "4"). At these workstations, the empty shipping totes are removed from the pallet, unfolded and then placed on a container conveyor system.

The empty pallet is then conveyed in the centre between the workstations and stacked in the discharge section via an automatic empty pallet stacking machine (see figure 4-21, point "11"). The stack with the empty pallets is either transferred via transfer point "10" to the T-car for supplying the workstations in repacking or via the short circuit in the area of the transfer point to the pallet conveyor, which transports the pallet back to the transfer point for the RGV system (see figure 4-21, point "2"). At this point, the empty pallet stack is picked up by the RGV system and then transported via one of the pallet lifts (see figure 4-20, point "7") to the Ground Floor, where it is then prepared for removal by an industrial truck via the retrieval section in the incoming goods area. The stack of empty pallets is then transported to a buffer area by the industrial truck. Alternatively, the pallet stack with the empty pallets on the first floor can also be transported over the bridge into the existing building using the RGV system.

In the event that the accumulation routes in front of the workstations for destacking the empty shipping totes are occupied or are not diverted to the accumulation routes in front of the workstations immediately after arrival, the option of circling is provided so that there is no backlog for supplying the workstations

in repacking. For this purpose, the pallet travels past the outfeeds on the accumulation routes to the workstations and is transferred to the return route in the direction of the RGV system before the staging area for transfer to the T-car and then travels in the opposite direction. At the level of the first discharge to the workstation for destacking the empty shipping totes, the pallet is then transferred back to the other conveyor line and can then be discharged onto the accumulation lines for feeding to the workstations.

If it is determined during destacking of the shipping totes that the shipping totes are heavily soiled or cannot be used due to other criteria, the pallet in question with the shipping totes is removed via the centre conveyor line at the workstations and then travels past the automatic stacking machine for the empty pallets and then via the conveyor line to the transfer station for the RGV system. The RGV system then takes this pallet to the separate removal finger (see figure 4-20, point "8"), where the pallet is removed and can then be transported to the ground floor via the combined passenger and goods lift next to the stairwell.

If the pallets are intended for the workstations in the repacking area, they are transported to the transfer point on the T-car after the delivery point of the RGV system (see figure 4-21, point "2") via the conveyor system to supply the workstations in the repacking area and made available there (see figure 4-21, point "10").

In the event that no T-car is currently available, this pallet can also use the small cycle described above for the pallets to the workstations for destacking empty shipping totes in order to avoid a backlog with regard to supplying the workstations for destacking empty shipping totes.

Figure 4-21, point "9" shows a possible location for the alternative offer of automatic removal, unfolding and feeding of the empty shipping totes with a possible conveyor connection.

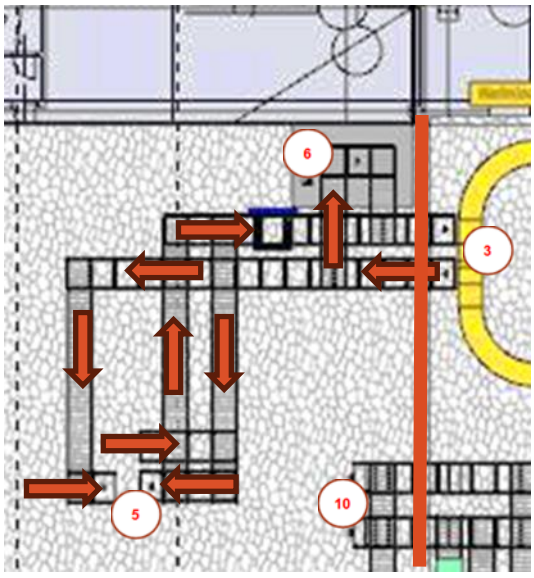


Figure 4-22: Connection to Repacking 2 and Checking station for pallets

After the pallets have been delivered to transfer point "3", they are either transported to the transfer stations on the T-car for connecting the workstations in repacking (see figure 4-22, point "5") or to the workstation for checking pallets (see figure 4-22, point "6").

There are 2 transfer stations for supplying the workstations in repacking (see figure 4-22, point "5").

If pallets can wait in front of the transfer stations of the T-car until they are picked up, it is possible for these pallets to be circulated in order to increase the buffer capacity of the line. In this case, the pallets are conveyed to the right-hand transfer point to the T-car and immediately before the transfer point for the T-car are moved to the right in the direction of conveying, either to return on the parallel conveyor system (short cycle) or to continue on the conveyor system in the direction of the checking station for the pallets, in order to then be transported from the conveyor line to the checking station back to the original feed line to transfer point "5" (large cycle).

The pallets that are to be returned to the HBW from the workstations in repacking or checked at the checking station are released from repacking by the T-car at the upper transfer point "5" and then transported in the direction of the checking station (see figure 4-22, point "6").

If the pallet needs to be secured by wrapping before it is returned to the HBW, an automatic wrapping machine (ring wrapper or similar) is provided in the conveyor system before reaching the checking station. After the load has been secured, the pallet is then prepared for transfer to the RGV system at transfer point "3". After being picked up by the RGV system with the destination HBW, the pallet is transported to the destination of the pallet lifts (see figure 4-20, point "7"), transferred there and transported via the pallet lifts to the storage level on the ground floor.

If the destination for the pallet is the checking station, the pallet is discharged to the workstation without being wrapped and can then be transported away from the checking station again after processing, with subsequent transfer to the RGV system.

If a pallet is to be checked, e.g. from the HBW, this pallet is transferred via the RGV system at transfer point "3" and is then transported back to the workstation in the direction of the checking station, crossing the removal path for the pallets.

4.6.4.3. Capacity and throughput requirements

For the technical design of the various conveying components, the following throughput rates in the maximum hour must be taken into account:

- HBW retrieval lines: max. 246 pallets / hour
- Feeding existing building or warehouse: max. 115 pallets / hour
- Feeding workstations Destacking empty shipping totes: max: 20 pallets / hour
- Feeding workstations Repacking: max. 111 pallets / hour
- Return to HBW from workstations Repacking: max. 53 pallets / hour

The technical system performance of each removal lane in front of the HBW as well as each conveyor lane must each be designed for 100% of the throughput requirement. Surcharges for the technical design to ensure fulfilment of the throughput performance and to enable additional material flows to the checking station must be taken into account by the Logistics Contractor on the basis of his experience.

The individual conveyor lines in this functional group must be equipped with sufficient accumulation capacities, taking the simulation into account.

4.6.4.4. Other specific requirements

The following special requirements must be taken into account for this function group.

- Steel platform on the 1st Floor:
    - The entire conveyor system on the 1st Floor in front of the HBW's retrieval sections must be mounted on a steel platform construction; the steel platform is limited by the fire protection walls shown in Figure 4-20.
    - When installing the conveyor technology and its components, the transfer of all dynamic and static forces that may act on the steel platform must be avoided or at least minimised by taking suitable measures.
- Retrieval lines in front of the HBW aisles:
    - The retrieval lines must be designed to be accessible, i.e. sheet steel plates must be arranged between the chain strands.
    - Maintenance platforms must be installed on the left-hand side of the retrieval lines in the layout.
    - The drives and other maintenance equipment of the pallet conveyor system must be provided on the left-hand side of the retrieval lines in the layout in order to ensure the easiest possible maintenance access from the rack aisle.
- Outfeed station:
    - A lifting table must be provided at the end of the removal station, which lowers the pallet to the height of the upper edge of the steel platform. This lifting table must be clad in accordance with the safety requirements and fitted with collision protection.
    - The unloading stations of the pallet conveyor system (see figure 4-20, point “8”) must be monitored with sensors that check the forks of the industrial truck are pulled out before the pick-up element performs a lifting or lowering movement at the loading or unloading station.
    - The individual components the unloading station must be easily accessible for maintenance.
    - The statics and anchoring of the conveyor system must be design or suitable safety measures taken in such a way that no permanent deformation or damage to the steel structure occurs when the conveyor is started by an industrial truck; see also Chapter 4.3.9.
- Integration of turntables:
    - The turntables must be integrated into the conveyor lines in such a way that there is only a minimal gap between the turntable and the conveyor line, so that when the pallet changes direction, there is no interference when the pallets are transported from the turntable to the subsequent conveyor.
    - The turntables must either be closed or secured by a fence to prevent possible personal injury due to crushing or similar.
- Integration of conveyor system closures:

- The pallet conveyor passes through two fire protection walls in the 1st Floor; in the wall marked orange in the layout (see figures 4-5 and 4-6), 6 conveyor system closures for pallets must be taken into account and supplied (without considering the alternative automatic destacking of empty shipping totes).
- The maximum height of a pallet is 2,200 mm, including pallet; the required opening for the conveyor system closure must be determined accordingly and the required opening size, the possible technical design / arrangement of the conveyor system closure on the fire wall must be actively and independently agreed with the General Planner PP.
- Only approved conveyor system closures are to be used. The Logistics Contractor must provide the Client with valid approval notices required according to Polish regulations outlined in the attached Construction Specification and containing all required certification and acceptance in accordance with local law, as well as the German Institute for Construction Technology (DIBt), if the conveyor system closures is situated in a fire wall. Type and proposed manufacturer of the closures need to be presented in the logistic contractor's offer.
- The requirements of chapter 4.3.9 must be observed.
- The possible or offered type of conveyor system closure must be documented by the Logistics Contractor in the offer.

- The conveyor sections in the area where industrial trucks are travelling must be equipped with suitable collision protection. In this function group, this applies to the retrieval section (see figure 4-20, point "8"), the right-hand conveyor from the transfer point "2" (see figure 4-20) and the conveyor sections for connecting the lifts as well as the lifts themselves (see figure 4-20, point "7").
- Transfer steps in conveyor technology: The Logistics Contractor must provide bridging steps over the conveyor system at suitable positions in the conveyor system, taking into account the requirements of escape routes and to realise easy access for maintenance. The Logistics Contractor is requested to document the location of the bridging steps in its offer by means of a corresponding drawing.

4.6.5. Functional system description FG 3 – Repacking area

4.6.5.1. Layout

The repacking area can be divided into 2 sections: manual repacking (see figure 4-23, "A") and automatic repacking (see figure 4-23, "B").

The repacking function group is connected to the T-cars "5" and "10" and the "Outbound area new HBW" function group via the described transfer points (see descriptions in the previous chapter).

The conveyor components in the repacking area are to be fixed to a concrete ceiling between the Ground Floor and the 1st Floor.

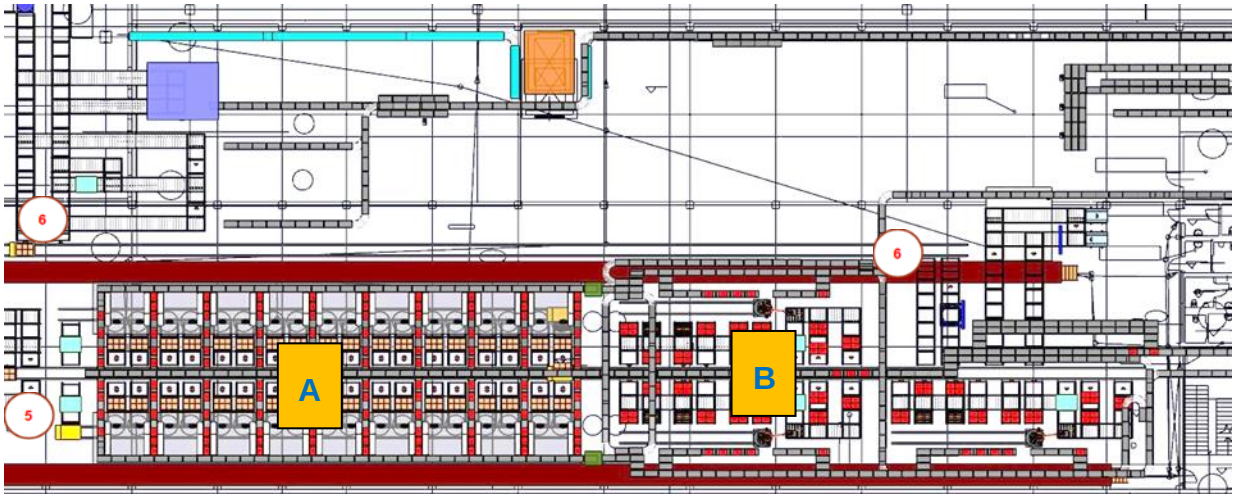


Figure 4-23: Overview Repacking area

4.6.5.2. Description of the functional processes

The following descriptions of the pallet conveyor system and its components are divided into the two areas - manual and automatic.

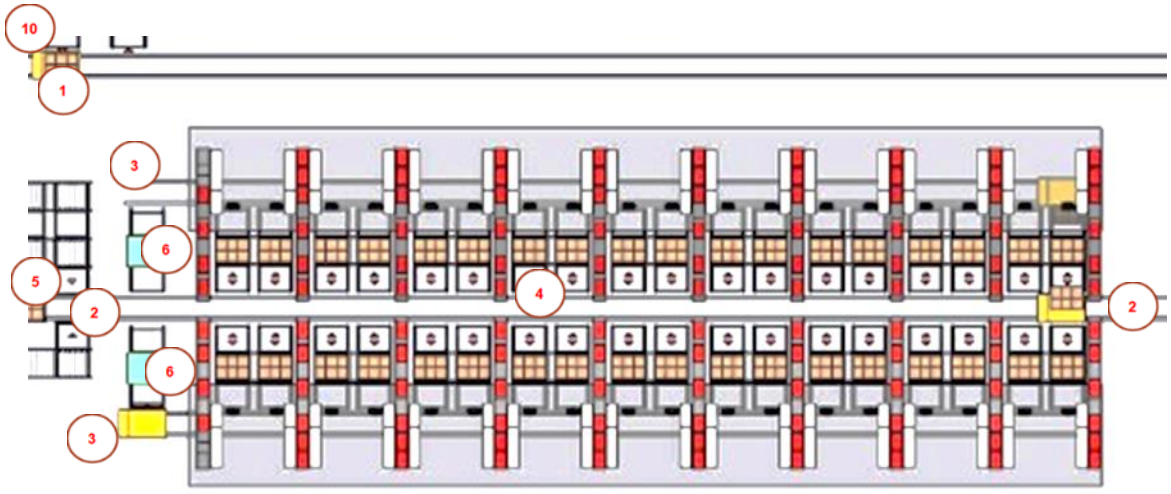


Figure 4-24: Overview manual Repacking area

The manual repacking area is connected to the previous functional group via the transfer points of the pallet conveyor system to the T-cars (see figure 4-24, point "5" and point "10"). At these two transfer points, the pallets are taken from the T-cars and distributed to the workstations. The pallets are transported via T-car "1" (see figure 4-24) either to the manual repacking area or to the automatic repacking area. The destination of the T-car is then transfer point "6" (see figure 4-23). Via this transfer point, the pallet is transferred to the next transfer point on the next T-car using pallet conveyor technology. At this transfer point, the pallet is taken over by a T-car travelling on the same rail as the T-car that takes over the pallets from transfer point "5" on the left-hand side of the manual repacking.

For the supply and disposal of the manual workstations, 2 T-cars travel on the same track to supply and dispose of the workstations (see figure 4-24, point "4") in manual repacking.

There are up to 36 workstations in the manual repacking area. The 36 workstations are created when full repacking is carried out at all workstations, i.e. all original pallets are emptied after repacking.

In addition to full repacking, partial repacking is also possible at the workstations. For this purpose, 2 directly adjacent full repacking workstation must be registered with the partial repacking functionality for a partial repacking workstation; this registration must be managed and controlled via the MFS in conjunction with the WMS. With partial repacking, the original pallet is transported to one of the two workstation and an empty pallet is provided at the second workstation.

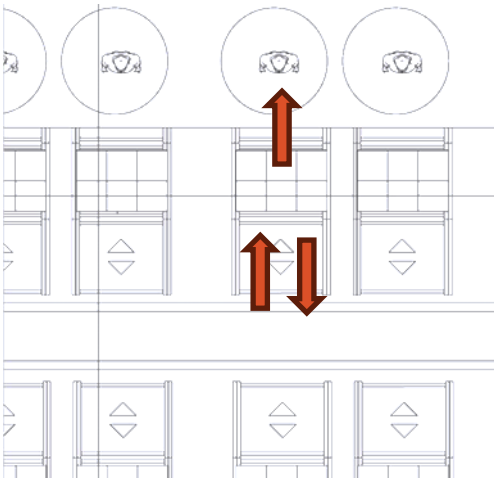


Figure 4-25: Layout manual workstation Repacking

The T-car moves the pallet to the defined workstation, which is determined by the MFS based on the workstation capacity utilization and transfers the pallet to the delivery location (see figure 4-25).

From the delivery area the pallet moves to the storage area directly in front of the workstation. The arrival of the pallet at the workplace must be reported by the MFS to the WMS so that the correct information can be provided by the WMS on the screen at the workplace.

As the employees are standing on a platform construction with a height of approx. 1,000 mm above the upper edge of the 1st Floor, the storage location directly in front of the workstation must be equipped with a lifting device that can be used to raise the pallet to an ergonomic height for the employee by pressing a pushbutton (see figure 4-27).

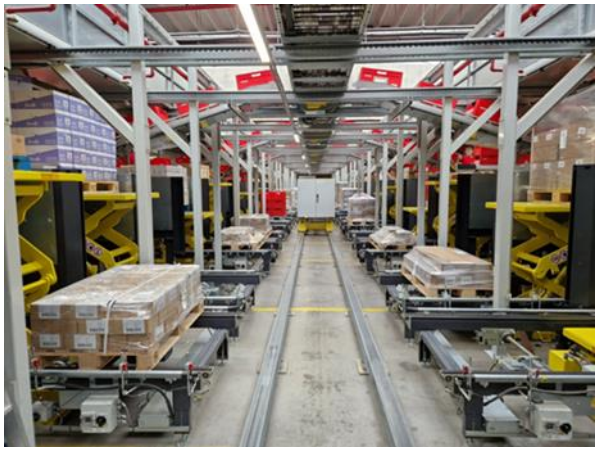


Figure 4-26: View of the T-car area in existing processing

When the pallet has become empty after repacking, the empty pallet is moved from the position on the lift table in front of the workstation to a transfer point under the platform construction for the workstation (see figure 9), from where the empty pallet is picked up by another T-car and then transported to the beginning of the workstation area (see figure 4-24, point "3").

The transfer area for the delivery by the T-car must also be used as a buffer area for the second pallet in front of the workstation. In the event that an incorrect pallet is in front of the employee at the workstation, it must be conveyed to an emergency okay station (see also process descriptions under chapter 3). For this reason, the two conveyors in front of the workstations must be designed as reversible conveyors. If there is a pallet at the transfer station and the pallet must be removed from the workstation via the transfer station, the pallet must be picked up from the transfer station by the T-car and transported either to another free workstation or to another defined destination in accordance with the process description in chapter 3 (see figure 4-24, point “5” or point “10” via transport over point “6” in figure 4-23).

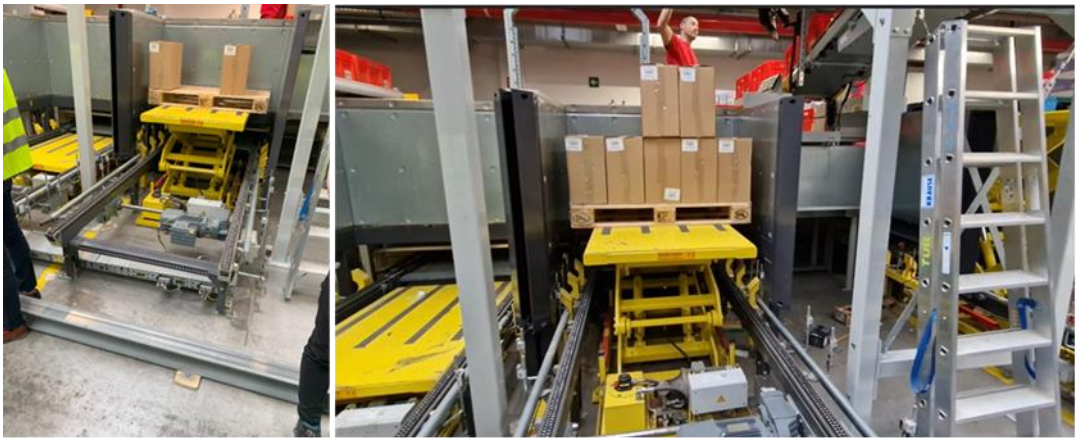


Figure 4-27: View of acutal lift table at the workstation from T-car perspective

In the case of partial repacking, the rear storage space of the infeed section must be kept free for the pallets to be processed, as the only partially unpacked or repacked pallet, provided it has not become empty, must then be removed from the workstations via the infeed and the T-car and fed to the HBW

for storage. On the second route for feeding the empty pallets to pick up the unpacked or repacked quantities, the rear storage space must also be kept free, as the filled pallet must then be removed again via the same route using the T-cars and transported to the HBW for storage, via the wrapping station near the checking station (see figure 4-22, point “6”).

The pallets that have become empty after repacking are made available for collection by a T-car underneath the platform for the employees. After the empty pallet has been picked up by the T-car, the pallet is transported to the beginning of the manual workstations on the left-hand side of the layout (see figure 4-24, point "3") to the delivery point and handed over.

After the empty pallets are handed over, they enter an automatic empty pallet stacker (see figure 4-24, point “6”) and are stacked automatically. Once the stack is full, it is placed in front of the automatic stacker again for collection by the T-car, which runs in the centre of the manual workstations.

This T-car then transports the stack of empty pallets either to the automatic repacking area as a replenishment for the robots or to transfer point "5", with further transport via the pallet conveyor system and the RGV system to the lifts in front of the HBW, from where it is transported to the ground floor or existing building, where it is then removed from the conveyor system and transported to an empty pallet buffer or designated place in the manual warehouse.

The manual workstations are set up in the same way on the left and right side of the centre-empty T-car area and the employees stand on both sides on a platform construction, under which a T-car moves on both sides to remove the empty pallets from the workstations. An automatic empty pallet stacker is then arranged on both sides on the left-hand side in layout figure 4-24.

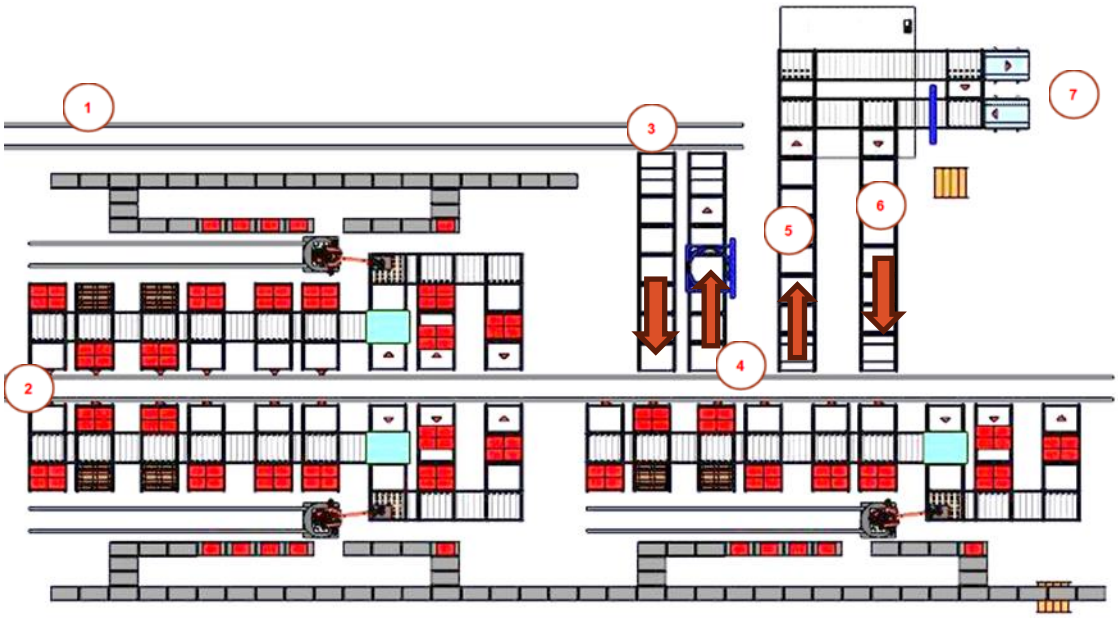


Figure 4-28: Overview automatic Repacking area

The automatic repacking area is transported and transferred by T-car "1" from transfer point "3" (see figure 4-23) with subsequent transfer at transfer point "3", transport to transfer point "4" and transfer by

one of the two T-cars "2" to the transfer position of the 3 robots specified by the MFS (see figure 4-28). Taking into account the supply / removal of the manual workstations, a total of 2 T-cars travel on one rail in the centre area across both repacking areas.

After repacking, pallets with filled storage totes (full repacking) or pallets from which partial quantities have been removed are transported to T-car "1" via transfer station "4" (see figure 4-28) and fed to transfer station "3" (see figure 4-23) via T-car "1"; The pallet is then fed to the pallet lifts in the pre-zone of the HBW via the pallet conveyor system, the RGV system, then lowered to the ground floor and from there stored in the HBW again. The pallets that are to be returned to the HBW from the manual workstations are stored in the HBW in the same way.

In the event that a pallet requires load securing, an automatic pallet wrapper (ring winder or similar) is provided in the pallet conveyor section between transfer points "4" and "3".

Faulty pallets are transported via the centre T-cars to transfer station "5", where they are transferred and transported to the Not-Okay station for further processing. This processing station is equipped with a platform construction so that the employee can walk completely around the pallet. The area between the conveyor rollers must be closed with tread plates. If the fault can be rectified directly at the workstation, the pallet is then automatically transferred to the return section and fed to transfer point "6" after the employee has given the go-ahead using a pushbutton. There, the pallet can then be picked up by the T-cars "2" and transported to the specified destination in accordance with the MFS specifications. If the fault cannot be rectified directly at the workstation, the pallet is ejected and lowered to the level of the 1st Floor to +6,500 mm via a lowering station at the end of the conveyor and removed from there by an industrial truck.

Pallets can also be brought into the system via this Not-Okay station. These are delivered to a lowered station that can hold a pallet, lifted and then fed to transfer point "6" (see figure 4-28) via the conveyor line. On this route, the pallet passes through a check station consisting of a contour, weight and clearance check as well as a barcode reading station. If errors occur, this pallet can be ejected after the check station onto the error line and then processed.

For the two T-cars travelling in the middle of the repacking area (see figure 4-24, point "2" and figure $-28, point "2"), a maintenance area must be provided at a suitable location at both ends of the track, where a T-car can also be parked if necessary due to a malfunction.

For the two T-cars (see figure 4-24, point "3") that travel under the working platform of the manual workstations in repacking, a maintenance space must be provided at a suitable location.

The processes on the robot for automatic repacking are described for one robot as an example.



Figure 4-29: Robot working area

At the current planning stage, robots are planned that move independently on rails (see figure 4-29, point "10".

The palletising of empty or filled storage totes is planned in the left part of the layout (left in the robot's travel range). Six storage locations are planned for this, so that up to five different items can be palletised in parallel per robot. An additional space is provided for the installation of a pallet with empty storage totes.

In addition, in the area of the robot in the area of the depalletising station (see figure 4-19, point "10"), a storage space for containers with clips must be provided to secure the top level of a pallet with containers. The exact position is determined as part of the implementation planning. This space must be accessible from the outside, as the containers are fed in manually.

In preparation for automatic palletising, an empty pallet is transported to the storage locations (see figure 4-29, point "4"). The empty pallets are first removed from the stacking machine for the empty pallets (see figure 4-29, point "3") and fed to the storage locations via the centre conveyor system. When the empty pallet is placed in one of the storage locations, the empty pallet is also assigned an article that is to be palletised on this pallet.

The storage totes to be palletised are provided to the robot for palletising on a higher container conveyor section (conveyor technology is described in the Tote Conveyor section).

Before reaching the transfer position, the storage totes are scanned and the position of the storage totes on the supply line is known to the robot via the data transmitted by the MFS.

The robot removes the storage tote from the staging line and places the storage tote on the pallet intended for the item in the storage tote.

When the pallet to be palletised is full, it is transported from palletising position "4" to transfer position "5", from where the pallet is picked up by one of the T-cars and transported to transfer station "4" (see figure 4-28) or in the direction of transfer station "5" (see figure 4-24), with subsequent onward transport to storage in the HBW,

In the right-hand part of the layout (to the right of the automatic stacking machine for the empty pallets), the depalletising of empty or filled storage totes is provided for. Only one pallet is depalletised at a time.

The T-cars transport the pallets for depalletising to transfer station "6" (see figure 4-29). After transfer to the pallet conveyor system, the pallet is transported to the depalletising position "7". From the transfer position to just before the depalletising position, at least 3 buffer positions must be created on the pallet conveyor system.

At the depalletising position, the robot removes the quantity specified by the MFS from the pallet and places it on a higher container conveyor (conveyor technology is described in the section on the dead conveyor).

If the pallet is not yet empty after depalletising and is to be returned to the HBW, the pallet is transported from the depalletising position onto the conveyor to transfer station "8" and made available for transfer by the T-cars.

When the pallet has become empty after depalletising, the pallet is conveyed from the depalletising position to the automatic empty pallet stacker and stacked. These empty pallets can then be used again for automatic palletising.

If fewer empty pallets come from the depalletising station than are required for palletising, stacks of empty pallets can also be fed to the empty pallet stacker via the transfer station directly in front of the empty pallet stacker via the T-cars. Stacks of empty pallets can be fed into the system via the Not-Okay station (see figure 4-28, point "7").

4.6.5.3. Capacity and throughput requirements

For the technical design of the various conveying components, the following throughput rates in the maximum hour must be taken into account:

- HBW to repacking area
    - to manual repacking workstations: max. 66 pallets / hour
    - to automatic repacking workstations / robots: max. 45 pallets / hour
- Repacking area to HBW
    - from manual repacking workstations (assumption): stacking automatically
    - from automatic repacking workstations / robots: max. 53 pallets / hour
- Workstations repacking to empty pallet puffer: max. 58 pallets / hour

The technical system performance of each removal lane in front of the HBW as well as each conveyor lane must each be designed for 100% of the throughput requirement. Surcharges for the technical design to ensure fulfilment of the throughput performance and to enable additional material flows to the checking station must be taken into account by the Logistics Contractor on the basis of his experience.

The individual conveyor lines in this functional group must be equipped with sufficient accumulation capacities, taking the simulation into account.

4.6.5.4. Other specific requirements

The following special requirements must be taken into account for this functional group.

- Infeed and outfeed station (Not-Okay station):

- A lifting table must be provided at the start of the infeed conveyor line / at the end of the removal conveyor line, which lifts or lowers the pallet from or to the height of the upper edge of the pallet conveyor. These lifting tables must be clad in accordance with the safety requirements and fitted with collision protection.
- The up- /unloading stations of the pallet conveyor system (see figure 4-28, point “7”) must be monitored with sensors that check the forks of the industrial truck are pulled out before the pick-up element performs a lifting or lowering movement at the loading or unloading station.
- Individual components the unloading station must be easily accessible for maintenance.
- Statics / anchoring of the conveyor system must be design or suitable safety measures taken in such a way that no permanent deformation or damage to the steel structure occurs when the conveyor is started by an industrial truck; see also Chapter 4.3.9.

- Manual workstations for repacking:
  - Workstations must be equipped with a lifting table. A U-shaped enclosure must be provided opposite workstations and the lift table to protect the employee from crushing and other possible injuries (see figure 4-30 and figure 4-3). This panelling must not impair functionality of the lift table and the materials handling components or the productivity of the employee at the workstation. Further workplace equipment is described in chapter 4.11.

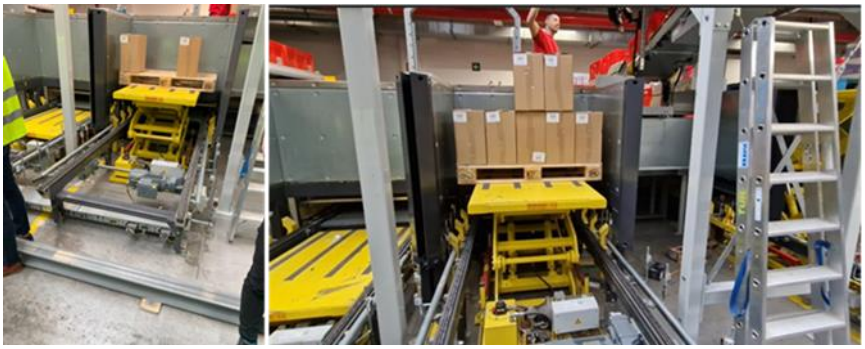


Figure 4-30: Lift table panelling as seen from the T-car

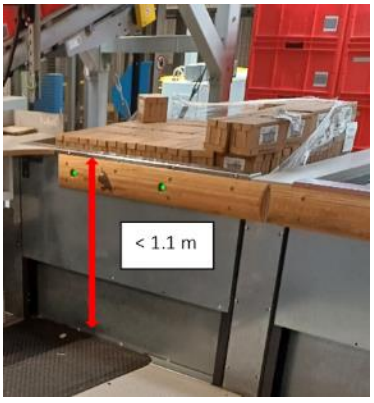


Figure 4-31: Lift table panelling from the employee's perspective

- The components that require regular maintenance must be easily accessible despite the panelling, either because they are not covered by the panelling or because parts of the panelling can be easily removed for maintenance.

- Constructions in the area of the travel path of the T-cars:
  - Necessary constructions in connection with the panelling of the workstations opposite the lift tables or for supporting the platform construction for the employees at the workstations or for the supports for holding the tote conveyor technology above the travel range of the T-cars must be arranged in such a way that the travel range of the T-cars is not restricted or the performance of the T-cars impaired.

    Constructions and their arrangement in today's processing are shown in the following illustration.

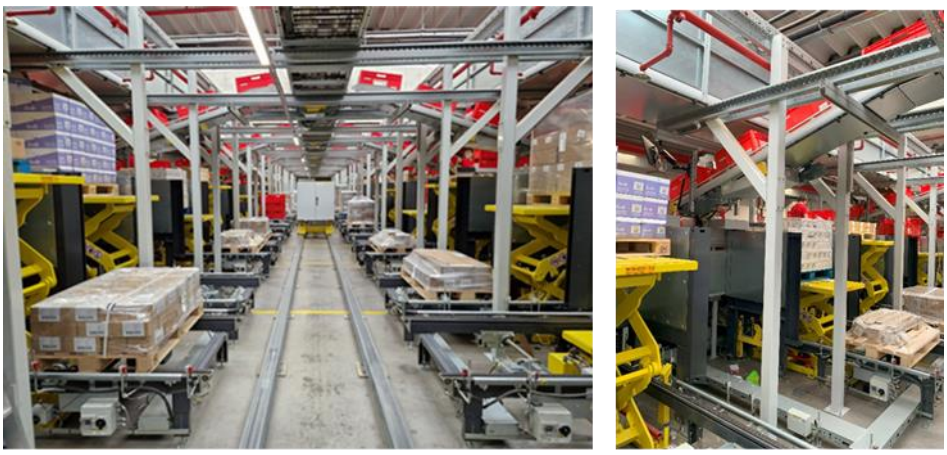


Figure 4-32: Steel structures in the area of the current T-car travel range

  - The design of the transfer stations between the pallet conveyor system and the T-cars must be such that the gap between the T-car and the pallet conveyor system is minimised and the transfer of pallets between the two systems can take place without problems or functional restrictions.
  - The design of the T-cars below the platform on which the employees stand in manual repacking area must be as low as possible so that the height of the T-car with empty pallet and rail construction is not higher than 650 mm (see figure 4-33 for current situation).

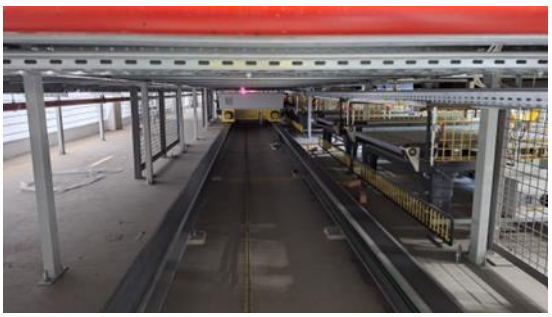


Figure 4-33: T-car for empty pallets under steel construction for workstations

- Requirements of construction and steering system of the T-cars:
    - If there is a height difference between the transfer stations of the pallet conveyor system in the infeed from or outfeed to the HBW and the pallet conveyor system or the discharge stations in the manual and automatic repacking area, this must be provided either by a lifting unit on the T-cars or a lifting unit in the pallet conveyor system from or to the HBW.

      If the lifting unit is present on the T-cars, this must not restrict the required capacity of the T-car.
    - In the travel range of the T-cars in the centre of the manual and automatic repacking workstations, it is intended that 2 T-cars can travel on the same rail and that each T-car can also travel to each delivery or pick-up point of the manual and automatic repacking workstations. The Logistics Contractor must specify the appropriate solution in its offer.
    - The Logistics Contractor is requested to examine the use of a T-car with 2 load handling devices, taking into account the throughput requirements and the simulation results. The use of a T-car with 2 load handling attachments is to be offered as an alternative.
- Driving range of the T-cars and the mobile robots:
    - The open travel area of the T-cars and the mobile robots must be protected against unauthorised access to the travel area with a fencing system.
    - Doors must be provided at suitable points in the fencing system to allow access for troubleshooting, maintenance and repairs.
    - The doors must be fitted with a key switch so that the T-car or robot is switched off and stopped when the door is opened. Restarting the T-car or robot in automatic mode is only possible after closing the door and removing the key.
    - The Logistics Contractor is requested to coordinate the arrangement of the doors in detail with the client as part of the implementation planning.
- Construction / fastening / anchoring of the conveyor components on the 1st Floor:
    - The design of the various conveyors and the arrangement of the drives must be such that the individual components that require regular maintenance are easily accessible.
    - The anchoring and fastening of the components of the pallet conveyor system, the automatic pallet stackers, the rail guide for the T-cars and the robots must be designed in such a way that the transfer of dynamic and static loads caused by the movements of the components or the movements on the components and the associated vibrations to the floor slab are avoided.
- The conveyor sections in the area where industrial trucks are travelling must be equipped with suitable collision protection. In this function group, in addition to the loading and unloading points, this applies to the retrieval section (see figure 4-28, point "7") and the conveyor sections on the eastern side of the Not-Okay station (see figure 4-28, point "7")

- Transfer steps in conveyor technology: The Logistics Contractor must provide bridging steps over the conveyor system at suitable positions in the conveyor system, taking into account the requirements of escape routes and to realise easy access for maintenance. The Logistics Contractor is requested to document the location of the bridging steps in its offer by means of a corresponding drawing.

4.6.6. Functional system description FG 4 – Existing warehouse

4.6.6.1. Layout

Pallet conveyor systems are to be installed on the ground floor and 1st Floor of the existing building or warehouse. The two layouts are shown below.

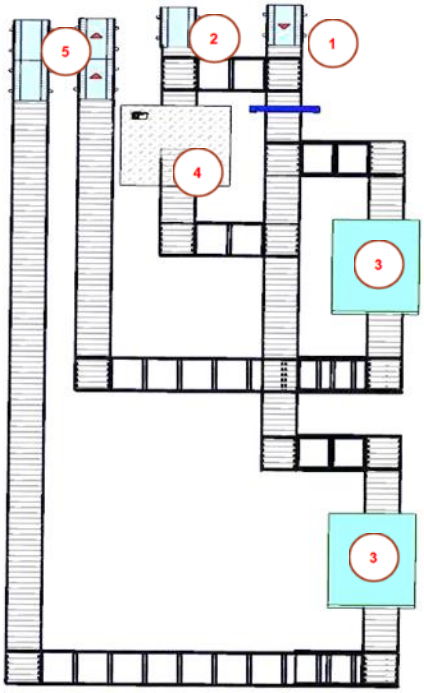


Figure 4-34: Layout Ground Floor existing warehouse

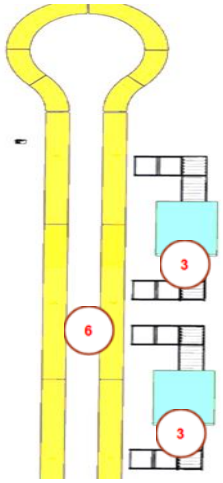


Figure 4-35: 1st Floor existing warehouse

4.6.6.2. Description of the functional processes

Pallets that are to be transported from the existing building to the new building are loaded at the loading point on the ground floor of the existing building using industrial trucks (see figure 4-34, point "1").

The loading stations can be lowered to enable operation by industrial trucks without a lift. Furthermore, the loading station is designed in such a way that 1 pallet can be loaded by an industrial truck.

After positioning, the load carriers pass through an identification point (I-point) where the contour, skid clearance, weight and legibility of the barcode are checked.

If errors occur after the check, the pallets are transported to the Not-Okay station (see figure 4-34, point “4”). This workstation is located on a platform (platforms at the different workstations are described in chapter 4.11) so that the employee can walk around the pallet. The spaces between the rollers of the pallet conveyor must be closed with tread plates (see figure 4-19).

If the detected fault can be rectified on the conveyor system, this is done at this workstation and the pallet is then transferred back to the storage section via the conveyor system after being released by a pushbutton. This pushbutton is a non-latching pushbutton and is designed according to ergonomic aspects and arranged in such a way that access to the load carrier and the necessary work processes are not hindered.

If the fault cannot be rectified on the conveyor system, the pallet is transported forwards to the removal station (see figure 4-34, point "2") via the conveyor system after being released using a pushbutton. The removal station is designed in exactly the same way as the loading station for storage.

Fault-free load carriers are then transported to the transfer points for the pallet lifts (see figure 4-34, point “3”). The lifts transport the pallets for the new building to the level of the 1st Floor and transfer the pallets to the pallet conveyor system, which transports the pallets to the transfer points of the RGV system (see figure 4-35, point "6").

The pallet lifts must be designed so that up to 2 pallets can be picked up and transported at the same time per transport operation.

The RGV system vehicles take over the pallets from the transfer points for transport of the pallets to the new building via the bridge between the new and existing building.

Pallets that are to be transported from the new building to the existing building are transported and transferred via the RGV system on the 1st Floor via a bridge between the new building and the existing building to the transfer stations in front of the pallet lifts in the existing building.

Pallets to be transported from the 1st Floor to the ground floor are transported via the lifts to the conveyor lines for retrieval in front of the lifts and are made available for collection by industrial trucks (see figure 34, point “5”). Two pick-up stations are planned on the ground floor of the existing building.

Furthermore, the pick-up station is designed in such a way that 2 pallets can be picked-up simultaneously by an industrial truck with a long fork (see figure 4-18).

All the conveyor elements required for this functional group and the distances between them must be designed in such a way that the conveyor functions to be performed are carried out without hindrance or disruption and a continuous material flow is ensured.

4.6.6.3. Capacity and throughput requirements

For the technical design of the various conveying components, the following throughput rates in the maximum hour must be taken into account:

- Number of pallets from existing building to new building: max. 30 pallets / hour
- Number of pallets from new building to existing building: max. 115 pallets / hour

The outfeed to the Not-Okay station must be technically designed for 100% of the throughput requirement for the storage sections.

The technical system performance of each storage lane after the pallet loading as well as each pallet lift and the retrieval lane must each be designed for 100% of the throughput requirement. Surcharges for the technical design to ensure fulfilment of the throughput performance must be taken into account by the Logistics Contractor on the basis of his experience.

The individual conveyor lines in this functional group must be equipped with sufficient accumulation capacities, taking the simulation into account.

4.6.6.4. Other specific requirements

The following special requirements must be taken into account for this function group.

- Infeed and outfeed stations:
    - The loading and unloading stations on and off the pallet conveyor system must be monitored with sensors that check the forks of the industrial truck are pulled out before the pick-up element performs a lifting or lowering movement at the loading or unloading station.
    - The individual components of the loading and unloading stations must be easily accessible for maintenance.
    - The statics and anchoring of the conveyor system must be design or suitable safety measures taken in such a way that no permanent deformation or damage to the steel structure occurs when the conveyor is started by an industrial truck; see also Chapter 4.3.9.

- Check at the identification point in the storage lanes after pallet loading:
    - Integration of a pallet continuous scale with the following features:
        - Automatic and calibratable;
        - Weighing range up to 1,500 kg;
        - System accuracy 0.5 kg;
        - Display and control panel designed according to ergonomic aspects;
    - Length, width and height control, subsequently adjustable;
    - Fork clearance check, foot position check;
    - Barcode scanner to read label from incoming goods;
    - IT interface for transfer of all measured values;
    - Display panel at the “Not-Okay” workplace for “Not-Okay” faults from control station;
- Pallet lifts:
    - The pallet lifts must be equipped with all necessary safety devices and barriers; in particular, the client's health and safety requirements attached to the tender must be taken into account.
    - Depending where the drives are positioned, they must be easily accessible for maintenance, i.e. on the ground floor is drives are positioned low, or on top if drives are at the top.
    - The pallet lifts are to be integrated into a steel platform that forms the 1st Floor. In this respect, suitable measures must be taken to prevent the transmission of vibrations or oscillations caused by the movement of the lifting and lowering processes in the lift to the steel platform.
- Steel platform: The steel platform that forms the 1st Floor in the existing building is part of the Logistics Contractor's scope of supply and services (description under chapter 4.13). This means that the pallet conveyors and the rails of the RGV system must be fastened to this steel platform in such a way that the dynamic loads caused by the movements on the pallet conveyors and the vehicles of the RGV system on the rails as well as vibrations are not transferred to the construction of the steel platform or that the transfer is minimised by means of suitable measures.
- The conveyor sections in the area where industrial trucks are travelling must be equipped with suitable collision protection. In this function group, in addition to the loading and unloading points, this applies to the conveyor lines and the lifts right-hand in the layout figure 4-34.
- Transfer steps in conveyor technology: The Logistics Contractor must provide bridging steps over the conveyor system at suitable positions in the conveyor system, taking into account the requirements of escape routes and to realise easy access for maintenance. The Logistics Contractor is requested to document the location of the bridging steps in its offer by means of a corresponding drawing.

4.7. RGV system

4.7.1. Functional description

The RGV system is used for the transport of load carriers from the inbound area of the new HBW (from the new building and from the existing building), from the new HBW to the repacking area and from the new warehouse to the existing building as well as from the repacking to the inbound area in the new building.

The RGV system is to be assigned to the following functional groups for the offer:

- Functional Group 1: Inbound area new HBW
- Functional Group 2: Outbound area new HBW
- Functional Group 3: Connection new building to existing building

The basic functionality, routing and other requirements are described below. The guidance of the RGV system is only functionally given. The drawings / sketches in the document reflect a principle representation of the material flow. The Logistics Contractor must present his solution within the scope of the offer and prove that the solution selected meets the functional requirements for quality and performance.

4.7.2. Requirements for RGV system

4.7.2.1. Conveyed goods

The RGV system must be designed for the load carriers with the specifications specified in chapter 2.3.3

4.7.2.2. Capacity and throughput requirements

The capacity and throughput requirements are defined below for each function group.

4.7.2.3. General requirements

In principle, the requirements according to chapters 4.2 and 4.3 are to be fulfilled.

The scope of delivery and services of the RGV system includes:

- Routing and vehicles, according to description / drawing incl. the switches in the routing, conveying technology elements on the vehicles, controls, actuators and sensors. All required peripherals - even if not explicitly stated - must be included in the prices; this also includes scanners, light barriers, element control, fences, etc.;
- Precise graphic representation (ground plan, side view etc.) of the RGV system;
- Bridging over the rails in areas where this is necessary, collision protection etc. (see requirements according to chapter 4.2 and 4.3);
- Necessary stations for maintenance and repair, incl. equipment to bring a new vehicle out of the system or into the system; the Logistlcs Contractor has to document the considered equipment in his offer;
- Connection of the steering system of the RGV system to a failure analysis and system visualisation system including load level monitoring of the RGV system in the control station. (see requirements according to chapter 6.4.2);

- Control cabinet incl. wiring up to the control cabinet and from the control cabinet to the RGV system; main connections are set up according to the client's specifications. The final location of the stationary switch cabinets shall be determined in the context of the execution planning with the General Planners (PP) and the Client. The cabling from the switch cabinets to the system components is part of the contractor's scope of services and delivery and must be included in the offer price (see requirements in accordance with Chapter 4.3.5).
- The following functions must be ensured:
    - Ensuring maximum congestion capacity on the required routes;
    - When determining the required number of vehicles in the RGV system and the control system, the specified throughput requirements must be taken into account.
- The Logistics Contractor determines the number of vehicles used, depending on required throughput and his experience. The number of chosen vehicles must be documented in detail by the contractor within the scope of his offer.

4.7.3. Functional system description FG 1 – Inbound area new HBW

4.7.3.1. Layout

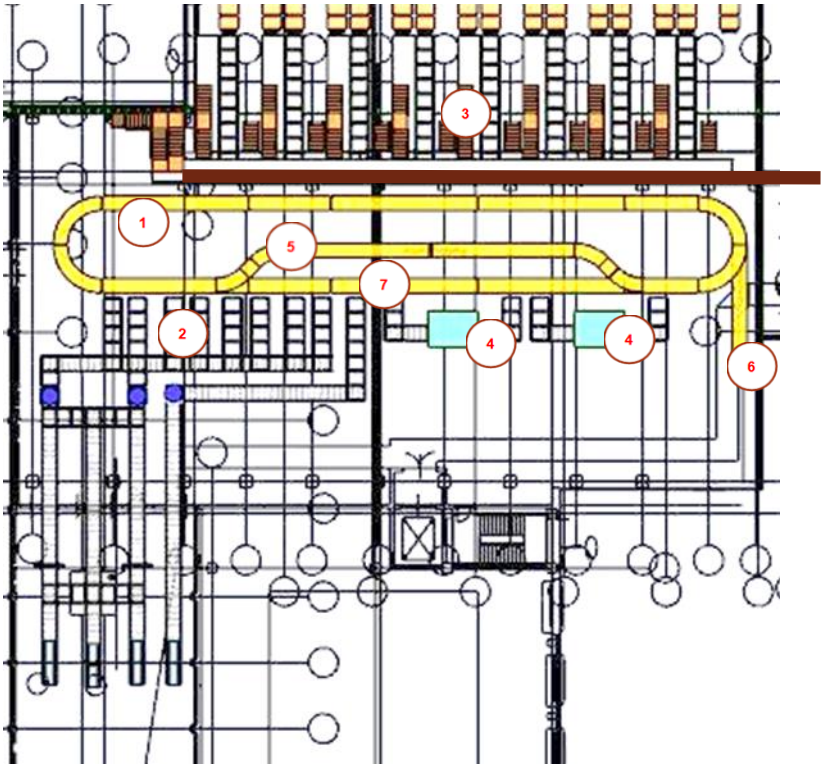


Figure 4-36: Layout Functional Group 1

4.7.3.2. Description of the functional processes

The pre-zone loop of the RGV system for storing the pallets in the new HBW is located on the ground floor of the new building (see figure 4-36, point "1").

The pallets to be stored are provided on the buffer lanes and the transfer stations of the pallet conveyor system for collection by the RGV system (see figure 4-36, point "2"). The pallets are then taken from these transfer stations by the vehicles of the RGV system and transported to the transfer points of the storage infeed sections (see figure 4-36, point "3") in front of the aisles of the HBW, where they are delivered to the pallet conveyor system.

If the destination for the pallets picked up at point "2" is the existing building, these pallets are transported to one of the transfer points in front of the lifts (see figure 4-36, point "4") and handed over after being picked up at point "2". The pallets are lifted to the 1st Floor via the lifts and transferred there via the pallet conveyor technology of function group 2 of the RGV system for transport into the existing building.

In addition, pallets must be removed from the transfer station in front of the lifts from the 1st Floor (empty pallet stacks or faulty pallets or pallets from the existing building) and transported to the transfer station of the pallet conveyor for retrieval and transferred to it (see figure 4-36, point "7").

In addition to the loop for the RGV system, a waiting area for empty vehicles is provided, in which vehicles that are not required are parked until they are needed to fulfil the current transport requirements (see figure 4-36, point "5").

A maintenance and repair station is provided on the eastern side of the building for the RGV system on the ground floor of the new building (see figure 4-36, point "6"). Vehicles can also be brought into or taken out of the system via this station.

4.7.3.3. Capacity and throughput requirements

For the technical design of the vehicles of the RGV system and the number of needed vehicles, the following throughput rates in the maximum hour must be taken into account:

- Transfer inbound stitches to the HBW: max. 226 pallets / hour
- Transfer inbound stitches to the lifts: max. 62 pallets / hour*
- Transfer from lifts to the HBW: max. 90 pallets / hour
- Transfer of lifts to the retrieval section: max. 7 pallets / hour

*Remark: This is the maximum flow per hour if some of the pallets delivered to the new building are to be stored in the existing building; in this case, the number of pallets stored in the new HBW is reduced accordingly

The technical system performance of the RGV system must be designed for 100% of the throughput requirement. Surcharges for the technical design to ensure fulfilment of the throughput performance must be taken into account by the Logistics Contractor on the basis of his experience.

4.7.3.4. Other specific requirements

The following special requirements must be taken into account for this function group.

- Transfer stations:
    - The RGV system vehicles and their load handling devices must be designed in such a way that the distance between the load handling device of the RGV system vehicle and the conveyor at the transfer station is minimised to ensure smooth and trouble-free pallet pick-up and delivery.

- In the area of the transfer stations on the accumulation sections in front of the individual aisles of the HBW, it must be taken into account for the fastening of the rail system that from the brown line in the layout (Figure 4-36) the floor slab of the high-bay warehouse is lowered by 500 mm compared to the floor slab on the ground floor of the new building.
- The individual components of the vehicles and for the load handling attachment must be easily accessible for maintenance and repair.

- Driving range of the RGV system:
  - The open travel area of the RGV system must be protected against unauthorised access to the travel area with a fencing system.
  - Doors must be provided at suitable points in the fencing system to allow access for troubleshooting, maintenance and repairs.
  - The doors must be fitted with a key switch so that the RGV system is switched off and stopped when the door is opened. Restarting the RGV system in automatic mode is only possible after closing the door and removing the key.
  - The Logistics Contractor is requested to coordinate the arrangement of the doors in detail with the General Planner PP and Client as part of the implementation planning.
- Maintenance area:
  - The maintenance and repair area for the RGV system vehicles must be provided with sufficient space so that there is also room for a workbench and a cabinet with small spare parts.
  - In addition, the maintenance area must be equipped with a lifting device with which heavy components of the vehicle can be lifted to facilitate the removal and installation of such parts (see figure 4-37).



Figure 4-37: Maintenance area RGV system in current processing

- In the maintenance area, aids must also be provided that allow a vehicle to be brought into or out of the system. For this purpose, the access door in the safety fence must be appropriately large (see figure 4-37).
- The Logistics Contractor is requested to present the equipment for this maintenance area that it has included in its offer.

- Transfer steps in RGV area: The Logistics Contractor must provide bridging steps over the rail system at suitable positions, taking into account the requirements of escape routes and to realise easy access for maintenance. The Logistics Contractor is requested to document the location of the bridging steps in its offer by means of a corresponding drawing.

4.7.4. Functional system description FG 2 – Outbound area new HBW

4.7.4.1. Layout

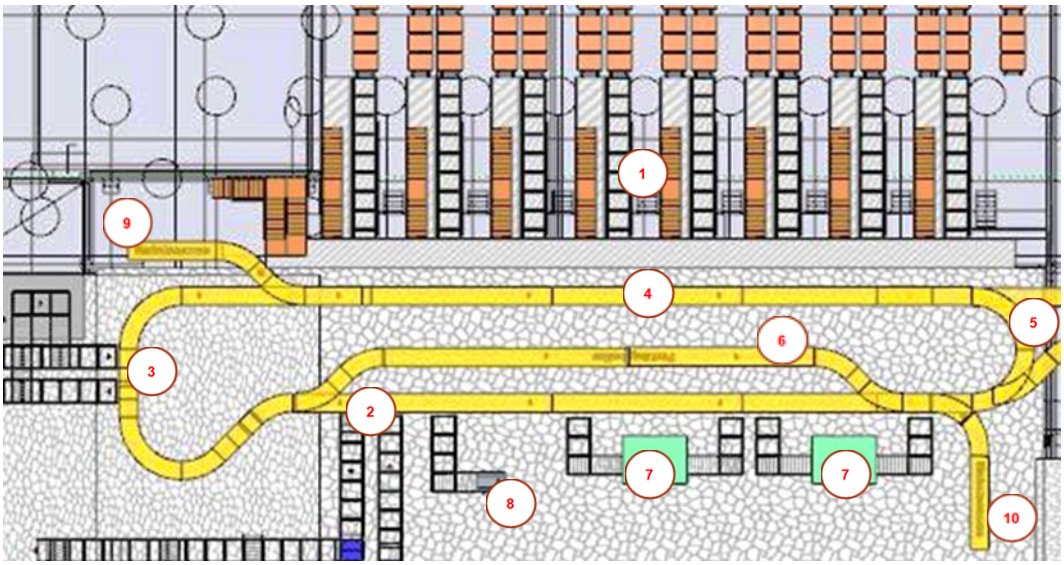


Figure 4-38: Layout Functional Group 2

4.7.4.2. Description of the functional processes

The retrieval circuit of the RGV system for retrieving pallets from the HBW is located on the 1st Floor of the pre-zone in the new building (see figure 4-38, point "4").

The pallets removed from the HBW are made available at the transfer stations at the end of the accumulation routes in front of the HBW aisles for acceptance by the RGV system vehicles (see figure 4-38, point "1").

After the pallets have been picked up from the HBW's retrieval lanes, they are transported to the following possible destinations by the RGV system vehicles:

- Transfer points for supplying the workstations in repacking (see figure 4-38, point "2" and point "3");
- Transfer points in the existing building via the junction to the bridge between the buildings (see figure 4-22, point "3");

- Transfer points to the lifts for transporting the pallets via the lifts to the ground floor as a special process if required (see figure 4-38, point "7");
- Transfer point for the removal of pallets with damaged product packaging and leaking liquid as a special process (see figure 4-38, point "8").

Some transfer points can also return goods to the HBW; these are then taken from the respective transfer points by the RGV system vehicles and delivered to the transfer points of the lifts:

- Return storage of pallets from the workstations in repacking via transfer points "2" and "3" and
- Storage from the existing building via the bridge between the two buildings via junction point "5".

Stacks of empty pallets can also be transported from transfer points "2" and "3" via the RGV system, which are then to be delivered to the transfer points in front of the lifts, or pallets with damaged items can also be transported via the RGV system, which are then to be delivered to the transfer point of the separate retrieval section (see figure 4-38, point "8").

In addition to the loop for the RGV system, a waiting area for empty vehicles is provided, in which vehicles that are not required are parked until they are needed to fulfil the current transport requirements (see figure 4-38, point "6").

A maintenance and repair station is provided on the western side of the building for the RGV system on the 1st Floor of the new building (see figure 4-38, point "9").

A separate drop-off and pick-up station is provided in the eastern part of the 1st upper floor in the HBW pre-zone (see figure 4-38, point "10") in order to bring vehicles into the system on the 1st Floor or to take them out of the system.

4.7.4.3. Capacity and throughput requirements

For the technical design of the vehicles of the RGV system and the number of needed vehicles, the following throughput rates in the maximum hour must be taken into account:

- From HBW to Repacking (transfer stations “2” and “3”): max. 111 pallets / hour
- From HBW to existing warehouse (junction point “5”): max. 115 pallets / hour
- From HBW to lifts (transfer station “7”): max. 90 pallets / hour
- From Repacking (transfer stations “2” and “3”) to the lifts: max. 53 pallets / hour
- From existing warehouse (junction point “5”) to the lifts: max. 30 pallets / hour

The technical system performance of the RGV system must be designed for 100% of the throughput requirement. Surcharges for the technical design to ensure fulfilment of the throughput performance must be taken into account by the Logistics Contractor on the basis of his experience.

4.7.4.4. Other specific requirements

The following special requirements must be taken into account for this function group.

- Transfer stations:

  - The RGV system vehicles and their load handling devices must be designed in such a way that the distance between the load handling device of the RGV system vehicle and the conveyor at the transfer station is minimised to ensure smooth and trouble-free pallet pick-up and delivery.
  - The individual components of the vehicles and for the load handling attachment must be easily accessible for maintenance and repair.

- Driving range of the RGV system:
  - The open travel area of the RGV system must be protected against unauthorised access to the travel area with a fencing system.
  - Doors must be provided at suitable points in the fencing system to allow access for troubleshooting, maintenance and repairs.
  - The doors must be fitted with a key switch so that the RGV system is switched off and stopped when the door is opened. Restarting the RGV system in automatic mode is only possible after closing the door and removing the key.
  - The Logistics Contractor is requested to coordinate the arrangement of the doors in detail with the client as part of the implementation planning.
- Maintenance area:
  - The maintenance and repair area for the RGV system vehicles must be provided with sufficient space so that there is also room for a workbench and a cabinet with small spare parts.
  - In addition, the maintenance area must be equipped with a lifting device with which heavy components of the vehicle can be lifted to facilitate the removal and installation of such parts (see figure 4-37).
  - In the separate area (see figure 4-38, point “10”), aids must also be provided that allow a vehicle to be brought into or out of the system. For this purpose, the access door in the safety fence must be appropriately large.
  - The Logistics Contractor is requested to present the equipment for this maintenance area that it has included in its offer.
- Fastening the rails and fencing system on the 1st Floor:
  - The rails and the fence system are to be mounted on a steel platform on the 1st Floor.
  - The fastening on the steel platform must be designed and executed in such a way that dynamic loads and vibrations caused by the movements of the RGV system vehicles are not transferred to the steel platform.
- Transfer steps in RGV area: The Logistics Contractor must provide bridging steps over the rail system at suitable positions, taking into account the requirements of escape routes and to realise easy access for maintenance. The Logistics Contractor is requested to document the location of the bridging steps in its offer by means of a corresponding drawing.

4.7.5. Functional system description FG 3 – Connection new to existing building

4.7.5.1. Layout

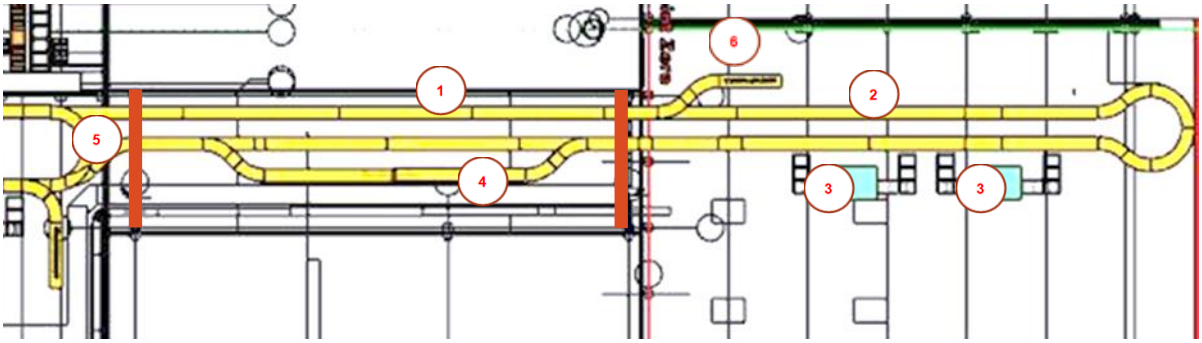


Figure 4-39: Layout Functional Group 3

4.7.5.2. Description of the functional processes

The connection point to the loop in front of the HBW is junction point "5" in figure 4-39. From this point, the pallets are first transported via the RGV system vehicles over a bridge (see figure 4-39, point "1") between the new building and the existing building and then on a steel platform in the existing building (see figure 4-39, point "2") to the transfer points in front of the lifts in the existing building (see figure 4-39, point "3").

This material flow concerns the removal of goods from the HBW to the existing building and the loading of pallets that have been delivered to the new building and are then to be stored in the existing building.

In addition to the material flow to the existing building, a small material flow of pallets with empty folded shipping totes towards the HBW in the new building must also be ensured. These pallets are made available at the transfer stations in front of the lifts on the steel platform on the 1st Floor of the existing building for collection by the RGV system vehicles (see figure 4-39, point "3").

In addition to the loop for the RGV system, a waiting area for empty vehicles in the bridge between the building is provided, in which vehicles that are not required are parked until they are needed to fulfil the current transport requirements (see figure 4-39, point "4").

A maintenance and repair station is provided on the western side of the building for the RGV system on the 1st Floor / steel construction of the existing building (see figure 4-39, point "6").

4.7.5.3. Capacity and throughput requirements

For the technical design of the vehicles of the RGV system and the number of needed vehicles, the following throughput rates in the maximum hour must be taken into account:

- From HBW / new building to existing building: max. 115 pallets / hour
- From existing building to new building: max. 30 pallets / hour

The technical system performance of the RGV system must be designed for 100% of the throughput requirement. Surcharges for the technical design to ensure fulfilment of the throughput performance must be taken into account by the Logistics Contractor on the basis of his experience.

4.7.5.4. Other specific requirements

The following special requirements must be taken into account for this function group.

- Transfer stations:
    - The RGV system vehicles and their load handling devices must be designed in such a way that the distance between the load handling device of the RGV system vehicle and the conveyor at the transfer station is minimised to ensure smooth and trouble-free pallet pick-up and delivery.
    - The individual components of the vehicles and for the load handling attachment must be easily accessible for maintenance and repair.
- Driving range of the RGV system:
    - The open travel area of the RGV system must be protected against unauthorised access to the travel area with a fencing system (in the bridge and on the steel mezzanine in the existing building).
    - Doors must be provided at suitable points in the fencing system to allow access for troubleshooting, maintenance and repairs.
    - The doors must be fitted with a key switch so that the RGV system is switched off and stopped when the door is opened. Restarting the RGV sysem in automatic mode is only possible after closing the door and removing the key.
    - The Logistics Contractor is requested to coordinate the arrangement of the doors in detail with the client as part of the implementation planning.
- Integration of conveyor system closures:
    - o The vehicles of the RGV systems passes a firewall on both sides of the bridge between the two buildings (see figure 4-39, point “1”, orange marked lines). 4 conveyor system closures for the vehicles of the RGV systems must be taken into account and supplied by the Logistics Contractor.
    - The maximum height of a pallet is 2,200 mm, including pallet; the required opening for the conveyor system closure must be determined accordingly and the required opening size, the possible technical design / arrangement of the conveyor system closure on the fire wall must be actively and independently agreed with the Building Contractor.
    - Only approved conveyor system closures are to be used. The Logistics Contractor must provide the Client with valid approval notices required according to Polish regulations outlined in the attached Construction Specification and containing all required certification and acceptance in accordance with local law, as well as the German Institute for Construction Technology (DIBt), if the conveyor system closures is situated in a fire wall. Type and proposed manufacturer of the closures need to be presented in the logistic contractor’s offer.
    - The requirements of chapter 4.3.9 must be observed.

  - The possible or offered type of conveyor system closure must be documented by the Logistics Contractor in the offer.

- Maintenance area:
  - The maintenance and repair area for the RGV system vehicles must be provided with sufficient space so that there is also room for a workbench and a cabinet with small spare parts.
  - In addition, the maintenance area must be equipped with a lifting device with which heavy components of the vehicle can be lifted to facilitate the removal and installation of such parts (see figure 4-29).
  - The Logistics Contractor is requested to present the equipment for this maintenance area that it has included in its offer.
- Fastening the rails and fencing system on the 1st Floor:
  - The rails and the fence system are to be mounted on a steel platform on a bridge construction and on a steel platform for the mezzanine in the existing building.
  - The fastening on the bridge construction and on the steel platform must be designed and executed in such a way that dynamic loads and vibrations caused by the movements of the RGV system vehicles are not transferred to the bridge construction or the steel platform.
- Transfer steps in RGV area: The Logistics Contractor must provide bridging steps over the rail system at suitable positions, taking into account the requirements of escape routes and to realise easy access for maintenance. The Logistics Contractor is requested to document the location of the bridging steps in its offer by means of a corresponding drawing.

4.8. Picking Gallery, incl. shuttle warehouse

4.8.1. Description of function

The design of the picking gallery with the integrated shuttle warehouse for storage totes to supply the picking stations and the associated equipment is described in detail in the following chapters. The conveyor technology for the storage and shipping totes as well as the Pick-by-Light system, which is to be integrated, is described in more detail in the chapter on tote conveyor technology (chapter 4.9).

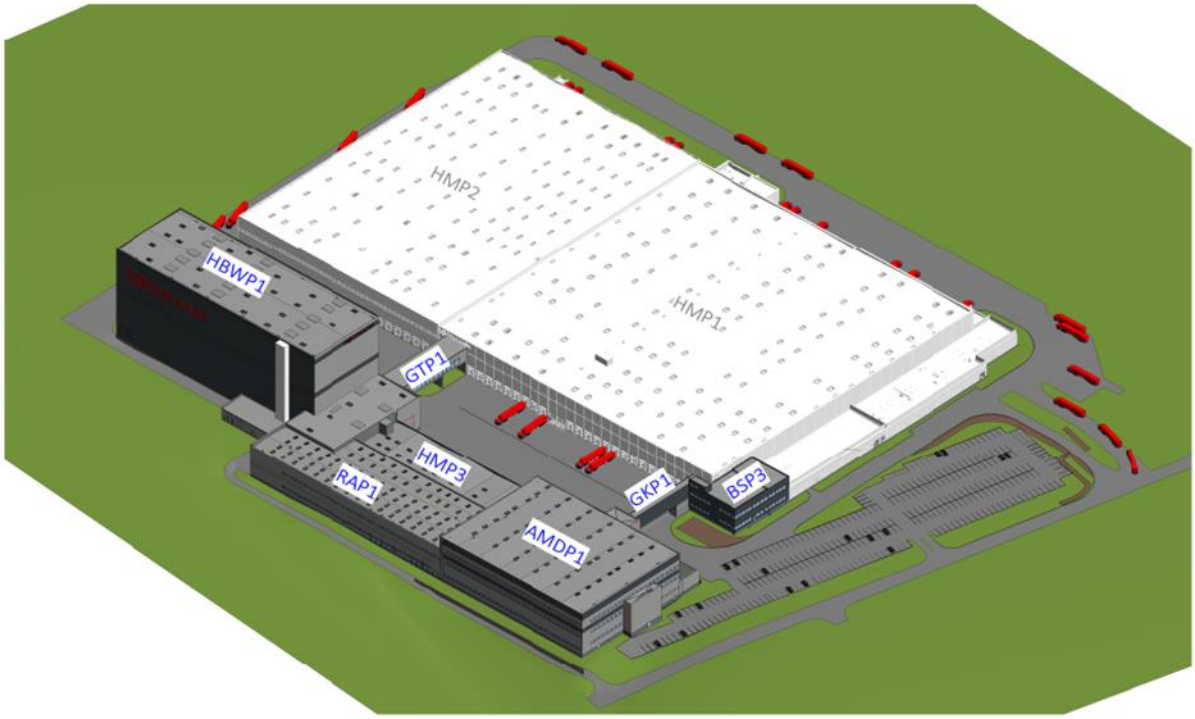


Figure 4-40 Overview of the building sections

The picking gallery with the integrated shuttle warehouse has a structural height of approx. 18 metres and is built into the building (no silo construction).

The picking gallery area is located in the AMDP1 section of the building (see illustration above). The picking gallery area in this part of the building is lowered by 1.5 m compared to the pre-zone (building section HMP3 in the illustration above), i.e. the floor slab for the installation of the shelving and platform construction is at -1,500 mm.

The integrated shuttle warehouse for the storage totes consists of 12 aisles with storage spaces for the storage totes and flow channels for the picking stations.

In addition to the racking construction for the shuttle warehouse and the picking stations, the tendered scope of supply and services for the logistics contractor also includes all platform constructions for the picking levels and the maintenance levels outside and inside the aisles as well as the stairs to overcome the height differences between the platform levels, the pick-by-light system to support the picking process, the automatic shuttle vehicles and the automatic lifts for the shuttle vehicles as well as the connecting route for the shuttle vehicles to change aisles.

The Picking Gallery with the integrated shuttle warehouse has the following key functions:

- Storage of storage totes for the required replenishment at the picking stations;
- Transfer of the storage totes created in repacking for storage in the rack aisles (from RAP1);
- Transferring the replenishment of storage totes to the picking locations from the replenishment shelf area to the flow channels for the picking locations;
- Supporting the picking of articles in the various picking stations on the individual levels by using pick-by-light technology;

- Removal of storage totes (filled or empty) from the replenishment area of the rack aisle and from the picking locations;
- Return of empty storage totes to the repacking area to supply the workstations in repacking (RAP1);
- Inclusion of the elevations for the different routes of the conveyor systems for the storage totes and the shipping totes.

The basic layout is described in the attached plans and extracts from the plans in this section.

The load carriers to be stored are fed to the picking gallery or shuttle warehouse from the repacking area via a combination of standard container conveyor technology and automatic shuttle vehicles in the rack aisles, whereby the load carriers to be stored are transferred to the branch lanes on each storage level in front of the racks by means of container lifts.

The removal of the storage totes and their transfer to the picking locations or removal from the storage area is carried out by shuttle vehicles; if changes are required in the levels of the same aisle for the transfer of the storage totes, the shuttle vehicles can be moved accordingly in the levels via shuttle lifts.

The shuttle vehicles can also be moved to other aisles via these shuttle lifts.

The functionality of the racking system and the shuttle vehicles, as well as the container conveyor technology to be integrated, is achieved when the load carriers can be stored, retrieved and transferred without disruption in continuous operation in today's quality. The storage and warehouse operating technology must be designed accordingly.

4.8.2. Requirements for the Picking Gallery with integrated shuttle warehouse

4.8.2.1. Conveyed and stored goods

The racking system, shuttle vehicle and conveyor technology must be designed for the storage totes described in chapter 2.3.4.

4.8.2.2. Higher-level material flow | Interfaces

For the Picking Gallery with the included shuttle warehouse, the information and comments in chapter 5 apply.

4.8.2.3. Capacity and throughput requirements

In the Picking Gallery with the included shuttle warehouse with the 6 aisles, 117,072 bin location for storage totes and totes in picking locations can be realised at same heights and with double-deep storage in the reserve area and 3 totes in the depth for the picking locations.

The services listed below must be carried out by the complete Picking Gallery and the included shuttle warehouse across all aisles or shuttle vehicles. It cannot be assumed that the load will be equally distributed over all aisles. Unbalanced loads must be taken into account accordingly.

The required warehouse throughputs are:

- Put-away into the shuttle warehouse: max. 930 totes / hour;
- Transfer from storage bin to channel for picking: max. 930 totes / hour.

The required storage capacity results from the requirements of the replenishment orders for the reserve area in the shuttle warehouse; the required storage totes are produced or depalletised in repacking and then fed to the shuttle warehouse in the picking gallery via the conveyor system.

The required retrieval capacity results from the retrieval requirements for replenishing the picking location in the individual picking aisles

In addition, throughput reserves for additional movements, i.e. system- and process-related stock placements and removals must be taken into account (not included in the quantity structure).

The above requirements are based on a static evaluation of the throughput requirements on the base of the underlying put-away and picking strategies. This design must be verified by a dynamic analysis (simulation).

The contractor has to ensure the storage / retrieval hourly throughputs in 3-shift operation from Monday to Friday and 1-shift operation on Saturday and Sunday.

4.8.3. Functional system description

4.8.3.1. Layout

The picking gallery with the integrated shuttle warehouse consists of 3 picking levels with 6 picking aisles each, with an aisle of the integrated shuttle warehouse on each side of a picking aisle.

The picking gallery with the integrated shuttle warehouse is to be erected in the AMDP1 part of the building and is to be integrated into the building as an installation (no silo construction) with regard to the required steel structures and platform constructions.

The automated shuttle warehouse consists of 12 rack aisles, which are combined with the picking levels of the Picking Gallery.

The storage totes are stored double-deep in the shuttle warehouse; the flow channels for the picking locations have a channel depth of 3 storage totes and are integrated into the racking construction of the shuttle warehouse.

The picking gallery is directly adjacent to the repacking area on the north side. The wall between the repacking area and the picking gallery is a fire protection wall.

On the western side of the Picking Gallery is the pre-zone for the storage and retrieval of the storage totes. In addition, conveyor circuits for the shipping totes are provided on the western and eastern sides of the picking gallery to connect the individual picking aisles and picking stations.

The following illustrations show the top view and a sectional view of the Picking Gallery; see drawings in the appendix for further illustrations.



Figure 4-41: Functional layout HBW – top view

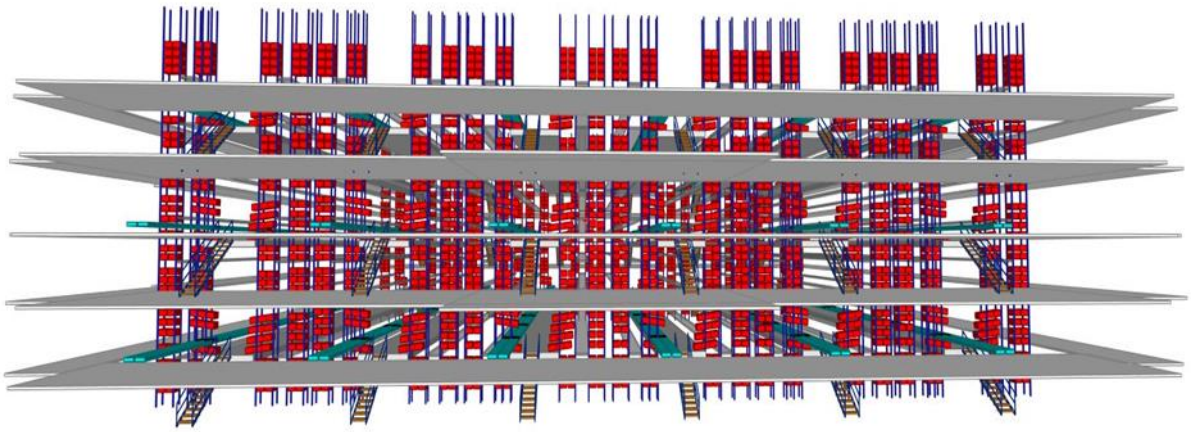


Figure 4-42 : Functional layout Picking Gallery - sectional view from western side

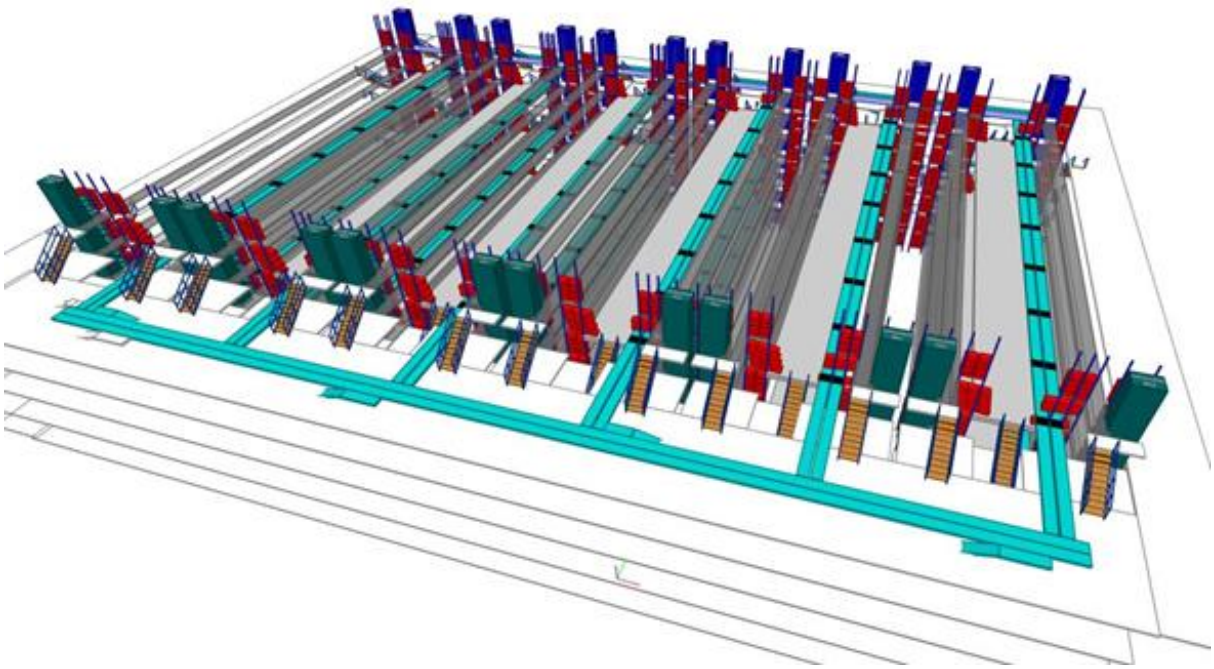


Figure 4-43 : Functional layout Picking Gallery - view of upper level

4.8.3.2. Description of the racking system

The entire shelving system of the Picking Gallery and automatic shuttle warehouse combination consists of 6 identical modules across the width of the entire Picking Gallery (see illustration below).

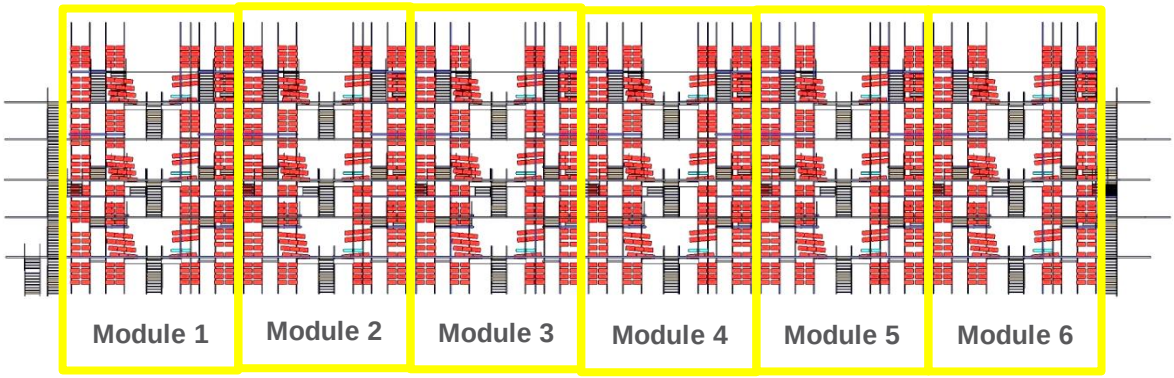


Figure 4-44 : Functional layout Picking Gallery – section view of modules

4.8.3.2.1. Modulation / Dimensioning / Structure

The structure of the individual modules is described in more detail in the following figure.

The functional structure of the shelving is described below, as it must be taken into account in the shelving design.

- Depth rack reserve area for storage totes

(double-deep storage): 1,300 mm

- Depth rack picking area for storage totes
  (double-deep storage): 1,300 mm
- Depth rack / channel for picking location
  (3 storage totes depth) max.: 2,200 mm (see figure 4-6)
- Height of storage totes: 280 mm
- Height of rack construction: 18,000 mm
- Number of aisles: 12
- Number of levels per aisle: different (see figure 4-6)
- Number of channels / bins over length of rack: 72
- Distance between the rows of a double rack row (generally
  between the storage totes): 600 mm
- The shelf dimensioning is carried out for 100% shelf load and 100% bay load.
- At least 117,072 bin locations must be realised in the Picking Gallery;
  - 9,072 picking locations with the length of 3 storage totes and
  - 89,856 bin locations for reserve of totes.

The contractor must select all detailed designs, such as the width of the supports, the height of the cross beams (taking into account the height of the rail construction for the shuttle vehicles) and the distances between the storage totes and the rack constructions as well as the required static stability, taking into account the platform construction to be connected to the rack construction, in accordance with the requirements and document them in his offer.

For information purposes, the following parameters were used as a basis for the design, although these must be checked and specified by the manufacturer:

The functional structure of the shelving in one module is described below, as it must be taken into account in the shelving design.

- Height parameters left / right shelf line of the module (see figure 4-45, point „1“)
  - Number of levels over the shelf height: 32
  - Height of storage tote 280 mm
  - Distance top edge of stored goods bottom edge
    of sprinkler head (incl. lifting space load carrier) 150 mm
  - Height of construction for mezzanine in picking level
    (see figure 4-45, point “5”) 400 mm
  - Lower approach dimension (measured from base plate): 600 mm

- Shelf construction base plate 1,500 mm
- Total rack height 18,000 mm

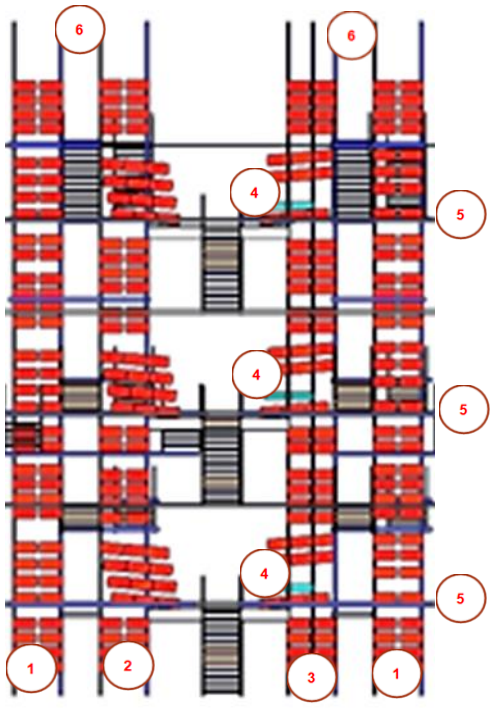


Figure 4-45 : Functional layout Picking Gallery – section view of one module

- Height parameters left shelf line with picking locations of the module (see figure 4-45, point „2“)
  - Number of levels over the shelf height (reserve totes): 20
  - Number of picking locations over shelf height: 12
  - Height of storage tote: 280 mm
  - Distance top edge of stored goods bottom edge of sprinkler head: 150 mm
  - Height of construction for mezzanine in picking level (see figure 4-45, point “5”): 400 mm
  - Lower approach dimension (measured from base plate): 600 mm
  - Shelf construction base plate: 1,500 mm
  - Total rack height: 18,000 mm

- Height parameters right shelf line with picking locations of the module (see figure 4-45, point „3“)
    - Number of levels over the shelf height (reserve totes): 20
    - Number of picking locations over shelf height: 9
    - Number of conveyor level (see figure 4-45, point “4”) 3
    - Height of storage tote: 280 mm
    - Distance top edge of stored goods bottom edge of sprinkler head: 150 mm
    - Height of construction for mezzanine in picking level (see figure 4-45, point “5”): 400 mm
    - Lower approach dimension (measured from base plate): 600 mm
    - Shelf construction base plate: -1,500 mm
    - Total rack height: 18,000 mm

- Width parameters (for one module, see figure 4-6)
    - Aisle width shuttle vehicle (clear width, see figure 4-45, point “6”): 1,000 mm
    - Depth rack for storage totes (double-deep storage): 1,300 mm
    - Aisle for picking between storage totes left and right side: 2,000 mm
    - Additional length for flow channels picking locations: 2,000 mm
    - Distance between modules left / right side: 600 mm
    - Width of one module, incl. half of distance between modules 11,500 mm
    - Width picking gallery 6 modules 69,600 mm

- Length parameters
    - Number of storage locations: 72
    - Width of storage totes: 400 mm
    - Distance between rack construction and tote: 20 mm
    - Column / rack construction width 60 mm
    - Shelf length 36,000 mm

The dimensions given above depend on the technology used in coordination with the construction planning / realisation and are to be understood here as reference values only.

The Logistics Contractor is requested to configure and offer the shelving system according to his manufacturer-specific technology.

The shelving must be positioned in the planned building or the planned column grid in the building in such a way that the loss of possible storage spaces in the shelving is minimised and only affects the rows of shelving in which the replenishment for the picking location is located, no restrictions or reductions in the picking locations due to the column grid in the building.

The Logistics Contractor must adapt his manufacturer-specific Picking Gallery configuration to the available space in this part of the building in accordance with the building layout in the appendix.

The current dimensions in the length of the rack rows and in the width for the picking gallery should not be exceeded if possible, as this would result in restrictions on all sides of the stage constructions with the conveyor systems and the escape routes for staff. In particular, the escape routes and the stage constructions themselves must not be restricted or enlarged.

4.8.3.2.2. Safety and service facilities

In the area of the Picking Gallery maintenance and escape routes are to be provided (in each level of the stage construction of the Picking Gallery). The maintenance and escape routes should be designed in accordance with the relevant guidelines, depending on the design of the routes for the tote conveyor technology, the stairs required to overcome the height differences of the various stage constructions and the building concept. In the area of the shuttle lifts on the floor of -1,500 mm a maintenance area in front of each shuttle lift is to be realised.

In the case of escape routes, the requirements of the fire protection and escape route concept must be considered.

The stage construction, platforms and their accessibility via stairs are described in chapter 4.8.5.

4.8.3.2.3. Other specific requirements

Fire protection

A sprinkler system in the Picking Gallery is assumed; in this context the classification to HHS3 / HHS4 in accordance with VdS CEA 4001 is currently assumed. It is assumed that sprinklers will be installed on defined level of the rack construction.

The sprinkler system is installed by the Building Contractor and is not part of the tendered scope of supply and services of this invitation to tender.

The Logistics Contractor must coordinate this interface intensively with the Building Contractor.

Suitable fastening options for the sprinkler lines, sprinkler heads etc. must be taken into account and ensured by the Logistics Contractor in consultation with the Building Contractor when designing the racking.

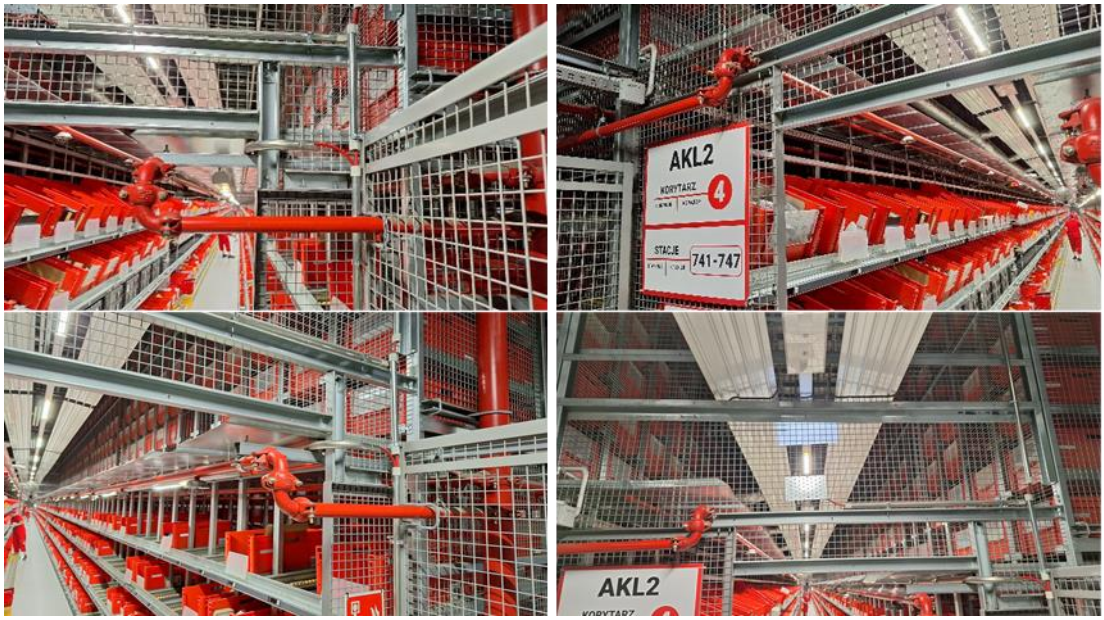


Figure 4-46: Example of integration of sprinkler pipes in the AKL system today

In addition to considering the fastening and integration options, fastening options for lighting and heating in the area of the picking aisles must also be taken into account (see also the photos above). These fastening options, e.g. via cross-bracing between the rows of racks above the picking aisles, must be agreed in detail with the Building Contractor during the execution planning of the steel structures for the racks and the steel platforms in the Picking Gallery. These fastening options and the associated loads on the steel structure must be taken into account by the Logistics Contractor when preparing the racking and platform statics.

Personal protection measures

Special measures are required in the rack construction to protect employees in the picking area from falling objects.

This includes securing the reserve spaces for the storage totes, which are located above the picking locations, with a grid at the rear end of the double-deep storage spaces (see figure 4-47). These grids must be taken into account by the Logistics Contractor and installed in the racking system.



Figure 4-47: Protective equipment to safeguard employees during order picking

In addition to these grids at the rear end of the storage location in the rack, a level with individual steel sheets can also be seen in the photo above. These steel plates are required slightly above the picking locations at each picking level along both sides of the picking aisle; they are intended to protect the picking employee from falling objects. These steel plates are to be supplied and installed by the Logistics Contractor on the 3 picking levels with the 18 picking aisles.

Fastening shelves and stage construction to the base plate

The racks and the stage construction has to be mounted on a smooth reinforced concrete plate. The appropriate aids for installation, for bridging tolerances, must be provided. The subdivisions (expansion joints) of the floor plate are to be considered according to the specifications of the building realisation.

The offer also includes a detailed drawing (ground plan, side view, shelf modulation and stage construction with stairs) of the racking system of the shuttle warehouse and the stage constructions, incl. the crossings, platforms, maintenance area, escape/maintenance corridors, aisle barriers, stairs, etc.

The rack and stage / platform construction includes all elements, such as all columns, all traverses and all necessary screw and anchoring materials, the substructure for the upgrading of the conveyor system, platforms and escape routes, fencing for the shuttle system, warning and information signs as well as all materials required for assembly.

The complete rack constructions must be grounded in accordance with Chapter 4.3.8.

4.8.4. Description of the shuttle system in the shuttle warehouse of Picking Gallery

4.8.4.1. Modulation / Configuration / Structure

Automatic shuttle vehicles are to be used in the shuttle warehouse, which travel within the individual levels in the 12 rack aisles and can change between the rack aisles using a shuttle lift at the end of each rack aisle.

The specific approach dimensions and needed drive-over dimensions (rack side with the shuttle lift) of the shuttle vehicle must be considered as specifications for the foundation plate of the Picking Gallery and the design of the combined rack system and stage constructions. Within the scope of the offer, the Logistics Contractor shall document the concrete approach and drive-over dimensions as well as the static and dynamic loads of the storage and retrieval systems as well as the loads of the racks and the stage constructions / platforms.

The Logistics Contractor's scope of supply and services includes 12 shuttle lifts (one for each aisle, see figure 4-48) on the eastern side of the Picking Gallery, which are connected to each other at the top stage level by a cross connection so that the shuttle vehicles can also change picking aisles if necessary (shown in blue connecting line in Figure 4-48).

The Logistics Contractor's scope of supply and services also includes the required number of shuttle vehicles to ensure the required throughput, including the installation of all functional, performance and control elements and equipment required to fulfil the requirements.

Furthermore, the scope of delivery and performance of the Logistics Contractor shall include all equipment for the design of the maintenance areas and safety equipment.

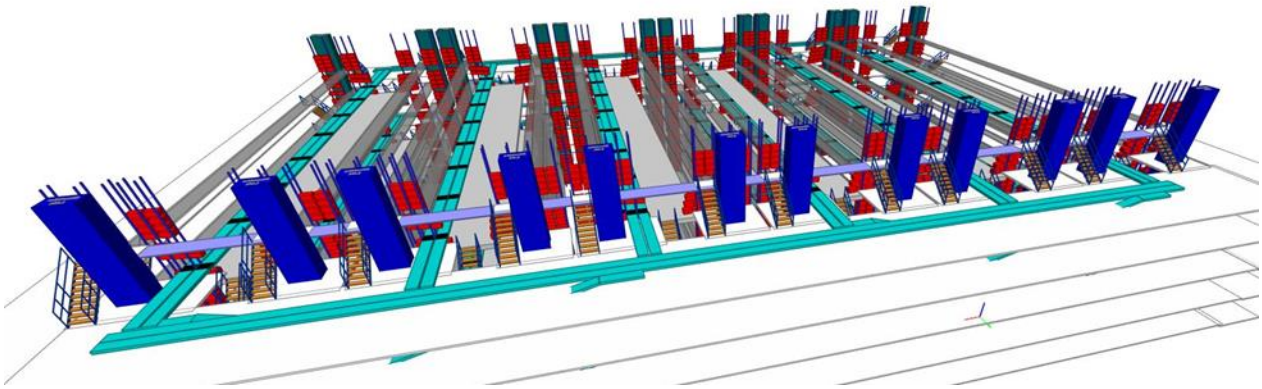


Figure 4-48: View shuttle lifts and cross-connection shuttle lifts

The following assumptions regarding the configuration and structure of the automatic shuttle system were taken as a basis for the planning and are to be considered by the Logistics Contractor:

- The design was based on a maximum working aisle for the shuttle vehicles width of 1,000 mm.
- The shuttle vehicle is designed for double-deep storage in the shelves.
- The shuttle vehicle picks up one storage tote per icking tour.
- The maximum weight of a storage tote is 30 kg
- The shuttle lifts are equipped with a removal option for the shuttle vehicles in the area of the base plate at -1,500 mm, via which shuttle vehicles can be removed from the system for repairs and maintenance. The Logistics Contractor is requested to make a proposal for the number of these removal options (for all shuttle lifts or only for 2 shuttle lifts to ensure redundancy).
- It must also be possible to return shuttle vehicles to the system via this removal position.
- This removal option must be designed with a safety fence in accordance with the legal regulations and the requirements for personal protection. The Logistics Contractor is requested to present its preferred solution in its offer.

4.8.4.2. Safety and service equipment

The requirements according to chapter 4.3.11 must be observed**.**

4.8.4.3. Operating modes

The following operating modes must be provided:

- On-line operation:
  The shuttle vehicles are operated fully automatically (normal operation). This fully automatic operation refers to the execution of the motion task which the shuttle vehicle control receives from the higher-level control of the MFS.

- Manual operation + semi-automatic:
  Storage and retrieval of the storage totes is carried out via the control panel on the next switch cabinet and/or via a manually pluggable tablet on the shuttle vehicle. The fork cycle runs automatically after manual initiation.
- Maintenance / set-up mode:
  All movements of the shuttle vehicles are controlled using the camera both via the control panel on the control cabinet and/or via a manually pluggable tablet on the shuttle vehicle.

4.8.4.4. Cycle time calculation

The required number of shuttle vehicles must be determined by the Logistics Contractor, taking into account the throughput requirements and necessary changes in the aisle levels via the shuttle lift. The Logistics Contractor must document the determination of the required number in the offer, stating the assumptions made for the determination.

The determined number of required shuttle vehicles must be verified by the Logistics Contractor in the simulation.

4.8.4.5. Rail construction for track shuttle vehicles

The mounting rail construction for the track shuttle vehicles must be taken into account in the design of the shelving (static proof of stability against vibrations from the dynamic behaviour of the shuttle vehicles).

Depending on the design of the shuttle vehicle, needed buffer systems may be required for these to absorb the kinetic energy when braking at the end of the aisle.

In this respect, coordination must take place in good time at the interface between the Logistics Contractor and the construction / realisation of the base plate. Furthermore, the static, dynamic loads of the shuttle system (especially the shuttle lifts) must be specified by the Logistics Contractor.

4.8.4.6. Other specific requirements

The control of all work movements must be carried out automatically, i.e. the shuttle vehicles receives a transport order via the higher-level control of the MFS and executes it automatically.

The lower track is mounted on a reinforced concrete plate. The appropriate aids for installation and for bridging tolerances must be provided.

The subdivisions (expansion joints) of the floor plate are to be considered according to the specifications of the construction realisation.

The individual aisles in the Picking Gallery (included shuttle warehouse) are designed as separate safety zones, so that maintenance of one aisle is possible without also having to shut down the other equipment. For this purpose, the aisles are separated from each other by safety fences in the front and back zones.

Within each aisle, maintenance platforms must be provided at several levels above the shelf height, which can be reached from the platform constructions around the Picking Gallery via stairs, as these are not at the same height as the platform constructions around the Picking Gallery (see figure 4-49 and 4-50).

With the hall floor at -1,500 mm, 8 maintenance levels are provided within the rack aisle in which the shuttle vehicles travel. The distance between the maintenance levels is chosen so that, on the one hand, the employee can easily reach the vehicles on the different levels and, on the other hand, the height difference to the platform constructions in front of and behind the picking gallery is not too high (access to the maintenance levels via stairs from the levels of the platform constructions in front of and behind the picking gallery).

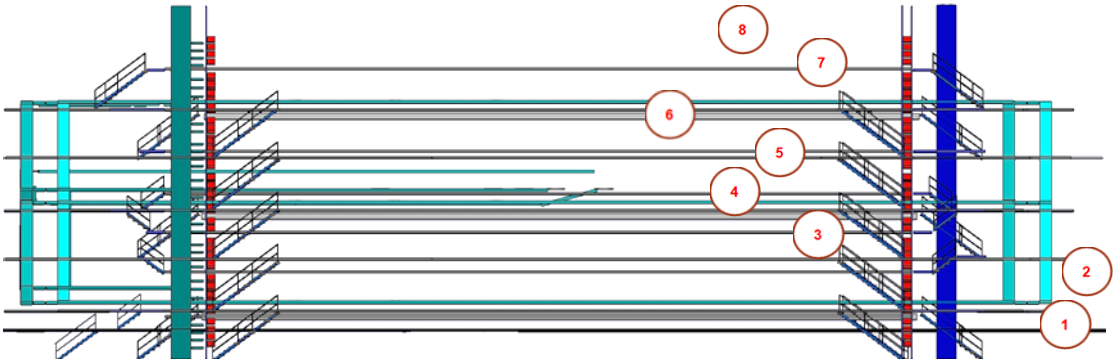


Figure 4-49: Rear aisle containment / safety zones with fences in the HBW



Figure 4-50: View of the current installation for maintenance platforms into the aisle

Electrically secured access and escape doors must be integrated into this fence for each aisle. Each access door must be fitted with a door contact so that the relevant aisle is switched off when it is opened (emergency stop). The doors can only be opened with the key used to switch the aisle on and off at the control panel itself (key switch). The doors must be designed as escape doors.

The key can only be removed when the aisle is switched off. The keys of the individual aisles are not interchangeable. Access to the danger zone is only possible after the aisle has been switched off.

Furthermore, the following requirements must be considered:

- Correct conveying and material flow tracking of the storage units through appropriate control of the individual shuttle vehicle;
- Data exchange with the higher-level material flow system (MFS);
- Information printout and visualisation of the material flow image - of the current plant status - in the control station (interface via MFS to WMS);
- Hierarchical and modular structure, thus easily comprehensible and expandable (modular principle);
- Great ease of maintenance and service;
- Switchover option in the event of system or subsystem failures and transfer of material flow information from a data backup memory;
- Network and control connection to the control cabinets.

4.8.5. Mezzanine constructions in the Picking Gallery

Various stage constructions are planned in the Picking Gallery area, which are described in more detail below.

4.8.5.1. Platform construction for the picking aisles

A platform construction is provided in the individual picking aisles (see figure 4-51, areas in light grey).

These platform constructions are accessible via staircases leading from the platform constructions around the picking gallery.

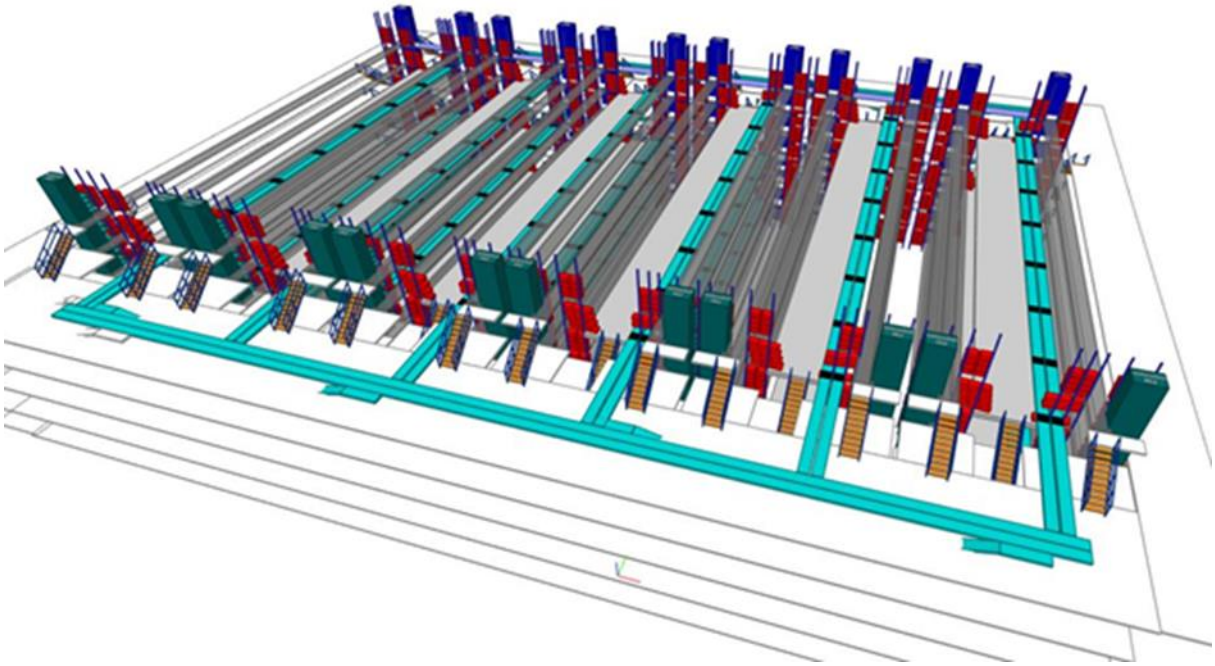


Figure 4-51: View of the upper picking level in the Picking Gallery

This platform, which is present in every picking aisle (i.e. 18 times) and on which the order pickers walk, must be designed in a closed form, e.g. by supporting chipboard. The current design of the platform construction can be seen in the following photos (see figure 4-52).

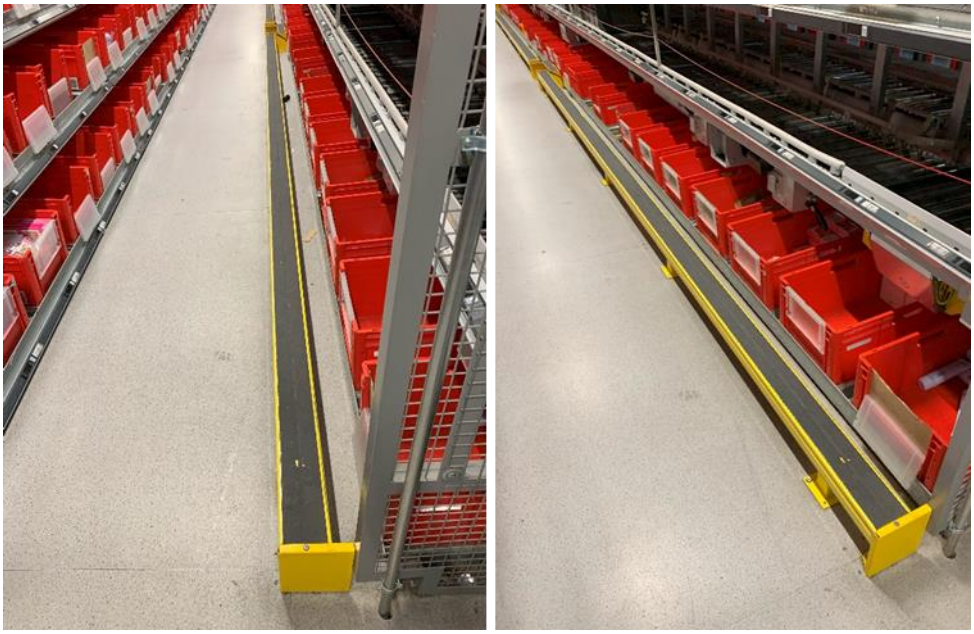


Figure 4-52: View of the current platforms in the picking aisles

On one side of the picking aisle on the platform construction, an access point must be provided for the picker to reach the higher levels of the pick locations. This access option must be provided on the side on which the conveyor system for the shipping totes runs through the picking stations (see figure 4-52, construction in yellow).

4.8.5.2. Platform construction around the Picking Gallery

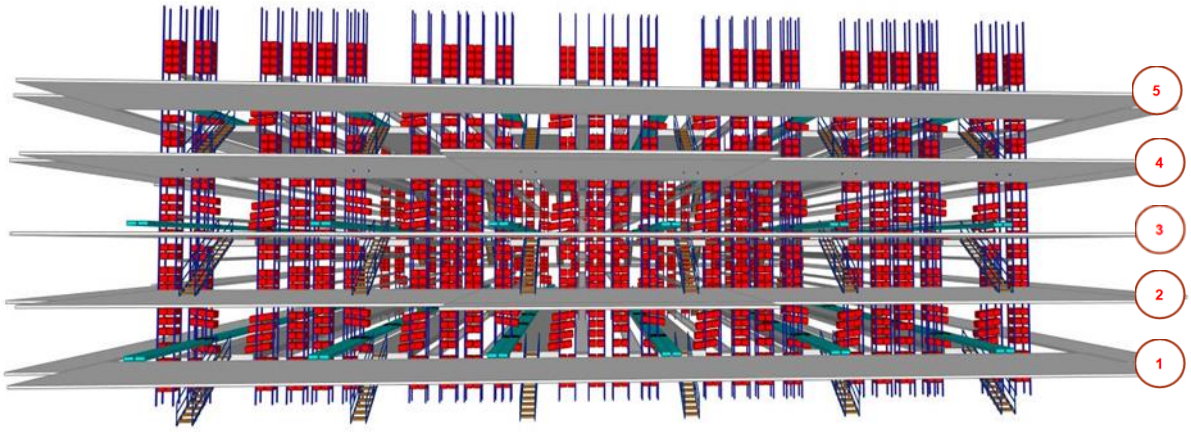


Figure 4-53: Section of mezzanine construction in front of HBW as principle

Platform constructions are provided at various levels around the racking structure of the Picking Gallery to ensure accessibility for picking staff to the picking aisles and accessibility for maintenance / servicing staff to the conveyor systems outside the racking structure of the Picking Gallery (see figure 4-53).

These platform constructions are part of the Logistics Contractor's scope of supply and services.

The following platforms are planned at the following heights:

- Level +1,000 mm (see figure 4-53, point "1")
- Level +3,600 mm (see figure 4-53, point "2")
- Level +6,100 mm (see figure 4-53, point "3")
- Level +8,800 mm (see figure 4-53, point "4")
- Level +11,200 mm (see figure 4-53, point "5")

The platform constructions on the +3,600 mm and 8,800 mm levels are connected to the stairwells in the building and the escape routes for the order pickers are planned via these levels (see figure 4-54, green marked areas). The positioning in the height of these two levels is therefore fixed.

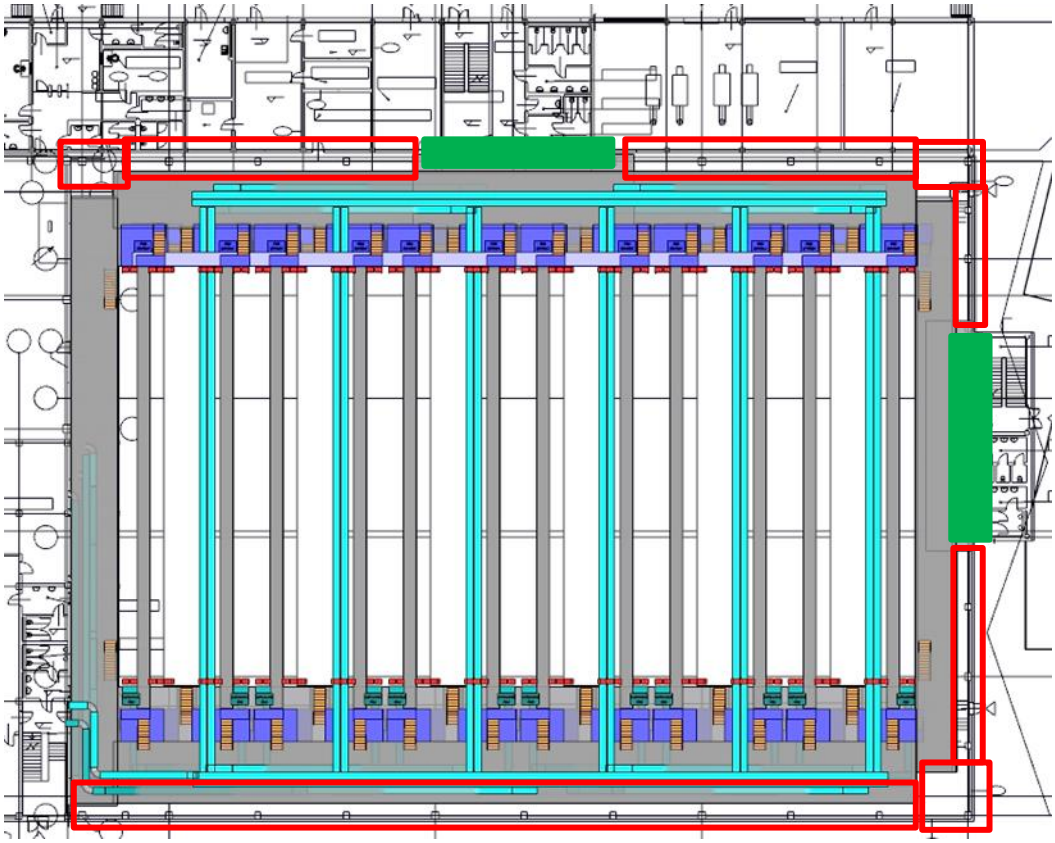


Figure 4-54: Integration of the steel platforms into the planned building

The steel platforms on the different levels must be integrated into the building in such a way that the floor space of the building is not completely filled (see figure 4-54). In the areas marked in red, there are

openings between the stage construction and the wall of the building; this is a requirement from a fire protection perspective. The extent to which these areas are sufficient to fulfil the requirement must be checked by the Logistics Contractor during the implementation planning in coordination with the planning of the building.

The following requirements must be taken into account for the design and execution of the stage constructions around the shelving structure of the Picking Gallery:

- The stage construction is currently planned as a closed stage with a chipboard surface. The way in which the stage surface is to be closed in terms of material and any open areas to be kept free must be agreed in detail by the Logistics Contractor with the building planning department and the General Planner (PP) as part of the execution planning.
- Appropriate railings must be installed on all sides of the platform where there is a gap to the building wall or a gap to other components / shelving etc. to prevent people from falling.
- All stage sides must be provided with a raised edge so that small parts lying on the stage cannot accidentally fall over the edge of the stage onto another stage level or onto the floor slab.
- The elevations of the conveyor systems for storage and shipping totes must be provided and secured on the stage structures.
- Stairs must be provided at many points within the platform structure, particularly on the west and east sides, which personnel can use to access the picking aisles. In addition, stairs must be provided from each of these platforms and from the floor slab for maintenance and servicing personnel to access each platform level around the picking gallery as well as the maintenance levels in the aisles of the shuttle warehouse. All these stairs must be designed in accordance with the applicable regulations.
- As the platform structure cannot be attached to the building wall, the entire structure must be designed in such a way that it can be structurally connected to the racking system of the Picking Gallery itself.
- The static and dynamic loads from the shelving system of the Picking Gallery, from the use of the automatic shuttle warehouse, from the elevation of the conveyor technology for the storage and shipping totes and the passenger traffic must be taken into account in the statics of the platform system.

4.9. Tote conveyor technology

4.9.1. Functional description

This section describes the different container conveyor systems for storage and shipping totes. As picking in the Picking Gallery is supported by a pick-by-light system and there is therefore an interface between the control system of the tote conveyor and the shipping totes, the pick-by-light system is described in a separate section of this chapter.

The container conveyor system is utilised,

- to transport the storage totes from the repacking area to the automated shuttle warehouse in the picking gallery to store the filled storage totes and
- to transport empty storage totes from the picking gallery back to the repacking area.

Tote conveyor technology is also used for this purpose,

- to transport unfolded empty shipping totes from the destacking workstations to the picking galley, where they are used for picking parts,
- to transport the shipping totes through the various picking stations in the picking gallery until they are filled (with transport through several picking stations also at different picking levels) and
- to transport filled shipping totes from the picking gallery to the existing building via the bridge between the new and the existing building for dispatch.

The tote conveyor system is divided into the following functional groups for a more detailed description and for this tender:

- Functional Group 1: Storage tote conveyor in Repacking area;
- Functional Group 2: Storage tote conveyor in Picking Gallery;
- Functional Group 3: Shipping tote conveyor for empties to Picking Gallery;
- Functional Group 4: Shipping tote conveyor in Picking Gallery
- Functional Group 5: Shipping tote conveyor from Picking Gallery to Sequenzer

The basic functionality, routing and other requirements are described below. The guidance of the different conveyor technology is only functionally given. The drawings / sketches in the document reflect a principle representation of the material flow. The Logistics Contractor must present his solution within the scope of the offer and prove that the solution selected meets the functional requirements for quality and performance.

4.9.2. Requirements for tote conveyor technology

4.9.2.1. Conveyed and stored goods

The tote conveyor technology must be designed for the load carriers with the specifications specified in chapter 2.3.3

4.9.2.2. Capacity and throughput requirements

The capacity and throughput requirements are defined below for each function group.

4.9.2.3. General requirements

In principle, the requirements according to chapters 4.2 and 4.3 are to be fulfilled.

The scope of delivery and services of the tote conveyor technology includes:

- Conveying technology, according to description / drawing incl. the required infeed and outfeed elements, converters, turntables, other conveying technology elements and machines, controls, actuators and sensors. All required peripherals - even if not explicitly stated - must be included in the prices; this also includes scanners, light barriers, element control, rotating beacons etc.;
- Precise graphic representation (ground plan, side view etc.) of the tote conveyor system;

- Stages / stands of tote technology, in areas where this is necessary, collision protection etc. for the conveyor technology itself and to protect the elevation of the conveyor technology in the repacking area, in front of the HBW and in the bridge between the new and the existing building (see requirements according to chapter 4.2 and 4.3);
- All conveyor crossings and platforms necessary for maintenance and repair of the conveyor lines (the position and number of conveyor crossings for reaching the maintenance points shall be specified by the Logistics Contractor within the scope of his offer);
- Connection to a failure analysis and system visualisation system including load level monitoring of the conveyor system in the control station. (see requirements according to chapter 6.4.2);
- Protective equipment, in detail in the transition area of the pre-zone loop and other areas as required;
- Control cabinet incl. wiring up to the control cabinet and from the control cabinet to the conveyor system; main connections are set up according to the Client's specifications. The final location of the stationary switch cabinets shall be determined in the context of the execution planning with the Client. The cabling from the switch cabinets to the system components is part of the contractor's scope of services and delivery and must be included in the offer price (see requirements in accordance with chapter 4.3.5).
- The following functions must be ensured:
    - Ensuring maximum congestion capacity on the required routes;
    - When configuring the conveying elements and the control system, the specified throughput requirements must be taken into account.

The Logistics Contractor determines the number of scanners used in the tote conveyor technology according to his "control philosophy" (scanning before branching - logical material flow tracking). It ensures trouble-free and offset-free transport. The number of scanners used must be documented in detail by the Logistics Contractor within the scope of his offer.

4.9.3. Functional system description FG 1 – Storage tote conveyor in Repacking area

4.9.3.1. Layout

The overview of this function group is shown below. For further explanation of the function group, this overview is divided into individual parts and illustrated.

The conveyor technology of this function group is located on the 1st floor in the area of the repacking and there in the area of the manual workstations (see figure 4-55, point "A") and the automatic workstations with the robots (see figure 4-55, point "B").

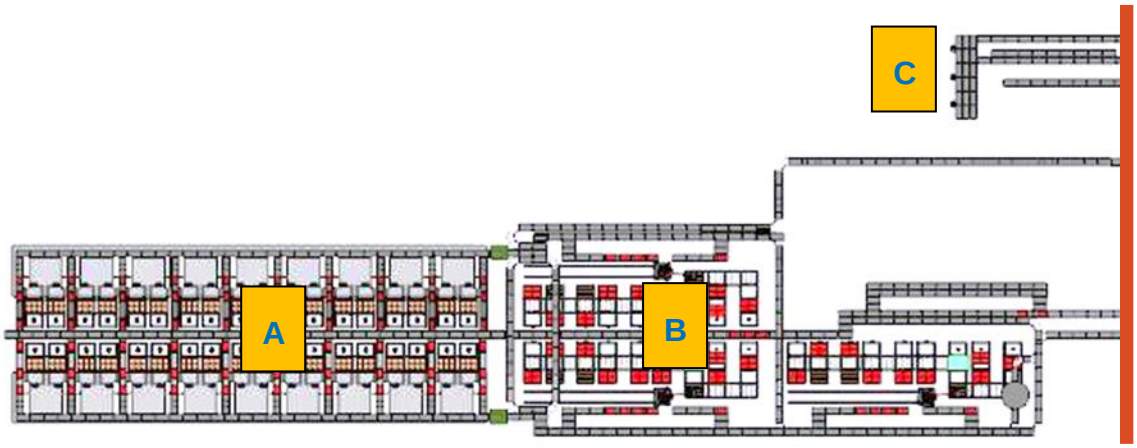


Figure 4-55: Overview Layout Functional Group 1

Area C in the above illustration is a shared area for the storage and shipping totes; the Not-Ok work-stations and test stations for storage and shipping totes are located in this area.

4.9.3.2. Description of the functional processes

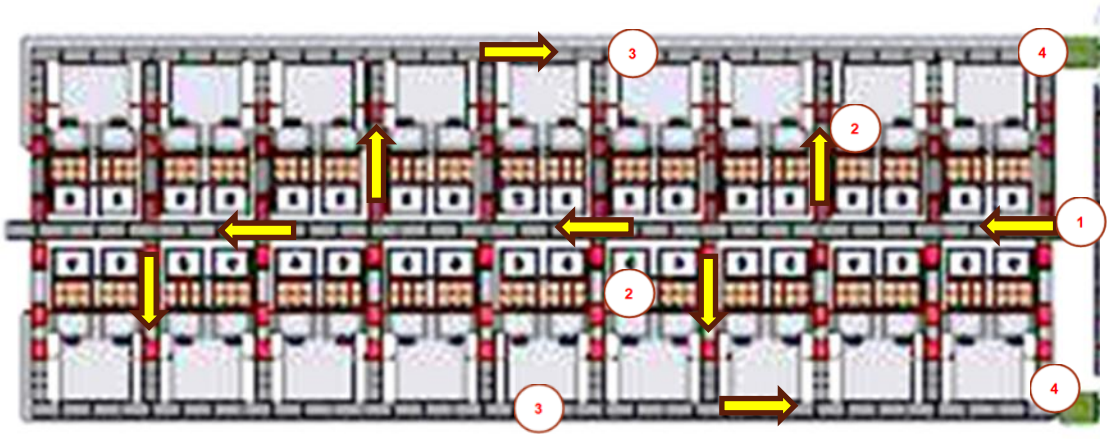


Figure 4-56: Layout Functional Group 1 – manual Repacking

The empty storage totes arrive at point "1" in the system of manual workstations in the repacking area and are then routed centrally above the workstations. From this centre section, the empty storage totes are transported to each of the 36 workstations via inclines. For this purpose, 20 inclined sections (see figure 4-56, point "2") are planned. An example of the current handling process can be seen in figure 4-57.
At the end of the downhill stretch, the empty containers are made available for the workstation. The empty storage tote is pulled by hand onto a work surface in the form of a spherical roller table and then filled with material from the pallet.

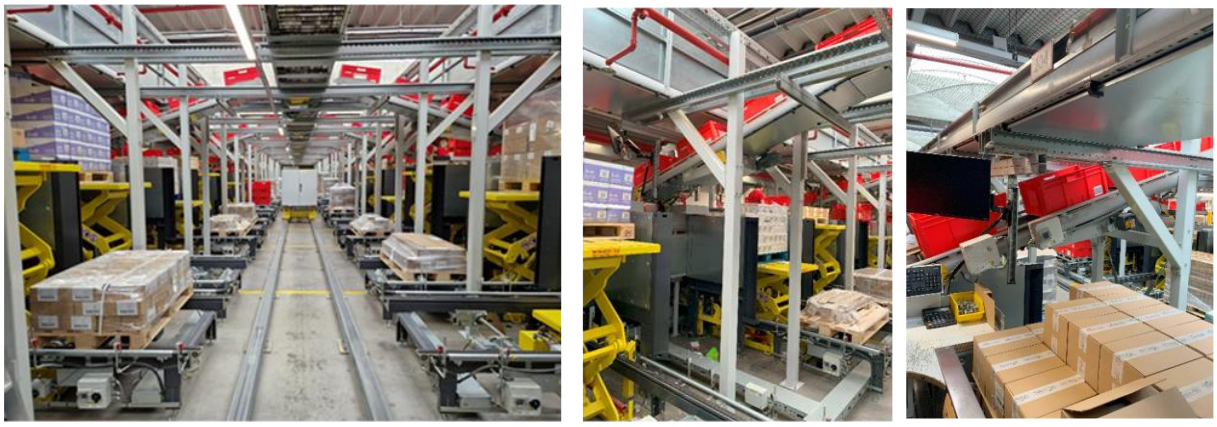


Figure 4-57: Layout FG 1 – Example arrangement d conveyor above workstations

After the storage tote has been filled, the container is pushed over the ball roller table onto a container conveyor system at the back of the workstation (example from today's processing see figure 4-58).



Figure 4-58: Layout FG 1 – Example of discharging conveyor technology in manual repacking

On the rear discharge (see figure 4-56, point "3") on both sides of the workstations, the filled storage totes are transported to the lifts on the south side of the workstations (see figure 4-56, point "4"). These lifts take the filled storage totes to the automatic repacking area.

To ensure that employees can escape from the workstations, authorised hinged sections must be integrated into the conveyor system in the respective area of the workstation. In order to be able to open these hinged sections, a pushbutton must first be pressed, which then releases the hinged section and the control system on the conveyor system prevents a container from being transported onto the hinged section.

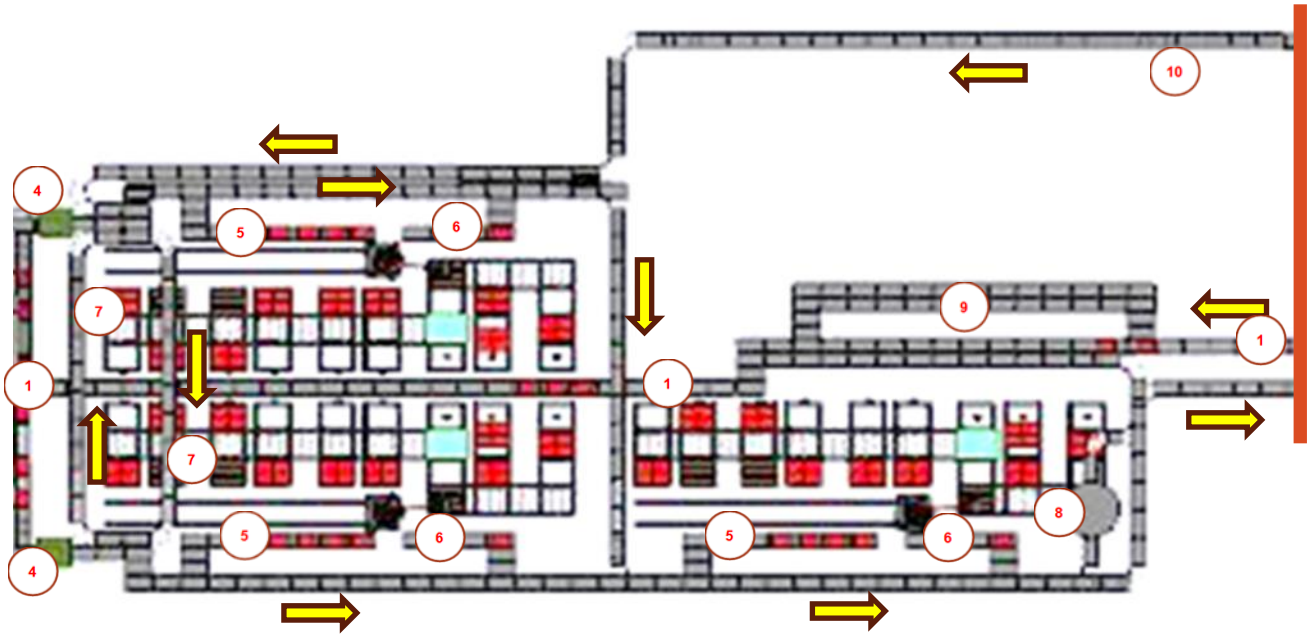


Figure 4-59: Layout Functional Group 1 – Automatic Repacking

The empty storage totes from the picking gallery reach the repacking area via conveyor line "1". The empty storage totes are then either transported via the main line towards the manual workstations or discharged via 2 parallel accumulation lines (see figure 4-59, point "10"), where they are buffered before being fed to the manual workstations.

The filled storage totes reach the automatic repacking area via the lifts (see figure 4-59, point "4"); the conveyor system following the lifts in the automatic repacking is located above the feed section "1".

The cross conveyors "7" in figure 4-59 ensure that the filled storage totes can reach each robot after manual repacking in order to be palletised automatically.

The filled storage totes that are to be stored in the shuttle warehouse in the picking gallery are guided from the upper (eastern) side of the manual repacking after the lift past the upper robot and then between the two lower robots onto the lower main conveyor line, which transports the filled storage totes from the lower (western) lift to the robots or for storage in the shuttle warehouse.
Before point "8", the storage totes are checked to ensure that the handle opening for picking is on the correct side (opening is on the narrow side of the storage totes; this opening can be open or closed by a plastic lid). If the opening is not on the correct side, the storage tote is transported on the track with the turning device / turntable to turn the storage tote so that the handle opening is on the correct side. The rotated storage tote is then ejected back onto the main line.

The storage totes are then transported along the main route through the firewall into the picking gallery area.

If filled storage totes are to be palletised automatically after manual repacking, they are discharged via the conveyor system after lifts (see figure 4-59, point "4") and the cross-connections "7" to the robots

onto the removal lines for palletising (see figure 4-59, point "5"). The storage tote is scanned before the last buffer location at the end of the removal line so that the robot can also receive the instruction on which of the pallets provided the storage tote is to be palletised after picking up the storage tote.

Filled storage totes, which are automatically depalletised by the robots, are delivered by the robots to the discharge section "6" at the robot stations (see figure 4-59) and then transported by all robot stations to the western main conveyor section using the existing cross connection and then transported on towards the picking gallery.

Empty storage totes or filled storage totes to be removed from storage and palletised that come from the picking gallery and are then to be palletised are transported via conveyor line "10" (see figure 4-59) through the firewall into the repacking area. The storage totes are then transferred near the upper (eastern) lift (see figure 4-59, point "4") to the infeed to the robots and then fed to the removal sections in front of the robots via the cross-connections and the shortest possible routes in the same way as the filled storage totes (see figure 4-59, point "5").

Necessary height differences between the conveyor sections are compensated for by sections with inclines or declines; exceptions to this are the lifts in the discharge of the filled storage totes after manual repacking, as these are used to bridge larger height differences where conveyor sections with inclines would be too long and therefore require too much space.

In the conveyor system for the storage totes, automatic inspection stations should be provided at suitable points, which are equipped with a scale for checking the weight of the storage totes, a contour check, a check of the correct position of the handle opening for order picking and a scanner for identifying the barcode / RFID chip in the storage tote.
The locations for this checking stations in the layout provided by the Logistics Contractor must be labelled accordingly when the offer layout is submitted.

Faulty storage totes are then transferred to the conveyor system for the shipping totes on the other side of the firewall to the picking gallery on connections to be provided in order to be transported to the workstations in area "C" (see figure 4-55).

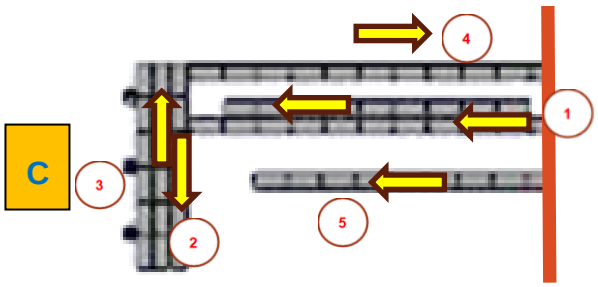


Figure 4-60: Layout Functional Group 1 – Not-Okay workstations

The faulty storage totes are transported via the main conveyor line in the direction of the picking gallery (see figure 4-60, point "1") and diverted on the other side of the firewall to a conveyor line for the

shipping totes and transported in the direction of dispatch to the east at the firewall on the side of the picking gallery for discharge onto the conveyor line for the emergency okay workstation (see figure 4-60, point "1"). On this conveyor line, the faulty storage totes are transported towards the conveyor circuit in front of the 3 workstations (see figure 4-60, point "2"). In order to create buffer capacity in front of the workstations, a parallel conveyor section is provided in the feed to the conveyor circuit in front of the workstations.

The storage totes to be processed are discharged from the small conveyor circuit in front of the 3 workstations directly to the workstation, processed and then pushed back onto the conveyor circuit. The processed storage totes are then transported back to repacking via the return line (see figure 4-60, point "4") or stored in the shuttle warehouse in the picking gallery (using a joint return line with the processed shipping totes to the conveyor circuits for the storage totes and shipping totes on the western side of the picking gallery). The storage totes or shipping totes are transported to the correct conveyor circuit via the connections via ascending or descending sections between the conveyor circuits in front of the picking gallery, from where they can then reach their final destination.

An additional conveyor line is provided in the area of the Not-Okay workstations for special retrievals from the Picking Gallery or feeds from the Repacking area. There are currently 10 buffer spaces on this route.

All the conveyor elements required for this functional group and the distances between them must be designed in such a way that the conveyor functions to be performed are carried out without hindrance or disruption and a continuous material flow is ensured.

4.9.3.3. Capacity and throughput requirements

For the technical design of the various conveying components, the following throughput rates in the maximum hour must be taken into account for the functional groups for the storage totes:

- Empty storage totes to manual Repacking workstations: max. 930 storage totes / hour
- Filled storage totes from manual Repacking to Picking Gallery: max. 550 storage totes / hour
- Filled storage totes from manual Repacking to robots for palletising (assumption): max. 380 storage totes / hour
- Filled storage totes from robots to Picking Gallery: max. 380 storage totes / hour
- Throughput turntable to rotage storage tote (assumption 10%): max. 100 storage totes / hour
- Thoughput lifts for storage totes in manual repacking: max. 930 storage totes / hour
- Repacking to Not-Okay workstation (assumption 10%): max. 100 storage totes / hour

Remark: The throughput quantities presented are currently being analysed and evaluated once again, taking into account the layout, and any quantities and quantity flows to be taken into account will be made available with the other additions to this tender at the end of July.

The technical system performance of each conveyor lane as well as each lift for totes must each be designed for 100% of the throughput requirement. Surcharges for the technical design to ensure fulfilment of the throughput performance must be taken into account by the Logistics Contractor on the basis of his experience.

The individual conveyor lanes in this functional group must be equipped with sufficient accumulation capacities, taking the simulation into account.

4.9.3.4. Other specific requirements

The following special requirements must be taken into account for this functional group.

- Elevation and fastening of the conveyor sections:
    - For all conveyor lines, it must be taken into account that they must be supported either on the planned platform constructions or on the storey ceilings; no suspension of conveyor lines from the ceiling of the storey or attachment to the walls of the building is to be provided; these are not possible according to the current state of planning.
    - The statics and anchoring of the conveyor system must be design or suitable safety measures taken in such a way that no permanent deformation or damage to the steel structure occurs when the conveyor is started by an industrial truck; see also Chapter 4.3.9.
- Check stations at the identification points in defined positions in the functional group:
    - Integration of a pallet continuous scale with the following features:
        - Automatic and calibratable;
        - Weighing range up to 40 kg;
        - System accuracy 0.1 kg;
        - Display and control panel designed according to ergonomic aspects;
    - Length, width and height control, subsequently adjustable;
    - Check the correct position of the gripping opening of the storage totes;
    - Barcode scanner to read label or RFID chip;
    - IT interface for transfer of all measured values;
    - Display panel at the “Not-Okay” workplace for “Not-Okay” faults from control station;
- Integration of turntables: The turntables must be integrated into the conveyor lines in such a way that there is only a minimal gap between the turntable and the conveyor line, so that when the changes of the tote direction, there is no interference when the totes are transported from the turntable to the subsequent conveyor.
- For conveyor lines that run above workplaces, escape routes and other traffic routes, the legally prescribed safety measures and the client's health & safety requirements must be implemented below the conveyor system so that no parts can fall from the dead parts or from the conveyor line (e.g. nets below the conveyor system).
- Integration of conveyor system closures:

  - The described conveyor lines for the storage totes lead through a fire protection wall at various points (see figure 4-5 and figure 4-6), so that 6 fire protection closures for containers are to be considered and supplied by the Logistics Contractor in the tendered scope of delivery and services.
  - The maximum height of a tote is 280 mm, including pallet; the required opening for the conveyor system closure must be determined accordingly and the required opening size, the possible technical design / arrangement of the conveyor system closure on the fire wall must be actively and independently agreed with the Building Contractor.
  - Only approved conveyor system closures are to be used. The Logistics Contractor must provide the Client with valid approval notices required according to Polish regulations outlined in the attached Construction Specification and containing all required certification and acceptance in accordance with local law, as well as the German Institute for Construction Technology (DIBt), if the conveyor system closures is situated in a fire wall. Type and proposed manufacturer of the closures need to be presented in the logistic contractor's offer.
  - The requirements of chapter 4.3.9 must be observed.
  - The possible or offered type of conveyor system closure must be documented by the Logistics Contractor in the offer.

- Lifts for storage totes:
  - The lifts for storage totes must be equipped with all necessary safety devices and barriers; in particular, the client's health and safety requirements attached to the tender must be taken into account.
  - Depending where the drives are positioned, they must be easily accessible for maintenance, i.e. on the ground floor is drives are positioned low, or on top if drives are at the top.
  - The lifts for the storage totes are to be integrated into 5 steel platforms, which form the different stage levels in the Picking Gallery. In this respect, suitable measures must be taken to prevent the transmission of vibrations or oscillations caused by the movement of the lifting and lowering processes in the lift to the steel platform.

- For maintenance and servicing, the relevant conveyor technology components must be arranged above the workstations and at higher conveyor levels above the floor for easy access. The arrangement and accessibility of the relevant conveyor components must be agreed in detail by the Logistics Contractor with the client's maintenance and servicing staff during the implementation planning phase.
- The conveyor sections or the constructions for their elevation in the area where industrial trucks are travelling must be equipped with suitable collision protection. In this functional group this applies to the conveyor sections on the 1st Floor in the Repacking area on the eastern side of the manual and automatic workstations (see figure 4-55, points "A" and "B") as well as the Not-Okay workstations (see figure 4-55 or figure 4-60, point "C).

- Transfer steps in conveyor technology: The Logistics Contractor must provide bridging steps over the conveyor system at suitable positions in the conveyor system, taking into account the requirements of escape routes and to realise easy access for maintenance. The Logistics Contractor is requested to document the location of the bridging steps in its offer by means of a corresponding drawing.

4.9.4. Functional system description FG 2 – Storage tote conveyor in Picking Gallery

4.9.4.1. Layout

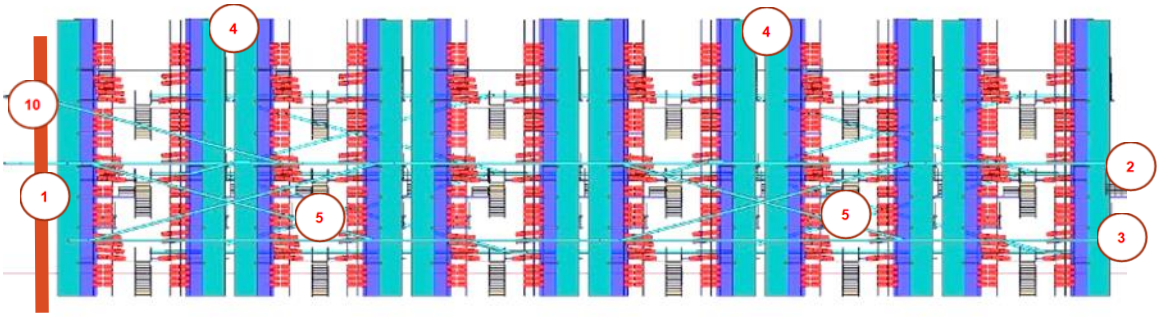


Figure 4-61 : Section west side Picking Gallery

4.9.4.2. Description of the functional processes

The filled storage totes reach the area on the western side of the picking gallery via conveyor "1" (see figure 4-61) and are conveyed from there to the storage conveyor circuit in front of the rows of shelves of the automatic shuttle warehouse in the picking gallery (see figure 4-61, point "2"). The storage totes are transported to the individual rack aisles via this storage conveyor circuit. A vertical conveyor is planned in front of each rack aisle (see figure 4-61, point "4", shown in turquoise), which then takes the storage totes from the accumulation lane in front of the vertical conveyor and transfers them to the short accumulation lanes per level in the rack row at the various storage levels; from there, the storage totes are taken over by shuttle vehicles and stored.

On the western side of the Picking Gallery there is also a retrieval level for the storage totes (see figure 4-61, point "3"). Storage totes to be retrieved from the shuttle warehouse (e.g. for sample testing, stocktaking, retrieval with subsequent palletising, etc.) are retrieved by the shuttle vehicles from the replenishment stations of the shuttle warehouse and transferred to the short accumulation lanes in front of each storage level. The storage totes are taken from these accumulation lanes by the vertical conveyors for retrieval in front of each rack aisle, independently of the vertical conveyors for storage, and then transferred to accumulation lines at the level of the retrieval circuit for feeding to the retrieval circuit.

The storage totes are fed to the conveyor for the storage level via ascending conveyors at several points in the retrieval circuit (see figure 4-61, point "5") and then discharged from the storage level onto a conveyor for the shipping totes. Using the conveyor for the ship-ping totes, the retrieved filled storage totes are either transported via connection "10" (see figure 4-61 and figure 4-5) with subsequent feeding to the palletising robots or discharged to area "C" (see figure 4-61 and figure 4-60) for processing errors, random checks and stocktaking.

In the conveyor system for the storage totes, automatic inspection stations should be provided at suitable points, which are equipped with a scale for checking the weight of the storage totes, a contour check, a check of the correct position of the handle opening for order picking and a scanner for identifying the barcode / RFID chip in the storage tote.
The locations for this checking stations in the layout provided by the Logistics Contractor must be labelled accordingly when the offer layout is submitted.

4.9.4.3. Capacity and throughput requirements

For the technical design of the various conveying components, the following throughput rates in the maximum hour must be taken into account for the functional groups for the storage totes:

- Filled storage totes to shuttle warehouse in Picking Gallery: max. 930 storage totes / hour
- Filled storage totes from shuttle warehouse to Repacking
  (not defined, to be defined in phase of execution planning): to be defined
- Empty storage totes to manual Repacking (replenishment): max. 930 storage totes / hour
- Empty storage totes to automatic Repacking for palletizing
  (not defined, to be defined in phase of execution planning): to be defined
- Picking Gallery to Not-Okay workstation (assumption 10%): max. 100 storage totes / hour

Remark: The throughput quantities presented are currently being analysed and evaluated once again, taking into account the layout, and any quantities and quantity flows to be taken into account will be made available with the other additions to this tender at the end of July.

The technical system performance of each conveyor lane as well as each lift for totes must each be designed for 100% of the throughput requirement. Surcharges for the technical design to ensure fulfilment of the throughput performance must be taken into account by the Logistics Contractor on the basis of his experience.

The individual conveyor lanes in this functional group must be equipped with sufficient accumulation capacities, taking the simulation into account.

4.9.4.4. Other specific requirements

The following special requirements must be taken into account for this functional group.

- Elevation and fastening of the conveyor sections:
  - For all conveyor lines, it must be taken into account that they must be supported either on the planned platform constructions or on the storey ceilings; no suspension of conveyor lines from the ceiling of the storey or attachment to the walls of the building is to be provided; these are not possible according to the current state of planning.

  - The statics and anchoring of the conveyor system must be design or suitable safety measures taken in such a way that no permanent deformation or damage to the steel structure occurs when the conveyor is started by an industrial truck; see also Chapter 4.3.9.

- Check stations at the identification points in defined positions in the functional group:
  - Integration of a pallet continuous scale with the following features:
    - Automatic and calibratable;
    - Weighing range up to 40 kg;
    - System accuracy 0.1 kg;
    - Display and control panel designed according to ergonomic aspects;
  - Length, width and height control, subsequently adjustable;
  - Check the correct position of the gripping opening of the storage totes;
  - Barcode scanner to read label or RFID chip;
  - IT interface for transfer of all measured values;
  - Display panel at the “Not-Okay” workplace for “Not-Okay” faults from control station;
- For conveyor lines that run above workplaces, escape routes and other traffic routes, the legally prescribed safety measures and the client's health & safety requirements must be implemented below the conveyor system so that no parts can fall from the dead parts or from the conveyor line (e.g. nets below the conveyor system).
- Lifts for storage totes:
  - The lifts for storage totes must be equipped with all necessary safety devices and barriers; in particular, the client's health and safety requirements attached to the tender must be taken into account.
  - Depending where the drives are positioned, they must be easily accessible for maintenance, i.e. on the ground floor is drives are positioned low, or on top if drives are at the top.
  - The lifts for the storage totes are to be integrated into 5 steel platforms, which form the different stage levels in the Picking Gallery. In this respect, suitable measures must be taken to prevent the transmission of vibrations or oscillations caused by the movement of the lifting and lowering processes in the lift to the steel platform.
- For maintenance and servicing, the relevant conveyor technology components must be arranged above the workstations and at higher conveyor levels above the floor for easy access. The arrangement and accessibility of the relevant conveyor components must be agreed in detail by the Logistics Contractor with the Client's maintenance and servicing staff during the implementation planning phase.

- Transfer steps in conveyor technology: The Logistics Contractor must provide bridging steps over the conveyor system at suitable positions in the conveyor system, taking into account the requirements of escape routes and to realise easy access for maintenance. The Logistics Contractor is requested to document the location of the bridging steps in its offer by means of a corresponding drawing.

4.9.5. Functional system description FG 3 – Shipping tote conveyor to Picking Gallery

4.9.5.1. Layout

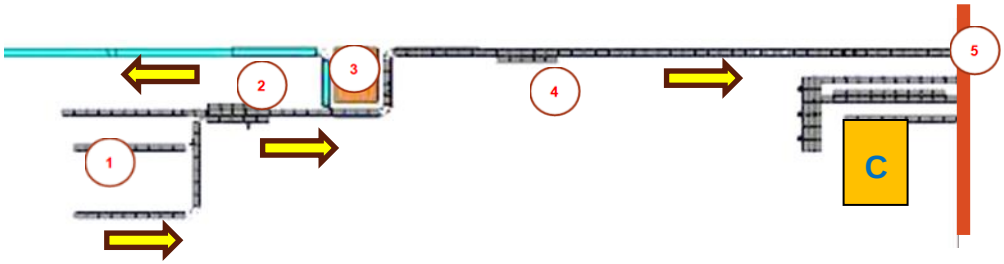


Figure 4-62 : Conveyor shipping totes – 1st Floor Repacking area

4.9.5.2. Description of the functional processes

The folded shipping totes are manually depalletised, unfolded and placed on the conveyor system at 2 workstations, which are connected by means of pallet conveyor technology (see fig. 4-62, point "1"). These shipping totes are required for order picking in the individual picking stations in the Picking Gallery.

After the empty shipping totes have been set up, they travel to a checking station where it is checked whether the shipping tote is completely unfolded, whether the barcode or RFID chip can be read and whether the shipping tote is empty and clean.
If the shipping tote is faulty, it is ejected at the checking station onto a fault line, processed and, once all faults have been rectified, transported back onto the conveyor system in the direction of the picking gallery.

A combined passenger and goods lift is provided on site at point "3" in figure 4-62. To ensure free access to this lift, the conveyor system for the shipping totes at this point must be at a height of approx. 2,500 mm above the corridor for the 1st Floor; therefore, a gradient must be provided in the conveyor route from the direction of the 2 workstations.

In addition, there must be a passageway between the checking station (see figure 4-62, point "2") and the lift (see figure 4-62, point "3") so that an employee with a pallet on the hand pallet truck can reach the pre-zone for the HBW underneath the conveyor system.

After the lift, the empty shipping totes are transported towards the firewall (see figure 4-62, point "5"). From the lift to the firewall, 2 conveyor lines run one above the other; one for empty shipping totes in

the direction of the picking gallery and the other for filled shipping totes in the direction of dispatch in the existing building.

In the event that empty shipping totes are required in dispatch, it is possible to remove them from the conveyor flow from the destacking workstations to the picking gallery. For this purpose, a diverter is provided at point "4" (see figure 4-62) with a subsequent ascending section, which then transfers the empty shipping totes to the other conveyor system in the direction of dispatch in the existing building.

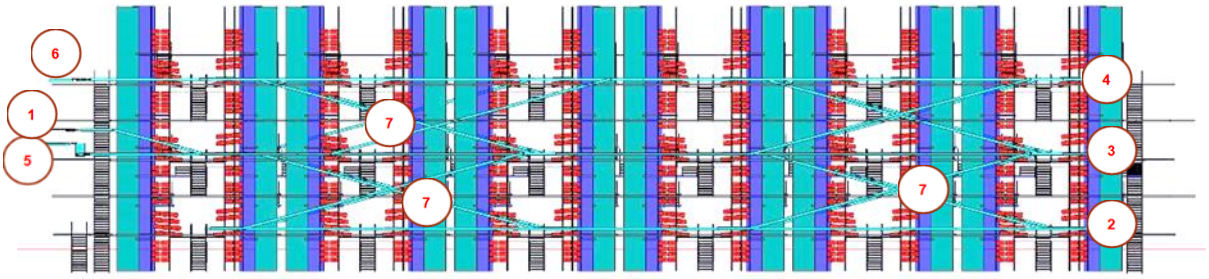


Figure 4-63 : Section west side Picking Gallery conveyor for shipping totes

The empty shippint totes enter the picking gallery area via point "1" (see figure 4-63) and are then transported parallel to the northern wall to the pre-zone area on the western side of the picking gallery.

In this pre-zone, 3 conveyor circuits are provided for transporting the shipping totes to the 3 picking levels in the Picking Gallery (in addition to the two levels for the storage totes; see figure 4-63, point "2", point "3" and point "4"). These conveyor circuits are connected to each other at several points via ascending and descending sections (see figure 4-63, point "7"). This allows the incoming empty shipping tote to be conveyed to each level and to each picking aisle. An example of such a conveyor circuit can also be seen in figure 4-64, point "4"; this is the uppermost conveyor circuit for the uppermost picking level in the Picking Gallery.

These conveyor circuits for the shipping totes are connected to the conveyor circuits for the storage totes on the western side of the picking gallery via ascending and descending sections at several points. This is also to ensure that empty or possibly full storage totes from the pick locations in the picking stations can also be conveyed back to the destinations of the Not-Okay workstation or to the repacking area. These empty and, if necessary, full storage totes are placed on the conveyor system for the shipping totes in the area of the picking stations and transported from there to one of the conveyor circuits of the shipping totes on the western side of the Picking Gallery. The destinations in the repacking area can then be reached via the connections to the conveyor circuits for the storage totes. Faulty storage totes with the destination of the Not-Okay workstation are then transported further via the conveyor system for the shipping totes in the direction of the existing dispatch building and discharged at point "1" (see figure 4-63) to the Not-Okay workstations (Not-Okay workstations are described under Functional Group 1 (see figure 4-60).

In order to ensure that every picking station in the Picking Gallery can be reached from every picking station, the 3 conveyor circuits at the height of the picking levels in the Picking Gallery on the eastern side of the Picking Gallery are provided once again in line with the design on the western side of the Picking Gallery.

From the different conveyor circuits on the western and eastern sides of the picking gallery, the shipping totes are discharged onto the routes to the picking stations at the different picking levels or, on return transport from the routes, are transferred from the picking stations to the conveyor circuits.

Finished shipping totes, i.e. shipping totes that are to be sent to dispatch in the existing building after picking, are discharged via the conveyor circuits on the western side of the picking gallery onto a discharge line in the direction of dispatch in the existing building and are conveyed parallel to the northern wall of the picking gallery in the building in the direction of the breakthrough through the firewall (see figure 4-63, point "6". This connection is only provided from the west side of the picking gallery.

In the conveyor system for the shipping totes, automatic inspection stations should be provided at suitable points, which are equipped with a scale for checking the weight of the storage totes, a contour check, a check of the correct position of the handle opening for order picking and a scanner for identifying the barcode / RFID chip in the storage tote.
The locations for this checking stations in the layout provided by the Logistics Contractor must be labelled accordingly when the offer layout is submitted.

4.9.5.3. Capacity and throughput requirements

For the technical design of the various conveying components, the following throughput rates in the maximum hour must be taken into account for the functional groups for the storage totes:

- Empty shipping totes to Picking Gallery: max. 1,005 shipping totes / hour
- Filled shipping totes from Picking Gallery to existing building: max. 1,005 shipping totes / hour
- Picking Gallery to Not-Okay workstation (assumption 10%): max. 100 shipping totes / hour

Remark: The throughput quantities presented are currently being analysed and evaluated once again, taking into account the layout, and any quantities and quantity flows to be taken into account will be made available with the other additions to this tender at the end of July.

The technical system performance of each conveyor lane as well as each lift for totes must each be designed for 100% of the throughput requirement. Surcharges for the technical design to ensure fulfilment of the throughput performance must be taken into account by the Logistics Contractor on the basis of his experience.

The individual conveyor lanes in this functional group must be equipped with sufficient accumulation capacities, taking the simulation into account.

4.9.5.4. Other specific requirements

The following special requirements must be taken into account for this functional group.

- Elevation and fastening of the conveyor sections:

- For all conveyor lines, it must be taken into account that they must be supported either on the planned platform constructions or on the storey ceilings; no suspension of conveyor lines from the ceiling of the storey or attachment to the walls of the building is to be provided; these are not possible according to the current state of planning.
- In the area of the 1st Floor in the repacking area (see figure 4-62), 2 conveyor lines run one above the other on the eastern wall (in the illustration above) from the right-hand fire wall to the lift in the centre; this must be taken into account during the elevation.
- The statics and anchoring of the conveyor system must be design or suitable safety measures taken in such a way that no permanent deformation or damage to the steel structure occurs when the conveyor is started by an industrial truck; see also Chapter 4.3.9.

- Check stations at the identification points in defined positions in the functional group:
  - Integration of a pallet continuous scale with the following features:
    - Automatic and calibratable;
    - Weighing range up to 40 kg;
    - System accuracy 0.1 kg;
    - Display and control panel designed according to ergonomic aspects;
  - Length, width and height control, subsequently adjustable;
  - Check the correct position of the gripping opening of the storage totes;
  - Barcode scanner to read label or RFID chip;
  - IT interface for transfer of all measured values;
  - Display panel at the “Not-Okay” workplace for “Not-Okay” faults from control station;
- Integration of conveyor system closures:
  - The described conveyor lines for the shipping totes lead through a fire protection wall at one point (see figure 4-8, point “5”), so that 1 fire protection closures for containers has to be considered and supplied by the Logistics Contractor in the tendered scope of delivery and services.
  - The maximum height of a tote is 280 mm, including pallet; the required opening for the conveyor system closure must be determined accordingly and the required opening size, the possible technical design / arrangement of the conveyor system closure on the fire wall must be actively and independently agreed with the Building Contractor.
  - Only approved conveyor system closures are to be used. The Logistics Contractor must provide the Client with valid approval notices required according to Polish regulations outlined in the attached Construction Specification and containing all required certification and acceptance in accordance with local law, as well as the German Institute for Construction Technology (DIBt), if the conveyor system closures is situated in a fire wall. Type and proposed manufacturer of the closures need to be presented in the logistic contractor’s offer.
  - The requirements of chapter 4.3.9 must be observed.

- The possible or offered type of conveyor system closure must be documented by the Logistics Contractor in the offer.

- For conveyor lines that run above workplaces, escape routes and other traffic routes, the legally prescribed safety measures and the client's health & safety requirements must be implemented below the conveyor system so that no parts can fall from the dead parts or from the conveyor line (e.g. nets below the conveyor system).
- The conveyor sections or the constructions for their elevation in the area where industrial trucks are travelling must be equipped with suitable collision protection. In this functional group this applies to the conveyor sections on the 1st Floor in the Repacking area on the eastern side (see figure 4-62, points “1” and “2” as well as between point “3” and point “5”).
- For maintenance and servicing, the relevant conveyor technology components must be arranged above the workstations and at higher conveyor levels above the floor for easy access. The arrangement and accessibility of the relevant conveyor components must be agreed in detail by the Logistics Contractor with the client's maintenance and servicing staff during the implementation planning phase.
- Transfer steps in conveyor technology: The Logistics Contractor must provide bridging steps over the conveyor system at suitable positions in the conveyor system, taking into account the requirements of escape routes and to realise easy access for maintenance. The Logistics Contractor is requested to document the location of the bridging steps in its offer by means of a corresponding drawing.

4.9.6. Functional system description FG 4 – Shipping tote conveyor in Picking Gallery

4.9.6.1. Layout

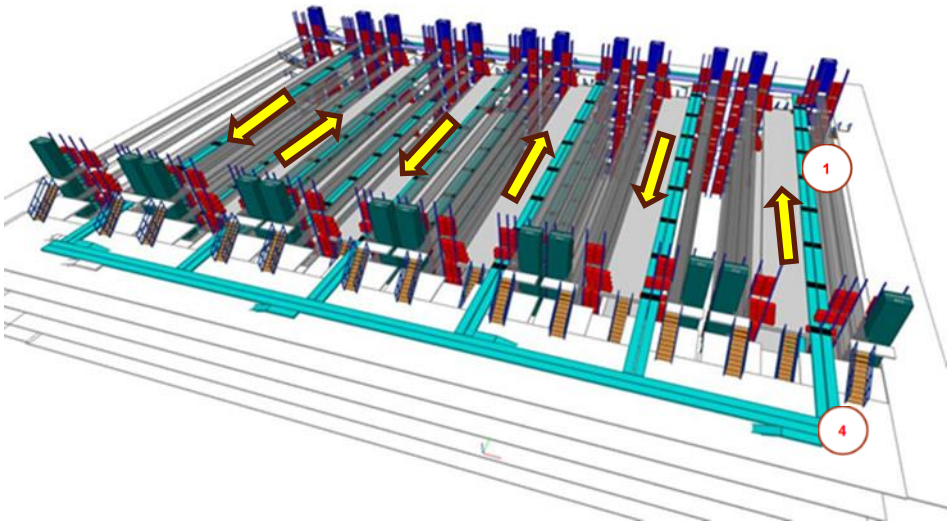


Figure 4-64 : Overview of picking stations upper picking level in Picking Gallery

4.9.6.2. Description of the functional processes

This function group consists of the conveyor lines with the picking stations in the individual picking aisles across the 3 picking levels of the Picking Gallery. This is shown as an example for the top level of the picking gallery in figure 4-64.

After being ejected from the conveyor circuit in front of the picking level (see figure 4-64, point "4"), the shipping totes are conveyed past the picking stations in the individual picking aisles (see figure 4-64, point “1”). Figure 4.64 shows a possible conveying direction for the shipping totes at the top level using arrows. This conveying direction and the course of the transport route via the picking aisles in the level is only an example. The effective conveying direction must be determined during the implementation planning phase, taking into account the simulation to be carried out by the Logistics Contractor.

There are 5 picking stations in a picking aisle along the length of the rack. The shipping totes are diverted from the main conveyor lines to the current target picking station and made available there for picking.

The first e.g. 3 storage locations of the picking station are located on a driven conveyor system.

The front container is automatically scanned and the pick locations for this container in this picking station are displayed via the pick-by-light displays. The picker takes the bin and pushes it manually over the part of the non-driven conveyor system in the picking station. When all the positions in this picking station for the shipping tote have been picked, the picker pushes the shipping tote manually back onto the main conveyor section in the rack. Pushing off must be possible at every position of the non-driven part of the conveyor system.

In the event of faulty containers in the flow racks of the pick locations, these are removed from the pick locations and manually pushed onto the main conveyor line via the position at the start of the non-driven part of the conveyor system if the container has been previously identified on the screen/tablet or similar at the workstation and is therefore known to the material flow system.

The same conveyor technology and the same sequence is provided on all 3 picking levels.

The number of picking stations in a picking aisle and the length of the driven conveyor technology at the picking station is currently the basis for the planning. This basis must be verified as part of the simulation to be carried out by the Logistics Contractor and the planning must be adjusted if necessary on the basis of the simulation results in the Logistics Contractor’s implementation planning.
In the conveyor system for the shipping totes, automatic inspection stations should be provided at suitable points, which are equipped with a scale for checking the weight of the storage totes, a contour check, a check of the correct position of the handle opening for order picking and a scanner for identifying the barcode / RFID chip in the storage tote.

The locations for this checking stations in the layout provided by the Logistics Contractor must be labelled accordingly when the offer layout is submitted.

4.9.6.3. Capacity and throughput requirements

For the technical design of the various conveying components, the following throughput rates in the maximum hour must be taken into account for the functional groups for the storage totes:

- To be filled shipping totes in the Picking Gallery: max. 1,005 shipping totes / hour
- Empty storage totes in the Picking Gallery: max. 930 storage totes / hour
- Picking Gallery to Not-Okay workstation (assumption 10%): max. 100 shipping totes / hour

Remark: The throughput quantities presented are currently being analysed and evaluated once again, taking into account the layout, and any quantities and quantity flows to be taken into account will be made available with the other additions to this tender at the end of July.

The technical system performance of each conveyor lane as well as each lift for totes must each be designed for 100% of the throughput requirement. Surcharges for the technical design to ensure fulfilment of the throughput performance must be taken into account by the Logistics Contractor on the basis of his experience.

The individual conveyor lanes in this functional group must be equipped with sufficient accumulation capacities, taking the simulation into account.

4.9.6.4. Other specific requirements

The following special requirements must be taken into account for this functional group.

- Elevation and fastening of the conveyor sections:
    - For all conveyor lines, it must be taken into account that they must be supported either on the planned platform constructions of the Picking Gallery; no suspension of conveyor lines from the ceiling of the storey or attachment to the walls of the building is to be provided; these are not possible according to the current state of planning.
    - The elevation of the conveyor technology on the structure of the various steel platforms in the Picking Gallery must be planned and designed in such a way that vibrations and oscillations caused by the driven conveyor lines with the containers on them are not transferred to the steel structure of the platform construction in the Picking Gallery as far as possible. Suitable measures must be provided and implemented by the Logistics Contractor for this purpose.
- Check stations at the identification points in defined positions in the functional group:
    - Integration of a pallet continuous scale with the following features:
        - Automatic and calibratable;
        - Weighing range up to 40 kg;
        - System accuracy 0.1 kg;
        - Display and control panel designed according to ergonomic aspects;
    - Length, width and height control, subsequently adjustable;
    - Check the correct position of the gripping opening of the storage totes;
    - Barcode scanner to read label or RFID chip;
    - IT interface for transfer of all measured values;
    - Display panel at the “Not-Okay” workplace for “Not-Okay” faults from control station;

- For conveyor lines that run above workplaces, escape routes and other traffic routes, the legally prescribed safety measures and the client's health & safety requirements must be implemented below the conveyor system so that no parts can fall from the dead parts or from the conveyor line (e.g. nets below the conveyor system).
- For maintenance and servicing, the relevant conveyor technology components must be arranged above the workstations and at higher conveyor levels above the floor for easy access. The arrangement and accessibility of the relevant conveyor components must be agreed in detail by the Logistics Contractor with the client's maintenance and servicing staff during the implementation planning phase.
- Transfer steps in conveyor technology: The Logistics Contractor must provide bridging steps over the conveyor system at suitable positions in the conveyor system, taking into account the requirements of escape routes and to realise easy access for maintenance. The Logistics Contractor is requested to document the location of the bridging steps in its offer by means of a corresponding drawing.

4.9.7. Functional system description FG 5 – Shipping tote conveyor to Sequenzer

4.9.7.1. Layout

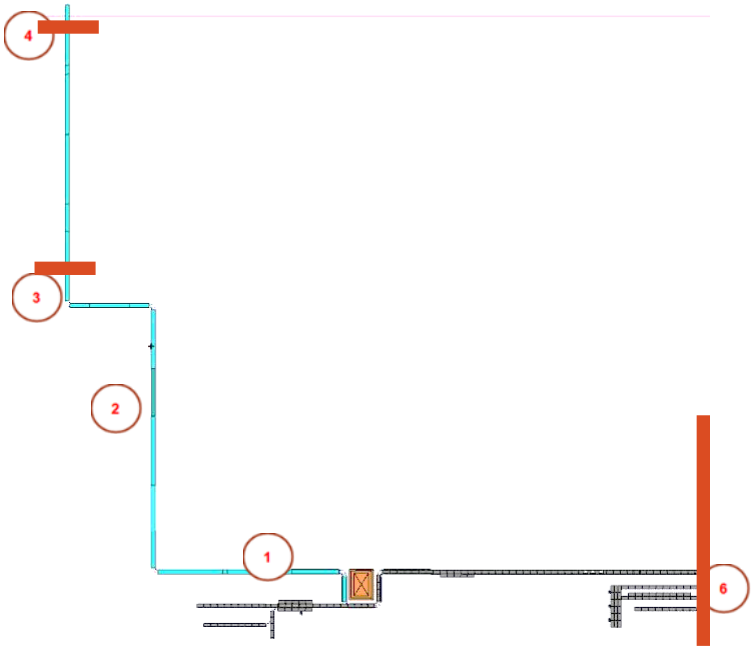


Figure 4-65: Overview Repacking area

4.9.7.2. Description of the functional processes

This functional group includes the conveyors on the southern side of the firewall between the repacking and the picking gallery, which transport the storage and shipping totes from the conveyor circuits to the Not-Okay workstations (see figure 4-65, point "6") and transport the shipping totes to the breakthrough through the firewall near point "6".

From the firewall, the shipping totes are conveyed along the eastern wall (upper wall in repacking) above the conveyor lines for the empty shipping totes in the direction of the picking gallery.

After bypassing the combined passenger and goods lift and passing the checking station for empty shipping totes (see figure 4-65; Point "1"), the conveyor system is brought back from the high level to a height of approx. 700 mm above the upper edge of the conveyor system via a conveyor section with a gradient.

In the further course in the area of the pre-zone of the HBW (see figure 4-65, point "2"), the conveyor must again be provided with an incline, as a combined passenger and goods lift is planned in the area of point "2", so that a clear height of approx. 2,300 mm must be provided under the conveyor in order to ensure easy access to the lift.

The conveyor section can then be brought back to the level of 700 mm at the top edge of the conveyor by means of a downward slope.

Between points "3" and "4" (see figure 4-65), the conveyor section for the shipping totes runs on the bridge between the new and the existing building at a conveyor height of +700 mm from the top edge of the conveyor. In area "4", this conveyor section for the shipping totes is then transferred to the functional group / the area of the existing building.

4.9.7.3. Capacity and throughput requirements

For the technical design of the various conveying components, the following throughput rates in the maximum hour must be taken into account for the functional groups for the storage totes:

- Filled shipping totes from Picking Gallery to existing building: max. 1,005 totes / hour

The technical system performance of each conveyor lane as well as each lift for totes must each be designed for 100% of the throughput requirement. Surcharges for the technical design to ensure fulfilment of the throughput performance must be taken into account by the Logistics Contractor on the basis of his experience.

The individual conveyor lanes in this functional group must be equipped with sufficient accumulation capacities, taking the simulation into account.

4.9.7.4. Other specific requirements

The following special requirements must be taken into account for this functional group.

- Elevation and fastening of the conveyor sections:
    - For all conveyor lines, it must be taken into account that they must be supported either on the planned platform constructions for the bridge between the new and existing building or on the storey ceilings; no suspension of conveyor lines from the ceiling of the storey or attachment to the walls of the building is to be provided; these are not possible according to the current state of planning.
    - In the area of the 1st Floor in the repacking area (see figure 4-62), 2 conveyor lines run one above the other on the eastern wall (in the illustration above) from the right-hand fire wall to the lift in the centre; this must be taken into account during the elevation.

  - The statics and anchoring of the conveyor system must be design or suitable safety measures taken in such a way that no permanent deformation or damage to the steel structure occurs when the conveyor is started by an industrial truck; see also Chapter 4.3.9.

- The elevation of the conveyor technology on the structure of the steel construction of the bridge between the new and the existing building must be planned and designed in such a way that vibrations and oscillations caused by the driven conveyor lines with the containers on them are not transferred to the steel structure of the bridge. Suitable measures must be provided and implemented by the Logistics Contractor for this purpose.
- Integration of conveyor system closures:
  - The described conveyor lines for the shipping totes lead through a fire protection wall at one point (see figure 4-11, point “6”) in the wall between Repacking area and Picking Gallery as well as the beginning and the end of the bridge between the new and existing building (see figure 4-11, points “3” and “4”), so that 3 fire protection closures for containers has to be considered and supplied by the Logistics Contractor in the tendered scope of delivery and services.
  - The maximum height of a tote is 280 mm, including pallet; the required opening for the conveyor system closure must be determined accordingly and the required opening size, the possible technical design / arrangement of the conveyor system closure on the fire wall must be actively and independently agreed with the Building Contractor.
  - Only approved conveyor system closures are to be used. The Logistics Contractor must provide the Client with valid approval notices required according to Polish regulations outlined in the attached Construction Specification and containing all required certification and acceptance in accordance with local law, as well as the German Institute for Construction Technology (DIBt), if the conveyor system closures is situated in a fire wall. Type and proposed manufacturer of the closures need to be presented in the logistic contractor’s offer.
  - The requirements of chapter 4.3.9 must be observed.
  - The possible or offered type of conveyor system closure must be documented by the Logistics Contractor in the offer.
- For conveyor lines that run above workplaces, escape routes and other traffic routes, the legally prescribed safety measures and the client's health & safety requirements must be implemented below the conveyor system so that no parts can fall from the dead parts or from the conveyor line (e.g. nets below the conveyor system).
- The conveyor sections or the constructions for their elevation in the area where industrial trucks are travelling must be equipped with suitable collision protection. In this functional group this applies to the conveyor sections on the 1st Floor in the Repacking area on the eastern side (see figure 4-65, along the wall of the east side) and in the area in front of the HBW (see figure 4-65, point "2") and in the area of the bridge between the new and the existing building (see figure 4-65, between point "3" and point "4").

- For maintenance and servicing, the relevant conveyor technology components must be arranged above the workstations and at higher conveyor levels above the floor for easy access. The arrangement and accessibility of the relevant conveyor components must be agreed in detail by the Logistics Contractor with the client's maintenance and servicing staff during the implementation planning phase.

4.10. Conveyor belt for waste disposal

4.10.1. Layout

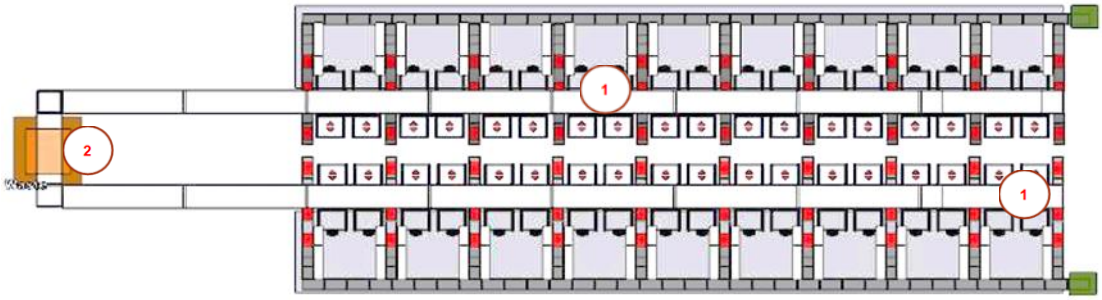


Figure 4-66: Layout conveyor belt waste disposal

4.10.2. Functional system description conveyor belt waste disposal

Above the workstations in manual repacking, there is a collection belt for cardboard boxes on each side of the workstations, which transports the cardboard boxes to a central press container.
The employees in manual repacking throw the cardboard boxes upwards onto this collecting belt. To prevent them from throwing the cardboard boxes over the collecting belt, the back of the collecting belt must be provided with a higher sheet steel edge as seen by the employee, from which the cardboard box then bounces off and falls onto the collecting belt.

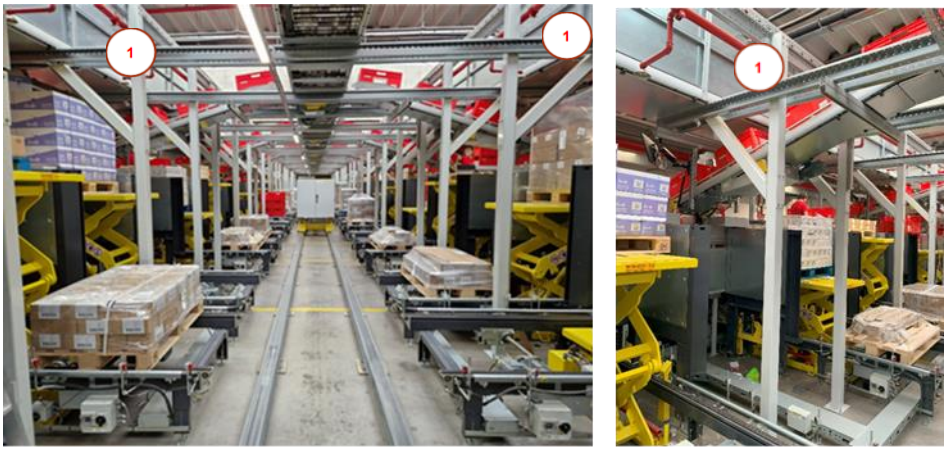


Figure 4-67: Layout conveyor belt waste disposal

Figure 4-67 shows the current arrangement of the collection belts (labelled "1"). The elevation for the collecting belts is taken into account in the design of the elevation for feeding the storage totes.

After the collecting belt above the workstations, both strands must be continued and then brought together (see figure 4-66, point "2").
A shaft is structurally provided in the ceiling of the first floor to the ground floor at or in the area of the merging point.

At present, the following waste materials are to be transported via the waste conveyor belt in addition to the cardboard packaging (see figure 4-68). These are paper divider (1,200 x 800 mm) and paper corner (2,100 x 600 x 600 mm)



Figure 4-68: Example conveyor belt waste disposal additional to cartons

The collection belts then drop the cardboard boxes into this chute. At the lower end of this chute, the cardboard boxes fall onto further conveyor belts, which then transport the cardboard boxes to the central press (see example figure 4-68).



Figure 4-69: Example conveyor belt waste disposal

The Logistics Contractor's scope of supply and services includes the collecting belt above the workstations, the merging of the collecting belts, the lining of the shaft through the floor dock to the ground

floor and the conveyor technology on the ground floor until the cardboard boxes are fed into the automatic central press. The press is provided by the client.
For the calculation, it can be assumed that the press will be located on the ground floor in the immediate vicinity of the planned shaft. The exact location of the central press is currently being worked on and has not yet been finalised. The Logistics Contractor will coordinate the exact location and the exact routing for the connection of the central press to the shaft as part of the implementation planning.

4.10.3. Other specific requirements

The following special requirements must be taken into account for this function group.

- Elevation and fastening of the conveyor sections:
    - For the elevation of the collecting belts, it must be taken into account that this takes place on the planned storey ceiling; an elevation must be provided, a suspension from the ceiling is not planned or possible.
    - It is possible to use the elevation of the collecting belts in the elevation for the conveyor technology of the storage totes.
    - This elevation must not lead to any restriction of the conveyor technology for containers, pallets and the T-cars in the manual repacking area.
- The elevation of the conveyor technology on the structure of the steel construction on the storey ceiling of the 1st Floor must be planned and designed in such a way that vibrations and oscillations caused by the driven conveyor lines with the waste on them are not transferred to the steel structure of the storey ceiling. Suitable measures must be provided and implemented by the Logistics Contractor for this purpose.
- Integration of conveyor system closures:
    - The storey ceiling between the 1st floor and the ground floor is a fire protection ceiling, so that the shaft must be closed with an approved fire protection closure in the event of fire.
    - The required opening for the system closure must be determined accordingly and the required opening size, the possible technical design / arrangement of the system closure on the fire wall must be actively and independently agreed with the Building Contractor.
    - Only approved conveyor system closures are to be used. The Logistics Contractor must provide the Client with valid approval notices required according to Polish regulations outlined in the attached Construction Specification and containing all required certification and acceptance in accordance with local law, as well as the German Institute for Construction Technology (DIBt), if the conveyor system closures is situated in a fire wall. Type and proposed manufacturer of the closures need to be presented in the logistic contractor's offer.
    - The requirements of chapter 4.3.9 must be observed.
    - The possible or offered type of conveyor system closure must be documented by the Logistics Contractor in the offer.

- For conveyor lines that run above workplaces, escape routes and other traffic routes, the legally prescribed safety measures and the client's health & safety requirements must be implemented below the conveyor system so that no parts can fall from the dead parts or from the conveyor line (e.g. nets below the conveyor system). Suitable measures must also be taken to prevent the opening for the shaft from falling in.
- The conveyor sections or the constructions for their elevation in the area where industrial trucks are travelling must be equipped with suitable collision protection. In this functional group this applies to the conveyor sections on the Ground Floor between the shaft and the central pressing machine.
- For maintenance and servicing, the relevant conveyor technology components must be arranged above the workstations and at higher conveyor levels above the floor for easy access. The arrangement and accessibility of the relevant conveyor components must be agreed in detail by the Logistics Contractor with the client's maintenance and servicing staff during the implementation planning phase.

4.11. Sequencer system technology

4.11.1. Functional description

The sequencer system technology is used for buffering and automatic / manual stacking of shipping totes ensuring predefined order of stacks. Automatic stacks are created on dollies, whereas manual stacks are created by employees onto roll cages/dollies.

The sequencer system is located within the existing warehouse and is fed with shipping totes via different inputs:

- Via bridge from new building : 1.005 totes / h
- Via manual input existing warehouse : 700 totes / h
- Via manual input from Łódź : 250 totes / h
- Via mezzanine existing warehouse : 100 totes / h

In total 2.055 shipping totes / h input have to be processed by the sequencer system.

In addition, 40 empty shipping totes / h will be received via bridge and 150 shipping totes / h will be consolidated to 75 shipping totes / h by employees within the system. The shipping totes that have become empty after consolidation must be added to the buffer areas for empty ship-ping totes in the automatic dolly stackers.

The system needs to offer possibility to manually feed empty shipping totes in case of malfunction of the automatic conveyors. Manual workstations can be utilised for this.

The inherent shuttle system has to be provide a minimum capacity of 4.200 shipping totes locations (Assumed in functional layout -> 4.400 shipping totes).

The sequencer system technology is to be assigned to the following functional groups for the offer:

- Functional Group 1: Shuttle system
- Functional Group 2: Peripheral conveyors
- Functional Group 3: Automatic dolly stackers.

The basic functionality, routing and other requirements are described below. The guidance of the shuttle system and totes conveyor technology is only functionally given. The drawings / sketches in the document reflect a principle representation of the material flow. The Logistics Contractor must present his solution within the scope of the offer and prove that the solution selected meets the functional requirements for quality and performance.

As an option the Client considers introducing an automatic destacker for totes from dollies for a flow of totes from Łódź warehouse to Pyskowice warehouse (based on the stipulated flow of 250 totes per hour). Potential location will be indicated by the Client during offer calculation period, by end of July. If the vendor sees possibility of optimising the layout and indicating this position, then this needs to be calculated and shown on the layout as an option price.

4.11.2. Requirements for sequencer system technology

4.11.2.1. Conveyed and stored goods

The totes conveyor technology must be designed for the load carriers with the specifications specified in chapter 2.3.3

4.11.2.2. Capacity and throughput requirements

The capacity and throughput requirements are defined below for each function group.

4.11.2.3. General requirements

In principle, the requirements according to chapters 4.2 and 4.3 are to be fulfilled.

The scope of delivery and services of the sequencer system technology includes:

- Sequencer system technology, according to description / drawing incl. the required infeed and outfeed elements, converters, turntables, other conveying technology elements and machines, controls, actuators and sensors. All required peripherals - even if not explicitly stated - must be included in the prices; this also includes scanners, light barriers, element control, rotating beacons etc.;
- Precise graphic representation (ground plan, side view etc.) of the sequencer system;
- Stages / stands of sequencer system technology, in areas where this is necessary, collision protection etc. (see requirements according to chapter 4.2 and 4.3);
- All conveyor crossings and platforms necessary for maintenance and repair of the shuttle system, dolly stackers and conveyor lines (the position and number of conveyor crossings for reaching the maintenance points shall be specified by the Logistics Contractor within the scope of his offer);
- Connection to a failure analysis and system visualisation system including load level monitoring of the sequencer system in the control station. (see requirements according to chapter 6.4.2);
- Protective equipment, in detail in the manual areas and dollystacker prezones and other areas as required;

- Control cabinet incl. wiring up to the control cabinet and from the control cabinet to the sequencer system; main connections are set up according to the client's specifications. The final location of the stationary switch cabinets shall be determined in the context of the execution planning with the Client. The cabling from the switch cabinets to the system components is part of the contractor's scope of services and delivery and must be included in the offer price (see requirements in accordance with Chapter 4.3.5).
- The following functions must be ensured:
    - Ensuring maximum congestion capacity on the required routes;
    - When configuring the conveying elements and the control system, the specified throughput requirements must be taken into account.

The Logistics Contractor determines the number of scanners used in the sequencer system technology according to his "control philosophy" (scanning before branching - logical material flow tracking). It ensures trouble-free and offset-free transport. The number of scanners used must be documented in detail by the contractor within the scope of his offer.

4.11.3. Functional system description FG 1 – Shuttle system

4.11.3.1. Layout

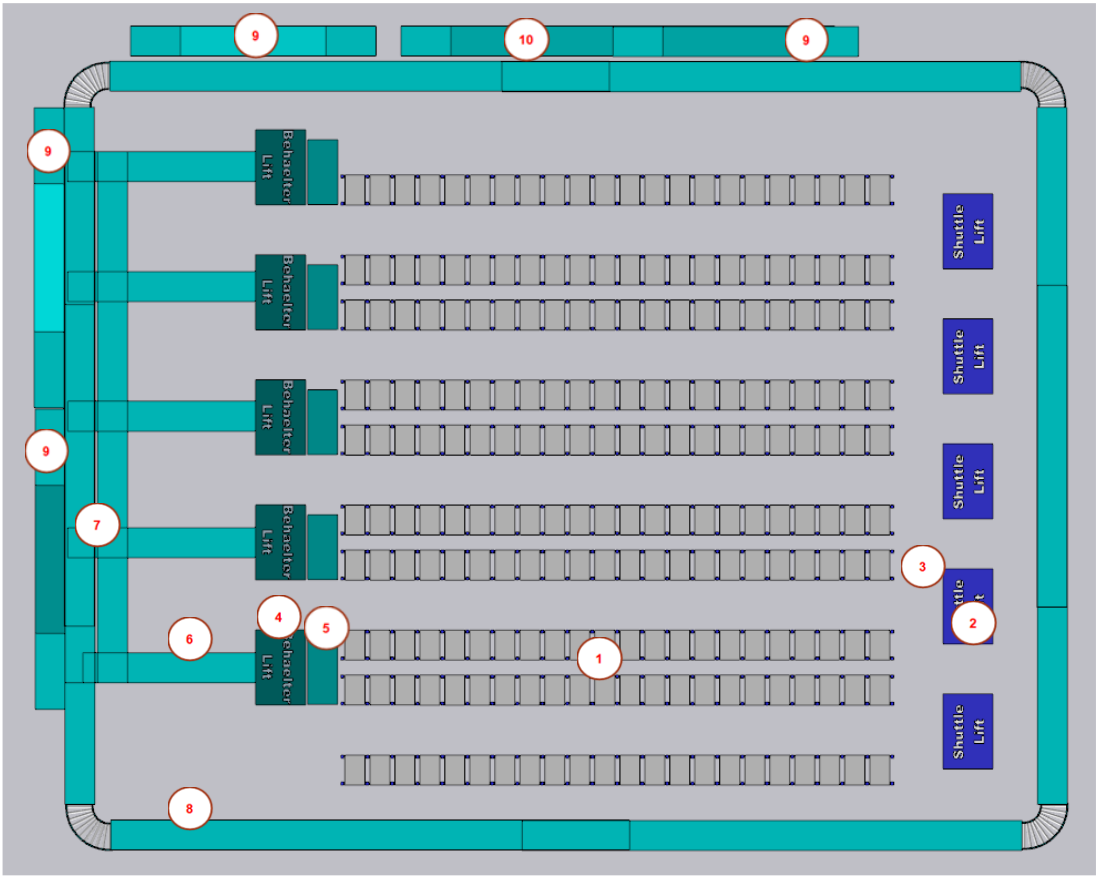


Figure 4-70: Layout Functional Group 1 [top view]

4.11.3.2. Description of the functional processes

The Shuttle system works as a buffer for the shipping totes and as a main sequencer, i.e. to retrieve the buffered totes in a predefined order.

The shipping totes are buffered single deep, within 5 aisles, 20 levels planned (see figure 4-70, point "1").

The total height of the installation should not exceed 12 m.

Each aisle should be equipped by a shuttle lift, as to allow shuttle to change the level, without loaded tote (see figure 4-70, point "2").

In addition shuttle can change the aisle at a distinct level (see figure 4-70, point "3").

Via lifts (see figure 4-70, point "4") the totes are moved from the 2 inbound levels to their put-away level or from their buffer/storage level to one of the 2 outbound levels.

Every Totes lift has got change over stations (see figure 4-70, point "5") to shuttle on each shuttle level.

Every totes lift has got connections to attached conveyors (see figure 4-70, point "6") on several levels, 2 for inbound (planned at height of approx.. 700mm and 1500mm) and 2 for outbound (planned at height of approx.. 2,500 mm and 3,300 mm).

In front of lift conveyors several short loops (see figure 4-70, point "7") at different levels are located, directly connected to connections to lifts.

Connected to every short loop is a large loop (see figure 4-70, point "8") surrounding the shuttle system.

Inclination and declination belts connect the 2 inbound levels (see figure 4-70, point "9"), the 2 outbound levels (point "9") and connect inbound with outbound levels (inbound level 1 with outbound level 1 and inbound level 2 with outbound level 2 (see figure 4-70, point "10").

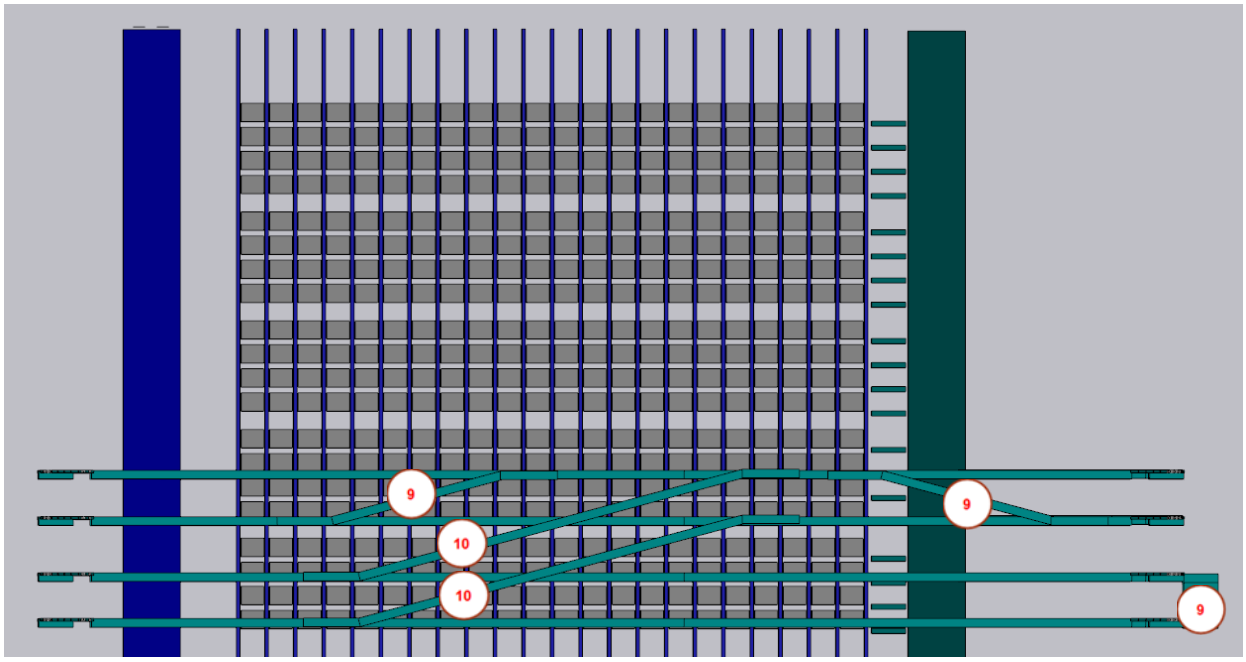


Figure 4-71: Layout Functional Group 1 [side view]

4.11.3.3. Capacity and throughput requirements

For the technical design of the various conveying components, the following throughput rates in the maximum hour must be taken into account:

- Inbound level 1: max. 1.050 totes / hour + 75 totes / hour consolidation
- Inbound level 2: max. 1.005 totes / hour
- Outbound level 1+2: max. 2.055 totes / hour + 150 totes / hour consolidation
    - Distributed almost evenly over the 2 outbound levels

The technical system performance of each conveyor and each lift as well as the number of shuttles must each be designed for 100% of the throughput requirement. Surcharges for the technical design to ensure fulfilment of the throughput performance must be taken into account by the Logistics Contractor on the basis of his experience.

The individual conveyor lines in this functional group must be equipped with sufficient accumulation capacities, taking the simulation into account.

4.11.3.4. Other specific requirements

The following special requirements must be taken into account for this function group.

- Infeed and outfeed stations:
    - The loading and unloading stations on and off the totes conveyor system must be monitored with sensors to identify presence / absence of totes for automatic start / stop of conveyors.
    - The individual components of the loading and unloading stations must be easily accessible for maintenance.
    - The statics and anchoring of the conveyor system must be design or suitable safety measures taken in such a way that no permanent deformation or damage to the steel structure occurs when the conveyor is started by an industrial truck; see also Chapter 4.3.9.
- Check at the identification point in the conveyor lanes for main inbound lanes:
    - Integration of totes continuous scales with the following features:
        - Automatic and calibratable;
        - Weighing range up to 40 kg;
        - System accuracy 0.1 kg;
        - Display and control panel designed according to ergonomic aspects;
    - Length, width and height control, subsequently adjustable;
    - Barcode / RFID scanner to read label from incoming goods;
    - IT interface for transfer of all measured values;
    - Display panel at the “Not-Okay” workplace for “Not-Okay” faults from control station;

- Connection lines and loops:
    - Maintenance platforms must be installed in a height distance of 2,1m according to the PN EN ISO1412-2 norm; covering always the aisles and surrounding loops and connecting inclination and declination belts. In case there are any specific obstacles or installations which impact the height, the distance can be reduced to 1,9m
    - The drives and other maintenance equipment must be provided on that side which ensures the easiest possible maintenance access from maintenance platforms.
- Totes and shuttle lifts:
    - The totes and shuttle lifts must be equipped with all necessary safety devices and barriers; in particular, the client's health and safety requirements attached to the tender must be taken into account.
    - Depending where the drives are positioned, they must be easily accessible for maintenance, i.e. on the ground floor is drives are positioned low, or on top if drives are at the top.
    - The totes and shuttle lifts are to be integrated into steel maintenance platforms. In this respect, suitable measures must be taken to prevent the transmission of vibrations or oscillations caused by the movement of the lifting and lowering processes in the lift to the steel platform.
- Transfer steps in conveyor technology: The Logistics Contractor must provide bridging steps over the conveyor system at suitable positions in the conveyor system, taking into account the requirements of escape routes and to realise easy access for maintenance. The Logistics Contractor is requested to document the location of the bridging steps in its offer by means of a corresponding drawing.

4.11.4. Functional system description FG 2 – Peripheral conveyors

4.11.4.1. Layout FG 2.1

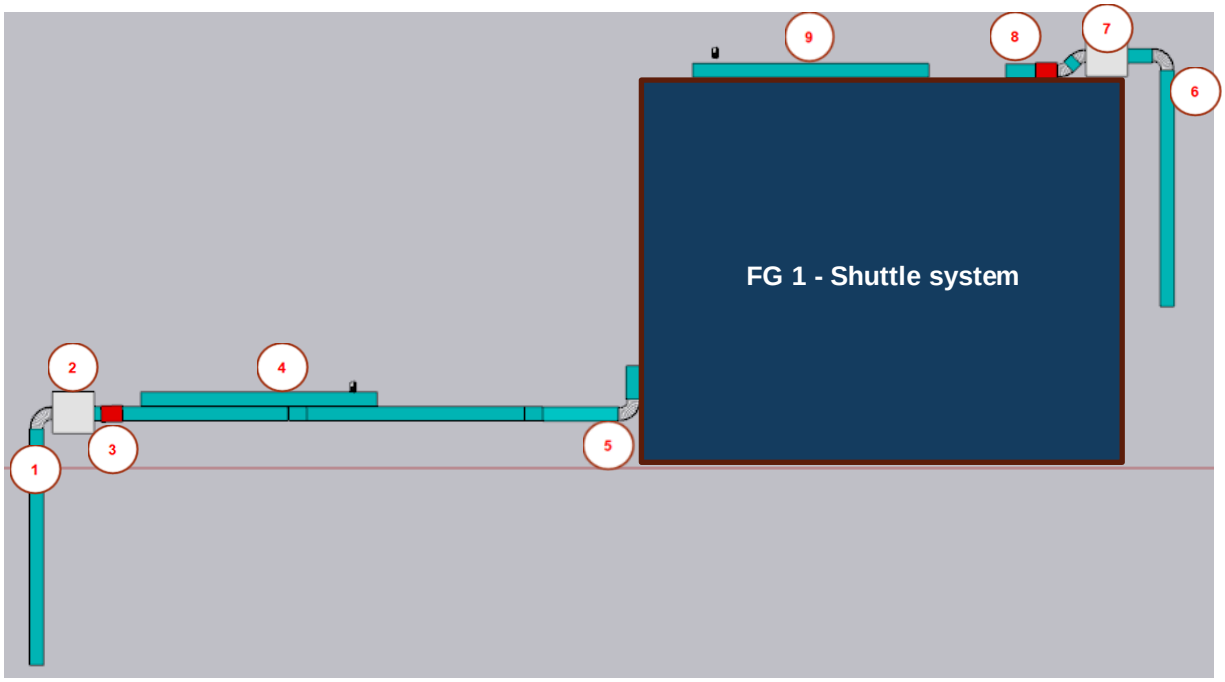


Figure 4-72: Layout Functional Group 2.1 [top view]

This functional group comprises all inbound and outbound related conveyours directly connected to the FG 1 - shuttle system, except the provisioning of the automatic dolly stackers (FG 3 – dolly stackers).

4.11.4.2. Description of the functional processes FG 2.1

At (see figure 4-72, point "1") filled shipping totes and empty shipping totes entering from new building via bridge the existing building.

Via a vertical conveyor (see figure 4-72, point "2") those totes are transported to level 700mm and then checked automatically (see figure 4-72, point "3") concerning weight, barcode / RFID chip, and optical concerning content distribution within tote (e.g. check of overhang).

After that checking point the empty shipping totes are rerouted to a separate conveyor leading towards the dolly stackers (described later within FG 3)

In case of an error the totes are rerouted to a local NIO station (see figure 4-72, point "4"). An employee working there can correct the error and then order the system to transport the corrected totes further towards the shuttle system, however the tote needs to pass control station again, to ensure that the amendment was made correctly.

In order and corrected totes are transported (see figure 4-72, point "5") to the connection onto the second main inbound loop of the shuttle system at level 1,500 mm.

At (see figure 4-72, point "6") shipping totes from the mezzanine are transported via vertical conveyor (see figure 4-72, point "7") to level 700 mm, passing an automatic checking station (see figure 4-72, point "8") and then transported onto the inbound conveyor loop of the shuttle system.

In case of an error the totes are rerouted to a local NIO station (see figure 4-72, point "9"). An employee working there can correct the error and then order the system to transport the corrected totes further towards the In case of an error the totes are rerouted to a local NIO station (point "9"). An employee working there can correct the error and then order the system to transport the corrected totes further towards the shuttle system.

4.11.4.3. Capacity and throughput requirements FG 2.1

For the technical design of the various conveying components, the following throughput rates in the maximum hour must be taken into account:

- From new building (figure 4-72, point “1”): max. 1.005 filled shipping totes / hour
  max. 40 empty totes / hour
- From mezzanine (figure 4-72, point “6”): max. 100 filled shipping totes / hour

The technical system performance of each conveyor and each lift must each be designed for 100% of the throughput requirement. Surcharges for the technical design to ensure fulfilment of the throughput performance must be taken into account by the Logistics Contractor on the basis of his experience.

The individual conveyor lines in this functional group must be equipped with sufficient accumulation capacities, taking the simulation into account.

4.11.4.4. Layout FG 2.2

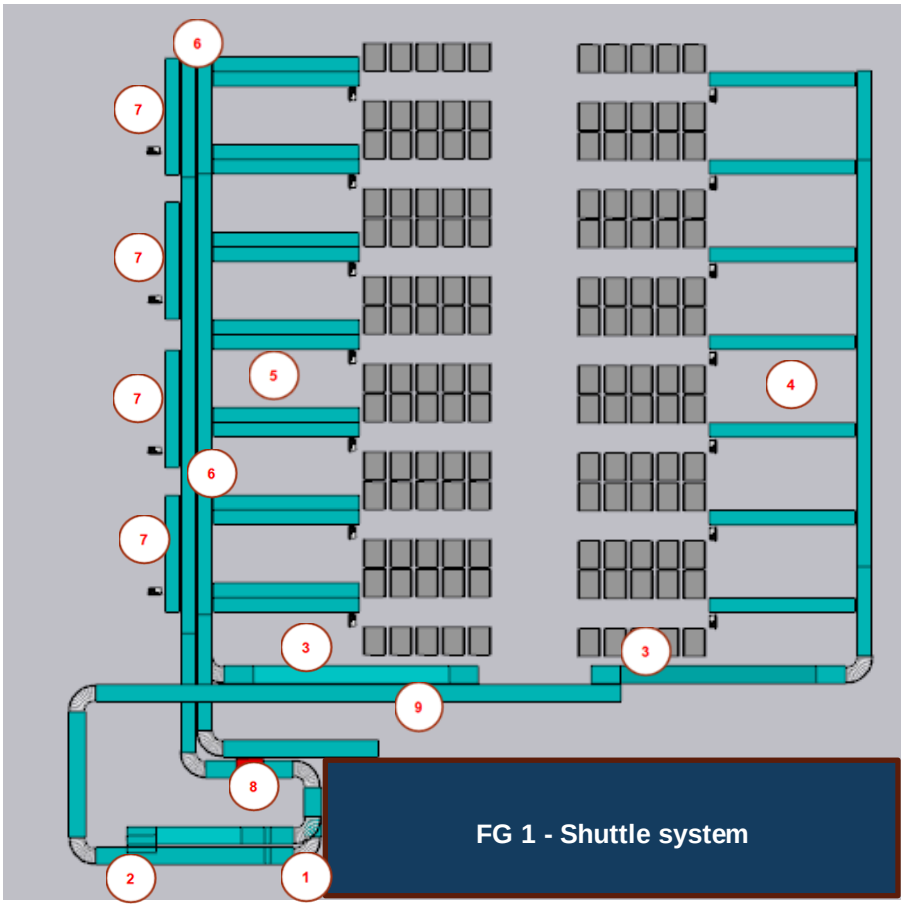


Figure 4-73: Layout Functional Group 2.2 [top view]

4.11.4.5. Description of the functional processes FG 2.2

At (see figure 4-73, point "1") shipping totes are sorted out from the two outbound levels (2,500 mm and 3,300 mm) of the shuttle system, combined on one conveyor (point "2", height 2,500 mm) toward the manual sorting and multifunctional area and transported via declination conveyors to level 700 mm.

At the area marked with (see figure 4-73, point “4”) 7 end sort fingers are located where employees are taking away the totes and pack them into roll cages.

At the area marked with (see figure 4-73, point “5”) 7 multifunctional sort fingers are located. In one mode those fingers can be used the same way as the end sort fingers described above. In addition each multifunctional sort finger is equipped with a second conveyor, which allows to transport totes back onto a main loop (see figure 4-73, point “6”).

This loop allows shipping totes to transport back into direction of shuttle system.

To this loop several additional working places (see figure 4-73, point “7”) are connected for the purpose of putting totes into the system manually by employees.

All totes which are directed via the loop towards the shuttle system are checked by a automatic checking station.

In case of error the totes will be transported via the large inbound loop of the shuttle system to the NIO located nearby (described within FG 2.1).

Otherwise the totes will be putaway into the shuttle system or in emergency case rerouted to weight sorter (see FG 2.3).

For multifunctional purpose a connection at point “9” between shuttle inbound loop (700 mm) and the loop for multifunctional fingers has been planned as to allow the flow of shipping totes to multifunctional fingers bypassing the outbound levels of shuttle system.

4.11.4.6. Capacity and throughput requirements FG 2.2

For the technical design of the various conveying components, the following throughput rates in the maximum hour must be taken into account:

- From shuttle (figure 4-73, point “2”): max. 1.005 filled shipping totes / hour
- From inbound (figure 4-73, point “7”): max. 250 filled shipping totes / hour (from external)
  + max. 700 filled shipping totes / hour (manual picking)
  + max. 40 empty shipping totes / hour

The technical system performance of each conveyor and each lift must each be designed for 100% of the throughput requirement. Surcharges for the technical design to ensure fulfilment of the throughput performance must be taken into account by the Logistics Contractor on the basis of his experience.

The individual conveyor lines in this functional group must be equipped with sufficient accumulation capacities, taking the simulation into account.

4.11.4.7. Layout FG 2.3

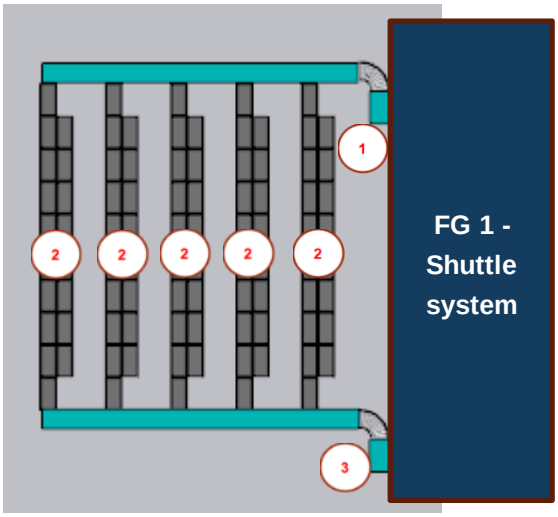


Figure 4-74: Layout Functional Group 2.3 [top view]

4.11.4.8. Description of the functional processes FG 2.3

At (see figure 4-74, point “1”) totes are sorted out, which have to be weight sorted for distinct dollies, one sort lane (see figure 4-74, point “2”) per dolly.

At (see figure 4-74, point “3”) the totes are put back onto inbound conveyor loop (700 mm) of shuttle system.

From that those sorted totes can be transported yia inclination connection conveyors to the outbound, i.e. to automatic dolly stackers.

4.11.5. Capacity and throughput requirements FG 2.3

For the technical design of the various conveying components, the following throughput rates in the maximum hour must be taken into account:

- From (figure 4-74, point “1”) / to (figure 4-74, point “3”): max. 1.005 filled shipping totes / hour

The technical system performance of each conveyor must each be designed for 100% of the throughput requirement. Surcharges for the technical design to ensure fulfilment of the throughput performance must be taken into account by the Logistics Contractor on the basis of his experience.

The individual conveyor lines in this functional group must be equipped with sufficient accumulation capacities, taking the simulation into account.

4.11.5.1. Other specific requirements FG 2.1-2.3

The following special requirements must be taken into account for this function group.

- Infeed and outfeed stations:
    - The loading and unloading stations on and off the totes conveyor system must be monitored with sensors to identify presence / absence of totes for automatic start / stop of conveyors.
    - The individual components of the loading and unloading stations must be easily accessible for maintenance.

  - The statics and anchoring of the conveyor system must be design or suitable safety measures taken in such a way that no permanent deformation or damage to the steel structure occurs when the conveyor is started by an industrial truck; see also Chapter 4.3.9.

- Check at the identification point in the conveyor lanes for main inbound lanes:
  - Integration of totes continuous scales with the following features:
    - Automatic and calibratable;
    - Weighing range up to 40 kg;
    - System accuracy 0.5 kg;
    - Display and control panel designed according to ergonomic aspects;
  - Length, width and height control, subsequently adjustable;
  - Barcode / RFID scanner to read label from totes;
  - IT interface for transfer of all measured values;
  - Display panel at the “Not-Okay” workplace for “Not-Okay” faults from control station;
- Connection lines and loops:
  - Maintenance platforms must be installed in a height distance of 2,1m according to the PN EN ISO1412-2 norm; covering always the aisles and surrounding loops and connecting inclination and declination belts. In case there are any specific obstacles or installations which impact the height, the distance can be reduced to 1,9 m; covering always the outbond lanes to manual sort and connecting inclination and declination belts.
  - The drives and other maintenance equipment must be provided on that side which ensures the easiest possible maintenance access from maintenance platforms.
- Totes and shuttle lifts:
  - The tote lifts / vertical conveyors must be equipped with all necessary safety devices and barriers; in particular, the client's health and safety requirements attached to the tender must be taken into account.
  - Depending where the drives are positioned, they must be easily accessible for maintenance, i.e. on the ground floor is drives are positioned low, or on top if drives are at the top.
- Transfer steps in conveyor technology: The Logistics Contractor must provide bridging steps over the conveyor system at suitable positions in the conveyor system, taking into account the requirements of escape routes and to realise easy access for maintenance. The Logistics Contractor is requested to document the location of the bridging steps in its offer by means of a corresponding drawing.

4.11.6. Functional system description FG 3 – Automatic dolly stackers

4.11.6.1. Layout FG 3.1

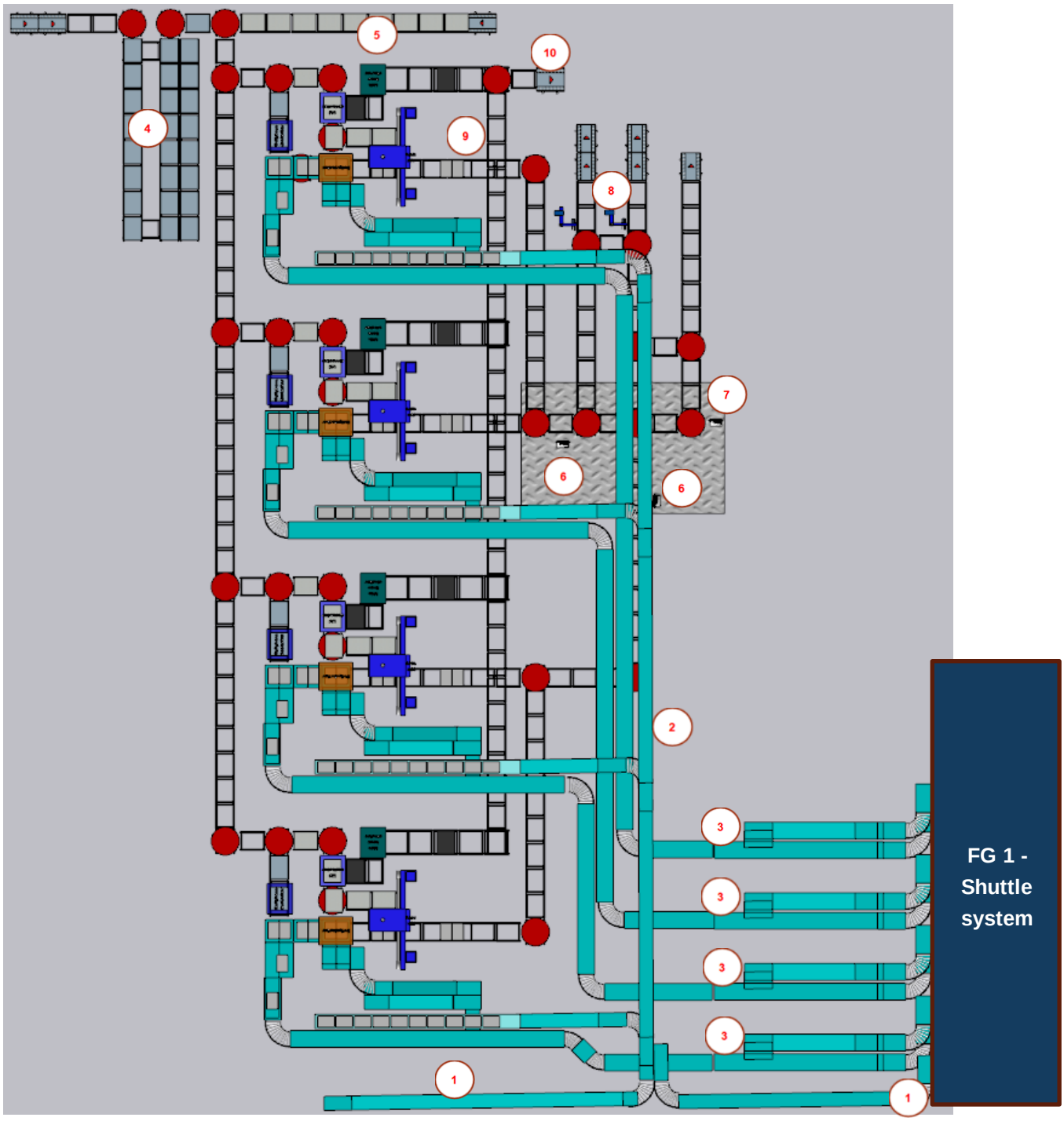


Figure 4-75: Layout Functional Group 3.1 [top view]

4.11.6.2. Description of the functional processes FG 3.1

At (see figure 4-75, point "1") empty shipping totes coming from new building or manual inbound of existing building are provided to 4 dolly stackers via a central lane (see figure 4-75, point "2").

The dolly stackers are provided by filled shipping totes via dedicated sort outs (see figure 4-75, point “3”) connected to outbound levels of shuttle system.

Stacks of empty dollies are buffered centrally (see figure 4-75, point “4”) and distributed via conveyor to the 4 dolly stackers. The loading station has to be designed in such a way that more than one dolly can be moved at a time.

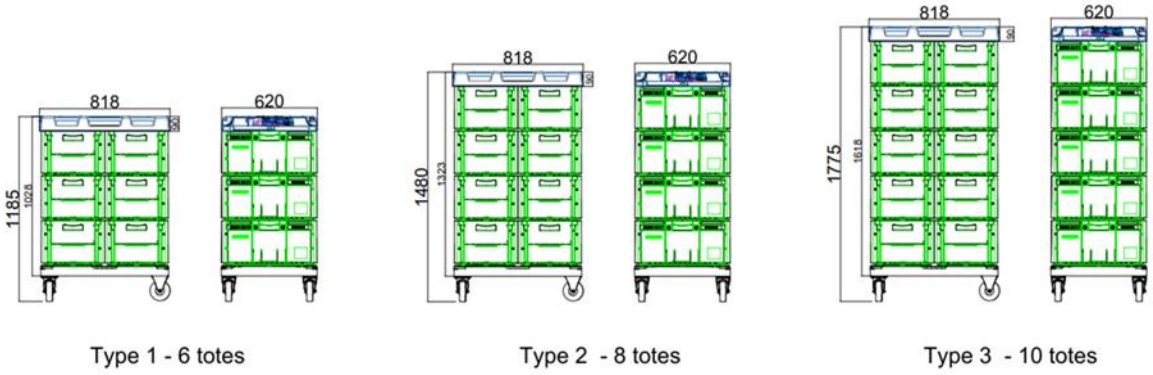


Figure 4-76: Example of dolly stacks

Stacks of lids are buffered centrally (see figure 4-75, point “5”) as well and distributed via same conveyor to the 4 dolly stackers.



Figure 4-77: Example of Lids stack and related loading station

Stacked shipping totes on dollies are conveyed to workstations (see figure 4-75, point “6”), where further processing by employees takes place. For that 2 dolly stacker share the same workstation.

After processing at workstation the dolly may can be transported to a NIO workstation (see figure 4-75, point “7”). At that workstation the employee decides after his correction work, if the dolly can reenter normal processing or has to be removed at a dedicated unloading point.

For normal processing the dollies pass an automatic labelling station (2 for redundancy purpose, see figure 4-75, point “8”). After that they can be unloaded. The unloading station has to be designed in such a way that more than one dolly can be removed at a time.

Stacks of lids basis a collected on a dedicated conveyor (see figure 4-75, point “9”), which is crossing the dolly outbound conveyors of the dolly stackers.

At the end of this collecting conveyor the stacks of lids basis can be unloaded at a special station (see figure 4-75, point “10”).



Figure 4-78: Example of Lids basis stack and related unloading station

4.11.6.3. Capacity and throughput requirements FG 3.1

For the technical design of the various conveying components, the following throughput rates in the maximum hour must be taken into account:

- Empty shipping totes: max. 40 shipping totes / hour
- Filled shipping totes: max. 2.055 shipping totes / hour
- Empty dolly stacks: max. 27 stacks / hour (240 dollies/h / 9 dollies per stack)
- Lids stacks: 10 stacks / hour (240 dollies/h / 24 lids per stack)
- Dollies: 240 dollies / h
- Lids basis stacks: 1.7 stack / hour (10 stacks/h / 6 basis per stack)

The technical system performance of each conveyor must each be designed for 100% of the throughput requirement. Surcharges for the technical design to ensure fulfilment of the throughput performance must be taken into account by the Logistics Contractor on the basis of his experience.

The individual conveyor lines in this functional group must be equipped with sufficient accumulation capacities, taking the simulation into account.

4.11.6.4. Layout FG 3.2

FG 3.2 is part of FG 3.1; one automatic dolly stacker more in detail concerning functionality.

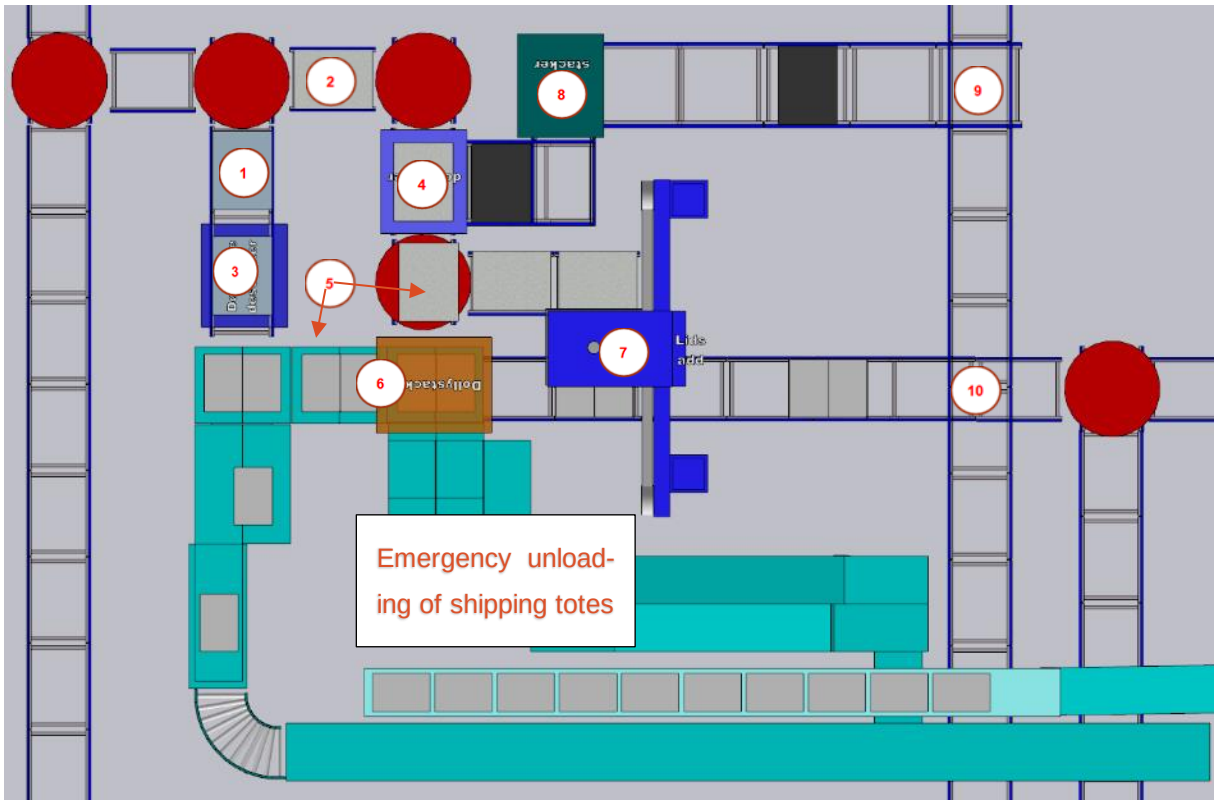


Figure 4-79: Layout Functional Group 3.2 [top view]

4.11.6.5. Description of the functional processes FG 3.2

Each automatic dolly stacker has got it's own small interim buffer for stacks of dolly bases (see figure 4-79, point "1") and lids stacks (point "2").

After destacking unit for dollies (see figure 4-79, point "3") and destacking unit for lids (see figure 4-79, point "4") small interim buffers for single dollies and for single lids exists (see figure 4-79, point "5")

Shipping totes are paired and stacked onto single dolly (see figure 4-79, point "6").

Lids are added after stacking of shipping totes has been finished (see figure 4-79, point "7").

Empty basis for lids are collected and stacked (see figure 4-79, point "8")

Stacked lids basis are collected on main conveyor (see figure 4-79, point "9") and transferred to common unloading station (described in FG 3.1).

At certain locations conveyor for stacked shipping totes on dollies has to cross the collecting conveyor for stacked lids basis (see figure 4-79, point “10”). At this point the stacks will not change direction or orientation, i.e. dollies move straight from North to South and stacked lids basis move straight from West to East.

The control system has to ensure, that only one item at time can pass those crossings.

4.11.6.6. Capacity and throughput requirements FG 3.2 (single dolly stacker)

For the technical design of the various conveying components, the following throughput rates in the maximum hour must be taken into account:

- Empty shipping totes: max. 10 shipping totes / hour
- Filled shipping totes: max. 514 shipping totes / hour
- Empty stacks of dolly bases: max. 7 stacks / hour
- Lids stacks: 2,5 stacks / hour
- Dollies: 60 dollies / h
- Lids basis stacks: 0,26 stack / hour

The technical system performance of each conveyor, destacker and stacker must each be designed for 100% of the throughput requirement. Surcharges for the technical design to ensure fulfilment of the throughput performance must be taken into account by the Logistics Contractor on the basis of his experience.

The individual conveyor lines in this functional group must be equipped with sufficient accumulation capacities, taking the simulation into account.

4.11.6.7. Other specific requirements FG 3.1-3.2

The following special requirements must be taken into account for this functional groups

- Connection lines and loops:
    - Maintenance platforms must be installed in a height distance of 2,1m according to the PN EN ISO1412-2 norm; covering always the aisles and surrounding loops and connecting inclination and declination belts. In case there are any specific obstacles or installations which impact the height, the distance can be reduced to 1,9 m; covering always the outbond lanes from shuttle as wwell as the empty totes provisioning lanes to the different stacker and connecting inclination and declination belts.
    - The drives and other maintenance equipment must be provided on that side which ensures the easiest possible maintenance access from maintenance platforms.
- (De) stackers:
    - The (de)stackers must be equipped with all necessary safety devices and barriers; in particular, the client's health and safety requirements attached to the tender must be taken into account.
    - Depending where the drives are positioned, they must be easily accessible for maintenance, i.e. on the Ground Floor is drives are positioned low, or on top if drives are at the top.

- .

- Transfer steps in conveyor technology: The Logistics Contractor must provide bridging steps over the conveyor system with functionality of safety crossing at suitable positions in the conveyor system, taking into account the requirements of escape routes and to realise easy access for maintenance. The Logistics Contractor is requested to document the location of the bridging steps in its offer by means of a corresponding drawing.

4.12. Workstations

The requirements for the various workstations in the automated system are described below. In addition to these requirements, the Health & Safety Requirements of the client in the system must also be observed and taken into account.

4.12.1. Workstations in pallet conveyor technology

Not-Okay workstations are provided at several points in the pallet conveyor system. The following Not-Okay workstations are provided:

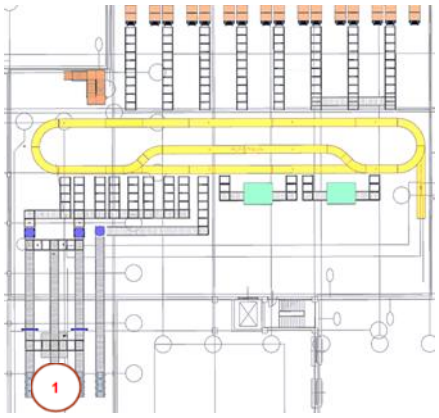


Figure 4-80: Layout Functional Group 1 - Ground Floor pre-zone HBW

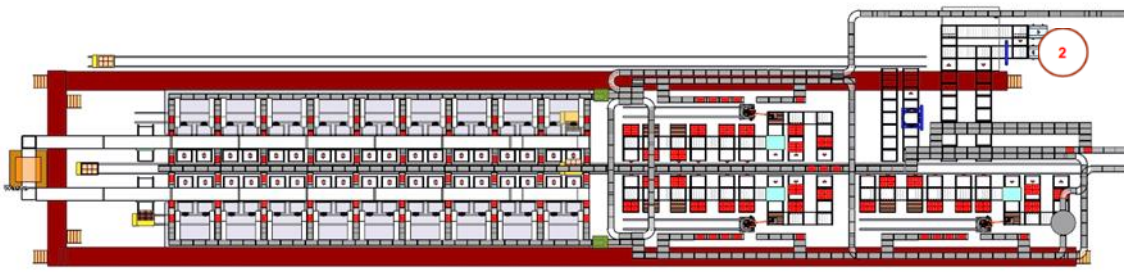


Figure 4-81: Layout Functional Group 3 - 1st Floor

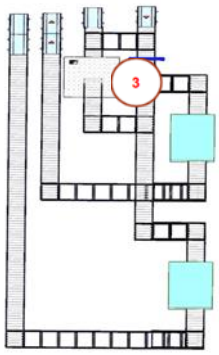


Figure 4-82: Layout Functional Group 4 - Ground Floor existing building

At the Not-Okay workstations in figure 4-80, figure 4-81 and figure 4-82, platform constructions must be provided so that the employees can walk around the pallet to be processed. For this purpose, the free spaces between the rollers in the conveyor system must be closed off with tread plates (see figure 4-4 as an example).



Figure 4-83: Today´s working platforms and closing free-space conveyors

The fire protection requirements to be observed are that the steel structure for the stage and the covering on the stage and between the open spaces of the conveyor technology must be designed in accordance with fire protection class "A" in accordance with Polish regulations.

In order to access this work platform, a small staircase or several steps must be provided and these are included in the scope of delivery and services. The steps must be constructed in accordance with Polish regulations.

In accordance with Polish regulations, the platforms must be fitted with appropriate railings on the sides; the outer edge of the platforms must also have an upstand so that small parts lying on the work surface cannot be accidentally kicked off the work platform and enter the conveyor system.

The processing station for the current pallet on the conveyor must be equipped with a lifting device that can raise the pallet to a height of approx. 500 mm above the upper edge of the platform so that it can be easily removed if the free space between the runners of the pallet is disturbed. This lifting and

subsequent lowering function must be carried out manually using a pushbutton and the safeguarding of the working area of the lift table when the lift table is raised must be taken into account and implemented in accordance with Polish regulations and the client's health & safety requirements.

This pushbutton can be arranged together with the pushbutton for releasing the pallet for removal after processing. These pushbuttons are non-latching pushbuttons, and they are designed according to ergonomic aspects and arranged in such a way that access to the load carrier and the necessary work processes are not hindered.

This workstation should also display the errors detected on the pallet currently being processed (see example in figure 4-84).



Figure 4-84: Example of the error display at the Not-Okay workstations

In addition, terminal stands with space for a screen and a keyboard as well as for a label printer and storage space for a hand scanner must be provided at the emergency OK workstations.

For the Not-Okay workstation in the repacking area (see figure 4-81), it should be noted that the width of the platform design not only includes the integration of one conveyor, but two conveyors. However, only the conveyor with the error processing station is to be equipped with a lifting device.

In addition to the Not-Okay workstations, a further workstation is provided on the 1st floor for checking pallets (see figure 4-85).

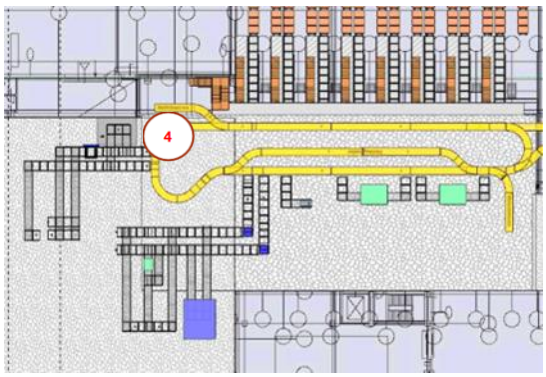


Figure 4-85: Checking station for pallets in 1st Floor

The requirements described above for the platform of the workstations also apply to the platform form of this workstation; it should be noted that this workstation platform is larger than the other workstation forms (currently planned approx. 5 x 4 m).

This workstation does not require a lifting device to raise the pallet or an error display, as is the case with the Not-Okay workstations.

A terminal stand is to be provided and supplied, which has a shelf for a screen, a keyboard, a label printer and a hand scanner.

4.12.2. Workstations in tote conveyor technology

4.12.2.1. Not-Okay workstations for totes

Not-Okay workstations are provided at several points in the tote conveyor system. The following Not-Okay workstations are provided:

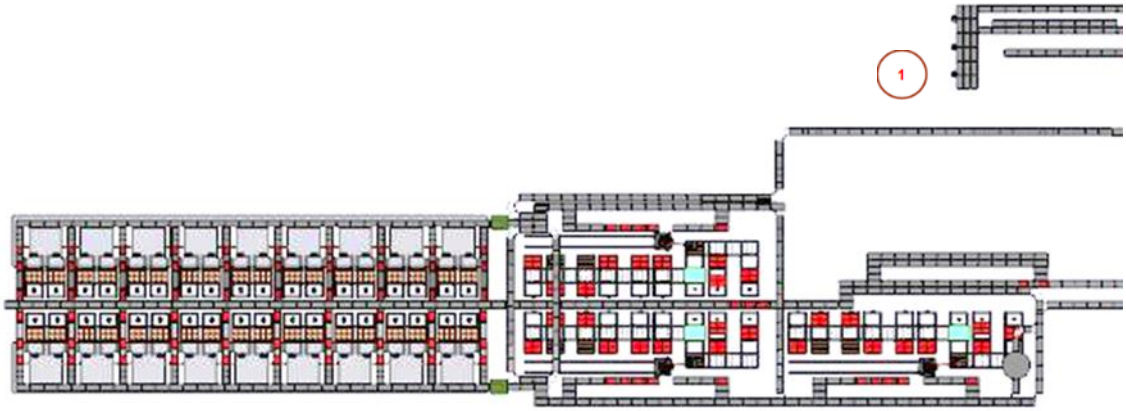


Figure 4-86: Overview of the arrangement of Not-Okay workstations on the 1st Floor

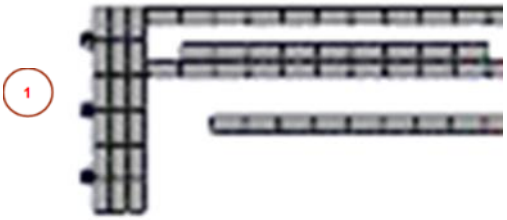


Figure 4-87: Central Not-Okay workstations for reserved totes on the 1st Floor

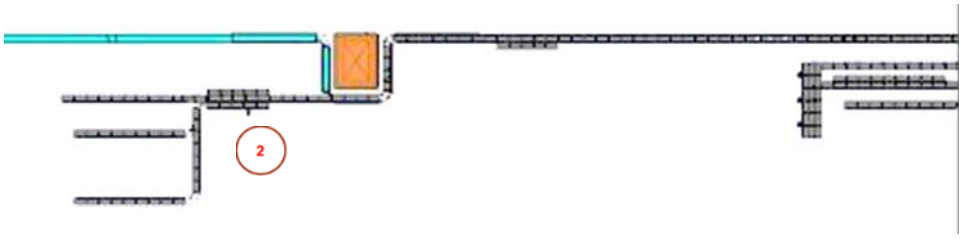


Figure 4-88: Not-Okay and checking station for empty shipping totes on the 1st Floor

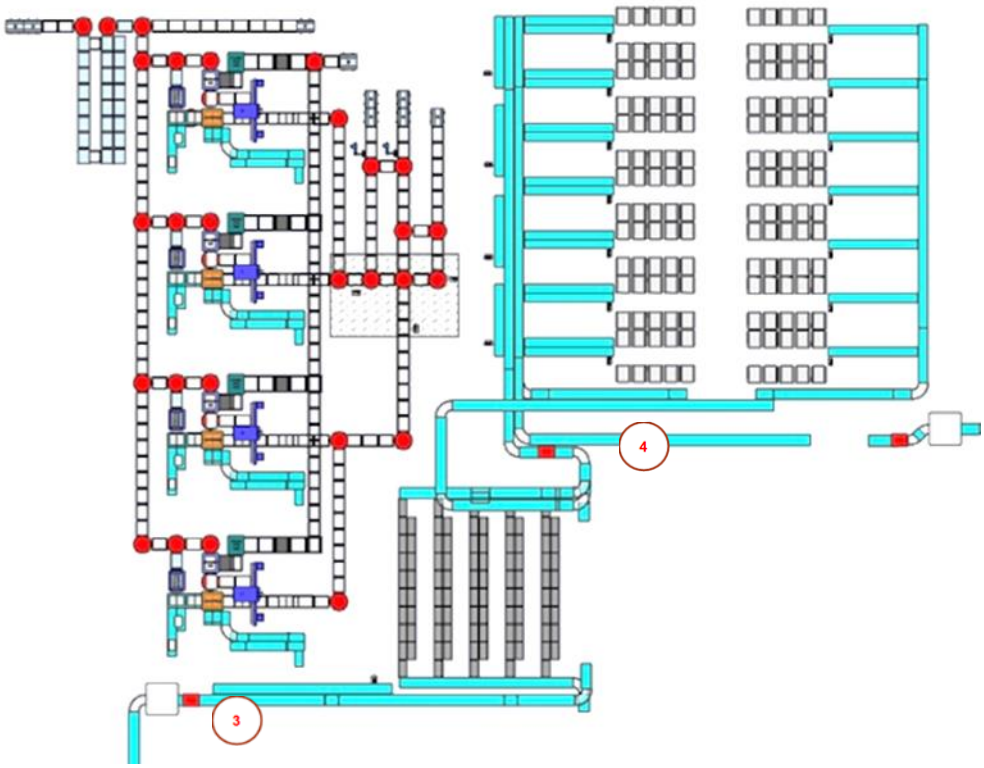


Figure 4-89: Overview of the arrangement of Not-Okay workstations in existing warehouse

On the 1st Floor of the new building, 3 workstations are planned in a central position (see figure 4-86 and figure 4-87) for processing faults that occur in connection with storage totes and shipping totes. These 3 workstations will also be used for other checks and inventory counting.

These workstations must be equipped with a work surface in an ergonomic position that allows the container to be inspected to be pulled onto the work surface (therefore the work surface must be equipped with ball rollers). This work surface must be connected to the conveyor system. The work surface must be equipped with driven rollers so that the processed totes are automatically fed into the conveyor lines after pressing a pushbutton.

In addition to the work surface, a terminal stand must also be placed and supplied, which enables the installation of a terminal, a keyboard, a label printer and the storage of a hand scanner.

This equipment must also be provided and supplied for the Not-Okay workstations and the checking station for empty shipping totes on the 1st Floor of the new building (see figure 4-88, point “2”) and for the Not-Okay workstations in the existing building (see figure 4-89, point “3” and point “4”).

4.12.2.2. Workstations for manual destacking empty shipping totes

The two workstations for unstacking and unfolding the empty shipping totes (see figure 4-87, places left from point “2”) must be equipped with a work surface in an ergonomic position that allows the container to be inspected to be pulled onto the work surface (therefore the work surface must be equipped with ball rollers). This work surface must be connected to the conveyor system. The work surface must be equipped with driven rollers so that the processed totes are automatically fed into the conveyor lines after pressing a pushbutton.

In addition to the work surface, a terminal stand must also be placed and supplied, which enables the installation of a terminal, a keyboard, a label printer and the storage of a hand scanner.

4.12.2.3. Workstations in manual Repacking

The workplace equipment required and to be supplied by the Logistics Contractor in the repacking area is described below.

Stage constructions

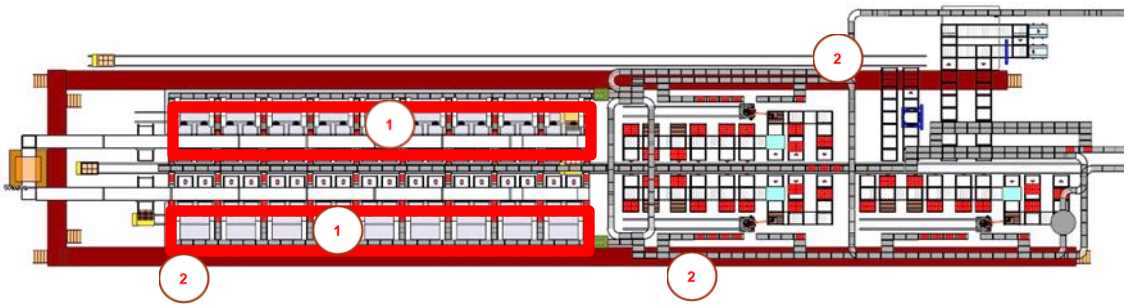


Figure 4-90: Overview workstations Repacking

The workstations in manual repacking are provided on a platform construction (see figure 4-90, point "1", red marked areas), under which a T-car travels, which transports the empty pallets away after repacking (see the descriptions for the pallet conveyor system).

As a result, the upper edge of the platform is at a maximum of 1,000 mm.

In addition to the platform construction at the workstations, platform constructions must also be supplied and installed, which employees can use to escape if necessary (see figure 4-90, point "2", shown in brown).

These platforms for the escape routes are directly connected to the platform construction at the workstations and must be realised at the same height as the platforms at the workstations. There must be no gap between the two platforms.

The surface of the platform structures must be designed as a closed ceiling. On the open sides of the platforms, the edges of the platform construction must be provided with an upstand so that parts lying on the platform surface cannot be accidentally stepped on and then enter the area of the conveyor technology.

The design of the platform surface must be agreed from the Logistics Contractor with the Client during the execution planning phase. The design of the platform construction must comply with fire protection class A in accordance with Polish law.

In order to access the platform construction for the escape routes, which also provide access to the platforms for the workstations, stairs or steps must also be provided at various points (see figure 4-90).

Workstation equipment

At the workstations for manual repacking, protective panelling with a height between 750 mm and 900 mm, measured from the upper edge of the platform at the workstation, must be provided opposite the lifting table over which the pallet is provided (see description of the pallet conveyor system and see figure 4-91).

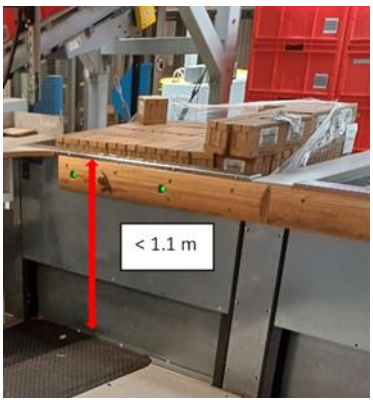


Figure 4-91: Workstation panelling opposite lift table

At the upper end of this protective panelling, an additional panelling must be provided into which push bottons are integrated, which are then flush with the surface of the additional panelling (no protruding parts) and against which the employee can lean when removing the cartons from the pallets. In the existing process, these are wooden panelling (see figure 4-91).



Figure 4-92: Workstation manual Repacking - Worktop and spherical roller table

At the workstations, a work surface must be provided on one side (on the side of the empty storage tote infeed) for placing cartons removed from the pallet. The purpose of this work surface is to enable the cartons to be opened so that the contents of the carton can then be repacked into an empty storage tote (see figure 4-92, picture on the left side). This work surface requires a dimension of (width x depth) 900 x 600 mm.

Adjacent to this work surface is a work surface fitted with small ball castors. It must be possible to place 2 empty storage totes next to each other on this work surface so that the long side of the storage totes faces the employee (see figure 4-92, picture on the right side).

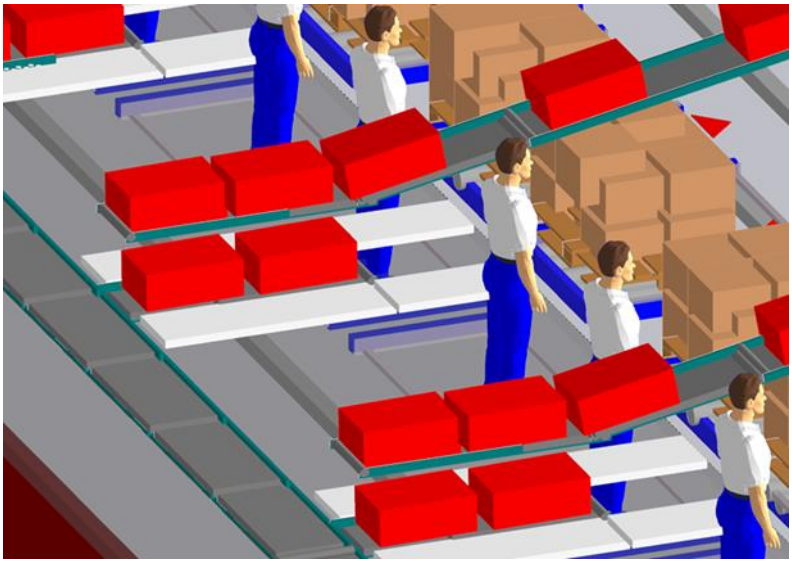


Figure 4-93: Workstation manual Repacking - Worktop and spherical roller table

Figure 4-93 shows the arrangement of the different worktops in relation to the conveyor system (in light grey). The empty storage totes (shown in red) are provided via the upper conveyor system, manually removed from there, filled and then manually pushed over the ball roller table into the lower centre conveyor section, from which the filled storage totes are then automatically fed onto the collecting belt behind the workstations. The centre conveyor section is operated from 2 sides.

The manual workstations for repacking (see figure 4-93) must be equipped with a work surface in an ergonomic position that allows the container to be filled to be pulled to the conveyor for filled totes in the middle of two workstations (therefore the work surface must be equipped with ball rollers). This work surface must be connected to the conveyor system. The work surface must be equipped with driven rollers so that the processed totes are automatically fed into the conveyor lines after pressing a pushbutton.

For each workstation a terminal stand must also be placed and supplied, which enables the installation of a terminal, a keyboard, a label printer and the storage of a hand scanner.

4.12.2.4. Workstation Picking Gallery

Stage constructions

The picking aisles are to be constructed on the 3 picking levels on an enclosed platform, which is accessed via stairways at the front and rear from the 5 platform levels in the picking gallery (see figure 4-94).

This platform construction must be provided with a raised edge on the open outer edges (not in the area of the stairs) so that parts lying on the platform surface cannot be accidentally stepped over the outer

edge of the platform and therefore cannot enter the area of the automatic shuttle warehouse in the Picking Gallery.

The design of the platform surface must be agreed from the Logistics Contractor with the Client during the execution planning phase. The design of the platform construction must comply with fire protection class A in accordance with Polish law.

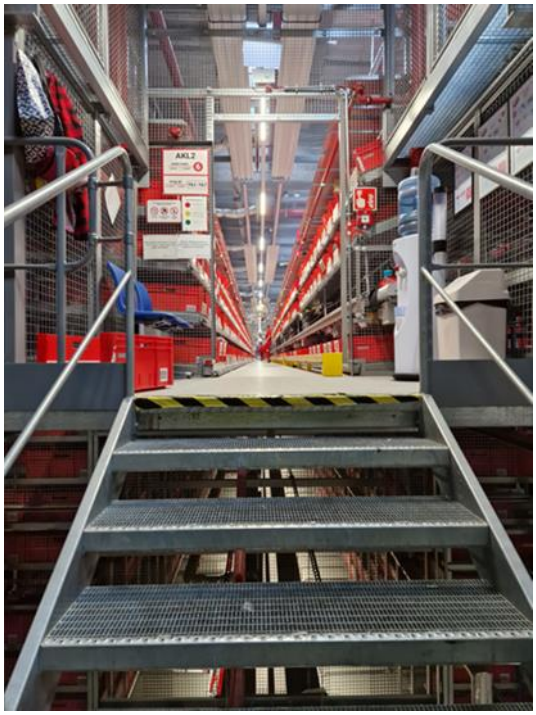


Figure 4-94: Access to picking platform in the picking aisle



Figure 4-95: Footstep in the picking aisle

A Footstep must be installed on the surface of the platform structure, connected to the steel structure of the platform. This step must be installed on the side of the picking aisle where the conveyor technology for the picking stations is located (see figure 4-95). This step makes it easier for employees to access the upper level of the picking location.

Pick-by-Light system

To support the picking process, a pick-by-light system must be supplied, installed and commissioned by Logistics Contractor in the picking aisles for 9,072 picking locations.

A display for the picking lane is to be installed at the start position for the picking station, on which the order and all pick positions of this order can be seen after the shipping tote has been scanned.

For this purpose, a corresponding device for attaching the display and a small shelf for documents and the scanner must be provided at this central station of the picking station.

The pick-by-light system requires a corresponding data exchange with the MFS in order to display the individual orders, control the pick-by-light displays and map the order processing statuses.

The following requirements must be taken into account for the pick-by-light system:

- Functional requirements for the use of a visualization application cooperating with data from WMS and MFS:
    - The display on which the visualization will be switched must be able to read data regarding the locations from which the product is to be picked up, along with the quantity.
    - Display a counter of picked lines in relation to the total number of picks (e.g. 1 of 12).
    - Synchronize the application with the automation control system so that confirmation of product picking on the automation from the picking location is automatically marked on the visualization by graying out the tote with the picked product and to update the counter.
    - Color match between the highlighted tray icon on the visualization and the color of the light at the physical picking location.
    - Display the highlighted login and employee's name in the application while matching the colors assigned to picking.
    - Neighboring stations cannot use the same colors.
- Data exchange between WMS and MFS: The WMS and automation control system is the source of information for the application to visualize information such as:
    - the login, including the name of the employee logged in at the picking station;
    - the location of the products that are needed for picking;
    - the number of products to be picked;
    - the total number of lines to be picked relative to one employee

- the execution of a picking at picking station after it has been physically confirmed.

- Process description
  - The picking process will be optimized by using an application to visualize the picking at the picking station. Scanning a tote at the picking station triggers two actions at the same time:
    - highlighting on the display the locations from which the worker is to pick the goods, along with the required quantity, and displaying the total number of lines to be picked;
    - highlighting the lamp assigned to the tote from which the worker is to physically pick the goods along with the required quantity.
    - display to show information about tote which is currenty being picked, and the next one in the queue.
  - The color of the lamp at the picking station should match the color of the highlight on the tablet.
  - When the employee picks the product and confirms it, with the light on the tablet going out, the location from which the employee picked the product will be grayed out and the counter of picked lines will be updated.
- Possible cases
  - The possibility of picking one list by one worker - the application highlights everything in one color matching the color used at the picking station.
  - The possibility of picking one list by two workers - the application uses two colors for highlighting that match the colors used at the picking station.

4.12.2.5. Workstations for shipping totes from existing warehouse

In the area of the processing in the existing building, 4 manual feeding stations are provided for the introduction of shipping totes from the processing in the existing building (see figure 4-96, point "1").

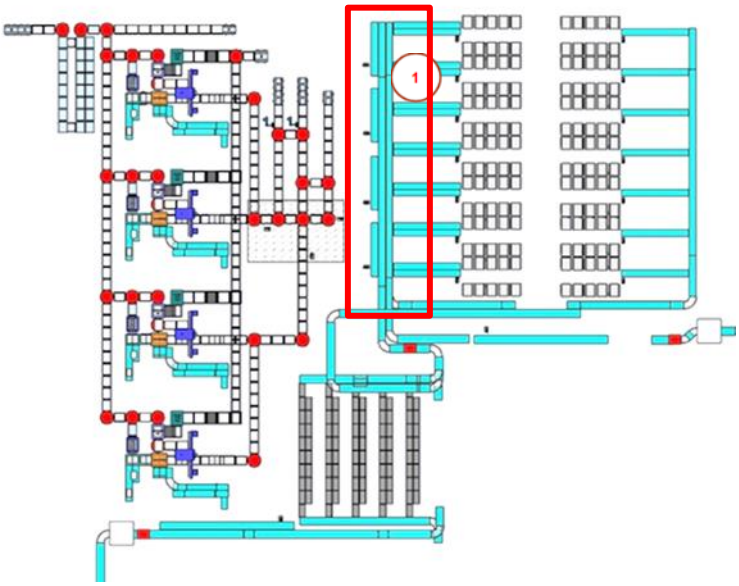


Figure 4-96: Input workstations for shipping totes from existing warehouse

These workstations must be equipped with a work surface in an ergonomic position that allows the shipping totes to be inspected to be pulled onto the work surface (therefore the work surface must be equipped with ball rollers). This work surface must be connected to the conveyor system. The work surface must be equipped with driven rollers so that the processed totes are automatically fed into the conveyor lines after pressing a pushbutton.

In addition to the work surface, a terminal stand must also be placed and supplied, which enables the installation of a terminal, a keyboard, a label printer and the storage of a hand scanner

4.12.2.6. Not-Okay workstations for dollies with shipping totes

In the processing area of the existing building, workstations for processing dollies with palletised shipping totes are provided on a platform. The height of the platform depends on the technology selected for the automatic transport of the dollies.

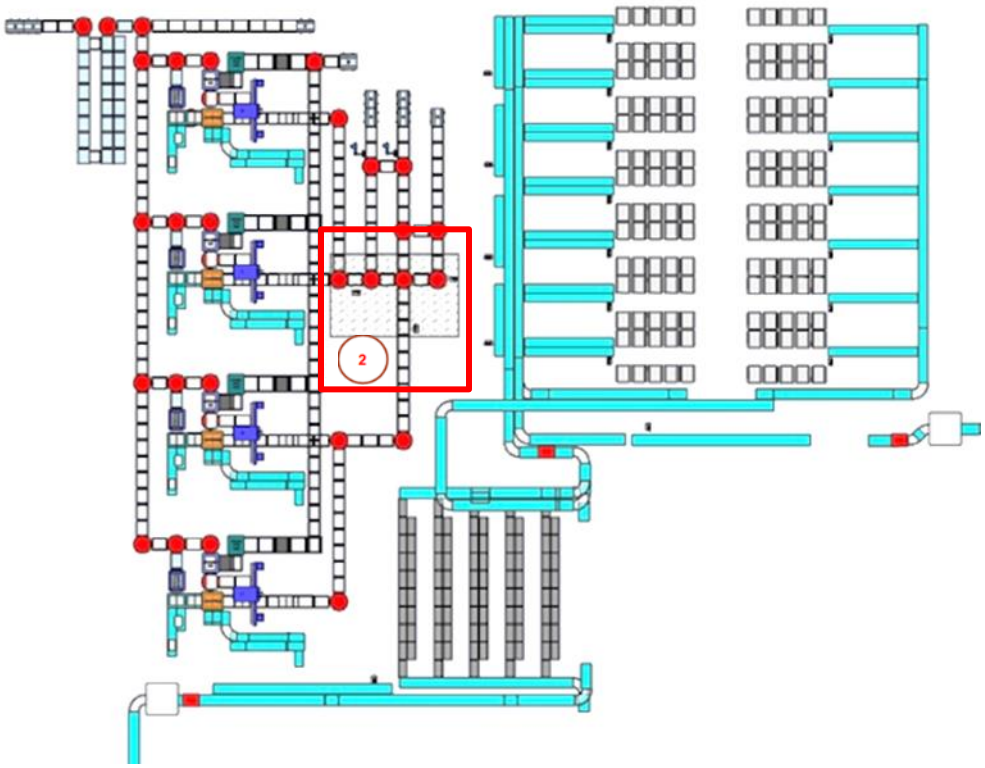


Figure 4-97: Workstations for dollies

The workstations are provided in the area marked in red (see figure 4-97, point "2"). Two workstations are provided on the platform for the reworking of dollies coming from the automatic stacking machine and an emergency okay station for the dollies.

A platform must be provided for the workstations and for the Not-Okay station, on which the employee can walk around the dollies, with functionality for safety crossing. For this purpose, the platform area must be closed and the free space in the conveyor system for the dollies must be closed with tread plates. The current planning envisages a platform of approx. 40 m². The position and size of the platform must be defined more precisely as part of the implementation planning.

The fire protection requirements to be observed are that the steel structure for the stage and the covering on the stage and between the open spaces of the conveyor technology must be designed in accordance with fire protection class "A" in accordance with Polish regulations.

In order to access this work platform, a small staircase or several steps must be provided and these are included in the scope of delivery and services. The steps must be constructed in accordance with Polish regulations.

In accordance with Polish regulations, the platforms must be fitted with appropriate railings on the sides; the outer edge of the platforms must also have an upstand so that small parts lying on the work surface cannot be accidentally kicked off the work platform and enter the conveyor system.

To remove the dollies from each of the 3 workstations after processing, the employee must press a pushbutton. The dolly is only transported onwards once the pushbutton has been pressed.

These pushbuttons are non-latching pushbuttons, and they are designed according to ergonomic aspects and arranged in such a way that access to the dollies and the necessary work processes are not hindered.

At all workstations, a terminal stand is to be provided and supplied, which has a shelf for a screen, a keyboard, a label printer and a hand scanner.

4.13. Steel constructions

This chapter describes other steel structures for platforms and special steel structures that are part of the Logistics Contractor's scope of supply and services.

4.13.1. Steel construction existing warehouse

In the existing warehouse building, a platform construction is to be realised at the height of the bridge between the new and the existing building, on which the RGV system runs to connect the new HBW and into which 2 lifts for pallets are integrated in order to connect the ground floor in the existing building.

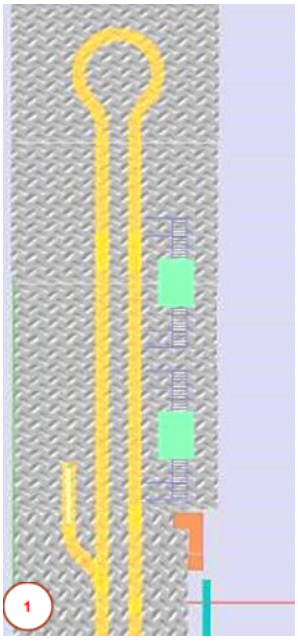


Figure 4-98: Steel construction für RGV system in existing building

The stage construction / steel mezzanine must be designed as a closed surface. It must be taken into account that the platform construction itself and also the support for the closed surface must be designed in accordance with fire protection class A under Polish law.

The currently planned area of the stage construction is approx. 680 m².

The design of the surface or the support on the stage construction must be agreed by the Logistics Contractor with the client as part of the execution planning.

The platform construction must be provided with an upstand on the open sides so that parts lying on the platform surface cannot be accidentally stepped on and then get into the conveyor system under the platform. The stage construction must also be fitted with appropriate railings on the open sides in accordance with Polish law.

When designing the platform, it must be taken into account that there is a pallet conveyor system below the platform. The platform construction, in particular the arrangement of the elevation and the dimensions of the uprights, must be designed in such a way that the elevation does not stand inside the pallet conveyors or impair the functionality of the pallet conveyor system.

The static and dynamic loads from the RGV system and the pallet lifts to be integrated into the platform must be taken into account when dimensioning the elevation of this platform. The platform construction must be able to absorb the static and dynamic loads caused by the conveyor movements on the platform. These static and dynamic loads must not be transferred to the hall floor of the existing building. To this end, the Logis-tics contractor must consider and implement appropriate measures in the attachment of the platform construction to the hall floor.

At the upper edge of the platform shown in figure 4-98, it should be noted for the elevation that loading and unloading stations for pallets to and from the pallet conveyor system are provided in the area under the platform. In this respect, the elevation must be designed in such a way that the operation of these loading and unloading stations by industrial trucks is not restricted. If elevations are provided at these points, they must be appropriately secured against impact by the industrial trucks.

The position of the access staircase to the stage (see figure 4-98, orange marked area) must be determined as part of the implementation planning, when the available space for the staircase is known in more detail, taking into account the conveyor technology under the stage and next to the stage and taking into account easy access to the staircase through the conveyor technology on the ground floor.

A maintenance area for the RGV system vehicles is also planned on the lower left-hand side of the platform (see figure 4-98, point "1"). In order to reach this maintenance area without switching off the RGV system, the Logistics Contractor must provide 2 alternative options:

- Installation of a second staircase directly in the immediate vicinity of the maintenance area (e.g. at point "1" in figure 4-98 or
- Design the platform in such a width and length that the employee can access the platform via the stairs provided (see figure 4-98, orange marked area), then turn right behind the pallet lift towards the top end of the platform, then turn right again and then head back towards the maintenance area in the bottom left-hand corner. With this alternative, the width of the platform must be designed so that there is sufficient space of at least 1,200 mm next to the fencing for the travelling area of the RGV system. In the event that the platform then extends towards the upper edge over the main traffic route in the existing building, it must be taken into account for the construction of the platform that the elevation cannot then be made directly at the upper end but must be pulled slightly inwards.

Which of the two options is to be implemented is determined as part of the Logistics Contractor's implementation planning. Both options must be considered and included in the price for the quotation.

4.13.2. Additional steel construction HBW

In addition to the following descriptions, the requirements and description from the document "Architecture and building's installations requirements for the structure" of the general planning for the construction apply.

4.13.2.1. Mezzanine in pre-zone of HBW

A steel platform construction is to be supplied by the Logistics Contractor for the pre-zone of the HBW. This steel platform construction spans the area shown in blue in Figure 4-2 ("Lower Part of the HBW").

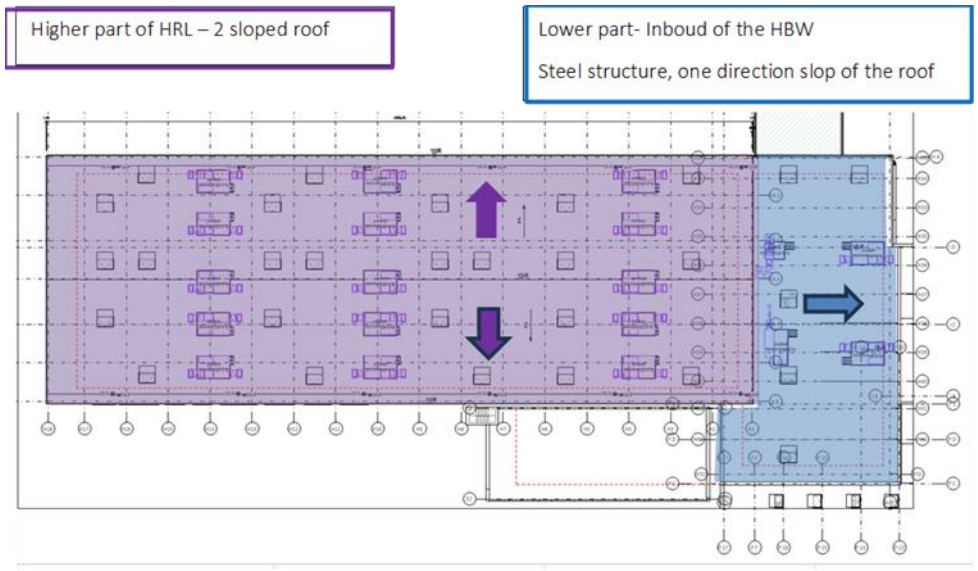


Figure 4-99: Demarcation of the HBW pre-zone for the steel platform construction

This area of the pre-zone of the HBW has the same fire class as the HBW itself. The left-hand side of the pre-zone to the actual HBW shown in figure 4-99 is open and the HBW is not separated by a fire wall.

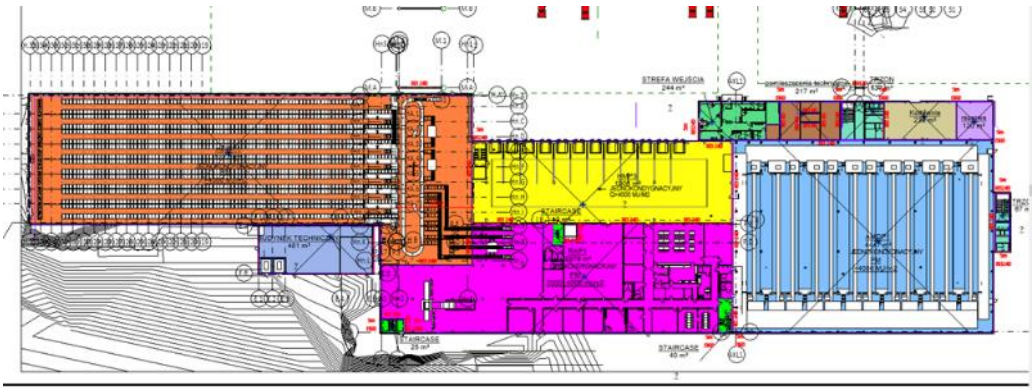


Figure 4-100: Division of the fire compartments on the Ground Floor

The categorisation of the individual parts of the building into different fire protection classes and the associated requirements can be found in the general planning document for the construction mentioned at the beginning and must be taken into account by the Logistics Contractor.

The upper edge of the steel platform construction to be supplied by the Logistics Contractor is +6,500 mm. The materials handling equipment intended for the HBW pre-zone, such as pallet conveyor technology and rails for the RGV system as well as tote conveyor technology stands, must then be installed on this platform surface; the two pallet lifts to ensure the connection between the first floor and the ground floor must be integrated into the platform construction.

When installing the conveyor technology on the steel platform construction and integrating the pallet lifts into the platform construction, care must be taken to ensure that no oscillations or vibrations are transmitted to the steel construction and thus also to the floor slab of this pre-zone due to the dynamic loads caused by movements on the conveyor technology. Suitable measures must be taken and implemented by the Logistics Contractor.

The steel structure must be able to absorb all static loads on the platform caused by the conveyor technology, personnel traffic and the use of hand pallet trucks.

An upstand must be provided on the open side of the steel platform (towards the HBW) so that no parts of the platform surface can accidentally step over the edge of the platform and thus enter the conveyor system area below.

In addition to this upstand, a railing must also be installed on the open side in accordance with Polish law. However, the necessary openings for the pallet conveyor system in the direction of the HBW rack aisles must be taken into account during this installation. These areas must be secured in such a way that no persons can fall through the openings into the area of the pallet conveyor system in front of the HBW.

When dimensioning the platform construction and the associated support grid below the top edge of the platform, it must be taken into account that pallet conveyor technology is planned below the platform. The support grid for the platform construction must be selected in such a way that the elevation of the platform construction does not stand in the pallet conveyor system or in the travel path of the RGV system below the platform and impair its function.

When arranging the supports for the stage construction, it is also important to note the restriction that the stage supports can only be attached to the hall floor from a distance of 800 mm from the planned fire protection wall, i.e. the stage supports cannot be arranged on the outer edge of the stage.

The top of the stage must be essentially closed. The Logistics Contractor must agree in detail with the general planner for the construction as part of the execution planning any free areas required, which are to be provided with a grating, for the realisation of openings for smoke extraction or for the ventilation of the areas below the stage. This also applies to the extent to which the openings for the pallet lifts in the stage area can be used for this purpose.

The arrangement of open areas with gratings must be selected in such a way that they do not interfere with the pallet conveyor technology and the RGV system with regard to their functional fulfilment and the fulfilment of the required throughput rates.

The design and execution of the platform surface, taking into account the structural and fire protection requirements, must be agreed in detail by the Logistics Contractor with the general planner for the construction and the client as part of the execution.

On the eastern side of the platform, the upper edge of the platform is flush with the upper edge of the carriageway in the bridge between the new and the existing building. This finish must be seamless so that there are no gaps or steps between the two components.

It is planned that the steel construction to be supplied by the Logistics Contractor will be expanded in order to have all steel constructions in one hand and to achieve consistent quality.

This extension includes the provision of steel structures for the structural measures in connection with the façade and roof of the pre-zone of the HBW.

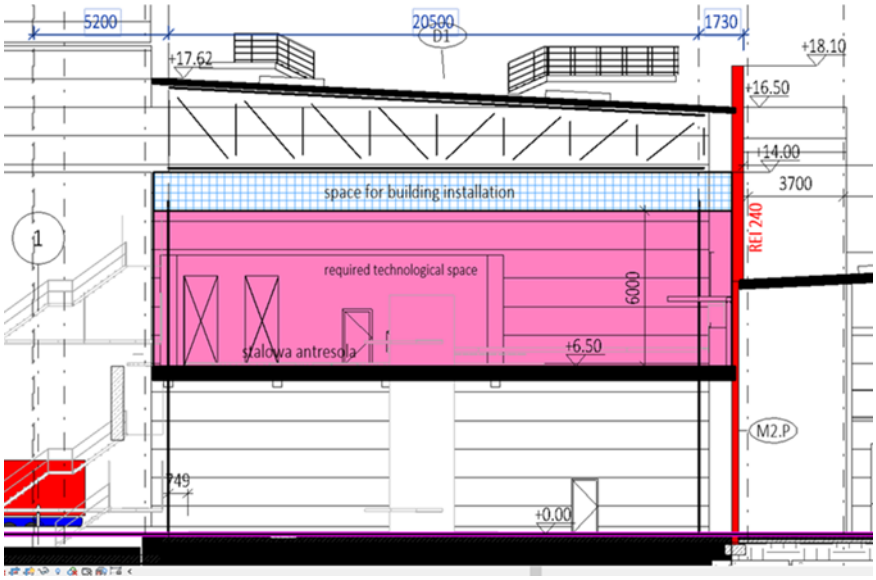


Figure 4-101: Section of the pre-zone of the HBW

In order to fulfil the above requirements, the Logistics Contractor is requested to take into account and implement the following requirements in the execution of the steel platform construction; this is part of the Logistics Contractor's scope of supply and services:

- Extension of the platform supports for the illustration and realisation of the steel structures and the necessary substructures for fixing the façade cladding (see also figure 4-101); this means extending the steel structure on one side from 6,500 mm to +16,500 mm and on the other side from +6,500 mm to +17,600 mm;
- Realisation of the roof structure as well as the substructure for the roof layers and the installation structures for smoke/heat extraction systems etc. above the HBW pre-zone;
- Realisation of 4 steel platforms with the associated stairs on the roof to accommodate HVAC units (see figure 4-101 and figure 4-102); the position of the steel platform and the loads to be taken into account for the roof structure can also be found in the document mentioned at the beginning of this section and other plans in the appendix.



Figure 4-102: Arrangement of steel platforms on the roofs HBW / pre-zone HBW

4.13.2.2. Roof installation HBW

In addition to the shelving structure for the HBW and the substructure for fastening the façades, the Logisitcs Contractor's scope of supply and services also includes other items. These are listed below. Further information can be found in the appendix "Architecture and building's installations requirements for the structure" and the attached drawings.

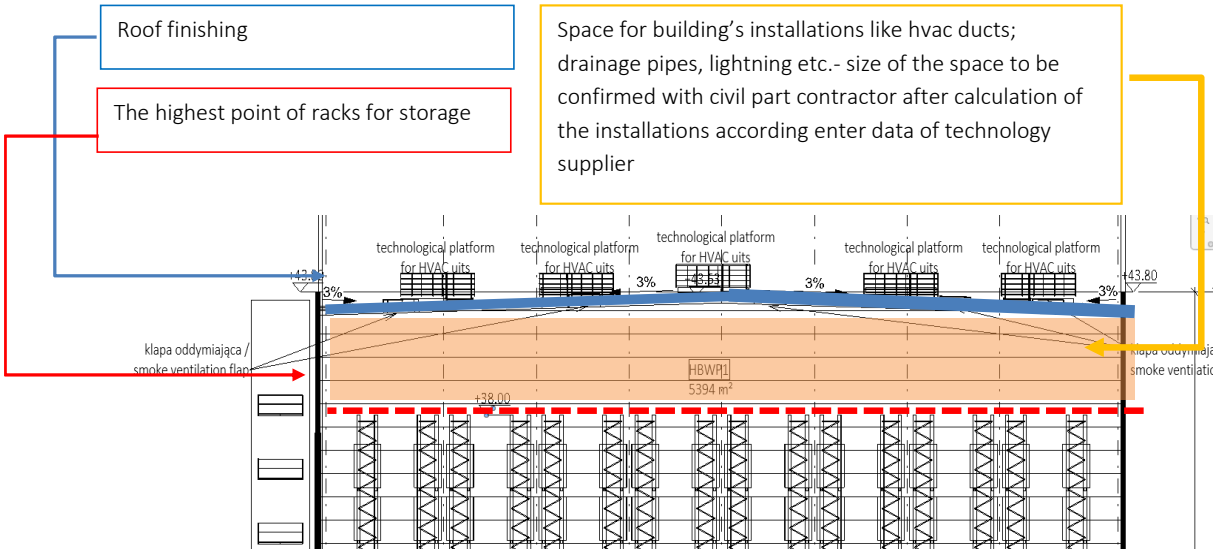


Figure 4-103: Section of the roof structure for the HBW

The racking construction for the HBW must be designed in such a way that the roof construction is also supported by the racking and is connected to the racking. This roof structure and built-in structures for smoke and heat extraction systems, skylight domes etc. in the roof are part of the Logistics

Contractor's scope of supply and services; the installation of roof layers, roof waterproofing and HVAC units are not part of the Logistics Contractor's scope of supply and services.

The required height of the roof structure must be agreed in detail with the general planner of the building as part of the execution planning, as the height of the roof structure also depends on the technical building system components to be integrated into the roof structure.

Steel platforms for HVAC units and the associated steps for reaching the top of the platform are to be realised at 15 points on the roof. These steel platforms are part of the Logistics Contractor's scope of supply and services. These steel platforms are to be connected to the steel structure of the roof.

In addition to these additional steel structures for the HVAC units on the roof and the roof structure itself, the loads from the roof layers / roof seals etc. must also be taken into account when designing the racking system or the statics of the racking system. Corresponding information regarding the weights and other requirements can be found in the document mentioned in the appendix.

5. Scope of delivery of IT / MFS

5.1. Preface

Apart from MFS functionality described and inherent in material flow, processes and automation technology there are additional deliveries and services to cover by the Logistics Contractor. At first there are additional deliveries and services described in the following chapters.

In addition the Client worked out documents containing demands / guidelines, which have to be fulfilled by the Logistics Contractor.

These documents are part of the tender specification and are handed over within the appendix of the tender specification.

The file names appended are as follows:

11. WMS for Client BluePrint 2024 04 19.docx
12. D2027 - Automated stocktaking process at HBW high storage warehouse.docx
13. D2027 - Change of picking location.docx
14. D2027 - Handling of shipping totes on the panel.docx
15. D2027 - Heavy totes at lower levels.docx
16. D2027 - New method of logging in.docx
17. D2027 - Picking visualization.docx
18. D2027 - Telegram 107.docx
19. D2027 - The concept of two workers on one picking stations.docx
20. D2027 - Visualization of the workload of aisles on the top of rack.docx

5.1.1. Introduction / Overview

The Client, as a leader in the drugstore market, plans to implement a new WMS that will meet the highest standards and requirements of all system users. In addition, this system must be integrated with the MFS system in order to control, monitor and manage all logistics processes in the warehouse area in an advanced way, keeping in mind that the WMS is the superior system in relation to the material flow system (MFS).

The WMS is responsible for the management of manual processes, but for all automated processes, communication and responsibilities between these essential systems for the warehouse must be carefully designed, where the automation layer part is the responsibility of the Logistics Contractor (LC).

Communication and monitoring of data exchange processes between systems must be transparent and easy for users to control the status and quality of data exchange.

In the case of the WMS, the Client is considering cloud-based solutions in addition to the standard on-premise implementation. Whatever the decision, the WMS and MFS systems must be integrated and communicate reliably. The Logistics Contractor will include the aforementioned aspects in the proposal for the solution concept and server hardware as well as high-availability networks.

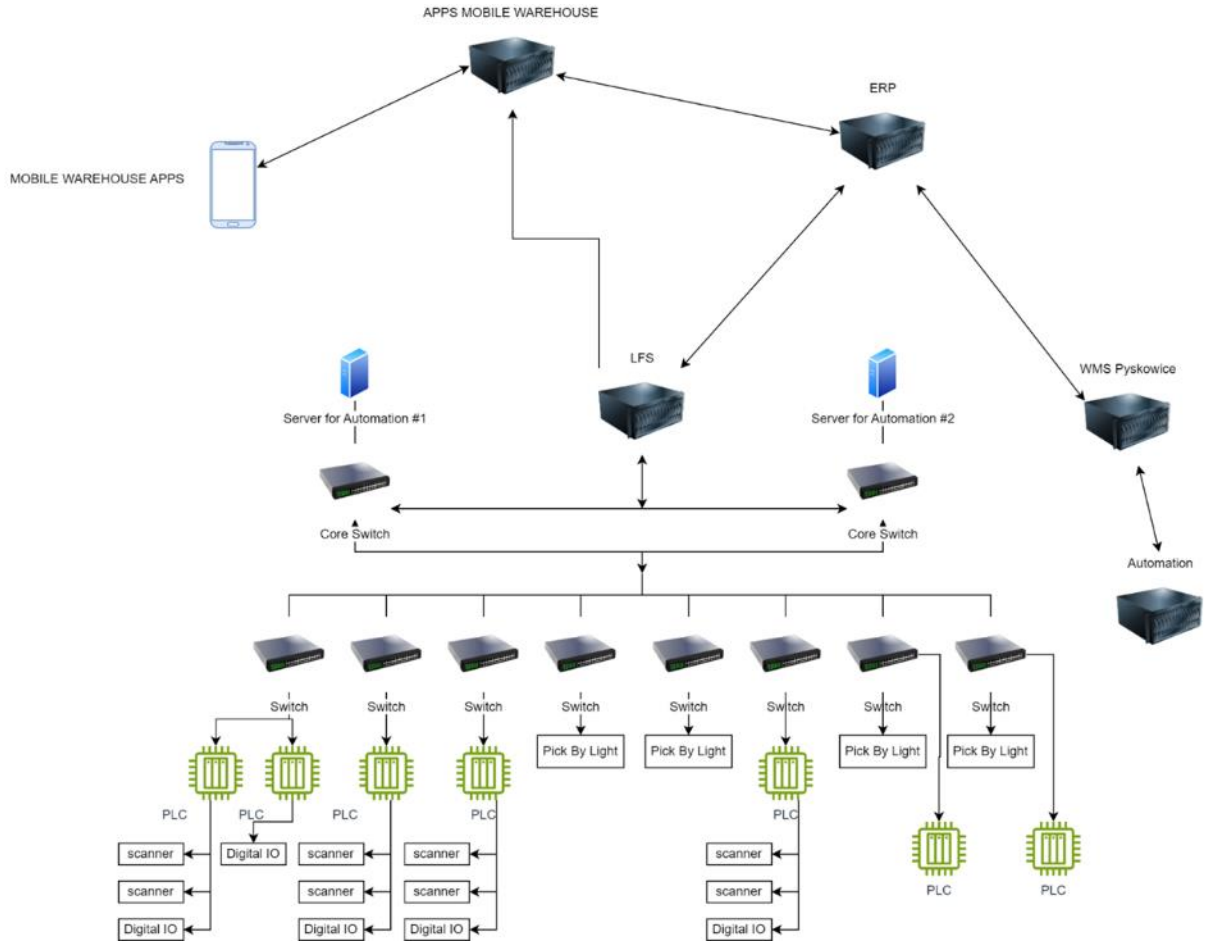


Figure 5-1: IT-System structure

The IT systems structure shown above shows a diagram of the current interconnections and segmentation of functionality and places the new connections for the Pyskowice warehouse in the diagram.

The term Material Flow System (MFS) as used in this tender includes both the Material Flow System itself and all subordinate systems, in particular programmable logic controllers (PLCs) and associated sensors/actuators, MHE visualization with error analysis system and system statistics.

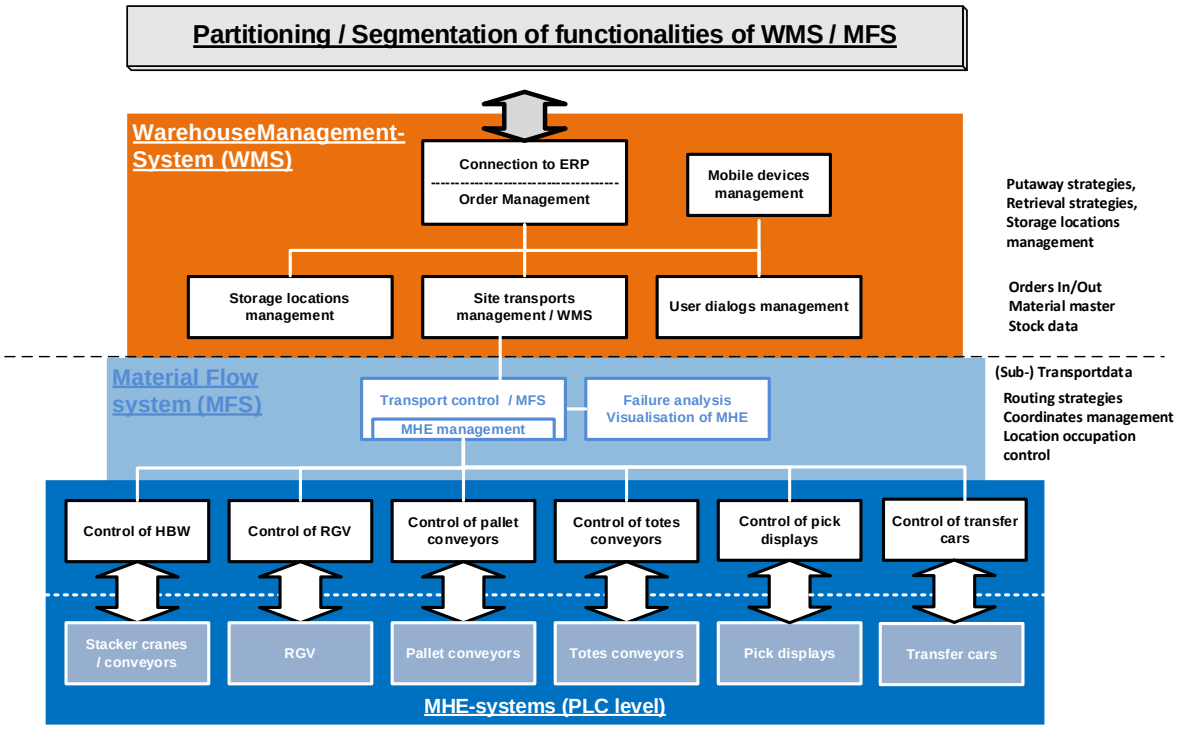


Figure 5-2: WMS/MFS structure

The IT-system structure presented above shows only a possible segmentation of functionalities.

The Logistics Contractor is requested to present and explain the recommended segmentation of functionality in its bid.

The assignment of tasks for the IT systems, in particular between the WMS and MFS, will be agreed upon between the contractors and the client as part of the requirements specification phase.

In this case, the discussions will be three-way because the WMS provider will also participate.

The contractor is also being asked to explain in detail all proposals for integrating or separating MFS functionality within the WMS or from the WMS.

The details of the network components and network delivery terms will be described later.

5.1.2. General technical requirements

We require the automation to be fully redundant at the two location level and operate in HA mode. provides two independent locations plus a third for witness locations if the automation architecture requires it.

Switching software/servers does not affect business operations and automation should be switched in dynamic mode with no noticeable stoppage of processes on the warehouse side.

Switches between production and backup should occur on a quarterly basis and we expect them to be performed by the vendor.

If SAN (Fiber Channel) Switches will be required, they are to be fully managed by the Logistics Contractor and their implementation is to be handled by the Logistics Contractor.

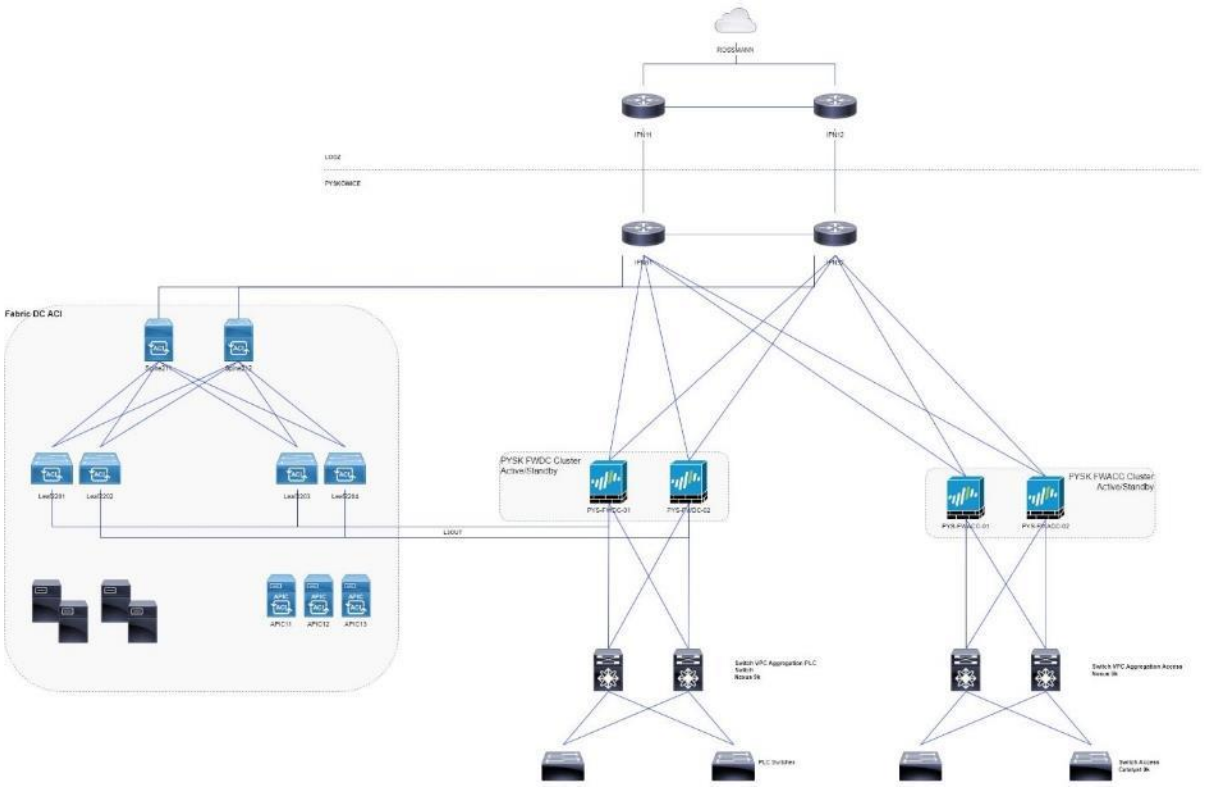


Figure 5-3: Network design

5.1.3. Network design

5.1.3.1. Overview of the scheme

The network is fully managed by the Client. The network provided by the Client. for the automation vendor includes 4 Firewalls (PaloAlto), aggregation switches (cisco nexus), switches for the management network (Cisco Catalyst), switches for devices in access points of automation cabinets (Cisco Catalyst/ IE series) and switches in IDFs for warehouse employees (Meraki).

5.1.3.2. Datacenter network

The Client provides and manages a datacenter network for servers based on the Cisco ACI solution. Servers will be connected to the switches by a port with a bandwidth of up to 25Gbps.

5.1.3.3. Warehouse Network

The storage network is divided into an automation network and a utility network. The automation network contains the derivative PLCs and the wireless network required for the operation of the automation equipment.

The utility network is a dedicated network for warehouse employees and users from the Client.

5.1.3.3.1. Wireless network standard

The wireless network will be based on meraki's 802.11ax solution. The Logistics Contractor is obliged to prepare guidelines for the wireless network in the automation design phase. This is understood as the placement of Access Points and the number of required networks and their purpose - standard, frequency.

5.1.3.3.2. Wired networks

The wired network will be brought to the automation cabinet and can be used by the Logistics Contractor (The automation cabinet is the interface between the Logistics Contractor and the Client). The Logistics Contractor is obliged to build connections between the automation cabinet and the automation installation. During the automation design phase, the Logistics Contractor is obliged to provide information on the need for the number of network outlets in each automation cabinet.

5.1.3.3.3. Automation Cabinets

This is the interface between the Client infrastructure and Logistics Contractor. The Logistics Contractor is obliged to provide information on the demand for the number of network outlets in the individual automation cabinet. In this cabinet will be located access switches, the Logistics Contractor, after the construction of the mileage, will connect the devices directly to the switch in the cabinet (without the possibility of installing an intermediate switch).

The maintenance of the cabinets will be carried out by the Client responsible persons. If the Logistics Contractor wishes to access the automation cabinet, such access should be carried out with the assistance of the Client responsible person.

5.1.3.3.4. Access points

The automation supplier must make the connections between the automation cabinet and the automation installation.

5.1.3.4. Maintenance of Datacenter network equipment

The Client is obliged to maintain the network equipment. The supplier is required to designate maintenance windows for the devices managed by The Client. Service windows should not be less frequent than once a month.

5.1.3.5. Maintenance of Warehouse network equipment

The Client is obliged to maintain network equipment. The supplier is required to designate service windows for network devices managed by the Client. Service windows should be no less frequent than once a month.

5.1.3.6. Network guidelines

The Logistics Contractor is obliged to provide guidelines :

Connection of active devices to the Client network (Datacenter Network, Access Network).

5.1.3.7. Network security

Changes requested by the Logistics Contractor will have to be reported in the ticket system, will be processed by the IT-Security department.

5.1.3.8. Network monitoring

Active equipment will be monitored.

IP addressing of servers and operator stations and other equipment should be agreed upon early in the design process.

Automation servers should collect logs of the software running on them and the system and keep them even after a reboot / shutdown for a period of not less than 30 days.

During the design phase, it should be agreed whether the logs (if so, which ones) are to be archived and how they are to be archived

5.1.4. Requirements for implementation

Installation of the server equipment is carried out on the Logistics Contractor 's side in designated cabinets by the Client in two separate locations.

The Logistics Contractor should provide all necessary cabling to interconnect the devices, which will be provided by the Logistics Contractor.

It must have all the rack rails to insert the devices into the cabinets.

The Client must be informed what size the equipment will be delivered to ensure space in the rack cabinets. We assume that the measure of the size of the devices is to be expressed in the unit U. e.g.

- Location I
- Server 1U, Switch 1U, Server 2U
- Location II
- Server 1U, Switch 1U, Server 2U

5.1.5. Requirements for operation and use

5.1.5.1. Hardware / Network

If the servers are sub-optimal and inefficient for the automation in operation, or the life cycle of the servers is coming to an end, the hardware should be immediately replaced with new hardware after arrangements with the Client.

Client stations should be located in the Client´s domain and there should be access to them via RDP.

5.1.5.2. MFS Software

The details of the mask and document layouts within the MFS scope must be defined and agreed with the Client in the specifications and design phase. The mask layout must always display the current, unique version designation of the associated dialog program as well as the current date and time.

In the footer area, the dialog mask contains a permanent status line. This line serves both to display error messages and to guide the user through prompting notes or messages about what the system is doing at the specified time.

For each dialog mask, the corresponding help functions must also be context-sensitive.

- Each input is checked for plausibility. The details of the contents of the plausibilities to be checked must be agreed with the Client. If incorrect entries are made, the operator is informed of this by issuing an error message on the display / screen and is prompted to enter again after confirmation by pressing a key.
- Status and error messages are to be executed as status/error texts in specified languages that the user can understand. The respective user group (control station personnel, warehouse workers) must be trained in the meaning of the status/error texts. Instructions for action must be formulated and documented. With the help of a "Back" function key, the return to the previous status (viewed hierarchically) is to be provided.

If particularly extensive messages are necessary, they are displayed in separate boxes that cross-fade part of the mask.

All output error messages and status information are logged with date and time stamp in a separate file in the MFS, i.e. a structured file with one formatted entry per message specifying the criticality (e.g. debug, info, warning, error, fatal) of the message. The log level of the log file must be adjustable in the configuration file.

Utilities must be provided for selecting, displaying and printing the log information. The utilities can be used from any screen terminal.

Log and parameter files depend on the operating system. For this reason, the appearance and procedure for printing must be agreed between the Logistics Contractor and the Client.

Furthermore, the following specifications apply to the output of data:

- Leading zeros must always be displayed, since, for example, batch numbers begin with a "0". Overview data on the masks are displayed column by column starting from left to right in ascending order, unless a different sorting has been explicitly specified.
- Data is printed in the order in which it was previously displayed on the screen. The principle applies: Everything that is to be printed can be viewed on the screen beforehand. The reverse conclusion also applies: Everything that is displayed on the screen can be printed. Both a hardcopy function and, where appropriate, a list printout must be provided.
- A function is to be provided, with which a complete list generation (e.g. of inventory data) is possible, without being limited by a data record limitation. It must also be ensured that this function does not restrict the performance of the entire system.
- Selecting, arranging and grouping when displaying / printing tables / lists must be configurable, the attributes used (attributes used for selection, attributes displayed in the table) and characteristics must be coordinated with the Client in the form of prototyping during implementation and approved by the Client.
- Tables created in this way can be easily exported to files (formats are to be defined with the Client in the specification phase) and imported into MS-OFFICE applications.
- For selecting, the use of placeholders or regular expressions must be implemented for each selection field.

All dialog programs can be active in several instances at the same time. Therefore, all data transactions must be transaction-safe. In particular, it must be ensured during implementation that orders are not

assigned to two dialogs at the same time, even if both are logged on for the same work mode (for example, both for removal from storage).

The dialog programs and utilities must be integrated in a menu system for clear operation. These utilities and the menu system must be coordinated in detail with the Client.

Certain function keys are always assigned, e.g. the help key. The same functions must be assigned to the same function keys across all dialogs. Opposing functions such as delete and create must never be assigned to adjacent function keys.

5.1.6. Requirements for the administrative environment

5.1.6.1. Network

EDR Antiviruses will be provided by the Client IT-Security section. The administration environment must be kept up-to-date and any vulnerabilities discovered by the vulnerability management software should be patched on an ongoing basis.

The Client will provide an interchange machine that complies with the current standards that are in the organization. The Logistics Contractor accepts the terms and conditions for the use of JUMPSTATION machines and VPN.

The VPN is opened on demand. The connection is made by GlobalProtect's VPN client

Instructions and account logins and passwords for the Logistics Contractor to connect to the installation will be provided after the VPN and JUMPSTATION rules are created.

The Logistics Contractor should provide a list of all the people (first name, last name, email) who will support the installation (hotline and others as needed)

An FTP server will be provided if files need to be moved/copied.

Connection of the Logistics Contractor to the installation of automation / servers will be possible only from the provided JUMPHOST

Possibility of using Zabbix tool on the servers. The Client would like to monitor parameters of the servers: activated services, server load and performance, actual status of machine, time from last update, etc…

Monitoring should be generated by separate channel which will be opened permanently

If software and licenses are required for remote automation management by the Logistics Contractor, it is up to the Logistics Contractor to provide the appropriate licenses and software on jumphost provided by the Client or create a server / virtual client inside its network with the necessary software, which would be accessed through JUMPHOST

5.1.6.2. User and rights management

In general, access to the MFS can only be granted via an access code and password. Preferably, the authorisation concept anchored in the respective operating system should be used.

The user administration is carried out by authorized persons on site. Only the system administrator (and his representative) create, change or delete new users. The following levels must be taken into account:

- User
- Usergroups

The creation of user groups is mandatory. In a user group, you can define which dialogs can be read, changed, or deleted. User groups and their authorisations must be freely configurable. Each user can be assigned to one or more user groups.

The principle of minimum authorisation applies to users.

The principle “Single Login” should be applied, even the login to different clients is needed.

5.1.6.3. Languages

All user dialogs, including the help function, are always available in English and Polish. The language displayed can be selected freely by the user.

5.1.6.4. Parameters

The IT systems for the MFS must ensure that without software changes (i.e. only by configuration) quantitative changes / extensions to the technical systems to be controlled (e.g. increase in the number of workstations), additional shelf aisles in the automatic HBW can be easily implemented without large manual interventions. In this way, it is possible, for example, to manage additional storage types or load carrier types.

Every dialog program of the MFS can be called from any computer. The warehouse control station uses system parameters to set which user dialogs can be called at which workstations by which logged-on users. If different user dialogs are configured at the same time for one user, the user can decide in which user dialog he wishes to process tasks.

5.1.7. Service and maintenance

Provision of warranty agreements from Logistics Contractor, equipment that is installed in the server room and is currently operating provided on the automation vendor's side. Cyclical maintenance windows should be put in place so that there is no problem with the ability to patch the systems associated with the automation servers.

Each service / maintenance should be announced a minimum of 2 weeks in advance and arranged with the Client.

Updates to environments / software should take place no less frequently than quarterly.

The Client requires updates and vulnerability remediation by the automation vendor. Critical updates should be installed no later than 1 month from the date of publication. Non-critical updates should be installed no later than 3 months from the date of publication.

The Client would like to connect Servers with their WSUS system responsible for patch management. Patch installation will be done after confirmation by supplier specialists

5.1.8. Data safety, security and backup

On the Logistics Contractor 's side, perform backups, restore the environment. Backup must be performed without affecting the production environment. It would be good if the restoration of the backup does not affect the production environment.

The cyclicity of backups should be as optimal as possible, which will not affect the environment downtime problems too much during the restoration and ensure the continuity of the automation operation.

Backups should be performed at intervals no greater than monthly with a retention of 30 days.

For keeping high standard of the safety in the system, the Client would like to scan system by XDR tool - verification and findings “open doors” in the network. Scanning of the Servers, applications, computers

The Logistics Contractor should provide all systems and devices in the latest available software version.

5.2. Scope of delivery and services software

The delivery of the hardware should be carried out, by the Logistics Contractor and a date should be set for the installation of the hardware in the Rack cabinets. In the agreement of the supplier-Client. Installation of the equipment should take place with a supervisor from the Client. The supervisor should point out the cabinets for equipment installation and indicate where to plug in the power cables.

Any software services should be provided by the Logistics Contractor with arrangements with the Client supervisors.

Rack-mounted equipment must have dual power supply.

5.2.1. Functions and User dialogs

Functions to be ensured by MFS:

- Management of conveyor lines and areas or means of conveyance (conveyor technology, stacker cranes, electric monorail floor system, electric monorail hanging system, etc.) and their capacity utilization
- Monitoring the availability of stacker cranes in whole automation and the availability of work-stations
- The transport administration coordinates the individual MH-systems, the conveyor technology, the stacker cranes, the monorails, the rf controlled fork lifts, in order to achieve physical transport via the MHE.
- The MH system parts have to be separated into emergency stop segments in that way, that if in one segment an emergency stop is active all other segments are still operational
- In combination with the subordinate individual / group controls, the MH-systems fulfil the following general tasks, both individually and in combination:
    - Manage current transport processes and statuses on the conveyor system
    - Prevent physical blockages and deadlock
    - Optimal MH connections between source and destination of a transport (within a MH-system and across all MH-systems) can be realized.
    - Synchronize the transfer of load carriers from one conveyor system to the following conveyor system.
    - Consider current loads/disruptions of conveyors or parts, achieve uniform utilization of the individual conveyors ready for operation at all times

- Automatically reintegrate repaired MH-Units, e.g. confirmation of a malfunction by the employee after troubleshooting at a stacker crane: orders which are not yet in execution are automatically redistributed to the individual conveyors which are currently ready for operation for the purpose of uniform utilization and the suppressed conveyors are automatically returned to their task, the replacement conveyors are relieved of their replacement task after processing their current order.
- Confirmations / states and errors/faults to the transport administration and / or error analysis system / system visualization.
- KPI creator - the ability to create charts describing errors, based on type of error, quantity of errors, priority

HBW:

- Management of the waiting positions storage stitch HBW – possibility to manage whole storage strategy (taking goods in and out of HBW)

Gallery pick / re-packing area:

- Buffer space management in the re-packing area buffer. Source-load carrier can be buffered there, until they are intended according to the criteria defined by the WMS (e.g. sequence, weight class) for removal to the workstations connected to the conveyor system. Adding counter how many pallets can be on buffer.
- The order in which the transport orders are processed must always be controlled by the WMS/MFS in accordance with the order of the telegrams for each storage and retrieval destination as well as via the assignment of priorities (e.g. order type, departure time, customer etc.). The detailing of the transport order strategies takes place in the requirement specification phase jointly between the contractor and Client.
- For the automatic determination of the transport targets for the load carriers, scanners are arranged in the conveyor technology which read the identification of the load carriers and transmit this information to the transport administration. The transport administration determines the transport destination (possibly in conjunction with the storage bin administration) and sends a corresponding transport command with the transport destination to the affected conveyor system. As an option, the contractor can also offer logical material flow tracking, provided that there are no disadvantages compared to the scanner concept.
- Sensor which will provide information how many totes are physically on automation

Functions for whole automation:

- Control / coordination / optimization and monitoring of transport and driving orders concerning the above-mentioned subsidies from source to destination, taking into account operating conditions, occupancy conditions, subsidy utilization as well as priorities according to WMS/MFS specifications, etc.
- Exchange of information with a system visualization and a failure alarm / failure analysis system (with display / logging of failures and their rectification)
- Determination Master Data for handling units possible to use on automation (pallet, RC, Dolly, tote, etc.)

- Material Flow checkup – specific menu with check list of all sensors on each automation, possibility to reset each sensor, possibility to block whole conveyor, error status indicators (green/red lights)
- Management of storage locations – list of storage locations, possibility to synchronize data with WMS and MFS to take goods out from warehouse. Visibility of high of pallet and storage location, pallet weight, possibility to block storage location and check reason of blocking (in case of manual or system blockade), possibility to define own blockades and to add description manually, possibility to change system location of pallet
- Management of buffer locations – possibility to define and edit buffers
- Visibility of all active transports on automation, possibility to stop/edit/change destination of transport, possibility to change priority
- The transport administration within WMS/MFS uses the functions of the storage unit management within WMS/MFS to determine an exact transport target (aisle, storage unit, area).
- The transport administration supports the operating modes automatic and semi-automatic / manual.
- The transport administration controls the conveyor systems via a transport matrix that can be configured (by the system administrator) and with which any transport that can be physically executed with the MH-systems can be logically mapped. If this results in alternative transport routes, the transport administration automatically selects the optimum route to the destination.
- In automatic mode, the transport orders are automatically converted into transport commands for the conveyor systems and processed there. In semi-automatic / manual mode, the status of the conveyor systems can be "manipulated" by the operators of the system by carrying out transports or modifying the occupied status of conveyor elements.
- For transport management, the following WMS/MFS system parameters, for example, must be provided in relation to the MH control and monitored automatically by the WMS/MFS:
    - Filling ratio limits for (order) buffer
    - Physical congestion capacity and virtual congestion capacity (consideration of overpressure behaviour and dynamic time behaviour) + Min./Max. thresholds
    - Max. number of load carriers that may be physically present in the pre-zone loop at the same time.
- Visibility of all handing units on automation, information about “NOREAD” in case of unreadable barcode with history of logs, to give possibly to check when and under which sensor barcode become damaged
- For “Not-Okay” processing, an interface must be provided in order to process faulty transports (e.g. No-Reads) on WMS/MFS terminals located on related Not-Okay conveyor ends.
- Visibility of all active telegrams – in case of some telegram will be not processed there will be information what something was not processed correctly
- Statistics – history of actions on automation, verification of loads of given components of the installation
- Log of stacker crane operation events

- In case of new functionalities new function should be possible to be added only by key-users to specific groups of people (they should not be visible for all users to avoid mistakes)
- Visibility of all services
- In addition to that the WMS/MFS have to manage the following (configurable) strategies:
    - A/B/C characteristics – dynamic calculation by WMS/MFS
    - Pre check characteristics of pallets (weight, dimensions) before putaway
    - Distribute same article + batch on different aisles
    - Distribute total load on HB rack system to support uniform settlement of baseplate
    - Apply strict FIFO per batch on stock removals

The functions listed above are not complete. Further functions and tasks are to be detailed between the Client and the Logistics Contractor of the WMS/MFS during the execution planning.

5.3. Technical control station / Material flow controller

The technical control station is used by the operating personnel to support and control the material flow system. The technical control station is equipped with a failure analysis system (FAS) and a system visualisation (SV). With the help of these systems, it must be ensured that bottlenecks and malfunctions in the individual subsystems/functional groups are detected at an early stage from a central location in order to be able to take appropriate countermeasures (described in the FAS) and thus optimise availability and performance. Furthermore, information about the system availability must be provided in order to be able to intervene in a controlling manner.

The MHE -visualisation and the failure analysis system (FAS) shall be independent of each other and shall be connected by the contractor via two separate message paths/interfaces.

The entire hardware and software requirements, including licenses, are included in the scope of the contractor.

5.3.1. System visualization

Visualizations of the work of the system operation are necessary. This fact should be agreed at the design stage

If possible, the visualizations should be accessible via the WWW (https) site

If necessary, the connection between the application and the server should be encrypted.

5.3.2. Failure analysis system (FAS)

In the scope of delivery and services of the Logistics Contractor is also a system visualisation comprising all MHE.

It serves the data acquisition, error analysis and statistics as well as the availability calculation.

The fault or error messages to be provided by the contractor shall contain at least the following information:

- Date and time (with milliseconds) of the fault
- Identification of the element or area concerned

- Detailed, "speaking" message text in English and Polish language

The failure reports must be defined and coordinated with the operator in such a way that the cause of the failure - in most cases - is already recognised by the operator on the basis of the failure report. The troubleshooting measures ("experience database") shall also be listed with, if applicable, references to more detailed information in the complete and detailed user manual.

In the field of material flow technology, the following plant data must be provided for statistical purposes:

- Running time
- Malfunctions / failures / states, also maintenance or EMERGENCY STOP
- Type of failures
- Downtime
- Duration and number of EMERGENCY STOP operations
- Start-up / Shutdown - Time points of the sub-systems conveyor technology and stacker cranes
- Operating time of the system elements
- Scanner - related read errors at the I-points
- Energy consumption of the systems (e.g. individual stacker cranes)
- Identification of transport units

Especially for fault detection

- Unique failure number
- Element description acc. to system layout
- Failure start
- Start troubleshooting (with dialog for technicians for troubleshooting)
- End of troubleshooting / confirmation
- Downtime of the element
- Malfunctions triggered by safety devices such as the opening of protective fences must be indicated separately.

Basically, the database of operating states must be available for the evaluation and determination of

- Service intervals
- Malfunction statistics
- Runtimes
- Downtimes
- System utilisation
- Reasons for downtime/errors
- Error-frequencies differentiated according to errors
- Energy consumption (active power)

over a longer period of time.

All failures that occur must be integrated into the control cabinet (with signal lamp/collective failure), the visualisation and the system for recording the statistics. The data to be recorded in the statistics system are specified even more precisely during the requirement specification phase between the Logistics Contractor, the Client and the WMS provider.

All system states and malfunctions shall be displayed on the respective switch cabinets/control cabinets, indicated in the visualisation and, if necessary, partially reported to the WMS.

The recorded failures shall be output with "Coming" and "Going" in a readable data record after acknowledgement. The output of independent "Coming" and "Going" messages for a system element in a list is not permitted.

The design and depth of the failure report / downtime recording shall be agreed between the Logistics Contractor and the Client while drawing up the specifications. In any case, a documentation of the stop reasons, the stop times (start and end of the stop) must be made. The coordination / clarification of the details takes place during the functional specification phase together with the Client.

The contractor is requested to indicate the necessary number of FAS/AV workstations with indication of the desired position (control station, area control station or similar) in his offer. The position and number will be confirmed by the Client.

When submitting the offer, examples for the FAS (structure, error logging, troubleshooting support) shall be attached.

5.4. Interface to the WMS from the Client

With regard to the decision about implementation new WMS system for Pyskowice Warehouse, details about interface and technology will be agreed with selected WMS provider and vendor of automation technology. We are expecting below possibilities.

Examples of data exchange:

- Transfer orders
- Transfer orders confirmation
- Transfer orders cancellation

Examples of technologies:

- TCP/IP connection
- IDoc/QRFC
- telegram communication
- sending & receiving connection

5.5. Scope of deliveries and services hardware

Installation of the equipment is carried out on the part of the Logistics Contractor and commissioning of the equipment is carried out with the assistance of a person responsible and authorized Client.

If access to the server room is required, such fact should be reported in advance to the persons responsible for the server rooms, access to the server room is carried out assisted by a person (local it) from the Client

In case of the need for a visit of a technician from the side of the equipment supplier, such fact should be reported to the local it department and the person responsible for the server rooms.

5.5.1. Mobile RF-Terminals

All mobile equipment (scanners, terminals, etc...) will be provided by the Client, plugged into the domain and configured accordingly.

The hardware will run on Android.

The hardware will be managed by the MDM system provided by the Client.

If the solution will require terminals to be provided by the Logistics Contractor, the model and manufacturer should be agreed with the Client in the design stage

5.5.2. Mobile desks

There will be designated desks for the Logistics Contractor's employees in the warehouse, network access will be implemented on them through a dedicated wifi network

5.5.3. Server hardware, operating system and database software

Server hardware - Fully supported requirement. In case of hardware equipment getting old, replacement with new hardware is required. We assume the life cycle of the equipment is 5 years, in the case of the hardware getting worn out, it is possible to shorten the replacement time of the hardware. Support should be 24/7

Operating System - The latest supported OS. In case of End of life of the system, an upgrade to the supported OS version is required, on the Logistics Contractor's side. OS upgrades should take place periodically at least once a month, maximum once a quarter by prior arrangement with the Client.

Database software - Any, most recommended for correct operation of automation, maintains software supplier. Updates should take place periodically at least once a month, maximum once a quarter by prior arrangement with the Client

5.5.4. Uninterruptible power supply (UPS)

Power is/should be supplied to the rack from two independent circuits. In the event of a failure, it will be 100% upsized and will not affect the operation of the automation if one of the circuits fails.

- managed PDU strips
- 19” RACK,
- ZERO U,
- 32A
- equipped with 14 TYPE E sockets, depending on the equipment to be located, there may also be a C13 or C19 socket - any quantity combination
- support for environmental sensors

- 3 F (3 phase)
- modular UPS with easy power expansion
- InRow air conditioning : Air-conditioning and power supply resulting from the assumption of a load we do not know at this stage
- from SE or Rittal

5.5.5. Technical documentation for installation

The technical documentation of the implemented or upgraded OT system should include:

(a) Functional description of the system,

b) Documentation of the system software,

c) User application documentation,

d) Technical diagram including network connection structure (logical and physical),

e) List of connections to external systems (list of protocols),

f) List of all network devices and hosts.

Network documentation should be divided into logical and physical:

(a) The physical topology should show the physical arrangement of devices with information on device type, operating system version, cable and connector type, and end and start points plotted.

(b) The logical topology should show how data is transmitted on the network. Graphic symbols of typical network devices (switches, routers, servers) with additional information should be plotted:

- IP address and subnet mask.
- Unique device identifier
- Connection type
- Routing and switching protocols.
- VPNs
- Static routes
- Data link layer protocols
- WAN technologies

5.6. VPN connection to the Client infrastructure

What the employee receives:

The employee of the Logistics Contractor receives an email with instructions for the first login to the ITSM application system, a link containing access to the ITSM application system (without SSO login) and also the password to unpack the ZIP "package", which is downloadable in the above-mentioned application system in a properly described task: "Accept receipt of files".

First configuration:

The employee/employees of the Logistics Contractor will create an individual account in our ITSM system (currently used 4me). After the account is created by our specialists, the employee/employees of the Logistics Contractor, using the link that is included in the email, generate a code, which is then sent to the employee's individual email address. With it, the employee is able to create his own password for an individual account in the application system.

Employee(s) of the Logistics Contractor will also be created an individual account(s) in our domain along with a certificate for your entire company. The login with the password to the account as well as the certificate is included in a previously prepared encrypted "package", which is sent to the ITSM system individually for each employee/employees of the Logistics Contractor. The password for unpacking the package, you receive personally to your email address.

The employee(s) of the Logistics Contractor should use a computer with malware protection software (anti-virus/Endpoint Detection and Response software) installed.

The employee(s) of the Logistics Contractor install the Certificate and VPN client (currently used GlobalProtect version 5.2. 13-48 or higher) on their computer. The link redirecting to download the client is included in the previously described "package". The current client supports systems: Windows 10, Windows 11 and macOS.

The employee/employees of the Logistics Contractor, when connecting to the Client for the first time, must launch the VPN client and authorize themselves with their named domain account. The person then enters the ITSM system page to report the opening of the connection. The next step is for a Client person to accept the request so that the connection can be set up.

Information about the completed request, the user receives an email. From that moment, the connection to the Client to the previously created transfer station takes place. The connection to the transfer station is made via RDP (if a per-company station was created - JUMP) or via external software (currently VMware Horizon) if a per-person station was created - VDI.

The link to download the application (currently VMware Horizon) can be found in the instructions provided in the previously prepared "package".

The created station (regardless of whether it is VDI or JUMP) has a basic Microsoft software package, a browser and an antivirus program. If there is a need to install additional programs or receive accesses, it is necessary to report such a need to an Logistics Contractor supervisor from the Client side.

Work performed at the interchange station is recorded on the firewall. Currently, work performed at the transfer station is not monitored by video recording. However, the Client reserves the possibility that in the future an identity security solution (e.g. a PAM-class system) may be introduced, which may have the following functionalities:

- Video monitoring and recording of sessions,
- Multi-factor authentication (MFA),
- Dynamic Authentication,
- Central repository of credentials.

Detailed information is included in the instructions, in a pre-prepared "packet," or in an email sent directly to each employee of the outsourcing company.

There is also other useful information such as:

- Instructions on how to log in to the application system for the first time
- Instructions on how to reset your domain account password yourself
- Information on how to report the opening of a remote connection

5.7. Additional cybersecurity requirements

- The delivered systems should have access to administrative interfaces using encrypted protocols.
- The system contractor should provide all systems and devices with the latest available software version.
- The provided systems should provide the ability to synchronize the time using the NTP protocol with a central time server.
- The provided systems should ensure that configuration changes are blocked by unauthorized persons.
- The Client reserves the right to detect and monitor vulnerabilities in every element of the infrastructure and in the applications used.
- The Client reserves the right to regularly review and audit the security of IT and OT systems and networks.
- The contractor should perform periodic vulnerability reviews of system elements and make updates to improve system security. If it is not possible to change the software (e.g. the new version introduces significant functional changes), remedial actions should be developed to minimize the threats.
- The supplier is obliged to respond to cybersecurity threats, minimizing potential damage to systems and data.

6. Implementation conditions and miscellaneous

6.1. Preliminary remarks

In addition to the operational implementation of the logistics systems of automated HBW, Picking Gallery, pallet conveyors, RGV´s, Shuttle system with stacking machines and all pallet and tote conveyors (e.g. material handling technology, steering systems, Material Flow Controller and visualization system) the contractor's offer also includes the services described below.

Where applicable, these are to be performed considering the relevant regulations, requirements and conditions of the authorities (e.g. Polish Office of Technical Inspection – UDT), official institutions, the local fire brigade and associations as well as the requirements of the Client and the local conditions.

Detailed information is used to support pricing and to prepare the project, but does not claim to be complete, as the Client has decided in favour of a functional tender.

The services mentioned must be included in the offer and documented.

The contractor shall perform all services on their own responsibility and independently after the Client has placed the order within the framework of the general contractor's contract for work and services.

The Client will not provide any further planning and implementation services; this with exception of the non-transferable "Client / operator" tasks or decisions.

6.2. Project organization

6.2.1. Project team Logistics Contractor

The execution of the project assigned to the contractor includes a complex project management task, which must be performed professionally in close coordination of all the trades involved in the construction phase.

For this reason, the Logistics Contractor has to set up an adequate project organisation and team structure:

- Coordination and control of the planning and project participants in cooperation with authorities / offices / associations etc., with regard to applications / approvals / acceptances with participation and information from the Client;
- Coordination (in terms of time and content) of its execution planning and implementation of the technical systems among each other as well as with the control / IT hardware / software and network systems;
- Coordination with the parallel construction planning and implementation measures (e.g. building, technical building equipment, fire protection technology, installation options for the contractor's scope of supply and services, construction site equipment on the site in the buildings etc.);
- Coordination with the ongoing operation for the installation scopes in the existing warehouse building as well as with the persons responsible from the Client for the structural designs and the building services equipment in the existing warehouse building;
- Coordination (in terms of content, schedule) of instruction / training measures for the employees of the Client as well as its representative (e.g. warehouse operative, maintenance staff etc.), based on prepared operating instructions for all electrical and mechanical equipment, guaranteeing the safety of the work and prepared for users in Polish language.

Throughout the duration of the project, the Logistics Contractor has to carry out controlling relevant and adequate to the project, as a basis for their duty to provide information.

6.2.1.1. Cross-departmental personnel deployment

For the implementation of the project, the Logistics Contractor appoints within the framework of their project organisation:

- a project manager (PM) with overall responsibility, who is available to the Client as a direct contact person with regard to all questions and who is on site from the time of the first design works (coordination meetings), construction and assembly steps as well as during assembly and start-up of the individual systems and coordinates the systems and interfaces;
- mechanical project manager (site main engineer);
- electrical project manager (site main engineer) for electrics (control system);
- IT project manager (MFS and interfaces to WMS of the Client).
- PLC project manager, visualization and/or SCADA project manager

6.2.1.2. Personnel deployment on site

In addition, the Logistics Contractor sets up the following functions within the project:

- a construction management i.e. foreman/ site manager (including designer certified in Poland for all required validations of design and execution), which is permanently on site from the time of the first construction and assembly steps as well as during the assembly and commissioning of the individual trades and coordinates all trades and their interfaces, and
- one installation supervisor for each of the individual trades.

6.2.1.3. Qualifications

A representative has to be appointed for each of the above functions. The qualification of the personnel employed has to be demonstrated (in accordance with the project requirements) by personal reference projects and certification (if available). The responsible personnel cannot be replaced without prior agreement with the Client before the end of the last implementation step and full overall system functionality.

The proposed project manager must be presented in the offer and is subject to the Client's acceptance, based on qualifications and experience. The Logistics Contractor has exclusively to employ qualified experts for the implementation of this project. The Client is entitled to demand the replacement of personnel for important and justified reasons.

As part of their offer the contractor must present proposed organisational chart foreseen for this project.

6.2.1.4. Obligation to coordinate

The contractor must have a proactive coordination obligation to coordinate with all affected interface trades. These are e.g. building construction, technical building equipment installations, fire protection installations, WMS of the Client, operational business of the Client, etc. The Logistics Contractor must be obliged to coordinate the interfaces to the specified trades and other trades considered from his point of view and scope. For this purpose, the contractor has to prepare an interface catalogue within the

context of the implementation / execution planning, stating the required specifications and the associated deadlines.

The Logistics Contractor has to consider that the installations for e.g. sprinkler system, fire protection system, lighting, heating etc. in the HBW and the Picking Gallery must be carried out in parallel to the installation of the racking systems and the installation of the stacker cranes / the shuttle systems as well as the mezzanines and conveyor systems, façade and roof, considering a slight time lag in the execution of the technical building equipment. In this regard, the Logistics Contractor must actively carry out very close coordination with the structural / building services trades (especially fire protection / sprinkler concept / electric supply, etc.).

The Logistics Contractor prepares a detailed planning, assembly and start-up schedule and agrees this with the Client, Metroplan and PP within 2 weeks of placing the order, in line with the tender specification time schedule.

The Logistics Contractor has to adapt its execution documents (plans / calculations etc.) to the local conditions, the operator requirements and the current level of detail.

Typical points of coordination include, but are not limited to:

- Aisle widths, drive-over dimensions, static and dynamic loads from the storage / conveying technology, requirements for the floor structure, breakthroughs for the conveying technology through walls, fire protection closures;
- Escape routes;
- Anchor boxes for the HBW shelf construction in the floor slab,
- Fixings, reinforcement-free or low reinforcement zones;
- Connected loads, feed points for storage / conveyor / control technology;
- Own cable ducts for cabling;
- Infrastructure for computer and control cabinet areas; installation sites / rooms;
- Requirements with regard to dimensional tolerances, permissible settlements and deflections;
- Integration of heating / ventilation / lighting in the storage / conveyor technology areas;
- Integration of sprinkler technology and supply lines;
- Smoke detector arrangement, if applicable;
- Position, size of assembly openings for conveyor technology / insertion openings for stacker cranes or their components
- Lighting, electricity, water, compressed air (if needed);
- Construction site equipment, containers
- Vehicle unloading, transport to the place of installation, ways, (aids are to be calculated and kept ready by the contractor);
- Network, connection points;
- IT infrastructure;

- Energy recording, energy management systems.

The Logistics Contractor coordinates independently all activities / coordination of the scope of delivery and services as well as all interfaces to the individual trades, e.g. construction / IT systems etc. and inform the Client in agreed time.

6.2.2. Duty to provide information

The Client has to be continuously informed by the Logistics Contractor about the status of planning, assembly preparation and assembly, IT planning / implementation / testing (technical systems, MFS and both in connection with WMS of the Client) and commissioning. In particular, the Client has to be informed in writing in good time in advance if deviations from the specifications or the making of decisions regarding the details of implementation (in terms of content / deadlines) become necessary.

In the event of postponements or other deviations from the agreed scope of services during the project period, the Logistics Contractor must notify the Client in writing as soon as possible, but not later than in 2 working days from identifying the possible delay, clearly describing the issue, stating the resulting consequences and presenting the proposed recovery plan.

The calculation has to be based on at least weekly project management and design meetings on-site or in the head office of the Client in Lodz, Poland. Weekly construction meetings are planned from the start of construction and assembly; the frequency may increase in case of important milestones or increased workload and critical scopes. The place for the meetings or discussions is, as required, on the construction site in Pyskowice, or in Łódź, depending on the purpose.

For each project management meeting, the contractor must prepare a status report on the progress of work and status, as well as look ahead for the next week, in advance (2 working days) and hand it over to the Client. The detailed contents of the report are to be coordinated with the Client and Metroplan.

6.2.3. Requirement for approval

All documents, such as e.g. the Logistics Contractor's execution plans, the verifiable drawings and specifications for IT (including PLC, MFS and interfaces to WMS of the Client) have to be released by the Client or a contracted third party and the Client prior to execution (in agreed time of 3 weeks ahead).

Deviations from approved execution documents - including details - require the written consent of the Client.

Before preparing detailed construction documents, the Logistics Contractor is obliged to coordinate all relevant structural and technical building dimensions with the Client and to include the dimensions resulting from this coordination in their planning or documents.

In doing so, the Logistics Contractor must continuously coordinate or review their execution documents (plans, calculations etc.) with the local conditions and with the current level of detail.

All these documents must be coordinated with the Client or their representative (Metroplan) at an early stage prior to their further use by the Logistics Contractor.

Only those documents have been released for execution which have been released in writing by the Client and their representative.

The approval note of the Client and their representative does not release the Logistics Contractor from its obligation to deliver the supplies and services in accordance with the performance, contract and function as well as the official / statutory regulations (authorities, institutions, associations, fire brigade).

The modification of execution drawings by the Logistics Contractor based on results from joint design discussions with the Client, Metroplan and PP (if required in terms of coordination with construction) or based on inspection by the Client shall be free of charge for the Client.

The Logistics Contractor is obliged to include the above-mentioned services and expenses in their offer price.

6.2.4. Control by the Client or their representative

The representative of the Client have the right of control over the planning and execution of the deliveries and services by the Logistics Contractor. The Client and their representative will monitor or has monitored the Logistics Contractor's planning / implementation services, outside the regular the Logistcs Contractor obligations, for compliance with the specifications and with the contract. The expenses for control and monitoring shall be borne by the Client. If, however, these expenses exceed the normal level:

- because the execution documents to be prepared by the contractor and checked by the Client or their representative are incomplete, faulty, not detailed enough and too imprecise;
- because the monitoring of the execution requires a disproportionate effort, as the contractor constantly deviates from the agreed obligations;
- because as a result of test interruptions of tests by the Client or their representative, more than one test repetition is necessary during the test / start-up procedure;
- because the expenses for acceptance must be incurred several times as a result of deviations from the requirements or considerable defects

The Logistics Contractor undertakes to reimburse the Client for the additional costs of these expenses after prior notification and agreement.

6.3. Project environment

6.3.1. Planning and implementation procedures

The planning status for material flow technology and IT systems (MFS and interfaces to the WMS of the Client) is functionally documented in the form of the tender document.

Parallel to this, construction and technical building services planning, detailing for the individual trades of building construction as well as building services engineering are also taking place. It is intended on the part of the construction planning department to take the results of the Logistics Contractor's execution planning into account, but the Logistics Contractor is not entitled to them.

After the order has been placed, the Logistics Contractor shall carry out the following activities independently and on their own responsibility:

- Execution planning and creation of the specifications for the warehouses / conveyors, control technologies and the MFS as well as the associated interfaces;
- Coordination and creation of a model description for the simulation with the contents described in chapter 6.4 Simulation;
- Execution of the simulation in accordance with the model description and optimization of the implementation planning and specifications based on the results of simulation;

- Development of an adequate project organization for the coordination of the execution planning (in terms of time and content) and technical systems among each other, as well as to the MFS, including protocol and coordination of meetings with the Client and their representative;
- As part of the execution planning, workplace samples of all intended workplaces must be carried out and approved in writing by the Client; see chapter 6.3.2.;
- Manufacture, supply, assembly and commissioning the entire scope of the contractor's supplies and services (in stages as well as in total);
- Assembly - Quality monitoring of the implementation of the warehouse / conveyor and control technology and implementation monitoring for the MFS and the interface to the WMS of the Client;
- Organizing / coordinating and controlling the project participants in cooperation with the authorities / institutions / fire brigade / associations / State Sanitary Inspection Building Supervision Office / PIP (National Labor Inspectorate) / Inspectorate of Environmental Protection / public safety Office of Technical Inspection (UDT), etc. regarding applications / approvals / acceptances with participation or information of the Client;
- Informing the Client of deviations from the specifications or the initiation of decisions with regard to the details of implementation;
- Test management and execution as well as staff training / instructions for operating personnel of the Client.

In this context, coordination between the Logistics Contractor (LC) and other project teams is necessary.

The Client assumes that the Logistics Contractor will carry out such coordination in agreed time and in full; the Client will not incur any additional costs as a result thereof.

In good time in this document generally means so early that no delays occur in the execution planning or in relation to defined deadlines in the implementation, which should be identified as far as practicable immediately after the awarding of contract and agreeing execution time schedule.

Any necessary coordination and advance performance on the part of the Client must be reported separately and at an early stage.

Additional costs due to lack of coordination will not be reimbursed.

The Logistics Contractor is responsible for the time planning of the overall project (including the preparatory and follow-up work of the Client or third parties). The Logistics Contractor shall specify the dates by which previous work which is not within the Logistics Contractor's scope of performance must have been completed so that the Logistics Contractor's performance can be performed without hindrance and time delays.

The schedule to be prepared by the Logistics Contractor has to be coordinated with the Client and approved in writing. Requests for changes to the schedule on the part of the Client have to be implemented by the Logistics Contractor. The contractor shall not be separately remunerated for any additional expenses incurred as a result.

If, in addition to the completion date of a service to be rendered by the Client, there are also restrictions with regard to the start date or the time schedule (e.g. necessary interruptions for services of the contractor or third parties), the periods in which the work must take place shall be specified to the Client precisely and unambiguously.

The Client has to ensure, that the entire of the scope of the project is allocated to relevant contractors (following after approval of the time schedule). Logistics Contractor does not bear any responsibility for services which are not within their scope of performance, neither for their completion within the agreed time frame and in the agreed quality.

6.3.2. Workstation sampling

Workstations, especially workstation in combination with automatic conveyors in the repacking area for storage totes and de-stacking area for shipping totes as well as in the picking area in the Picking Gallery, must generally be coordinated with the Client by the Logistics Contractor during execution planning in the form of samples and optimised according to ergonomic aspects.

For this purpose, the manufacturer (contractor) has to create a functional mock-up prototype of each workstation and enable the Client and their operating personnel to use the samples. The related IT equipment (e.g. terminals, printers, scanners) must also be integrated / taken into account in accordance with the relevant specifications during sample assembly. The requirements of the operating personnel have be considered and after approval by the Client the workplaces shall be assembled.

The expenses for this procedure are free of charge for the Client and must be considered already during the preparation of the offer.

6.3.3. Construction site equipment / installation openings / disposal

The Logistics Contractor is obliged to be familiarize with the local conditions and the possible site installation, access and material supply, including necessary water and power connections, and coordinate their requirements with the Client. All planning needs to take into account the limitations resulting from available space for site office, laydown zones and assembly zones, per the site plan outlined in the D2027 Construction Specification attached to this tender specification, The offer price includes the installation and supervision of the relevant construction site, transport, provision and maintenance of all necessary equipment and tools (personnel and industrial trucks, cranes, working platforms etc. are not provided) and personnel accommodation.

The contractor is obliged to keep his working area clean and to remove any waste, packaging material etc.

The energy costs incurred will be invoiced according to the actual usage.

The Logistics Contractor is liable in all cases for the work carried out by them and for the safety of their operatives on the construction site as well as for all personal injury and damage to property caused by their actions.

The Logistics Contractor has to ensure that the work incumbent upon him is carried out without damaging components. He is liable for all damage caused by their employees.

They must carry out all necessary and other measures to secure the construction site in accordance with statutory and police regulations as well as accident prevention regulations exclusively under their own responsibility.

Safety and protective measures prescribed by the authorities / institutions / fire brigade / and Client's own policies must be complied with and their ongoing control and compliance shall be monitored and documented by the Logistics Contractor. The contractor has to be solely and fully liable to the Client or third parties for all damage caused by omission of these safety and protective measures or their inadequate observance or by work such as welding, loading etc.

Access to the construction sites / assembly sites must always be via the access points agreed with the Client.

When submitting the offer, the contractor has to describe and provide a graphic representation of how he intends to bring in e.g. stacker cranes and his other material and which prerequisites must be fulfilled for this, e.g. position, size of the insertion openings, requirements for the quality of the floor for the erection crane, position and size of the areas for construction site equipment and material storage etc. The Logistics Contractor has also to describe how he intends to bring in the material for the crane as well as the types of installation cranes used during the assembly process.

Containers for assembly tools, etc. must be installed in the designated contractor compound area (aids for transport, unloading and loading must be calculated and kept ready by the contractor) according to thesite plan which is included in the D2027 Construction Specification.

The installation of the stacker cranes must be coordinated in good time with the General Planner and the Building Contractor for the building construction / building technology in terms of schedule and structural requirements.

After installation of sensitive technical trades, the Logistics Contractor has to ensure that these are adequately protected against dust, dirt, particles and moisture due to further construction and assembly work (e.g. stacker crane motors, open motor flanges covered and sealed with foils etc.).

The surfaces on which the contractor's material and equipment can be temporarily stored must be agreed in advance with the General Building Contractor and approved by the Client.

Compliance with the protective measures shall be monitored by the Logistic Contractor.

After completion of their work, the contractor has to remove all debris from the installation, wet clean and return the area used by them cleanly and remove all construction site and assembly equipment used by them.

Prior to completion of commissioning and prior to commencement of tests, the Logistics Contractor has to clean the entire scope of delivery and services of the Logistics Contractor (including all subcontractors) in accordance with the requirements. The expenses for this must be included in the quotation price and shall not be remunerated separately. With regard to the scope and timing of cleaning, the Logistics Contractor has to consult with the Client at an early stage.

The general coordination obligation at the interface to the building trades was specified in chapter 4.4 and must be observed by the Logistics Contractor.

6.4. Simulation

Within the scope of execution planning, the contractor has to demonstrate to the Client by means of simulation for the overall system, that the required material flow throughput requirements, the required qualities and performance are met by their solution ready for execution. The simulation comprises the entire material flow system incl. pre-zones, picking zones, workplaces and buffers, related processes with usage of forklifts and other material handling equipment as well as the connection to the existing warehouse.

The complete simulation model has to be made transparent comprehensible to the Client. The structure of the model for this simulation must be modular, so that individual modules can also be used as emulators for start-up.

The following module division is recommended by the Client. The Logisticx Contractor is free to choose a different division if the technical solution they have chosen makes this necessary:

- MFS (Strategies, processes); e.g:
    - Put-away, retrieval / return strategy HBW and Picking Gallery (bottleneck analysis pre-zone);
    - Transport strategies of Rail Guided Vehicle systems;
    - Conveyor system transport strategies;
    - Failure strategies for automatic systems;
    - Material flow system (Strategies).
- Per conveyor system
    - HBW (stacker cranes);
    - Picking Gallery (shuttle systems);
    - Conveyor technology (Groups ...);
    - RGV system / rail guided vehicles;
    - Shuttle system in the outbound;
    - Automatic stacking of shipping totes on dollies

The contractor is requested to describe the execution of the simulation in detail in their offer. In addition, it must be shown whether the plant visualisation for the animation layer of the simulation is integrated into the animation of the simulation or whether a separate representation is selected by the Logistics Contractor.

The expenses for the simulation are to be shown separately, but to be integrated into the total price for the overall project.

The scope of supply and services of the Logistics Contractor includes the verification of the functionality of the overall system offered, including relevant WMS / MFS strategies, based on a simulation by themselves or a third party.

For this purpose, the corresponding process flows are to be mapped in a simulation model in order to be able to examine and evaluate the resulting operational behaviour for different scenarios (e.g. peak day, average day, throughput sensitivities, malfunction and emergency strategies). In this way, the system limit throughput of the offered system planning is to be determined and existing bottlenecks and weak points are to be identified.

The aim of the simulation is to prove that the required quantities and services are fulfilled by the offered technical solution including strategies.

The simulation should be carried out systematically according to VDI 3633.

In the foreground of the simulation study is the answering of questions, which are exemplarily listed in the following:

- Proof of the conformity of the systems for the throughput requirements;
- Evidence of the optimal and requirement-compliant implementation of the operational strategy;

- Evidence of smooth operation of the HBW and the Picking Gallery;
- Proof of adequate dimensioning of the material flow technology;
- Proof of supply and disposal of all system areas in accordance with requirements;
- Optimization of buffer areas (e.g. uninterrupted supply of work stations);
- Optimization of the utilization of workstations and machines;
- Proof of adequate dimensioning of the upstream and downstream buffers of the workplaces;
- Proof of emergency strategies for maintaining operation in the event of failure of individual conveyor and storage elements.

Systems and functions considered and to be represented in the simulation are at least included:

- Stacker cranes;
- Shuttle systems;
- RGV systems;
- Conveyor technology;
- MFS and interface to the WMS of the Client.

In general, the overall system must be represented. Abstractions should only be provided in consultation with the Client.

All working sessions with the partner for the simulation are to be logged. Protocols shall be submitted to the Client promptly.

Results are to be prepared visually and in compressed understandable form for the Client.

In the following intermediate steps, releases must be obtained from the Client during the execution of the simulation after submission of the relevant documentation:

- Data basis;
- Extrapolation model based on actual data and extrapolation parameters (quantities, structures);
- Model description including:
    - Required evidence and objectives of the simulation;
    - Database of the Client used as a basis;
    - Explanation of the method of extrapolation;
    - Selected stepwise abstraction model (if applicable);
    - Scope of the simulated systems;
    - Detailed description of the technical systems, conveyor technology processes etc. considered;
    - Strategies (e.g. storage, removal and picking);
    - Higher-level strategies and control algorithms of the MFS;
    - Parameters to be defined manually for the simulation runs;

- Basic model;
- Experiments and sensitivities;
- Optimizations;
- Optimized model.

Basically, inputs into the simulation have to be parameterized in order to allow e.g. adjustments to manual process flows and / or to adapt services.

The bidder is asked to consider and present at least the following information in their bid:

- Proposal for the procedure (e.g. schedule, workshops, creation of model description, model verification, etc.);
- In which steps is the simulation run and how much time is likely to be required for these steps and overall;
- Data requirements (e.g. time period, level of detail, form of transfer, generation of initial inventory, order structures, master data, extrapolations, etc.);
- Proposal for the format of the system parameters (capacities / throughput, process times, etc.);
- Suggestions for abstraction (if necessary);
- Proposal for the form of presentation of the evaluations;
- Documentation / presentation of the implemented strategies;
- If necessary, comment on the planned animation.

The contractor has to eliminate the identified bottlenecks or weak points in a cost-neutral manner and adapt them in the execution planning, transfer any necessary optimisations to the execution planning and implement both accordingly.

The selected partner for the simulation must be stated in the offer and documented with references. The Client reserves the right to reject partners.

6.5. Emulation

With the emulation, the material flow functions / the functionalities of the MFS are to be tested under realistic conditions at a time when the system is not yet available, almost parallel to the software development.

Within the framework of the test and start-up procedure, the Logistics Contractor has to prove by means of emulation before the start of the actual planned tests that all strategies, functions and messages described in the Logistics Contractor's IT specifications as well as at the defined reporting points in the interaction between the PLC / MFS and the WMS of the Client are error-free. The emulation comprises the entire material flow system HBW, Picking Gallery, each incl. pre-zones, picking zones and buffers, related processes with usage of forklifts and other MHE-equipment as well as the connection to the existing warehouse.

The Logistics Contractor is requested to carry out their manufacturer-specific emulation, they must explain the procedure. In addition, it must be shown whether for the animation layer of the emulation the simulation to be offered is integrated into the animation of the emulation or whether a separate representation is selected by the Logistics Contractor.

The expenses for the emulation must be shown separately but have to be integrated into the total price for the whole project.

For this purpose, the contractor must provide appropriate software tools and generate the required test data according to the Client specifications.

6.6. Courses and training

6.6.1. General Requirements

Trained personnel is absolutely necessary to maintain storage operations. The scope of duties of these personnel includes the IT-supported operation of the automated systems such as stacker cranes, RGV system, shuttle systems, conveyors and the MFS as well as upkeep and maintenance work.

Care and maintenance by the personnel are important, since short reaction times are decisive in the event of faults occurring during operation (and these reaction times can only be achieved by personnel working on site) in order to guarantee a high level of system availability.

Since the work in the warehouse involves a wide variety of activities, the work is divided into activity classes in order to derive the necessary requirement profiles for the personnel to be employed in the material flow system.

The comparison of the requirement profiles with the actual abilities and skills of the personnel in the current Client location immediately shows the necessary training requirements for the future desired effective operation in the warehouse.

Since it can be assumed that the personnel have only limited or no knowledge in handling storage and conveyor technology, correspondingly extensive, systematic training courses must be carried out. The training contents must be planned, coordinate and carried out by the Logistics Contractor with the involvement of the personnel management of the Client.

The system administrators of the Client and a core team of employees must be thoroughly trained by the contractor. If the Client deploys external service providers for operation and maintenance, the same also applies to these personnel. The training objective is achieved, when the trained employees are able to independently master the tasks assigned to them. The training courses are carried out by the Logistics Contractor according to the principle: Demonstrate, participate, imitate based on self-explanatory training documents. The training progress is to be checked and documented by means of training protocols. Prerequisite for the start of the training is a successfully completed proof of function.

In addition to the preparation and execution of the training, the scope of services of the Logistics Contractor includes the handover of the necessary documents, operating instructions in at least three paper copies and electronic form. The documents are to be provided in English and Polish language.

The Client is entitled to have the trainings/instructions repeated four times in a period of 2 weeks free of charge for the Client, if the success is achieved.

The training is executed in Polish language. English can be considered but always with Client approval

The contractor has to take a 3-shift operation into account when evaluating the training effort.

The contractor has to document the completed training for each trade and have signed by the training participants.

The contractor must integrate the Client´s maintenance personnel and the Client's system specialists into the project at an early stage and provide all necessary information for operation and independent operation already during installation and commissioning.

6.6.2. Requiredprofiles

	Job category		Requirement profile
Warehouse Operation	**"Warehouse Administration"** Planning goods movements	1.	Operate dialog programs for scheduling and monitoring warehouse operations at the monitor workstation.
	"Operative" Execute goods movements	2.	Dialog programs for transport; operate systems; put-away and picking dialogs
Warehouse Maintenance	**"Maintenance Personnel"** Maintenance of mechanical and electrical components of storage and conveyor systems; maintenance of subordinate controls	3.	Identify faulty system parts and elements; rectify faults; clean, grease, replace mechanical system parts according to service manuals or visual / auditory inspection or commission an external service provider; maintain plant control / individual group controls according to service manuals
IT Support	**"System Administrator"** Maintenance of IT components for storage and conveyor technology	4.	Configure hardware and software, Operate diagnostic programs at the system workstation, analyse and evaluate messages from the system; Correcting failures or initiating external services

Table 6-1: Requirement Profiles

Requirement profiles 1: "Warehouse Administration"

The staff must have precise knowledge of the new logistical processes. In particular, detailed knowledge of the strategies implemented in MFC and the WMS is required. This includes, for example, the targeted definition of strategy parameters with the help of dialogue programs specially provided for this purpose as well as the initiation and monitoring of immediate stock removals.

Requirement profiles 2: "Operative"

The staff must operate the storage and conveyor systems as well as dialogs for put-away and picking. This includes IT-supported processing of transport processes with the help of dialogue programs. This work is done either with a mobile terminal / handheld (if necessary) or with computer workstations.

Requirement profiles 3: "Maintenance Personnel"

In addition to the cyclic maintenance and care of the mechanical system components, the personnel are responsible for the immediate elimination of mechanical malfunctions during operation.

This includes e.g. the straightening of tilted grids on the conveyor lines; adjustment / tensioning of supporting chains, rollers etc.

Further tasks are the maintenance of the actuators, sensors of the warehouse conveyor control system as well as the subordinate control system (e.g. PLC) in live operation and the elimination of minor malfunctions in this area.

This includes, for example, deleting / setting assignments, setting PLC parameters such as stopping times, threshold values etc.

Requirement profiles 4: "System Administrator"

The staff is responsible for the upkeep and maintenance of the IT-systems in the warehouse. It supports the persons in requirement profiles 1 and 2 if they have problems using their dialog programs. To this end, the staff of requirement profile 3 must be able to distinguish operating errors from hardware/software errors.

In the case of operating errors, the staff points out the correct handling of the dialog programs and helps to correct incorrect data (e.g. incorrect picked quantity entered) on the MFS and in the WMS. The staff uses special correction dialog programs for this purpose.

For hardware/software error detection, personnel use special status display and failure analysis programs. For this purpose, the staff must have detailed knowledge of the hardware and software. In particular, knowledge of the hardware components, operating systems, databases and data structures used is indispensable. With this knowledge, the staff is in position to react quickly and flexibly to errors that occur and to fix minor errors on the MFS and the WMS quickly and independently. Only in the case of serious error conditions does an external service provider have to be called in to fix the error.

6.6.3. Training content

Requirement profile 1:

- Material flow strategy concepts implemented in the MFS and the WMS;
- Connection to higher-level systems;
- Handling the dialog programs developed for this requirement profile;
- Operating the hardware of the monitor workstation;
- Training contents of the requirement profile 2.

Requirement profile 2:

- Processes of storage and picking;
- Procedures for initiating transports;
- Handling the dialog programs developed for this requirement profile, if applicable;
- Operating the hardware of the monitor workstation.

Requirement profile 3:

- Structure of the mechanics of the material flow control system;
- Maintenance of the mechanics of the material flow control system;
- Troubleshooting (error analysis, troubleshooting);
- Sensors / actuators (e.g. light barriers, contactors);

- Hardware structure of the control system; drive control, PLC control;
- Plant control / individual (group) controls (e.g. control sequence, bus systems, function, programming) incl. interfaces to MFS and fault analysis system;
- manual system operation by hand on site – consoles;
- Operation, evaluation, protection conveyor system closures system;
- Access security concepts;
- Maintenance and updating of documentation.

Requirement profile 4:

- Computer hardware (bus systems, peripherals);
- Networks (topology, protocols);
- Operating systems (operating modes, system start-up, shutdown, commands, shells);
- Databases;
- Backup systems;
- Security concepts in MFS and WMS (e.g. hardware: UPS, RAID10 / software: user rights, passwords);
- Structure and function of the data structures in the MFC and WMS;
- Handling of programs and equipment for maintenance, repair and care;
- Care and updating of documentation;
- Training contents of requirement profile 1 (except material flow strategy concepts in the warehouse).

6.7. Availability

6.7.1. Framework conditions

The Logistics Contractor must demonstrate an overall availability of at least 98 % for the overall system - mechanics / PLC's, MFC and in connection with the WMS of the Client.

The calculation of the availability of the warehouse, stacker cranes, shuttle systems, RGV vehicles, conveyors and control technology is based on the FEM guideline 9.222 and VDI 3581.

Both physical conditions (e.g. pallet stuck - runtime error) and the MFS or WMS interface errors attributable to their function are relevant for the downtime of a subsystem or element.

System downtimes caused by systems outside the responsibility of the Logistics Contractor are not taken into account.

The weighting factors for the downtimes of the subsystems or each element or individual functional groups are based on their functional frequency in relation to the total functional frequency (e.g. as a function of the material flows in % of the total material flow).

6.7.2. Availability and performance

The contractor has to prove the availability requested above based on the availability model; this model will be prepared by Metroplan and discussed in the negotiation round. The Logistics Contractor can make a proposal for the model in their offer.

In conjunction with this availability model the Logistics Contractor must prove an overall performance and performances for subsystems shown in the performance model.

6.7.3. Test and start-up procedures

6.7.3.1. Overview of the test and start-up phases

The complete start-up and all tests described below are scope of services of the contractor. The entire test / start-up / acceptance procedure must be prepared by the Logistics Contractor and carried out in accordance with the procedure described below. The expenses for this shall be integrated into the total offer price.

Detailed testing and acceptance procedures will be stipulated and discussed during tender negotiations.

The Logistics Contractor has to coordinate the requirements regarding the required test material with the Client in good time. The test conditions adapted to the general conditions must be determined in advance and approved in writing by the Client.

In order to ensure a smoothly put into operation of the warehouse, it is necessary, that the individual components of the overall system in the mechanical and controlling part are first tested individually and then as an overall system (bottom-up test procedure). The following hierarchical test setup is used for this purpose:

Technology

- Inspection of the installation (quality of the mechanical and electrical design) of the storage and conveyor technology (incl. switch cabinets and cabling), rack construction, platforms and steel construction etc.;
- Partial, performance and functional tests technology for individual automatic MHE-elements in connection with the subordinate control (PLC) of the contractor;
- Integration and function tests technology within the warehouse and conveyor technology and MFS without connection to the WMS.

IT

- Partial / functional tests IT, test of individual programs / program modules of the MFC and WMS, interface tests between programs / program modules (partial tests), following the completed tests of the lower MFS level including storage and conveyor technology, the coupling with the separately tested WMS of the Client takes place;
- Integration / function tests IT;
  After completion of the above-mentioned tests for all IT components, these are tested in the overall interaction (integration test; mass test);
- Test of the interface between MFS and WMS and ERP system.

Technology & IT

- Integration tests (e.g. mass tests) between storage, conveyor and control technology (MFS) and the WMS of the Client;
- Performance and availability proof before start of trial operation;
- Trial operation of all functional areas or functions with MFS and WMS (communication of the adjacent IT systems with the WMS, e.g. the ERP software);
- Early proof of availability of all functional areas or functions with MFS and WMS (during trial operation);
- Performance test of all functional areas or functions with MFS and WMS (as part of the trial operation);
- Final availability check for the entire system (availability with full service);
- Overall acceptance of all storage and functional areas (complete material flow system of warehouse).

6.7.3.2. Logistics Contractor / Client test sequence

The tests are always carried out and documented internally by the Logistics Contractor first and tested by the Client or their representative after successful proof.

The Logistics Contractor must document the preparation, execution and evaluation of the Logistics Contractor tests. The Logistics Contractor carries out all test steps independently and informs the Client about the success status of the individual tests.

The Logistics Contractor hand over the documentation of the preparation (the prepared start-up checklists based on the agreed test program between the Logistics Contractor and the Client) to the Client before the beginning of the tests; the documentation of the test results must be handed over to the Client after completion of the test execution.

Together with the Logistic Contractor, the Client creates a test program for the individual Client tests. In accordance with this test program, the Client and the contractor shall jointly test the functionality and performance of the relevant scope of delivery and performance of the contractor. Each test result of tests by the Client or their representative is recorded in a test protocol.

No changes and access to the control or IT software (incl. parameters) may be made by the Logistics Contractor during the tests by the Client.

The Logistics Contractor has to provide adequate personnel to be present for all tests by the Client or their representative, which have been jointly scheduled in advance, who are qualified for the (cross-system) recognition and elimination of errors and who are authorized to make decisions (also with scheduling or monetary effects).

The tests by the Client or their representative will be repeated once the Logistics Contractor has reported the correction of defects to the Client in writing. After correction of defects tests by the Client or their representative have to be repeated from beginning.

6.7.3.3. Responsibilities for each test

The responsibilities in the individual test phases are clearly defined:

Task	Responsibility
Definition of test cases and test scenarios - Developer Tests (FAT) - Component testing - Partial tests - Integration tests - Performance tests	contractor -> Client control only Logistics Contractor with the Client
Provision of test material - Labels, load carrier with products, data etc.	Client
Execution of the tests - Developer tests - Component testing - Partial tests - Integration tests - Availability tests - Performance tests	 Logistics Contractor -> Client control only Logistics Contractor with the Client
Reconciliation of test results (documentation)	Logistics Contractor with the Client
Provision of test-staff The contractor and the clint are responsible for the provision of own rest resources.	Logistics Contractor with the Client

Table 6-2: Responsibilities for each test

The Logistics Contractor has to provide the Client the necessary tools for the tests, e.g. interface- / system-emulators, test programs, order generator etc.

6.7.4. Test phases

The details of the test phases are described below.

6.7.4.1. Premature proof of function for key trades

Key trades are defined as components which, due to their complexity or warehouse relevance, are essential for the function of the overall plant. Key trades are defined during the quotation phase, but at the latest in the execution planning. As a rule, special machines and machines under special conditions are defined as key trades.

The aim of early proof of function is early confirmation and assurance of the function of key trades in line with requirements.

The functional proofs can be carried out e.g. by

- Proof and / or inspection of reference installations;

- Construction of test facilities at contractor's site;
- If necessary, installation of test systems after consultation with the Client.

6.7.4.2. Partial performance and functional tests of the technology

After the Logistics Contractor has prepared parts of the respective subsystem and the overall system ready for operation, the functional tests are carried out in the area of mechanics and the subordinate control system.

The partial tests comprise function tests (documents, dialogues and functions/processes) and technical performance tests related to e.g. stacker cranes, machines, conveying technology, workstations, IT infrastructure on the Logistcs Contractor etc.

The partial tests will be carried out after joint agreement in such a way that individual areas can be tested by the Client (with Logistics Contractor support) after successfully proven partial contractor tests, while the Logistics Contractor tests further parts of the system.

Ready for operation means that at least all mechanical functions in connection with the associated subordinate control can be tested via an appropriate test tool or test program.

The test tool or test program must be designed in such a way that the interface functionalities to the subordinate or connected subsystems can be tested.

The test environment includes a protocol system for data flow tracking or documentation of the test process in its individual steps.

The test tool is to be designed in such a way that control commands of the technology segments can be given to the conveyor components. The implementation of these commands must be controllable and verifiable (e.g. via a programming device).

The reaction of the technology segment control to signals from the mechanics must also be able to be tested and verified in detail.

The testing of the functionality on message level in the network within the respective technology segment has to be guaranteed.

Within these functional tests, performance tests relating to the individual system components are also carried out (e.g. stacker crane, monorail cycles); the basis for these performance tests are the specified throughput requirements.

The test material is provided by the Client. The partial tests technology / mechanics, incl. subordinated control, are divided into areas that make sense for materials handling. Details will be jointly agreed in good time before the start of the test.

The test for a function is aborted if the function is impaired and this impairment cannot be remedied by additional operating actions (of the warehouse operatives or system administrator).

The termination criteria will be agreed by the Client with the Logistics Contractor prior to the start of the test. In case of abortion during the partial tests, the failed tests must be repeated starting with contractor tests. Client´s tests are only repeated when the contractor has reported the correction of the defect to the Client.

6.7.4.3. Integration / function tests Technology

At the beginning of the integration test phase (or already during the partial tests), the Logistics Contractor, with the support of the Client performs subordinate (i.e. without WMS) mass tests at subsystem level in accordance with the contractually agreed maximum system throughput in order to prepare the system for the final integration tests with WMS. The system is tested at subsystem level for the necessary performance verification.

6.7.4.4. Partial / functional tests IT

The IT system is used to control the logistics processes in the warehouse. Due to its complex structure, a coordinated start-up procedure is indispensable, which includes several levels of complexity and a defined sequence for the integration of the MFS, WMS and the adjacent IT systems. This must be closely coordinated with the Client.

In order to test the interaction of IT components between the IT system levels (see VDI 3962 - Functional Levels), the first step is in principle to start with element control / technology, then to continue with group controls together, then to add the WMS, and finally to fully implement the entire IT system including interfaces to the ERP in connection with the technical systems.

Parallel to this "bottom-up" procedure, the administrative IT segments of the MFS and the WMS are checked for themselves in individual and (module) integration tests by the Client for compliance with functionality / quality and performance.

In the start-up procedure, several test versions can be available for each IT component in a test environment and one version in the configuration environment (of the current configuration) in the IT system.

The test environment contains IT components that have already been tested for themselves, but still have to be tested for their functionality in interaction with other IT components and with simulation tools, e.g. also by the user / end user, and the versions of the IT components that have already been transferred to the configuration environment.

The inclusion in the test or configuration environment and the test results must be documented in each case and communicated directly to the Client.

The MFS and WMS programs and interfaces are tested by the Client at the Logistics Contractor. For this purpose, the contractor shall provide appropriate premises.

The coupling tests with the technical systems are carried out on Client´s site after completion of the tests at the lower MFS level including storage and conveyor technology.

6.7.4.5. Coupling tests WMS / MFS

In this phase, the Logistics Contractor must demonstrate that the interface to the adjacent IT systems implemented by its functions in accordance with the specifications made in the requirements specification.

The Logistics Contractor has to define suitable WMS transmission test data in cooperation with the Client. In particular, it shall be verified that the implemented interface does not represent a performance bottleneck for the data transmission between WMS and MFS.

6.7.4.6. Coupling test WMS - ERP-system

In this phase, the Logistics Contractor has to demonstrate that the interface to the adjacent IT systems implemented by its functions in accordance with the specifications made in the requirements specification.

The contractor must define suitable WMS transmission test data in cooperation with the Client. In particular, it has to be verified that the implemented interface does not represent a performance bottleneck for the data transmission between MFS, WMS and ERP- systems.

6.7.4.7. Integration / function tests Technology and IT

The prerequisite for the integration test is that the previous test and integration steps for the mechanics and control of the warehouse / conveyor technology (MHE), but also for the functionalities on the MFS and WMS, including the interface to the adjacent IT systems, have been successfully completed and that the operating personnel has received adequate training.

Faults must be automatically logged via the failure analysis system of the MFS.

In accordance with the specifications and test targets defined by the Client and based on the test program specified by the Client, the contractor must prove that the operational systems are installed in conjunction with the MFS and its components in a performance and functional manner.

Since realistic data is to be used (e.g. past actual data for the orders, etc.), precise coordination between the contractor and the Client is required in advance.

The test material is provided by the Client in consultation with the contractor. The Client accompanies the test for the first time with their own personnel (instructions and training must be completed beforehand).

The integration test includes the entire warehouse / conveyor systems and the entire IT systems, including the adjacent IT systems (WMS and ERP).

At the end of these individual test phases, mass tests will be carried out in accordance with the contractually agreed maximum system throughput to prove the proper performance of the individual and overall systems under load.

The IT also checks the provision of the necessary transmission capacities/services between the IT systems involved.

During the integration test, the contractor has to keep adequate personnel on site to be able to solve interface problems at short notice.

After successful completion of the integration test, a protocol shall be drawn up and the system (or parts of the system) shall be put into trial operation (use of the system by the Client without acceptance). The preparation of the protocol is the responsibility of the contractor and must be approved by the Client.

6.7.4.8. Proof of performance and availability

The following table shows the test prerequisites with regard to availability and throughput for testing the entire system:

Criteria	Integration test (before start trial operation)	Advance proof of performance and availability	Final proof of performance and availability
Availability	>50 %	>93 %	>98 %
Throughput	>40 %	>80 %	100 %

Table 6-3: Target criteria of the test and start-up procedure

Both criteria (availability and throughput) must be fulfilled for the individual tests, i.e. in the integration test, for example, the availability of the overall system must be at least 50 % and the throughput of the overall system at least 40 % in order to be able to start trial operation.

6.7.4.9. Proof of performance and availability before start of trial operation

The basis for starting the trial operation is an integration test. In this test, the contractor must demonstrate an availability of at least 50 % and a throughput of at least 40 % for the entire system during 2 consecutive working days in 2-shift operation.

6.7.4.9.1. Advance proof of performance and availability in mass testing

The basis for the acceptance is an early proof of availability. In this test, the Logistics Contractor must demonstrate an availability of at least 93 % and a throughput of at least 80 % for the entire system during 2 consecutive working days in 3-shift operation.

The early proof of performance and availability takes place in the 3rd week after the start of the trial operation. For the proof of availability, the Client has to ensure that adequate orders for the MFS and WMS and correspondingly sufficient load carriers are available to achieve performance.

The basis for the early proof of availability is the availability model to be created.

The basis for acceptance is a performance test in which the contractor proves the agreed maximum throughput of the material flow system.

The performance test takes place 2 weeks after the start of the trial operation. The performance per system shall be demonstrated over a period of at least 2 hours, that of the entire system over a period of at least 8 hours.

The disturbance times occurring during the performance test shall not be reduced in the performance measurement, i.e. the actual throughput rates over the entire measurement period shall apply.

6.7.4.9.2. Final proof of performance and availability in mass testing

At the end of the trial operation (approx. 8 weeks), the final proof of performance and availability is provided. In this test, the contractor must prove an availability of at least 98 % and a system throughput of the entire system of 100 % of the orders transmitted by the Client in the period, but not more than the contractually agreed system throughput. The duration of the proof of performance and availability shall be 5 consecutive working days with 3 shifts each under the conditions of real live operation.

The Logistics Contractor must prove the required availability for his scope of delivery and services without and with interface to the adjacent IT systems. The calculation of the availability is based on VDI guideline 3581 and FEM 9.222.

The contractor is obliged to provide adequate personnel for this proof of performance and availability; this shall be considered in the offer price.

For the proof of performance and availability, the Client has to ensure that adequate orders for the MFS and the associated load carriers are available for the achievement of the performance.

If the final proof of performance and availability in mass testing has been successfully passed, the prerequisites for 100% effective operation are given.

6.7.5. Trial operation

The trial operation is only started if the Client has determined that the overall system has reached a performance and system safety (stability) which justifies the start of the trial operation.

The trial operation is characterised by the following features:

- the overall system has reached a largely trouble-free and stable state, which was proven by the successfully completed integration test;
- the entire system is operated in live operation with real goods;
- the training of the operating personnel has been completed.

Trial operation is carried out under normal operating conditions, with step-by-step power-up and step-by-step increase in stable plant behaviour.

The contractor is essentially entrusted with the following tasks within the framework of trial operation:

- Support of the operator personnel during familiarization and acclimatization;
- Support of the operator personnel in troubleshooting and fault rectification;
- Support of the operator personnel in setting up a database for recording typical faults of successfully performed troubleshooting measures (One-Point-Lessons).

During the trial operation, a detailed failure protocol is kept by the Client, from which the development of the overall system behaviour with regard to structure and performance is evident.

Any defects occurring shall be remedied by the contractor during trial operation.

The trial operation is carried out over a period of approx. 8 weeks. The trial operation can be shortened or extended by mutual agreement and depending on the overall system condition / behaviour.

Should the availability < 50 % or the throughput capacity of the entire system < 40 % be on average over 6 shifts during the trial operation, the Client has the right to interrupt the trial operation. The stability of the system availability as well as the throughput capacity must then be verified again with an advance performance and availability verification before the start of trial operation.

6.8. Troubleshooting

To support a high availability of the material flow system after successful acceptance, any malfunctions occurring which lead to standstill and/or impairment of operation, including remote maintenance, has to

be remedied at short notice by the Logistics Contractor. The Client's personnel or third parties contracted by the Client must always be actively involved in troubleshooting.

After the Client has reported the malfunction/error, the contractor must begin remedying the malfunction on site within 4 hours. The repair work must be successfully completed without interruption and delay. This applies to malfunctions which cannot be remedied by the customer's trained personnel.

In the area of control and MFS and WMS, work must be started immediately after receipt of the failure report via remote maintenance. The work must be completed without interruption or delay.

Maintenance and troubleshooting of the material flow system has to be free of charge to the Client within the warranty period.

6.9. Documentation

6.9.1. General documentation

The following documents are to be handed over 3 as hardcopies, as well as digitally on data carriers, according to the final state of realisation at the latest 4 week before total acceptance by the Client:

- Inventory drawings of the entire installed technical systems;
- General plans (1:200) / detailed plans on an appropriate scale;
- Technical data sheets for all elements of warehouse / conveyor / control technology;
- Electrical circuit diagram;
- Approval of components;
- Test certificates;
- Training certificates;
- Troubleshooting lists / documentation for troubleshooting;
- Wiring, installation and connection diagrams;
- Operating and maintenance instructions / manuals, incl. control technology;
- Wear parts/spare parts lists incl. price indication, delivery time and original spare part number of the manufacturer;
- For overall acceptance, the contractor must provide the Client with confirmation that the installation complies with accident insurance regulations and has been inspected thereafter;
- The acceptance certificate for the entire technical systems (conveyor systems, stacker cranes, platform constructions, etc.) from an expert / inspector according to Polish law as well as from the responsible offices analogous to the Office for Occupational Safety and Health, the Industrial Inspectorate;
- EC Declaration of Conformity and CE mark on the whole system;
- EC Directive Electromagnetic Compatibility (EMC);
- Software licenses;
- Spare parts catalogue – list of spare parts split into three categories (parts always in stock, catalog parts – easy available, special spare parts made to order).

All documents must be prepared in English and Polish. Any translation of documentation must be conducted by a translator, while certificates, official documents, and third-party statements must be prepared by a sworn translator.

The documentation has to be handed over in A4 folders with uniformly labelled spines, sorted with labelled dividers and tables of contents. The drawings are to be folded in DIN format and provided with hole reinforcers.

The electronic version of the documentation should be a consolidated document that takes into account relative paths to sections, chapters, and subchapters. The character limit for the path to the most nested file should be a maximum of 200 characters.

The electronic versions of the technical drawings should be provided in .dwg and .pdf formats. A drawing showing the fully connected automation installation in a 3D model should be extracted in .dwg and .ifc formats. Additionally, the model should be presented in isometric viewports from all four sides in .pdf format.

All documents must also be handed over on data carriers. The transfer formats (e.g. dxf, dwg, pdf format for drawings) must be agreed with the Client. Data sheet on system data.

Data sheet with information about:

- Date of manufacture;
- Machine number;
- Manufacturer;
- Key performance indicators,
- Energy consumption;
- Documents and required test certificates, concerning the purchased parts used by the contractor, e.g. equipment manual of a purchased servomotor.

All services and documents mentioned in connection with the documentation will not be remunerated separately; the costs thereof must be included in the offer price.

Without available and checked documents the total acceptance can be refused by the Client.

6.9.2. Documentation on information technology

The contractor must document the scope of delivery and services for information technology (MFS and interface to the WMS of the Client) and control technology (incl. PLC level) in accordance with the structure and contents listed below and make them available to the Client both in printed form and on electronic data carriers (the data carrier format has to be agreed with the Client).

When submitting their offer, the contractor is requested to describe the type and manner of the IT documentation offered by them.

Backup files are a part of IT documentation.

6.9.2.1. Draft documents (specifications, design documents)

- General parameters (e.g. equipment- and time-requirements, priorities and sequences, processing accuracies, min / max frequency of signals);

- Interfaces (e.g. purpose, use, parameters, transfer directions, communication protocols, synchronization mechanisms, layouts of user interfaces, transferred data (description as under data management));
- Functions and processes (e.g. purpose / use, resources used, dynamic relationships with other processes, interfaces used, local and global data, constants, input and output data, connections to the operating system, control and data flows, algorithms for normal- and exception- / error-cases, initialization and finalization steps, pre- and postconditions, processing of global data and states);
- Data storage (e.g. tables, attributes, characteristics, relationships to other data elements, references to physical units and standardizations, referencing to modules and processes with regard to reading and writing accesses to the table attributes, plausibilities / integrities).

6.9.2.2. Implementation documents

- Information about the source code (e.g. file name, version and variant, editor / date, project name, short description, programming language, call command, with parameter list if necessary, in- / output data, global and local data, constants, calling modules / functions, called data (-banks and -tables), modules / functions);
- The deposit or transfer of source code for standard and individual software has to be regulated in accordance with the terms of the contract for work and services;
- Information on translator- / binder- / loader- / installation-procedures (e.g. execution instructions, associated result logs and cross references);
- Identification of tools (e.g. compilers, binders, scripts, installation routines etc., exact designation, manufacturer and version information);
- List of static addresses for all devices and modules in PLC net and subnets (MHE).

6.9.2.3. User manuals

- Instructions for application and operation (e.g. initiation, execution, execution options, user inputs, execution, expected outputs, relationships to other functions, scheduling, restart, monitoring procedures);
- Error cases (e.g. total number of possible error situations, error messages, error diagnosis options, troubleshooting measures, recovery / restart procedures).

6.9.2.4. Diagnostic manuals

- Diagnostic environment (e.g. required software tools, required computers and devices, other facilities and aids, provision of the environment, operation of the environment);
- Diagnosis (e.g. possibilities, tools - implementation, evaluation, results);
- Any error message (e.g. exact characteristics, meaning and context, measures to remedy, correct operation of the system, device, software; correct supply of necessary information, correct operation of the interfaces; necessary repair work on the system).

6.9.2.5. Operating manuals

- Structure of the function modules (for example, technical structure, function assignment);
- Measures for starting operation (e.g. prerequisites, initiation, resumption of operation);
- Measures for the execution and monitoring of operation (e.g. fault characteristics, avoidance of faults, elimination of faults);
- Measures to interrupt or terminate the operation (e.g. conditions, interruption of operation, termination of operation, aftercare);
- Other operating conditions (e.g. safety regulations, training, special features of installation and configuration options, data transfer, implementation and transfer strategy, further developments, operational organization, logistics, infrastructure).

6.9.2.6. License certificates

License documents for databases used in the MFC and all installed software (including PLC / HMI developing tools) are to be handed over to the Client.

6.10. Acceptance

The acceptance is based on the terms of the contract for work and services and the acceptance document drawn up between both parties, which has to specify the details. The time sequence must be integrated into the binding schedule.

The decision for acceptance by the Client extends to the examination of contract conformity, i.e. completeness, quality, function, performance, safety, reliability as well as the checking of ease of maintenance in the event of a fault.

The following further criteria must be fulfilled for acceptance:

- The contractor has requested in writing that the equipment be made available for acceptance;
- Successful completion of trial operation;
- Passed performance test;
- Passed early proof of availability;
- Passed final proof of performance and availability;
- Training of operator staff has finally been completed;
- At the latest 2 weeks before the date of acceptance, all documentation documents must be available for inspection by the Client;
- Maintenance and service for the unrestricted operation of the system is regulated by contract or is guaranteed by the contractor until a contract is concluded.

If services cannot be accepted due to existing defects, the Logistics Contractor is obliged to inform the Client immediately of the date by which the defects will be remedied.

Protocols of the named prerequisites for formal acceptance have to be made, which shall be signed by the contractor and the Client.

In connection with the performance of the trial operation, the Logistics Contractor is obliged, at the request of of the Client, to make his services available to the Client for use prior to acceptance. The Logistics Contractor's liability obligation for his deliveries and services will not be limited thereby.

6.11. Spare and wear parts equipment

6.11.1. Establishment of a spare and wear parts warehouse during the warranty period

In order to have access at all times to the most important spare and wear parts in the event of maintenance and malfunctions, the contractor has to deliver or keep available spare and wear part equipment as consignment stock from the start of trial operation accordingly.

The Logistics Contractor has to submit a package offer for the possibility of taking over the spare parts package after the warranty period (valued in Euro). This package offer shall be documented including the rough composition of the spare and wear parts package.

6.11.2. Detailing at the beginning of trial operation

Upon the start of the trial operation, the Logistics Contractor has to hand over to the Client a detailed list of the spare and wear parts equipment kept in the consignment warehouse, including details of each element with details of the original manufacturer and the original spare part numbers. The Client must be able to order spare parts directly from the manufacturers.

The spare / wear part list is to be made in the form of a tabular overview.

The space required for the consignment warehouse must be specified at the latest by this time.

The Logistics Contractor guarantees to supply the necessary spare parts for a period of 10 years.

Regarding the spare and wear parts equipment, the Logistics Contractor and the Client shall agree after expiry of the warranty which parts / elements has to be taken over by the Client.

The Client has to conclude a separate contract with the contractor regarding the composition and costs of the spare and wear parts package at the end of the warranty period.

6.12. Support, Service, Maintenance and Repair

6.12.1. Organisation operation and maintenance

With their offer, the Logistics Contractor must demonstrate the organisation of the maintenance / servicing for their scope of delivery. Detailed information is expected on the following points:

- Number of system administrators on site (shift operation);
- Total number of system administrators;
- Different qualifications of the staff.

6.12.2. Repair and maintenance Material flow system and material handling devices

For the systems listed below (incl. control technology), the Logistics Contractor has to submit repair and maintenance offers together with the offer for the material flow system:

- (Periodic maintenance and repair work in the event of malfunctions, unless rectified by trained personnel from the Client))
    - Stacker cranes HBW incl. the subordinate control system;

  - Shuttle systems Picking Gallery and outbound area incl. the subordinate control system;
  - RGV system incl. the subordinate control system;
  - Conveyor technology incl. the subordinate control system;
  - MFS and visualization system;
  - Material handling devices including pallet and tote lifts.

- Client requirements for periodic maintenance Information:
  - Maintenance content, work to be performed, divided into work that can be performed by the personnel of the Client and work that must be performed by the contractor's personnel;
  - service intervals;
  - Maintenance costs in hours or days per element / subsystem.

The service and maintenance costs, also during the warranty period, must be shown separately in the offer and detailed in the investment and operating costs. The Logistics Contractor shall also specify the hotline costs during and after the warranty period, specifying various service scopes.

After expiry of the warranty, the Client reserves the right to conclude a separate contract with the contractor based on the conditions set out in the maintenance and repair offer.

The Client places the following requirements on the failure rectification:

- Mechanical failure: Beginning of troubleshooting on site (in the case of failures that cannot be remedied by the Client's personnel):
  - at the latest 4 h after notification (in case of notification from Monday - Fr. 05.00 to 24.00 o'clock);
  - at the latest 5 h after notification (for notification from Monday - Fr. 24.00 to 05.00 o'clock);
  - at the latest 4 h after registration (with registration Sa. 05.00 - 22.00 o'clock);
  - at the latest 5 h after registration (with registration Sat. from 18.00 o'clock).
- Start of troubleshooting for control, MFS faults via remote maintenance facility immediately after the fault is reported. Work is not completed until the fault has been completely rectified.

The offers must contain at least the following information regarding maintenance / repair:

- Nearest service base;
- Max. Response times in the event of failures;
- Costs per time unit and skilled worker;
- Further conditions such as travel costs, surcharges etc.

During the warranty period, the Client will not pay for repairs / fault rectification in connection with warranty cases.

In addition, the Logistics Contractor has to submit an offer for operational support by the Logistics Contractor's maintenance and repair personnel for the warranty period, considering the shift system.

After expiry of the warranty, the Client reserves the right to conclude a separate service/maintenance and repair contract with the contractor on the terms and conditions stated in the offer.

All information provided by the Logistic Contractor on the above maintenance and repair offers must be documented.

6.12.3. IT maintenance and care

For the maintenance of the MFS and the subordinated systems, a maintenance contract, an update service contract or a software maintenance contract has to be concluded between the Client and the Logistics Contractor, depending on the component form of the MFS.

The contractor is requested to describe the type and form of the "IT maintenance and support services" offered by him.

- **Hardware**

  The conditions for a maintenance contract must be briefly described (conditions / prices).

- **Database software**

  The conditions (conditions / prices) for update service contracts are to be presented. Indicate whether the installation of a new version can be called up if required or whether it is a flatrate offer.

- **User software**

  If required, the Client will order specific extensions to the MFS-software.

The conditions (conditions / prices) for software maintenance contracts are to be presented - this once related to number of hours per year, which can be called up if necessary, and once related to a daily rate, which is valid with spontaneous order by the Client.

6.13. Information from the contractor

6.13.1. General information of the Logistics Contractor

The Logistics Contractor is requested to describe in detail the information required in the previous sections on the scope of supply and services offered in his offer. The required details are minimum details; designs and technical details for each subsystem offered may need to be added.

This is necessary in any case, as this information is included in the qualitative evaluation of the tender and in the evaluation of the scope of supply and services offered with regard to the quality of execution.

Alternative / optional bids requested in the sections must be listed and documented separately.

6.13.2. Bidder´s declaration on the offer

By submitting its offer, the bidder (contractor) declares that

- the tender documents have been prepared completely and correctly and have been checked by him in all parts;
- the services to be rendered are clearly defined and that the turnkey execution can be carried out without any gaps and without additional demands on the basis of the offer;
- he guarantees the flawless execution of the trades;
- by signing the offer, he recognises the entire terms and conditions of this request for offer;
- he has taken note of the basis and conditions of the offer and agrees to their validity in this version for work contracts yet to be concluded until revoked in writing.

(Company stamp)

…….., …….. ……

(Place) (Date) (legally binding signature)

6.13.3. Time schedule

The Logistics Contractor is requested to comment on the planned milestone dates and to submit its schedule based on the milestones set when submitting the offer.

The following project milestones are planned in accordance with section 1.2.7 "Project milestones":

Nr.	Milestone	Date
1.	Handover of final static and dynamic loads for the HBWP1 baseplate	06/12/2024
2.	Handover of guidelines for the installation of anchor boxes in the area of HBWP1	10/02/2025
3.	Final requirements for the power supply for the logistic technology	13/01/2025
4.	Final coordinated layout for the HBWP1 racking	13/01/2025
5.	Signed and approved technical design for HBWP1	07/03/2025
6.	Final requirements for the power supply for the repacking HMP3 with In-bound	13/01/2025
7.	Final coordinated automation layout in repacking HMP3	13/01/2025
8.	Final signed and approved design for the entire repacking HMP3	07/03/2025
9	Final requirements for power supply for the transport gallery GT	12/01/2025
10	Final coordinated automation layout in the transport gallery GT	12/01/2025
11	Final signed and approved design for the transport gallery GT	07/03/2025
12	Final requirements for power supply for picking gallery AMDP1	12/01/2025
13	Submission of picking gallery structural design	12/01/2025
14	Signed and approved technical design for picking gallery AMDP1	07/03/2025
15	Completion of installation of sequencer in existing warehouse HMP1	15/06/2026
16	Delivery of anchor boxes for HBWP1 to site	26/09/2025
17	Completion of installation of racking in HBWP1 (incl. Pre zones)	03/04/2026
18	Completion of installation of stacker cranes in HBWP1	15/05/2026
19	Completion of installation of conveyors in pre- zones	15/06/2026
20	Early access for installation of picking gallery	25/06/2026
21	Completion of installation of picking gallery (all systems)	28/10/2026
22	Completion of installation in transport gallery GT	15/06/2026
23	Finalisation of functional tests of HBW, repacking, GT & sequencer	19/08/2026
24	Finalisation of functional tests for conveyor technology incl. High level control system (HBW, Repacking, GT, sequencer, excluding picking gallery and tote conveyor)	09/09/2026

25	Finalisation of performance test stacker cranes and conveyor technology, incl. material flow computer (excluding AKL & tote conveyor)	23/09/2026
26	Interface test MFC and WMS	23/09/2026
27	Finalisation of functional tests incl. high level control system and material flow computer for picking gallery and tote conveyor	16/12/2026
28	Finalisation of integration test warehouse / conveyor technology / MFC with higher level WMS	16/12/2026
29	Performance test- all installations / MFC and WMS	21/01/2027
30	Pre acceptance tests (%Throughput / %Availability)	28/01/2027
31	Go-Live (X% throughput) / Start of Ramp-up phase	28/01/2027
32	Final Acceptance Test (100% Throughput / 98% availability)	01/04/2027
33	Final Acceptance & 100% Operation	12/04/2027

Table 6-1: Project Milestones

6.13.4. Project team

The Logistics Contractor is requested to name the employees he intends to use for this measure. This includes at least the following information:

- Function in the project;
- Designation by name;
- Qualifications;
- Reference projects.

6.13.5. References

The Logistics Contractor is requested to name its references that are comparable to this project in terms of complexity.

The Logistics Contractor is requested to name its references for the key trades defined in the form that are comparable in complexity to this project, stating the following:

- Company of the customer;
- Location;
- Year of commissioning;
- General contractor status, if applicable;
- Description of the scope of delivery and services;
- General contractor scope, if applicable;
- Contact person at the company of the customer.

6.13.6. Technical specifications

The Contractor is requested to provide technical information on the required options and secondary offers for all trades to be supplied and commissioned by it under this invitation to tender.

This information relates in particular to the loads on the floor slab (racking systems and stacker cranes) resulting from the technical systems offered, the planned form of fastening the racking and conveyor technology to the floor slab or the platforms, the energy consumption of the automatic systems, the design of the collision protection in the area of traffic routes, the design and layout of the steel platforms put out to tender and the respective suppliers for the various logistics systems.

The Contractor is requested to document the offered components of the scope of delivery and services in addition to the descriptions by enclosing the relevant documents (manufacturer or supplier, performance, drawings and design or type).

6.13.7. Information on the implementation conditions

The Logistics Contractor is requested to clearly and comprehensibly document the requested contents and information from chapter 6.11 in his offer; this includes, among other things

- Inspection intervals and work to be carried out;
- Inspection costs in hours or days per shelving system;
- Nearest service centre;
- Response times for repairs;
- Costs per time unit and specialist;
- Other conditions such as travelling costs etc.;
- Prices for maintenance and repair work per automated system.

6.13.8. Information on the prices

The Logistics Contractor is requested to state its investment and operating costs for all trades to be supplied and commissioned by the Logistics Contractor in chapter 3, including details of the required options and the costs for training and regularly expected operating costs in the following structure:

- Compilation of unit prices:
    - The Logistics Contractor shall list the individual prices for each scope of delivery and service.
    - Alternative offers and options must be listed separately.
- Total price compilation:
    - The totals are calculated using the Excel calculations already stored.
    - Separate total price summaries are to be submitted for the alternative offers and the options.

All prices must be quoted in net € for each item listed with number and price per unit.

7. Appendix