Crane Safety
Common Sense

- Common Sense is the reason we have training.
- It is a “learned trait”.
- No one is born with the ability to operate a crane safely.
- Formal training for all operators, signalers, and maintenance personnel is essential to obtain “Common Sense”.
- “Stupid” CAN BE FIXED!
- Carelessness can be prevented.
- “Accidents” are rarely accidental.
- Complacency KILLS!
Investigators suspect that a **nylon strap may have started a horrifying chain reaction of events** that caused a **crane to collapse onto other buildings**.

But prosecutors pinned the blame for the disaster on a single crane rigger and his company, and refused to point fingers at the city's failings at the deadly site.
The new $2 million 55-foot Carver Marquis slipped out of its sling while being lowered into the water. Look at the top right and see the tiny figure of a guy hanging on as it nosedives into the ocean.

The men aboard had no choice but to ride it out, a fearful few seconds that were also captured on camera.
On July 14, 1999 Big Blue collapsed during the construction of the baseball stadium Miller Park in Milwaukee, Wisconsin, USA, with a load of 450 tons on the hook. Three people were killed. An investigation revealed that although the effects of side winds on the crane itself had been calculated, it had not been considered for the load the crane was lifting. The families of the 3 men collected over 99 million dollars after the jury found that Mitsubishi was negligent by not performing proper safety checks.
Types of Rigging and Slings

- Alloy Chain
- Wire Rope
- Metal Mesh
- Synthetic Rope Sling
- Synthetic Web Sling
- Synthetic Roundslings

Each type has advantages and disadvantages!
NYLON SLINGS aka WEB SLINGS

Web slings are the most economical of all types. They are light, versatile, flexible, and readily available. They are the most common type of lifting sling. They are not very resistant to abrasions, cuts, heat, or punctures. They require more care to avoid such threats when rigging.
TYPES OF WEB SLINGS

T=Triangle   C=Choker   E=Eye   EN=Endless   R=Reverse

Type 1
TC Sling

Type 2
TT Sling

Type 3
EE Sling

Type 4
EE Sling

Type 5
EN Sling

Type 6
RE Sling

Type 3 is sometimes seen as FE (Flat Eye)
Type 4 is sometimes seen as TE (Twisted Eye)
POLYESTER SLINGS aka ROUNDSLINGS

Roundslings are always endless. They tend to have greater elastic stretch under load than other types of slings. They are more flexible, especially in higher capacities. They are easily damaged by cuts, heat, or punctures but are resistant to abrasion. They can be repaired if mildly damaged.
CHAIN SLINGS

Chain has the advantage of being durable, very flexible, and its length can be made adjustable. It will tolerate a wide range of temperature from -40 to 400 F without derating and higher still with appropriate temporary derating. However, compared to other types, it is relatively expensive and heavy.
WIRE ROPE SLINGS

Wire rope is generally not as durable as chain and its upper temperature limit is about 200 F. It also isn’t as flexible as chain but its stiff yet springy characteristic can be an advantage if it has to be pushed through a hole or under a load.

If wrapped around a load, it will tend to deform permanently to the shape of the load, rendering it useless.

Wire rope is generally cheaper and lighter than chain but not as versatile or as adjustable.
WIRE MESH SLINGS

Wire mesh is expensive to purchase but easily repairable, making long-term cost reasonable. It is extremely durable and damage resistant. It can handle temperatures up to 550 F. It will easily contour itself if wrapped around a load and return to its original shape after use.
SLING INSPECTION

BEFORE EACH USE, CHECK FOR...

☑ Missing or illegible identification
SLING INSPECTION

BEFORE EACH USE, CHECK FOR...

☑ Acid or caustic attack
☑ Melting or charring
SLING INSPECTION

BEFORE EACH USE, CHECK FOR...

☑ Holes
SLING INSPECTION

BEFORE EACH USE, CHECK FOR...

☑ Cuts
SLING INSPECTION

BEFORE EACH USE, CHECK FOR...

☑ Abrasions
SLING INSPECTION

BEFORE EACH USE, CHECK FOR...

☑ Worn or Torn Stitching in a load bearing splice
BEFORE EACH USE, CHECK FOR...

☑ Tears or Snags
SLING INSPECTION

BEFORE EACH USE, CHECK FOR...

☑ Knots in any part of the sling
SLING INSPECTION

BEFORE EACH USE, CHECK FOR...

☑ Pitting, corrosion, cracks, distortion and broken end fittings
Working Rules for Slings

**Working Rules**

- Never load in excess of rated capacity.
- Never use a sling that is damaged in any way.
- Never pull a sling from a suspended load under tension.
- Never shorten with knots, bolts or other makeshift devices.
- All rigging MUST fit within the crane hook without loading the tip or latch kit. Use shackles if necessary.
- Always keep hands and fingers clear of un-tensioned loads.
- Always keep suspended loads clear of persons and obstructions.
- Always pad or protect slings from sharp edges of the load.
- Protect labels by facing them away from the load.
- Always THINK before you affect a load.
Types of Overhead Cranes

These are just a few of the many types & styles of Overhead Cranes
Parts of an Overhead Crane
DAILY REQUIREMENTS:
- Labeling: Ensure Capacity & Warning Labels are in-place and legible.
- Know the location of the Crane Disconnect
- Test operate all motions, ensuring that the motions agree with the controller markings.
- Test brakes to ensure control. Report any excessive drift.
- Check hooks for damage, stretching, and twists.
- Ensure the latch kit (if required) is functional.
- Check wire ropes/chains for wear, kinks, and other damage.
- Check upper limit switch by “inching” the block into it.
- Ensure that warning devices (horns, lights) are working.
- Examine the area for signs of oil leakage.
- Report any unusual sounds or visual discrepancies.
INSPECTING THE CRANE

KNOW THE RATED LOAD OF THE CRANE

Bridges, Jibs, Gantries, Monorails, etc. must have the capacity labeled on both sides of the equipment and in all operating areas.

Never exceed the rated Working Load Limit (WLL)
- Crosswrapping the drum exposes the cable to sharp edges.

- Upper limit switches can fail, resulting in death.
- Know your buttons. Make small tests to be certain.
- Know where the disconnect is located!
OVERHEAD CRANE OPERATIONS
Know the weight of the load

Procedure for Estimating Weight of Load

- Use a Dynamometer scale (BEST)
- Check shipping papers. (GOOD)
- Check nomenclature plates. (BEST)
- Use industry standard tables or charts. (BETTER)
- Consult with the equipment manufacturer. (BETTER)
- Estimate using weights of similar loads (GOOD)
- Never attempt a load lift based solely on a guess!
- Stay within 50% of the cranes rated capacity when estimating loads (or manufacturer recommendation).
PROPER RIGGING

- Decide the best method for secure handling.
PROPER RIGGING

- Decide the number of slings required.
- **NEVER EXCEED THE RATED CAPACITY OF A SLING.**
LOAD ANGLES

- As the angle of the rigging increases, the working load limit (WLL) decreases.
- At 30 degrees, the WLL is $\frac{1}{2}$ of the vertical rating.
- At 45 degrees, the WLL is about $\frac{5}{7}$ of the vertical rating.

Lifting Factors for a 1000lb rated sling:

- 500
- 710
- 870
LOAD ANGLES

- The CHOKER RATING is based on a 120 degree angle at the point of choke.
- Slings with fittings which are used in a choker hitch shall be of sufficient length to assure that the choking action is on the webbing.
LOAD ANGLES

☑ Slings used in a basket hitch shall have the loads balanced to prevent slippage.
Preparation

☑ Always protect slings with cover saddles, synthetic wear pads, burlap padding or wood blocking to prevent sharp bends and cutting edges.
PREPARING THE LOAD

Protecting Slings:

Protect Slings Against Sharp Edges

Protect Slings Against Sharp Edges
BASICS OF CRANE SAFETY

Safe Practices for Operators

- Never carry loads over workers. (Workers shall never walk under loads.)
- Never carry loads within close proximity of other personnel.
- Never leave a suspended load unattended. NEVER!
- Operators must keep line-of-sight with the load.
- Never allow riders on loads or hooks.
- Never allow unauthorized persons to operate cranes.
KNOW THE RATED LOAD OF THE CRANE

ALWAYS ENSURE THE LIFTING DEVICE AND ALL SUPPORTING COMPONENTS ARE RATED FOR THE LOAD TO BE LIFTED!
MOVING THE LOAD

☑ Never move the load over personnel.
NEVER ALLOW A COWORKER BETWEEN A FIXED OBJECT AND A LOAD!
PLAN THE LIFT FIRST – The crane operator is responsible for the load and the safety of all personnel in the area. HOWEVER, all personnel are responsible for their own safety. If you see crane movement in your area, protect yourself.
KNOW YOUR SAFE WORKING RADIUS

Always Know the Safe “DANGER” Radius of the Crane.
PLANNING THE LIFT

- Know where the load is going and how it’s getting there.
- Move anything obstructing the path.
- Ensure that all personnel in the area are aware of the plan.
- Ensure that the landing area is ready and capable of holding the load.
- Ensure you are familiar with the crane controls.
THINK BEFORE YOU LIFT

ALWAYS POSITION LIFTING DEVICE DIRECTLY OVER LOAD BEFORE LIFTING!
LIFTING THE LOAD

☑ Ensure proper placement of sling or slings.
☑ Ensure that all slings fit correctly in the hoist hook.
☑ Ensure that all slings are securely attached to the load.
☑ Position the hook directly over the load.
☑ Keep fingers and hands away from pinch points.
☑ NO BODY PARTS BETWEEN THE SLING AND THE LOAD!
☑ Verify that there are no twists and that all sharp edges have been guarded or padded.
HANDLING THE LOAD

LIFTING THE LOAD

- Raise the hook slowly until the slight tension is applied to the sling(s).
- Raise the load slowly and ensure that it is properly balanced. Lower the load if adjustment is necessary.
- After conditions are verified safe, raise the load in a deliberate fashion.
- Do not jog the hoisting motion. Avoid bouncing the load.
- Raise load only to the height necessary to clear lower objects.
- Whenever possible, maintain 12” clearance.
MOVING THE LOAD

- Begin moving the load slowly and deliberately.
- Avoid movement that might cause the load to swing. Do not jog the trolley or bridge motions.
- Do not operate more than one direction at a time.
- Continue to maintain 12” clearance if possible.
- Never leave the controls unattended while a load is suspended. If it becomes necessary to leave the controls, lower the load to the floor.

When traversing, use a guide-line for long loads if necessary.
LOWERING THE LOAD

- Check the landing area again. Ensure it is clear and capable of holding the load.
- Lower the load to a comfortable height for handling.
- Align the load to the required landing position.
- Slowly, but deliberately, lower the load to the landing area. Do not jog the lowering motion to avoid bouncing.
- Stop as soon as contact is made.
- Ensure the load is secure before lowering the hook to release the slings.
Safe Practices for Loads requiring a signaler

- Only one person is the designated signaler.
- Ensure hand signals are understood PRIOR to the first lift.
- Maintain line-of-sight with the operator.
- The operator should acknowledge every signal.
- Stop the operation if comprehension is lost.
- Operators must watch the signalers.
- If anything causes a change in the original plan, STOP!
HOIST. With forearm vertical, forefinger pointing up, move hand in small horizontal circle.

LOWER. With arm extended downward, forefinger pointing down, move hand in small horizontal circles.

BRIDGE TRAVEL. Arm extended forward, hand open and slightly raised, make pushing motion in direction of travel.

TROLLEY TRAVEL. Palm up, fingers closed, thumb pointing in direction of motion, jerk hand horizontally.

STOP. Arm extended, palm down, move arm back and forth.

EMERGENCY STOP. Both arms extended, palms down, move arms back and forth.

MULTIPLE TROLLEYS. Hold up one finger for block marked "1" and two fingers for block marked "2". Regular signals follow.

MOVE SLOWLY. Use one hand to give any motion signal and place other hand motionless in front of hand giving the motion signal. (Hoist slowly shown as example 1)

MAGNET IS DISCONNECTED. Crane operator spreads both hands apart, palms up.
CARE & STORAGE

AFTER THE LIFT IS COMPLETE

☑ Remove all rigging from the hook.
☑ Check all rigging for damage.
☑ Clean with soap and water if necessary.
☑ Store slings in a clean dry area.
☑ Follow proper storage rules. Never drag slings on the ground or floor.
☑ Report damaged or defective slings and follow proper disposal or replacement procedures.
☑ Raise the hook to at least 7’ above the floor.
☑ Stow the crane and pendant (or radio transmitter) in a safe location.
BE CAREFUL OUT THERE!