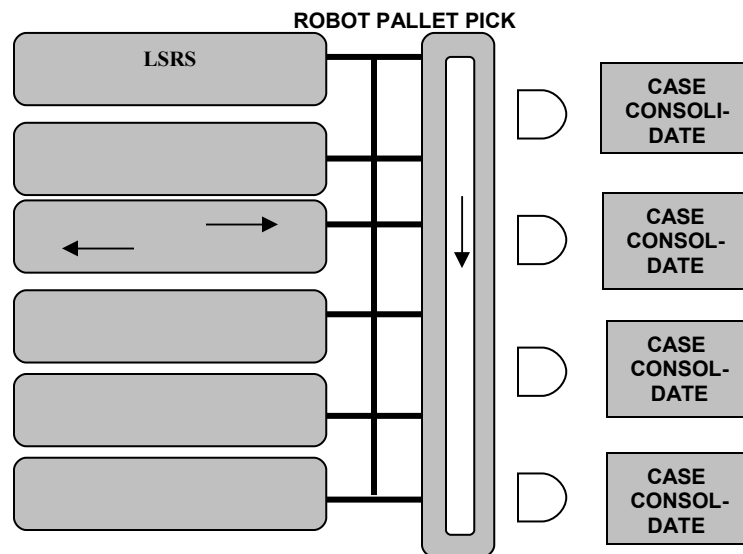


SEMI-AUTOMATED MATERIALS HANDLING SYSTEM

CASE AND PALLET LSRS PICKING SYSTEM WITH ROBOTICS

AUTO PALLET PICK AND MANUAL CASE CONSOLIDATE CONCEPT



INDUSTRIAL ENGINEERING AND MATERIALS HANDLING EQUIPMENT BUDGET COST PROPOSAL

**JD GRAY ASSOCIATES
CONTRACT INDUSTRIAL ENGINEERS**

**CASE AND PALLET SYSTEM WITH ROBOTICS EQUIPMENT AND
ATTENDANT INDUSTRIAL ENGINEERING SERVICES**

A semi-automatic materials handling system typically has space savings of 30%. At \$5 per square foot per month an annual space savings of \$1,980,000 would be realized.

Here are the work elements of a time study for a case picker. Approximately 75% of these work elements will be automated with the illustrated materials handling system. An overall labor projection gain for all job codes is 60%. At \$10 per hour an annual labor savings of \$800,000 is feasible.

WORK ELEMENT	ELEMENTAL TIME	STATUS
READ HAND COMPUTER FOR NEW PALLET LOCATION	0.075	AUTOMATED
PALLET JACK FROM STAGING LANE TO ROOM - AISLE – PALLET RACK.	.008	AUTOMATED
SCAN LABEL OF PALLET RACK	0.003	AUTOMATED
FIND CASE ON STORAGE PALLET.	.030	AUTOMATED
VERIFY ITEM DESCRIPTION (CASE ID ON PALLET VS HAND COMPUTER).	.030	AUTOMATED
VERIFY CASE QUANTITY.	.028	AUTOMATED
REMOVE CASE (S) FROM STORAGE PALLET AND PLACE ON ORDER PALLET.	.130	.130 (MANUAL)
READ HAND COMPUTER FOR NEXT CASE LOCATION.	.075	AUTOMATED
	.293	
TRANSPORT PALLET TRUCK TO NEW CASE LOCATION	0.139	AUTOMATED
WRAP PLASTIC AROUND FULL PALLET LOAD	0.006	AUTOMATED
PRINT LABEL AND APPLY TO PALLET LOAD	0.004	AUTOMATED
TRANSPORT PALLET LOAD FROM (ROOM 3 – AISLE 3) WITH PALLET JACK* INCLUDES SCANNING ID OF STAGING LANE.	0.008	AUTOMATED
TOTAL	.536	.130
SAVINGS		75%

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When comparing the total 35% savings of \$2,780,000 versus the total cost of \$2,707,600 a 11.7 month payback is achievable.

We will customize your products and job codes to a semi-automated case and pallet, pick and pack system. JD Gray Associates requires six (minimum number for contract) different job codes to prepare and cost our industrial engineering service proposal. Our services will include 1) time study, 2) line balance, 3) work station instructions, 4) layout, 5) visual aids, 6) training, 7) implementation). In addition we will perform the 8) final equipment specification and quote submission to vendor, 9) analysis of pallet utilization in existing pallet racks 10) critique of case and pallet order demand vs. JIT, 11) examination of a live storage and retrieval carousel maximum output versus throughput capacity with job code time synchronization.

Our proposed semi-automated case and pallet, pick and pack system - will incorporate the labor savings or output gain of our standards and methods program, our paced system and our semi-automated cells dependent on what level of labor controls you now have in-place.

The semi-automatic materials handling system illustrated and costed will process approximately 1000 pallets on 500 bi level pallet racks. The later will be mounted on precision indexing live storage and retrieval carousels and pallets removed by insert/extract programmable robots.

Generic job functions or codes include truck unloading, pallet sku breakdown, pallet put-a-way, pallet pick, case pick and truck loading.

One year is estimated for all equipment to be specified, quoted, manufactured and installed. Our industrial engineering services will support that time frame. We will also develop a monthly phased plan and layout to relocate existing pallet racks during the transition period while maintaining order continuity.

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Industrial Engineering Proposal

Semi-Automated Materials Handling System

Case and Pallet, Pick and Pack System With Robotics

Service Activity	Fee for each Existing Job Code	Number of Job Codes	Service & Fee Selection
Work Measurement	\$1,800	6	\$10,800
Line Balance	\$1,200	6	\$7,200
Final Case and Pallet Pick and Pack & Storage System (LSRS) Equipment Specification/Quote	\$1,100	6	\$6,600
Pallet Utilization Determination in Existing Pallet Racks. Case and Pallet Order Demand vs. JIT Critique	\$1,200	6	\$7,200
Develop a Monthly Phased Plan and Layout to Relocate Existing Pallet Racks during the Transition Period while maintaining Order Continuity.	\$1,000	6	\$6,000
LSRS maximum output vs. Thru put capacity with various Job Code Line Balances	\$1,500	6	\$9,000
Work Station Detailed Layout	\$1,800	6	\$10,800
Work Station Visual Aids	\$1,500	6	\$9,000
Departmental Layout	\$ 600	6	\$3,600
Final Job Code Detailed Description	\$ 600	6	\$3,600
Work Station Instructions	\$ 900	6	\$5,400
Group Leader Training	\$ 600	6	\$3,600
LSRS System Set-up	\$1,000	6	\$6,000
LSRS System Installation	\$1,700	6	\$10,200
LSRS System Follow-up	<u>\$1,500</u>	6	<u>\$9,000</u>
Industrial Engineering Fixed Price	\$18,000	6	\$108,000
Expenses - Travel and Per Diem for Three Weeks Onsite Data Collection	Travel Expenses Prepaid by Client		Travel Expenses Prepaid by Client
Expenses – Travel and Per Diem for Three Weeks Onsite System Installation	Travel Expenses Prepaid by Client		Travel Expenses Prepaid by Client

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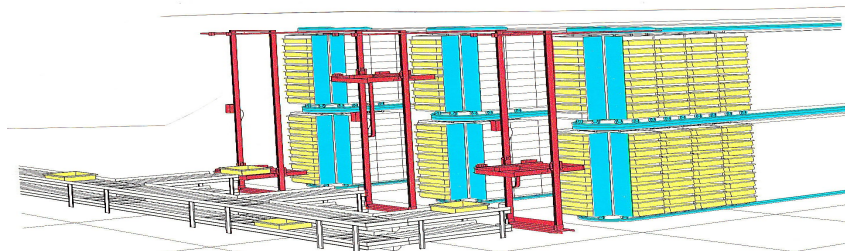
EQUIPMENT COMPONENTS AND BUDGET COST

LIVE STORAGE AND RETRIEVAL CASE CAROUSEL – Top drive carousel for standard and light duty applications controls. Fifty-six bin unit, 20 inch bin depth, 85 inch bin height and 24.5 inch bin width, with adjustable dust free wire shelves on varying spacing, overall bin height including single yoke is 104.15 inches, shelf rating of 75 lbs, shelf spacing six inch standard. Each bin includes lighttree visual and scheduling programming devices. – One Installed Unit - \$85,000



INSERT AND EXTRACT ROBOT - Parallel jaw gripper, variable servo-controlled gripper clamping pressure, precision linear bearings on gripper clamp and reach axis, all electric operation, spring-set platform holding brake, chain break sensors and catch brakes on masts, over-speed sensor, path-clear sensors, automatic chain take-up, powder coat finish, stainless steel bed and software controls – Three Installed Units - \$330,000. Track and software link to other LSRS for three units - \$150,000. Total \$480,000

Horizontal carousels + I/E robots



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LIVE STORAGE AND RETRIEVAL PALLET CAROUSEL – Bottom drive carousel for Heavy duty applications controls. 100 foot units each containing 50 platforms with a 2 level pallet rack or 100 pallets per carousel – Ten Installed Units @ \$150,000 each - \$1,500,000.

Total carousel pallet storage - 1000



CAROUSEL SOFTWARE SYSTEMS

WAREHOUSE EXECUTION SYSTEM

Changes the traditional architecture of warehouse and distribution software while optimizing labor and equipment to achieve higher productivity, reduced capital expense and improved return on investment.

Carousel Software for voice, light, wireless fulfillment manages the light, voice, or wireless based order fulfillment tasks necessary to provide outstanding performance.

INVENTORY MANAGEMENT SOFTWARE SYSTEM

Tracking the storage and order picking of all items in the system. It controls the Horizontal Carousels and associated equipment, such as light trees, sort bars, and scanners. It manages the order picking process in a manner that increases productivity and efficiency. It controls and optimizes Horizontal Carousels and Automatic Inserter/Extractor. It receives messages from a host computer that describes the type of operations to be performed. Using this list along with the real time status from the rest of the system, it optimizes the equipment to perform the work in the most efficient manner possible. It customizes numerous settings for each operator, enabling restricted tray locations, assigned tray locations, password protected tray numbers, user-defined delivery heights and many other personalized functions. It ties together all software packages and acts as the interface to the conveyor control system.

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LIVE ROLLER PALLET CONVEYOR - Live roller estimate of 800 linear feet at \$300 per foot or \$240,000 installed.



AUTOMATIC STRETCH WRAPPER - Up to 200 loads per hour. Installed budget price for one unit is \$300,000



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HORIZONTAL CAROUSEL (LSRS)

An automated storage and retrieval device consisting of a series of shelving sections (bins) mounted on a horizontal, closed-loop oval track. When activated, the bins rotate to bring requested items to the operator or automated picker.

Bottom Drive Carousel

Bottom drive carousels are horizontal carousels engineered for larger live loads and heavier duty cycles.

Twin Bin Carousel

Twin bin horizontal carousels are suited for small part picking applications requiring higher density, selectivity and throughput.

Top Drive Carousel

Top drive horizontal carousels are designed for standard and light duty applications.

Pallet Carousel

Pallet horizontal carousels store heavy-duty pallets for picking, buffering, and building split-pallet loads.

SAVINGS

Labor Productivity

Gains up to 800% over the use of conventional shelving and racks are accomplished by eliminating wasted walk and search time.

Inventory Accuracy

By providing accurate and timely inventory data, both the inventory levels and shortages can be reduced dramatically

Space Reduction

The carousels recover lost floor space by achieving the same storage capacity in *30% less space* than with static shelving.

Fast Payback (ROI)

Increased efficiencies allow companies to *recover their investment within 12-18 months*.

High Throughput

Picking rates up to 500 lines per hour, per operator allow *a single worker to be as productive as eight workers* picking from static shelving.

Extended cut-off times

Orders can be prioritized by computer based on shipping times and thus increases the ability to *ship more orders in a day*.

Improved Service to your Customers

Integrating inventory control software, light directed picking, and bar code scanning *assures up to 99.9% accuracy*.

Equipment Reliability

Durable and well engineered, carousels *provide nearly 100% uptime*.

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**A TYPICAL RETURN-ON-INVESTMENT
SAVINGS**

JOB CODE	CURRENT	PROJECTED	SAVINGS
LABOR			
Unload and Breakdown	10	7	3
Load	10	8	2
Put-A-Way	5	0	5
Pick Case and Pick Pallet	40	10	30
Total	65	25	40
Projected Annual Hours	130,000	50,000	80,000
Projected Hourly Rate with Fringe	\$10	\$10	\$10
Projected Job Code Annual Earnings	\$ 1,300,000	\$500,000	\$800,000
Sub Total – Labor Savings			60%
SPACE			
All	115,000 sq ft	82,000 sq ft	33,000 sq ft
Project Monthly Square Foot Rate	\$5	\$5	\$5
Projected Monthly Space Cost	\$575,000	\$410,000	\$165,000
Project Annualized Space Cost	\$6,900,000	\$4,920,000	\$1,980,000
Sub Total – Space Savings			30%
LABOR AND SPACE SAVINGS - DOLLARS	\$8,200,000	\$5,420,000	2,780,000
LABOR AND SPACE SAVINGS - PERCENT			35%

COST AND ROI

ITEM	COST	SAVINGS	ROI
CONSULTING FEE	\$108,000		
EQUIPMENT BUDGET	\$2,605,000		
TOTAL	\$2,713,000	\$2,780,000	11.7 MONTHS

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AGREEMENT

JD Gray Associates shall submit detailed service fee invoices to Company. Said invoices shall contain a detailed itemization of the date(s) on which services were provided and a description of tasks completed during the period with respect to which the invoice is submitted. On-site Per Diem expenses to be billed separately.

Each compensation payment made by Company to JD Gray Associates shall be within 10 days.

Company Property – JD Gray Associates agrees that any confidential information furnished by Company to JD Gray Associates or acquired by JD Gray Associates during the period in which JD Gray Associates is retained by Company is and shall remain the sole and exclusive property of Company and shall be placed in the hands of Company by JD Gray Associates upon termination of this Agreement including any copies made thereof.

Confidentiality – JD Gray Associates agrees that at no time, either during or after the period in which JD Gray Associates is retained by Company shall JD Gray Associates utilize or disclose to any third party any of the confidential information of Company.

Date: _____ Company Official _____ Purchase Order Number: _____

INDUSTRIAL ENGINEERING CONTRACT TERMS:

Payment Schedule

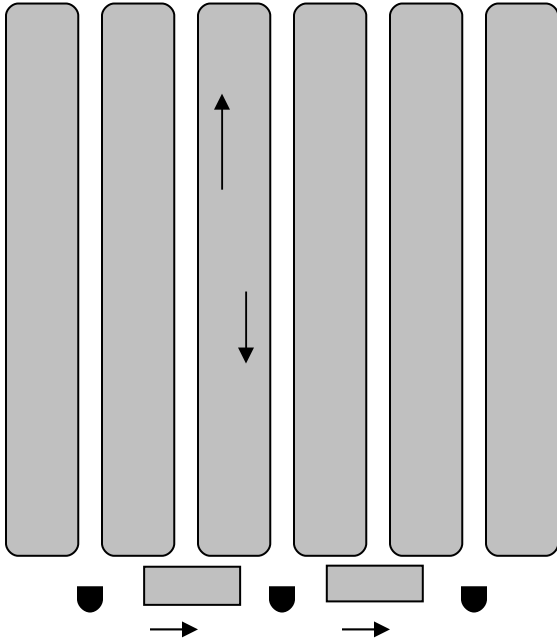
1. 20% upon approval and Purchase Order	\$21,600
2. 20% end of 1 st quarter (3 months)	\$21,600
3. 20% end of 2 nd quarter	\$21,600
4. 20% end of 3 rd quarter	\$21,600
5. 20% upon implementation	\$21,600
 TOTAL	<hr/> \$108,000

If there are additional job codes desired to be added to our semi-automated case and pallet, pick and pack system industrial engineering service activity, an additional consulting fee of \$18,000 plus travel expenses per family is required.

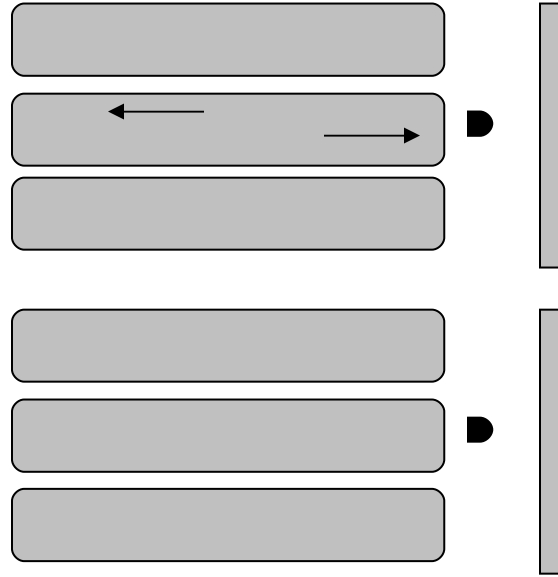
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CASE PICKING LSRS CONFIGURATIONS

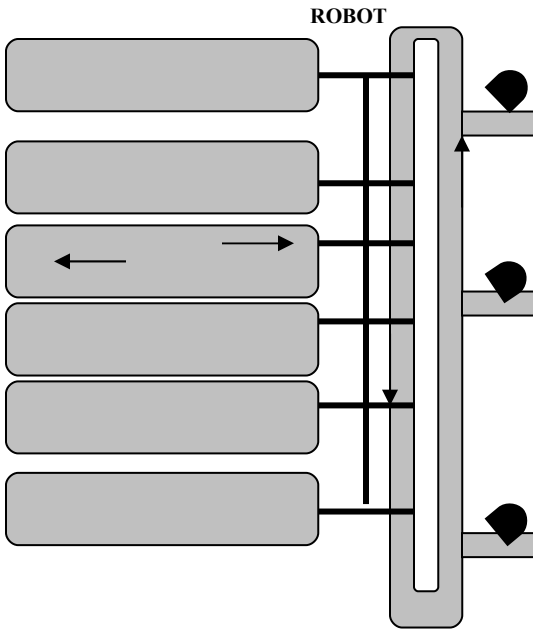
PICK AND PASS CONCEPT



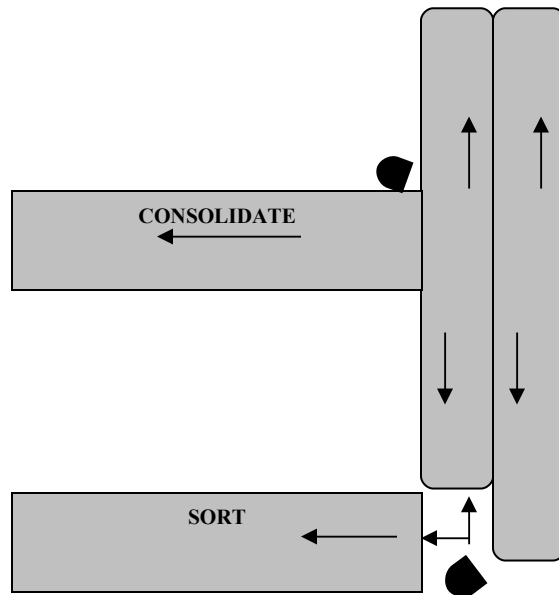
PARALLEL PICKING CONCEPT



REMOTE PICKING CONCEPT



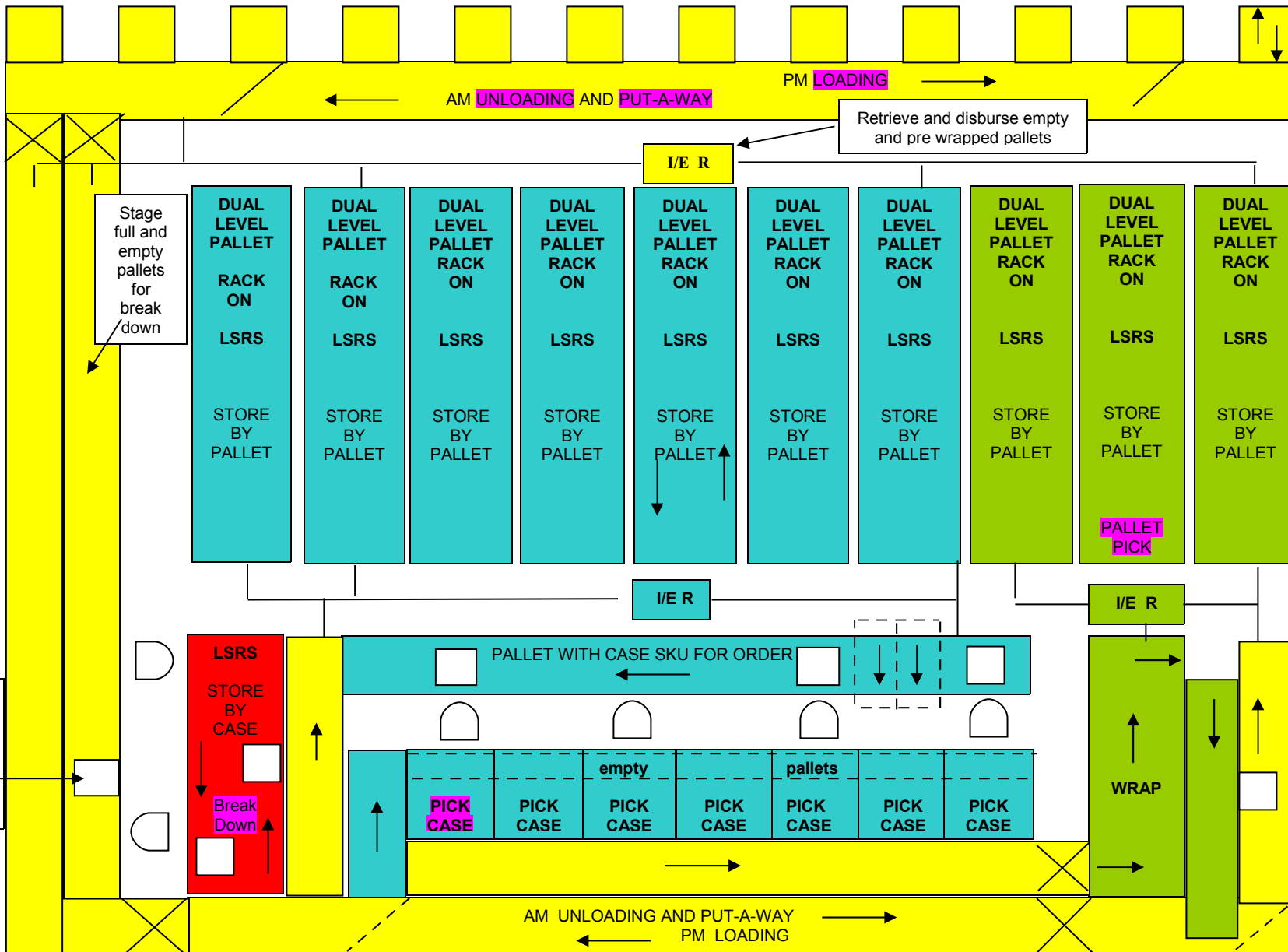
SORTING AND CONSOLIDATION CONCEPT



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CASE AND PALLET PICKING LSRS CONFIGURATION



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SEMI-AUTOMATIC MATERIALS HANDLING SYSTEM BY PHASE

PHASE		COST				SAVINGS			ROI MONTHS
NO	DESC	EQUIPMENT		CONSULTING		TOTAL	AMOUNT	DESC	
		COST	DESC	COST	DESC				
1	BREAKDOWN	\$85,000	(1) LSRS -CASE	\$29,250	25% OF ALL CONSULTING FEES	\$114,250	\$40,000 \$495,000 \$535,000	LABOR-2 25% OF SPACE SAVING	2.6
2	CASE PICK	\$1,050,000 \$160,000	(7) LSRS PALLET (1) I/E ROBOT	\$29,250	25% OF ALL CONSULTING FEES	\$1,239,250	\$420,000 \$495,000 \$915,000	LABOR-21 25% OF SPACE SAVING	16.2
3	PALLET PICK	\$300,000 \$450,000 \$160,000	WRAP (3) LSRS – PALLET (1) I/E ROBOT	\$29,250	25% OF ALL CONSULTING FEES	\$939,250	\$180,000 \$495,000 \$675,000	LABOR-9 25% OF SPACE SAVING	16.7
4	LOAD, UNLOAD & PUT-A-WAY	\$240,000 \$160,000	LIVE ROLLER (1) I/E ROBOT	\$29,250	25% OF ALL CONSULTING FEES	\$429,250	\$160,000 \$495,000 \$655,000	LABOR-8 25% OF SPACE SAVING	7.8
TOTAL		\$2,605,000		\$117,000		\$2,722,000	\$2,780,000		11.7