# Materials Load In/Out
# on
# Mid or High Rise Constructions

# DO THINGS DIFFERENTLY!


With building footprint space being at a premium in city center locations throughout the world, the pressure to build upward continues. The Sears Tower in Chicago, Kuala Lumpur's Petronas Towers, Taipei's 101 Tower and a host of others either in building or at planning stages, represent the 100+ story super high rise buildings. High rise development in Europe generally lies within the more modest 20 – 50 story range. The loading in/out of materials to various floor levels of these multi-story constructions should be a consideration in the construction planning process, though often it is insufficient and sometimes appears only to be considered as an afterthought. The efficiency of the materials loading process has an impact on the productivity of the various sub-contractors on a construction site. The constructions' "on time completion" are often dependant on the materials loading process. This theoretical study notes the various traditional methods of material load in/out, estimates their associated costs and suggests a new alternative to increase efficiency and reduce overall costs.

**OBJECTIVES of the STUDY**

- To examine and compare the current practices used for the loading in/out of materials in the construction of high rise structures.

- To propose an alternative to the current methods of materials loading for multi-story constructions, saving time, money and reducing safety risk.

## TRADITIONAL LOAD IN/OUT METHODS

"Material transportation for high rise building construction relies heavily on tower cranes" (Leung & Tam 1999) in conjunction with a platform built from scaffold (figure 1) or a combination of these and either a rack and pinion drive hoist (often called an Alimak or a Buck Hoist) (figure 2) or a mast climber figure 4. Contractors with material load in/out rely very much on access to the tower crane. However, tower cranes are in great demand worldwide and (Stephens 2006, Tucker 2007) are becoming increasingly difficult and costly to obtain, particularly at short notice. Contractors have to book tower crane hire up to 6 months ahead of the required time and (Assoc. Press 2007) the lead time for new build can be even longer.

Figure 1 Scaffold Platform

Figure 2 Rack and Pinion Drive Hoist

Figure 3 Static Platform

Figure 4 Mast Climber

Figure 5 Tower Crane

Figure 6 Tower Crane

In recent years the use of static loading platforms (figure 3) (platforms that extend out from the side of buildings and are stationary) have become commonly used. While there are a number of advantages in using the static loading platforms compared to the other methods for material load in/out, shown in the Feature Comparison (Table 1 on page 3), these platforms are also used in conjunction with a tower crane (figures 5 and 6). Substituting a static loading platform for a scaffold platform, while giving greater flexibility, particularly if the loading position has to be moved, still relies on access to the tower crane to lift and load materials from trucks on the ground to the level required. The use of a tower crane for load in/out of relatively light, typically 1 – 2 ton, loads of such items as packs of plaster board, pods, pipe work, concrete block, porta potties, etc. has several disadvantages. A balanced crane allocation must be implemented to avoid conflicts between users. "However, imbalance in crane usage is so common on site", (Leung & Tam, 1997) that conflicts regularly occur. This often causes delays that can have a ripple effect on other users progressing throughout the working day. In one study (Chan 1990) it was reported that utilization of tower cranes was about 71%, while a later study (Chan & Kumaraswarny 1995) suggested productive times were about 80% and the lack of full utilization was caused by delay in the provision of other resources such as the late deliveries of materials e.g. ready mix concrete, etc. Another factor to consider is (Leung & Tam 1997) "for safety (tower) crane operations usually are stopped during rain or when there is a strong wind". Also it is not uncommon for tower cranes to mechanically fail and it can sometimes take several days to get replacement parts particularly if they have to be shipped from another country.

| **FEATURE** | **STATIC TRANSFORM PLATFORMS** | **RACK & PINION DRIVE HOIST** | **MAST CLIMBER** | **SCAFOLD PLATFORM** | **TOWER CRANE** |
|---|---|---|---|---|---|
| | | | | | |
| Capacity (Typical) | < = 5 Ton | ~ 2 Ton | 1 – 2 Ton | > 8 Ton | > 10 Ton |
| Footprint | Within Building | External | External | External | External |
| Installation | No permanent structure tie-in to repair at end | Structural re-work needed | Structural re-work needed | Structural re-work needed | Foundation and Structural re-work needed |
| Utilization | Material Only | People and Material | People and Material | Material Only | Material Only |
| Positioning | Relocate-able | Fixed | Fixed | Fixed | Fixed |
| Loading Area | Multiple Sizes | Limited / Small | Limited / Small | Limited / Small | Limited / Small |
| Operator Requirement | One | Skilled | Skilled | None | Skilled |
| Design Cost | Low | High | High | Medium | High |
| Running Cost | Low | Expensive | Expensive | Low | Expensive |
| Complexity | Low | High | High | Medium | High |
| Usage | Dedicated | Multiple | Multiple | Dedicated | Multiple |

Table 1-Feature Comparison

The use of static or scaffold platforms can be complimentary to rack and pinion hoists and/or mast climbers, freeing up their time for other uses (They were originally intended for moving people rather than materials.) and other users. While a few promotional case studies on scaffold hoists and mast climbers have been written (e.g. www.sgb.co.uk) little, if any, academic examination has been carried out on their use.

Both scaffold hoists and mast climber systems have physical limitations, both in terms of capacity and speed where material movements are concerned. On construction sites using these systems, material movements often obstruct people movement and vice versa. Queues of people waiting to be transported to their working level can be delayed for an hour or more on tall multi story structures,

as materials are delivered to where they are required. Even a few people waiting for 15 minutes several times a day can swiftly accrue several man weeks of lost working time.

In a study by Mitric (1975) on Elevator Systems for Tall Buildings, he proposed models for the various elevator configurations and trip times. The rack and pinion hoist and mast climber can be considered as a basic elevator configuration. If the hoist/climber transporting materials goes in express mode (directly from the ground to the required level and back to ground), the time it will take ($t_r$) is :

$$t_r = hs_u + hs_d + t_u$$

where

h is the number of floors

$s_u$ is the upward speed per floor

$s_d$ is the downward speed per floor

$t_u$ is the unload time

However, in practice it is rare that hoists/climbers go in express mode and are interrupted at intermediate floor levels by other users wanting transportation up or down. In this case $t_r$ will be:

$$t_r = (hs_u + t_s n) + (hs_d + t_s n) + t_u$$

where

$t_s$ is the average time taken per intermediate stop
n is the number of intermediary stops

In practice it can easily be seen that for taller constructions with a greater number of intermediate floors $t_r$ is significantly increased, thus greatly slowing the transportation of material to the required destination. It can also cause great conflict between users.

On some construction sites, static platforms are used to replace the other methods or at least reduce their number, as contractors realize the savings that can be made on total project costs and the ease of management. Contractors may decide to use only one passenger hoist, leaving the materials loading to platforms. However, the greatest advantage to using static platforms against the hoists or mast climbers is the reduction in time taken to load in/out and hence a reduction of total project costs.

## LOGISTICS OF THE LOADING METHODS

**SCAFFOLD PLATFORM**

1. Design and check loadings imposed on the structure for each access position. Each new position means a new design process.
2. Erect scaffolding and tie in to the building.
3. Loading process
    a. Load arrives on site.
    b. Lift load off delivery truck by tower crane directly to scaffold platform.
    c. Move load from platform to work area.
4. Remove scaffolding.
5. Make good fixing points.

**RACK AND PINION HOISTS** (Often called Alimaks or Buck Hoists)

1. Design and check loadings for each access position. A new position means a new design process.
2. Design constraints mean the maximum load of hoist is typically less than 2 tons and the gate opening is a maximum of 6.4 feet leading to the requirement to break down full loads into 2 or 3 sub-loads.
3. Erect scaffolding and hoist.
4. Loading process
    a. Load arrives on site.
    b. Lift load off delivery truck by tower crane or fork lift, into a compound. (It is rare that the delivery truck can get directly to the hoist.)
    c. Break down loads into part loads.
    d. Transport to hoist.
    e. Lift into appropriate floor of building.
    f. Move load from hoist to work area.
5. Remove hoist and scaffolding.
6. Make good fixing points.

**MAST CLIMBER**

1. Design and check loadings for each access position. A new position means a new design process.
2. Design constraints mean the maximum load of the climber is typically less than 2 tons requiring a breakdown of full loads into 2 or 3 sub-loads.
3. Erect any scaffolding and mast climber.
4. Loading process
    a. Load arrives on site.
    b. Lift load off delivery truck by tower crane or fork lift into a compound. (It is rare that the delivery truck can get directly to the climber.)
    c. Break down loads into part loads.
    d. Transport to climber.
    e. Lift into appropriate floor into building.
    f. Move load from climber to work area.
    g. Remove climber and any scaffold.
5. Remove mast climber.
6. Make good fixing points.

**TOWER CRANE**

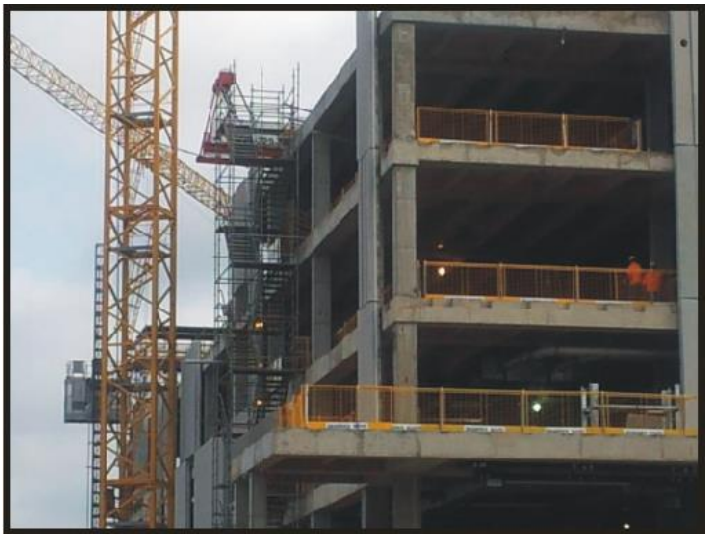
1. Design and check loadings for each access position. A new position means a new design process.
2. Erect crane
3. Loading process
    a. Load arrives on site.
    b. Lift load off delivery truck by tower crane.
    c. Lift onto appropriate floor into building.
    d. Move load from deck to work area.
4. Remove tower crane.
5. Make good fixing points.

## HIGH EFFICIENCY SYSTEM (LTD® SERIES)

Until 1949, cranes used in construction could lift vertically but had no horizontal movement, and materials were manually carried after being dropped. With Hans Liebherr's innovation, the tower crane could not only swing materials horizontally, but also be transported in parts and fully assemble itself at the construction site. His design, the TK-10, was a machine that had the slewing unit on the bottom, allowing the entire crane to rotate, with a horizontal jib on top. It was presented at the Frankfurt Trade Fair in 1949, but new designs came to the market almost immediately after its unveiling. The development of these new tower cranes came in time for the construction boom of the 1950s, when buildings were needed quickly and therefore cranes and other equipment were in high demand. Altogether, the ease in transportation and assembly, as well as the increasing efficiency, contributed to the development of taller building structures.


**Since the turn of the 20th century there has been little change toward improving the efficiency of material handling until now. The standard of efficiency and safety has been raised with the introduction of the innovative and highly efficient load lifting transfer deck (LTD®) which has changed the way construction moves material for these taller building structures.** A further development of the *static* platform loading method loading system combines the use of the **LTD®** with lightweight retractable accessory platforms to produce a highly efficient, virtually self-contained material hoisting system. Unlike previous systems, the **LTD®** is capable of quickly relocating its own platforms to higher levels. Therefore removing the need, and hence cost, of installing platforms at each floor level. A major advantage of this system is that after the initial installation of the **LTD®** all cranes (including tower cranes) are no longer needed for moving material. Tower crane access, being at a premium on construction sites, is an expensive asset to hire. It is particularly exposed to even moderate weather conditions and requires a skilled operator. The **LTD®** and retractable accessory platform system reduces the dependency on the tower crane and can often operate (depending where placed) when a tower crane cannot.

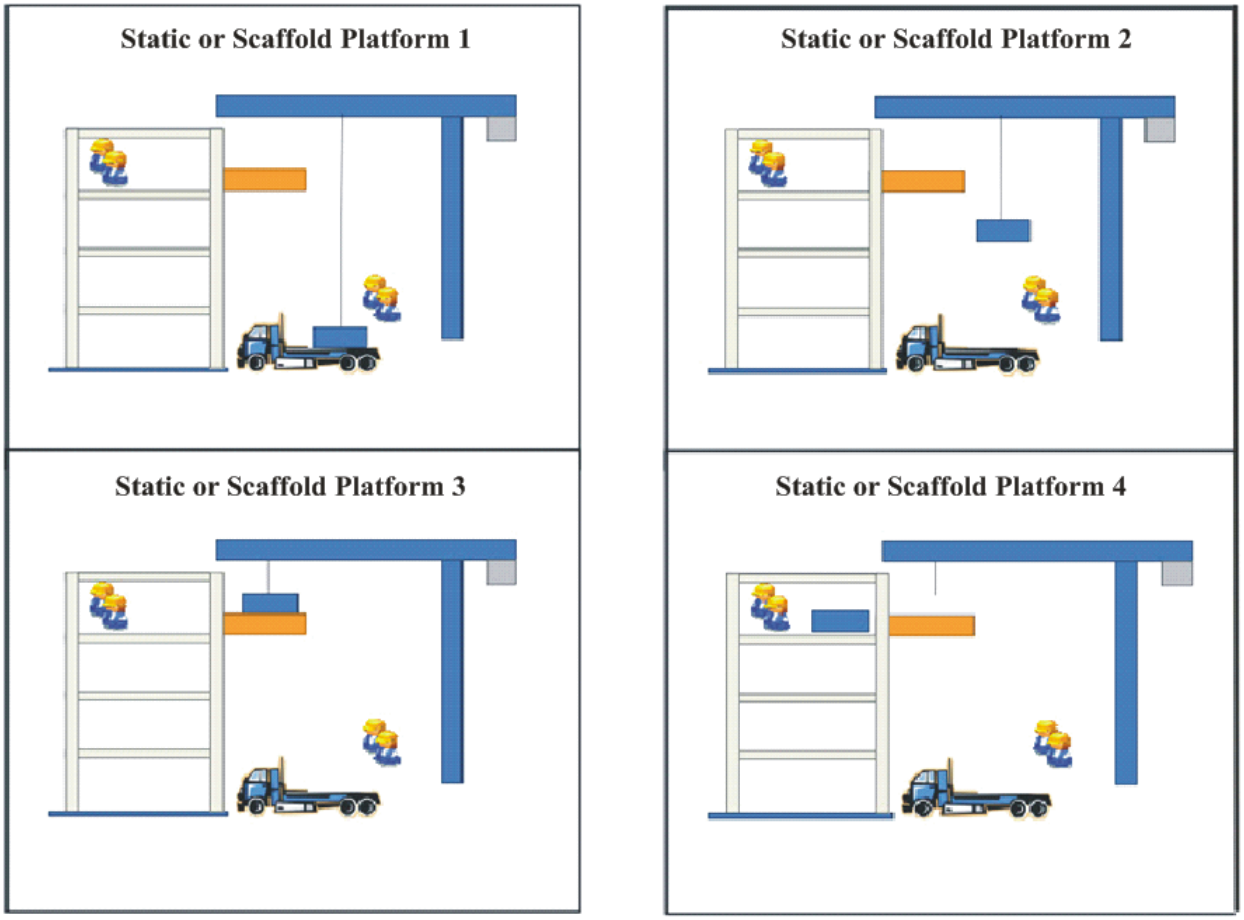
1. Check loadings and structure for access positions.
2. Design and manufacture any special steelwork for mounting purposes if required.
3. Install the **LTD®** using tower crane.
4. Install retractable accessory platforms using the **LTD®.**
5. Loading process
   a. Load arrives on site.
   b. Lift load off delivery truck by the **LTD®** and onto retractable accessory platform in one operation.
   c. Move load inside building with retractable accessory platform to work area.
   d. Lower hook for another load pick while first load is being moved to work area.
6. At the end of project, use the **LTD®** to remove retractable accessory platforms, and then the tower crane to remove the **LTD®**.



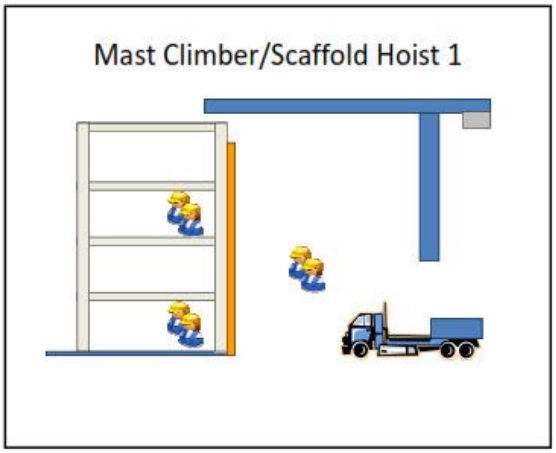
## DIAGRAMS OF LOADING PROCESSES

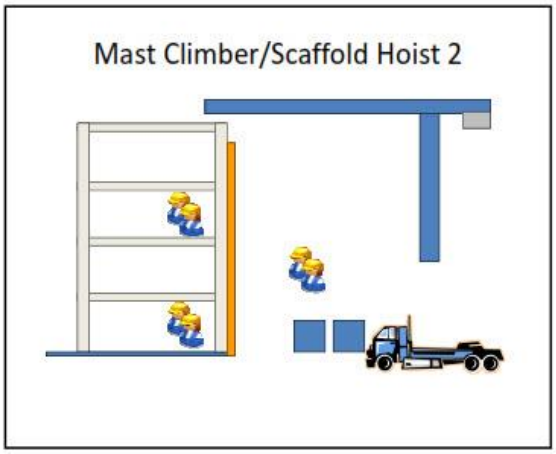
The diagrams below show the stages of the lifting process.

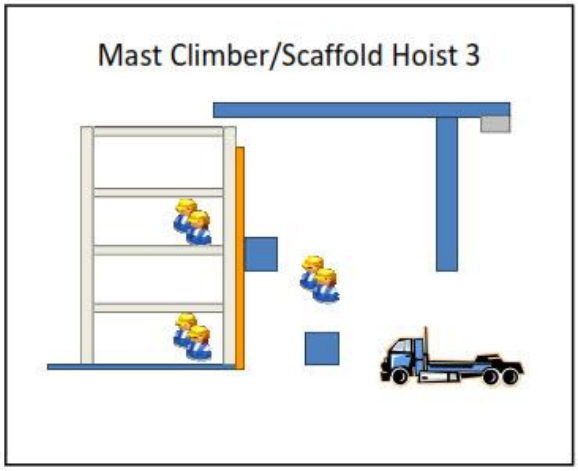
## STATIC or SCAFFOLD PLATFORM WITH TOWER CRANE

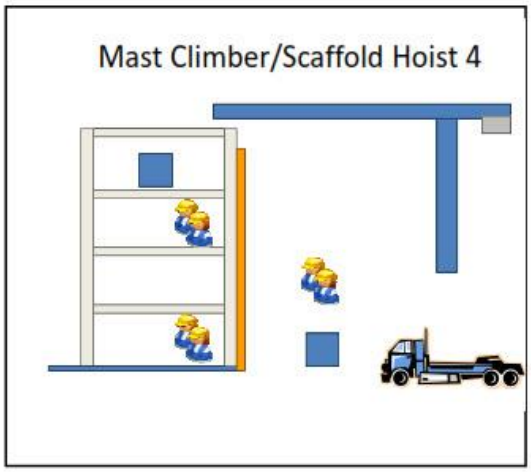


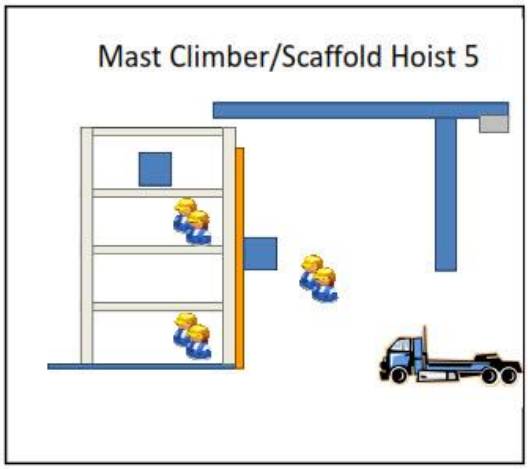
**MAST CLIMBER / SCAFFOLD HOIST / ALIMAK or BUCK HOIST**

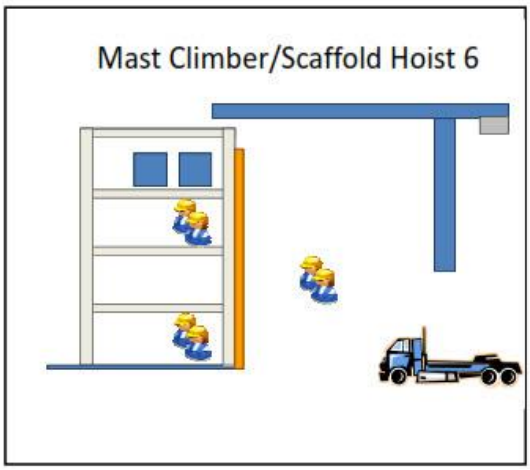


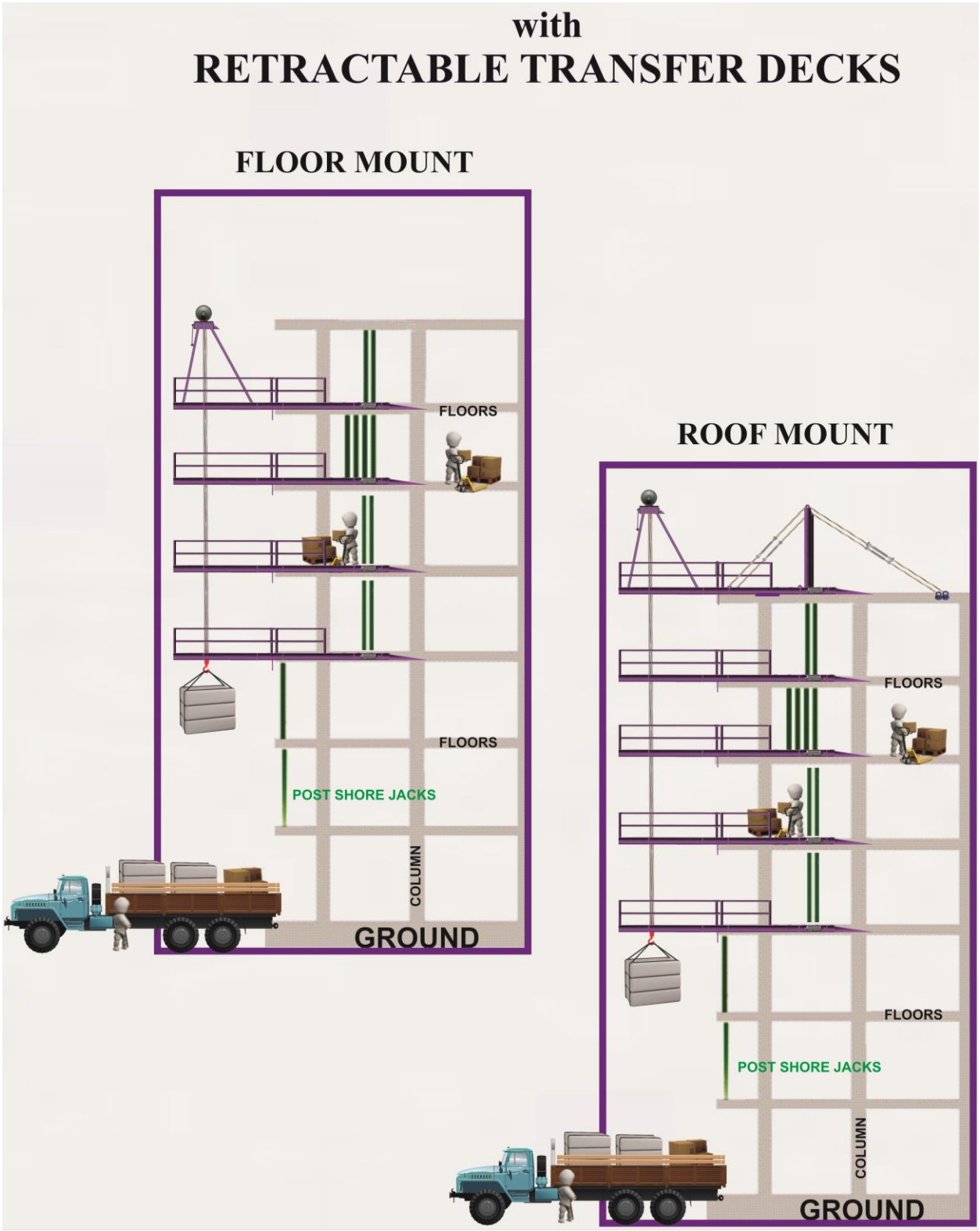



# LTD® SERIES


with
RETRACTABLE TRANSFER DECKS
FLOOR MOUNT
FLOORS
FLOORS
POST SHORE JACKS
COLUMN
GROUND
ROOF MOUNT
FLOORS
FLOORS
POST SHORE JACKS
COLUMN
GROUND

## IMPLICATIONS FOR PLANNING

Effective construction planning requires a complete understanding of each particular project (Proverbs, et al 1999). Planning was rated by Arditi (1985) as the highest influencing factor for achieving construction productivity improvement. The planning of how materials are to be loaded into a multi-story construction is often not considered as detailed as perhaps it should be. In order to co-ordinate all the multiple uses and users of loading equipment it must be planned in at the earliest opportunity to make the most efficient use of the loading method to be used. For example, placing loading platforms directly above access bays is obviously an ideal situation. However, the structure of the building and surrounding area may not allow this, but with a little advanced planning may permit moving access bays to an alternative position to maximize the loading efficiency.

With many different users needing materials to be loaded onto different floor levels it is vitally important to consider the time, and hence associated costs, with actual loads. Certain materials usually associated with the construction of the structure itself can only be loaded by use of the tower crane and those often take priority over other materials. As noted earlier, this places pressure on other users who need access to lifting capability and causes conflicts in the system.

From practical observation of the materials loading processes the following time model has been developed. This Time Model (Table 2 on page 11) is an estimated average of the actual process times (as sites vary so greatly), but demonstrates the wide differences in material loading times.
It has also assumed the express mode for hoist/climber, though in practice this will only rarely occur. Lift times can be significantly increased if multiple floor stoppages occur.

It has not considered the impact of tower crane closure due to weather conditions, which can be additional to the 20% of unproductive time noted earlier. It has estimated waiting time for cranes and scaffold hoists from site observations (double for hoist and climber as split loads).

"Cranes have come to symbolize building construction itself. They perform indispensable services in moving materials and components both vertically and horizontally." Shapira (2007). Before planners start to consider the allocation of tower crane time between multiple users they should first take a look at the requirements of the alternative loading systems available. Careful positioning of ground level access bays allows trucks delivering materials to sites to be positioned directly below upper level loading positions. This can eliminate the need for the horizontal transportation of loads. Lifting right from the truck eliminates multiple material handling and that too saves time and money. Consider doing things differently.

## INSTALLATION & REMOVAL TIME MODEL

| ASSEMBLY / DISASSEMBLY TIMES in HOURS | LTD® | Tower Crane | Rack & Pinion (Man & Material) Hoist | Mast Climber | Scaffold Hoist |
|---|---|---|---|---|---|
| | | | | | |
| Assembly | 4.0 | 16.0 | 20.0 | 10.0 | 12.0 |
| Scaffold Installation | | | | 10.0 | 10.0 |
| Installation | 1.5 | 10.0 | 20.0 | | 6.0 |
| Scaffold Removal | | | | 6.0 | 6.0 |
| Removal | 1.0 | 12.0 | 10.0 | 6.0 | 6.0 |
| Structure Remedial Work | | 6.0 | 10.0 | 6.0 | 6.0 |
| | | | | | |
| | | | | | |
| | | | | | |
| **HOURS** | **6.5** | **44.0** | **60.0** | **38.0** | **46.0** |

| PER LOAD TIME in MINUTES | LTD® | Tower Crane | Rack & Pinion (Man & Material) Hoist | Mast Climber | Scaffold Hoist |
|---|---|---|---|---|---|
| | | | | | |
| Remove from Transport | 3 | 3 | 3 | 3 | 3 |
| Transport to Compound | | 2 | 2 | 2 | 2 |
| Breakdown of Pallet to Smaller 2 Loads | | | 5 | 5 | 5 |
| Transport of Split Pallets to Load Position | | | 6 | 6 | 6 |
| Waiting Time | | 88 | 10 | 14 | 14 |
| Load into Hoist or Climber | | | 3 | 2 | 2 |
| Verticle Transit Time | 2 | 4 | 4 | 6 | 6 |
| Transport into building | 2 | 3 | 3 | 3 | 3 |
| Transport of Pallet to Work Position | 3 | 6 | 6 | 6 | 6 |
| | | | | | |
| **MINUTES** | **10** | **106** | **42** | **47** | **47** |
| | | | | | |
| **% TIME *LOSS* IF NOT USING LTD® SYSTEM** | | **91%** | **76%** | **79%** | **79%** |
| | | | | | |
| **POSSIBLE LOAD OUTS / DAY** | **75** | **8** | **12** | **10** | **10** |
| **POSSIBLE LOAD OUTS / 5 DAY WORK WEEK** | **375** | **40** | **60** | **50** | **50** |
| **POSSIBLE LOAD OUTS / PER MONTH (22 Days)** | **1650** | **176** | **264** | **220** | **220** |

*These estimates are based on a 10 story construction.*
Table 2- Installation / Removal Time Model

No doubt it could be argued that some of these times are overestimated while others are underestimated, but on aggregate these will tend to cancel each other out with the total time estimates being representative of reality. The implications of this work are that by careful consideration of ground level access at the building design stage and use of the most efficient loading systems, contractors can save significant project time on the construction build and reduce the risk of projects over running and incurring penalties.

## FINANCIAL IMPLICATIONS

Using the time model above, these can be converted into a cost estimate model shown in Table 3 on page 13. The assumptions made are based on costing information obtained from several major building contractors and major plant hire companies. The weekly hire and operating cost of a tower crane is typically $15,000 - $30,000 or greater. For this analysis, a conservative $20.,000 has been assumed. The typical hire cost of scaffold and platform is $6700/month for a 10 story construction. The actual cost of a five (5) month hire of a 60 feet long and 32 feet high mast climber is used and scaffold hoists are a similar cost to the tower crane. The typical hire of static platforms are those quoted by the contractors and hire companies. Note the costs for scaffold, hoists and climbers will increase in proportion to the height of the construction, where the static platform and **LTD®** system are the same and independent of construction height. For international comparison, at the time of writing, the USA hire costs, based on
1.55-1USD=1GBP, were similar to those of the UK. Although equipment rental costs were broadly similar in the Western countries, labor rates differ and readers should make their own judgments based on local labor rates as to the impact on overall costs.

From this analysis it can clearly be seen that the greater the number of loads, the greater the cost savings the combination of the **LTD®** and accessory platforms have over the other systems. If we make a conservative assumption that each floor level will have 50 loads, for constructions 10 stories and greater, the overall project cost savings achievable by using the combination of the**LTD®** and platforms are quite significant. As an actual example, for a 10 story hotel project in the Strand, London with the project managers, Urvasco a Spanish company, the actual number of loads of plasterboard and block work was 1838.

## INSTALLATION & REMOVAL COST MODEL

| ASSEMBLY / DISASSEMBLY COSTS | LTD® | Tower Crane | Rack & Pinion (Man & Material) Hoist | Mast Climber | Scaffold Hoist |
|---|---|---|---|---|---|
| | | | | | |
| Assembly / Installation | $840.00 | $25,000.00 | $2,600.00 | $1,350.00 | $1,400.00 |
| Removal | $750.00 | $25,000.00 | $2,000.00 | $750.00 | $750.00 |
| Structure Remedial Work | | $2,000.00 | $1,000.00 | $500.00 | $500.00 |
| Permits Required | NO | YES | YES | YES | YES |
| | | | | | |
| **TOTAL COST** | **$1,590.00** | **$52,000.00** | **$5,600.00** | **$2,600.00** | **$2,650.00** |

| PER LOAD COSTS | LTD® | Tower Crane | Rack & Pinion (Man & Material) Hoist | Mast Climber | Scaffold Hoist |
|---|---|---|---|---|---|
| | | | | | |
| Equipment Rental Pro-rated Per Avg. # Loads | $3.22 | $172.73 | $38.33 | $45.55 | $36.50 |
| Remove from Transport | | $17.50 | $17.50 | $17.50 | $17.50 |
| Transport to Compound | | $17.50 | $17.50 | $17.50 | $17.50 |
| Breakdown of Pallet to Smaller 2 Loads | | | $17.50 | $17.50 | $17.50 |
| Transport of Split Pallets to Load Position | | | $17.50 | $17.50 | $17.50 |
| Waiting Time | | $27.50 | $27.50 | $27.50 | $27.50 |
| Load into Hoist or Climber | | | $17.50 | $17.50 | $17.50 |
| Tower Crane Time (Process) | | $52.00 | | $29.05 | $29.05 |
| Verticle Transit Time | $1.66 | $3.32 | $3.32 | $4.98 | $4.98 |
| Transport of Pallet to Work Position | $4.75 | $10.50 | $10.50 | $10.50 | $10.50 |
| | | | | | |
| **TOTAL COST INCLUDING EQUIPMENT RENTAL** | **$9.63** | **$301.05** | **$167.15** | **$205.08** | **$196.03** |
| | | | | | |
| **TOTAL COST SEPARATE FROM EQUIPMENT RENTAL** | **$6.41** | **$128.32** | **$128.82** | **$159.53** | **$159.53** |

Table 3 – Installation / Removal Cost Model

<u>In addition to all the savings we have here, the greatest benefit comes from relieving the tower cranes from moving material to allowing them to build the building!</u>

## OVERALL TIME AND COST COMPARISON

| COST SAVINGS USING LTD® SYSTEM | LTD® | Tower Crane | Rack & Pinion (Man & Material) Hoist | MAST CLIMBER | Scaffold Hoist |
|---|---|---|---|---|---|
| **TOTAL PROJECT COSTS** | | | | | |
| COST to COMPLETE 500 LOADS | $3,301.36 | $93,705.45 | $66,531.21 | $80,946.82 | $80,969.55 |
| COST to COMPLETE 1000 LOADS | $6,602.73 | $187,410.91 | $133,062.42 | $161,893.64 | $161,939.09 |
| COST to COMPLETE 5000 LOADS | $33,013.64 | $937,054.55 | $665,312.12 | $809,468.18 | $809,695.45 |
| ***COST SAVINGS*** USING LTD® SYSTEM | | | | | |
| COST SAVINGS to COMPLETE 500 LOADS | | **$90,404.09** | **$63,229.85** | **$77,645.45** | **$77,668.18** |
| COST SAVINGS to COMPLETE 1000 LOADS | | **$180,808.18** | **$129,761.06** | **$158,592.27** | **$155,336.36** |
| COST SAVINGS to COMPLETE 5000 LOADS | | **$904,040.91** | **$662,010.76** | **$806,166.82** | **$776,681.82** |

| #DAYS TO COMPLETE LOADS COMPARISON | LTD® | Tower Crane | Rack & Pinion (Man & Material) Hoist | MAST CLIMBER | Scaffold Hoist |
|---|---|---|---|---|---|
| | | | | | |
| **# DAYS to COMPLETE 500 LOADS** | 6.7 | 62.5 | 41.7 | 50.0 | 50.0 |
| **# DAYS to COMPLETE 1000 LOADS** | 13.3 | 125.0 | 83.3 | 100.0 | 100.0 |
| **# DAYS to COMPLETE 5000 LOADS** | 66.7 | 625.0 | 416.7 | 500.0 | 500.0 |

## RISK

Another factor that must be taken into consideration is the element of risk. The risk of damage to the load increases with every time the load is handled. By reducing the handling, the risk of damage also reduces. With the scaffold platform and static platform systems, the load is transferred direct from delivery truck to the floor where it is required. With the mast climber or scaffold hoist systems, the load is broken down, often transferred to a holding compound, and then transferred into the scaffold hoist or climber, with a final transfer to the floor level. Compounded with this is the fact that using equipment such as forklifts etc., to transfer materials around a construction site has a high risk factor. The multiple handling means increasing the risk factor several fold as against the single lift from delivery truck to floor level. Reducing risk reduces wastage and thus reduces project costs.

Let us not forget that the entire job site becomes a hazard zone with the tower crane!

## CONCLUSIONS

Some systems can be used for transporting both people and materials while others are dedicated to the materials handling process. Each system has its particular benefits and primary uses. It is clear from this analysis that for the transportation of materials only, the systems dedicated to that use are significantly more efficient in terms of time taken to load materials and save on total project cost. In low labor cost economies, such as India, where material loading is often performed by manual effort, (One construction director pointed out the window and told the writer, “The three 20 story buildings opposite, which he built, …every load was carried up on the backs of men. It took months rather than weeks; but labor is very cheap here”.) In these situations time, rather than cost, should perhaps be given greater importance.

The advantages of the **LTD®** Retractable Accessory Platforms combination are:

- Up to 10,000 lb load capacity. The **LTD® SERIES** offers load capacities in 2,000 lbs, 4,000 lbs, 6,000 lbs, 8,000 lbs and 10,000 lbs.
- Wire Rope and hook speeds at over 200 fpm
- Brings loads into building to be safely unloaded
- Can be lifting one load while another is being unloaded on the desired floor
- Can be in use within 3 hours of delivery to job sight
- Can lift loads to every floor beneath the hoist with a accessory deck making the **LTD®** the most efficient hoist in the world
- Can be moved to different floors within a half hour and ready to use
- Creates a 20'x20' "loading zone" which helps in preventing the entire job site from being hazardous due to material moving
- Has remote option, can remotely operate 10 platforms and 1 hoist from 300 feet away
- Reduces labor loss by moving all material needed and eliminating wait time for workers
- Reduces crane time and cost
- Environmentally Green, leaves a smaller environmental footprint then a horse drawn carriage
- Uses Clarity Bio Degradable Hydraulic Fluid
- Easy to train employees to operate
- Simple push button for platform and lever for hoist
- All Industrial parts
- Minimal Maintenance
- Loads can be hoisted directly from bed of truck
- 100% Duty Cycle
- Dedicated to load in/out, thus eliminating or at least reducing usage conflicts
- Ease of installation, taking only a few hours
- Ease of operation, no skilled operator needed (Check regulations for your area.)
- Overall cost savings, particularly on taller constructions or where there are a high number of loads
- ROOF MOUNTABLE means it can service ALL floors in addition to the roof, if desired

This analysis has not considered the opportunity costs, for instance, what else could the tower crane be used for instead of moving materials to floor level or be removed earlier from job site? It is these costs that are perhaps the greatest of all and have such a major impact on project over-run times. By releasing tower crane time, projects are more likely to adhere to schedule, hence avoiding costly late delivery penalties.

In addition to all the previously listed benefits, the **LTD®** is perfect for remodels and even demolition in tight areas where cranes and imploding is not an option.

The **LTD®** also has the ability to be customized to fit a wider, narrower, shorter or longer need.

**In short, the LTD® is your material moving solution!!**

The new high efficiency **LTD®** system described was awarded the Innovative Product in 2008 at the CON/AGG Expo in Las Vegas.

The **LTD®** is rated as 29 CFR Part 1910.179 & ANSI/ASME B30.2 & B30.16.

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