

SCENE MANAGEMENT	Signals and warnings / LACES	5
	Scene safety considerations	6
	Scene operational considerations	7
STRUCTURE ASSESSMENT	Structure orientation	8
	Sectorisation	9
	Victim markings	11
	INSARAG marking systems	12
	Sketch maps	15
	Structure assessment	16
SEARCH OPERATIONS	Safety and operational considerations	17
	ASR levels	18
	Canine search considerations	20
	Interview questions	20
LIFTING & MOVING	Safety and operational considerations	21
	Resources and safety factors	22
	Load angles	24
	Force triangle sketches	26
	Slings mode factors	27
	Essential knots	28
	Block and tackle pulley systems	32
	Compound pulley systems	33
	Cribbing patterns	35



Urban Search & Rescue Operations

SHORING PRINCIPLES	Safety and operational considerations	36
	Safe work at height on shores	37
	Resources	38
	Timber measurements	39
	Shoring rules	41
	Paratech™ RSS tables / raker setup	43
	Standard nail patterns	44
	Gusset plate options	46
	U-box and trough bases	53
	Kerb beams and anchor fixings	55
	Timber shore length/diameter rules	57
	Timber cutting and measuring	58
	Cross-bracing	62
SHORING PATTERNS	45° / 60° Split Sole Raker	64
	Flying / Split Sole Raker	66
	Multi Insertion Point Raker	70
	T-Spot	72
	N-Post Vertical	74
	Laced Column	76
	N-Post Horizontal	77
	Sloped Floor 2A (perpendicular)	80
	Sloped Floor 2B (perpendicular)	82
	Sloped Floor (friction)	84
Window/Door Prefabricated	86	
Window/Door Built-in-Place	88	

BREACHING & BREAKING	Safety and operational considerations	90
	Resources	91
	Breaching techniques	92
	Precast prestressed concrete hazards	94
	Hot cutting safety considerations	96
	Hot cutting: window cut	97
	Hot cutting: vertical beams	98
	Hot cutting: angled cuts	100
	Hot cutting: horizontal beams	101
Cutting tensioned reinforcing cables	103	
CONFINED SPACE ENTRY	Safety and operational considerations	104
	Properties of common gases	104
	Safe system of work	105
CASUALTY CARE	Primary and secondary surveys	106
	AED, GCS and triage algorithms	108
REFERENCE	Properties of materials	111
	Metric–Imperial converter	113



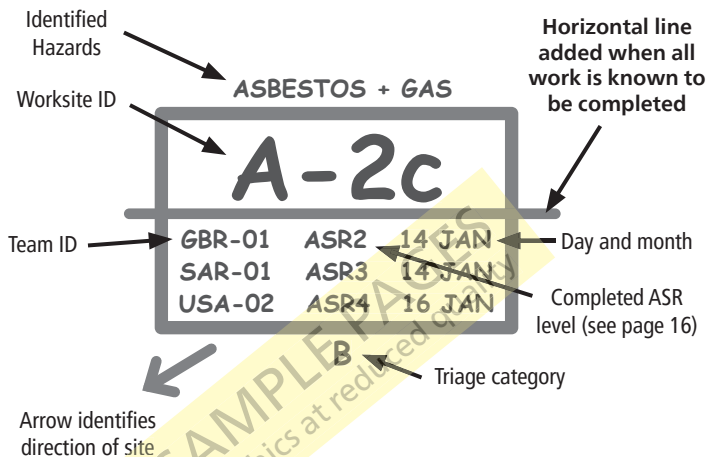
INSARAG
insarag.org



FEMA US&R
disasterengineer.org



ProGuide Series

WORKSITE MARKING (100 × 120cm BOX)

- ✓ Place markings in clear view near the point of entry.
- ✓ Leave space for three status updates.
- ✓ Use a colour-contrasting paint for high visibility.
- ✓ Additional important info can be added in plain English.
- ✓ Team ID is a three-letter Olympic code for the team's country (or SAR for international teams) followed by the designator (01 to 09 for IEC/IER teams, 10–99 for others).



Urban Search & Rescue Operations

LIFTING & MOVING RESOURCES

- Atmosphere monitors
- Lifting tripod / quad-pods
- Pulleys
- Rigging plates
- Karabiners / maillons
- Webbing slings
- Ropes
- Rope grabs / prussiks
- Bow and 'D' shackles
- Ratchet straps
- Powered and rope winches
- Air bags
- First aid / resuscitation kits
- Lighting units
- Concrete fixings
- Timber and cribbing
- Car-moving skates / jacks
- Load sensors
- Ground anchors
- Working platforms
- Bearing swivels
- Push-me pull-me bars
- Pry bars (levers)
- Lever hoists
- Chain hoists
- Laser range-finder

SAFETY FACTORS FOR LIFTING & MOVING (NOT LIFE)

METAL: 5:1

ROPE & FABRICS: 7:1

Apply the safety factor to a marked minimum breaking load (MBL).

The MBL is marked on PPE such as karabiners, NOT the SWL.

Items with a marked SWL (e.g. lifting shackles and winches) already include a safety factor, but may need to be further de-rated when human loads are being lifted.

Urban Search & Rescue Operations

ASR LEVEL 3: RAPID SEARCH AND RESCUE

Conducted in the early stages of an incident.

- ✓ USAR teams appointed to worksite(s).
- ✓ Rescue commitment comprises physical, canine, or technical search; limited debris removal, shoring, breaching & breaking.
- ✓ Limited penetration into structure/debris pile, with most rescue operations completed within hours.
- ✓ Identify worksites requiring Level 4 operations (which may happen concurrently if resources are available).

ASR LEVEL 4: FULL SEARCH AND RESCUE

- ✓ Identify, locate and rescue heavily trapped casualties.
- ✓ Penetration into the most accessible survivable voids.
- ✓ Extensive technical search, shoring, lifting and moving and breaching and breaking operations.
- ✓ Possible confined space working.
- ✓ Inter-agency cooperation.

ASR LEVEL 5: TOTAL COVERAGE SEARCH AND RECOVERY

Moving from rescue to recovery and transfer of responsibility.

- ✓ Operations to recover deceased victims, however it may still be part of the rescue phase if deemed necessary by coordinating authorities.
- ✓ Live victim finds possible on delayering.
- ✓ Includes searching/access into all voids, delayering working with heavy machinery.
- ✓ Close liaison with structural/demolition engineers required.
- ✓ Maintain minimum numbers of personnel in risk area.

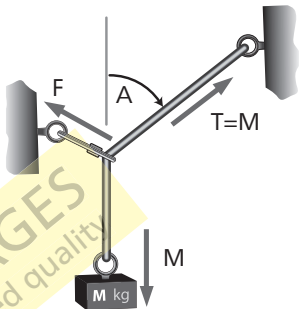
Urban Search & Rescue Operations

LOADS ON A DEVIATION POINT

When a rope deviates by angle **A**, the load on the deviation point **F** is given by the line tension **T** multiplied by the deviation factor **D**.

Rope tension **T** is equal to mass **M** provided it can slide freely through the deviation, so:-

$$F = M \times D$$



Angle A	20°	30°	45°	60°	90°
Deviation factor D	0.33	0.5	0.75	1	1.4

e.g. if $A=45^\circ$ and $M=100\text{ kg}$, the deviation load $F=75\text{ kg}$



For lifting and moving always keep the deviation angle A below 90°.

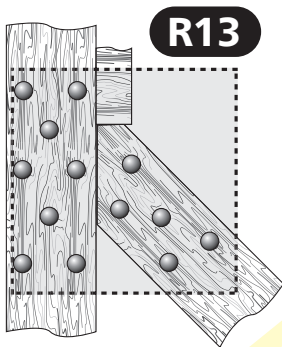
If the deviation has high friction and the rope is moving in either direction, **F** will be **up to twice as high** as the above figures indicate.

Urban Search & Rescue Operations

ALPINE BUTTERFLY KNOT: TYING SEQUENCE



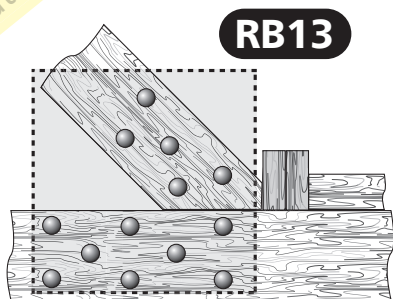
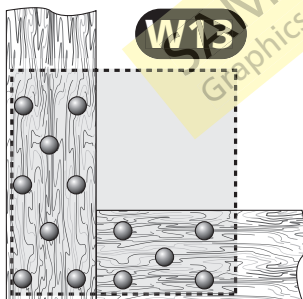
Raker shore gussets



R13 = top of raker post
W13 = wall/sole plate junction
RB13 = bottom of raker post

Always applied both sides.

⊖ **Half gussets are NOT an option for raker shores.**

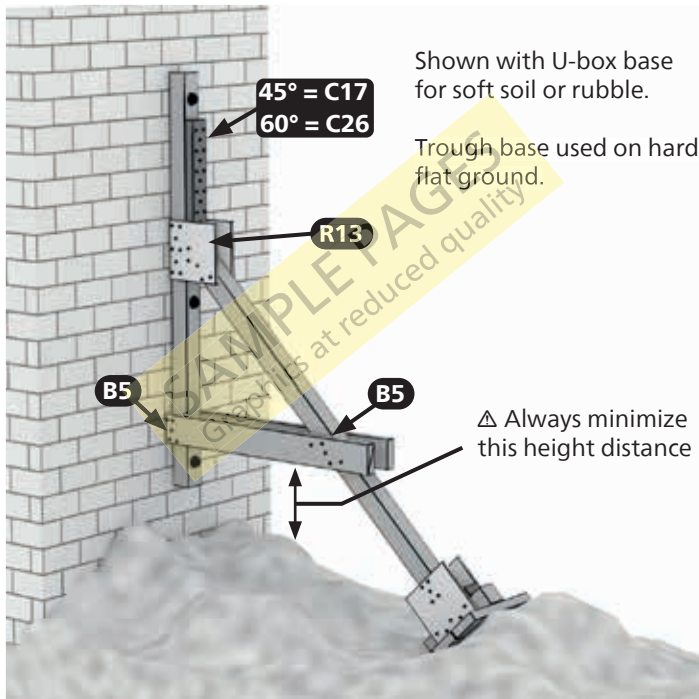


In pattern RB13 the gusset plate is shifted to allow clearance for the wedge blocks.



FLYING RAKER [CLASS 1]

Rapid initial shore for walls with obstructing debris or uneven ground surfaces. Choose base type to suit ground conditions.



Urban Search & Rescue Operations



DESIGN LOADS PER POST

4"×4" TIMBER

8FT HIGH = **3600** KG

10FT HIGH = **2200** KG

12FT HIGH = **1500** KG

6"×6" TIMBER

12FT HIGH = **9000** KG

16FT HIGH = **5400** KG

20FT HIGH = **3400** KG

Used for vertical bracing of ceilings, as a replacement for 'T' spot shores. Can be laced together to form a 3D lattice if required.



Max permitted floor slope = 3° .

Fit horizontal midbrace if height > 8ft [2.5m].

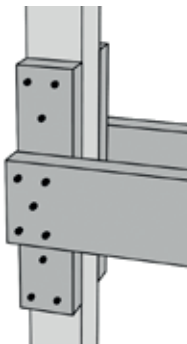
MAXIMUM PERMITTED POST SPACING

4"×4" HEADER, $S = \frac{1}{4}H$

8"×4" HEADER, $S = \frac{1}{2}H$

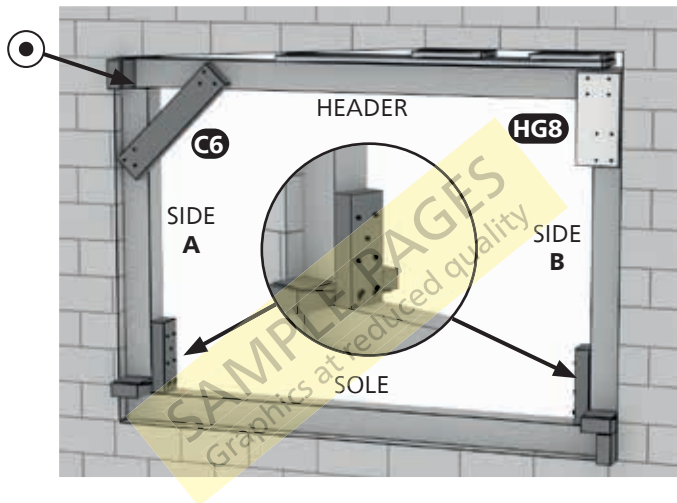
C6 cleats for thick mid-brace shown on right:

For higher or long-term placements, or where the supported slab may move, always use a laced-post column. For H less than 3ft [1m] without shear forces, consider cribbing.



WINDOW/DOOR FRAME SHORE

BUILT-IN-PLACE METHOD



Installation sequence: Sole ⇒ Header ⇒ Side A ⇒ Side B.

- ✓ C6 and HG8 are optional on rear face if access is restricted.
- ✓ At ☉ header **must** overlap side A by at least 1½" [40mm].
- ✓ Side post wedges held by 12" cleat with B5 plus 2 toe-nails driven into sole beam.

Timber size/width limits same as prefabricated version.

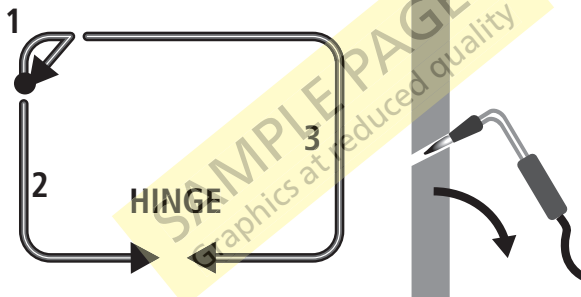


Urban Search & Rescue Operations

WINDOW CUT

Creates fold-out access panel in steel plate.

1. Cut a notch and insert search camera.
2. **If safe to do so**, cut the other sides leaving one or two sections on the bottom edge to act as hinges.



- ✓ Grip panel via notch using pliers etc., then fold out and down – cut off panel if required.
- ✓ **Ensure edges are cooled before entry.**
- ✓ Protect sharp edges with padding, tarpaulins, etc.
- ✓ In thicker plates taper the cuts towards the centre of the panel as shown, to prevent them from binding.

Urban Search & Rescue Operations

PATIENT QUESTIONING

SAMPLE

Don't assume the responses from an injured or confused person are correct!

Signs/symptoms

Allergies

Medications and (illegal) drugs

Previous medical history

Last meal time

Events causing the injury

PAIN ASSESSMENT

PQRST

Provoked by? (motion, touch, etc.)

Quality (stabbing, dull, etc.)

Region / radiation from / to where?

Severity? (scale 1-10)

Timing? (duration, trend over time)

PATIENT HANDOVER

NATMIST

Name

Age

Time of injury

Mechanism of injury

Injuries found

Signs and symptoms

Treatment given

Material	Density range (kg/m ³)	Ave density D (kg/m ³)	100kg cube sides (cm)	100kg sphere diameter (cm)
Aluminium	2700	2700	33	41
Brickwork	1600 - 2000	1800	38	47
Concrete, broken rubble	1200 - 1900	1500	42	52
Concrete, solid, dense	2000 - 2400	2200	35	44
Concrete, solid, ACB	450 - 1000	750	51	63
Concrete, solid, medium	1300 - 1700	1500	40	50
Glass, window	2600	2600	33	41
Hay, baled	120 - 240	180	82	101
Mild steel	7800	7800	23	29
Petrol	700	700	52	64
Sand, dry	1600	1600	39	49
Sand, wet	1900	1900	37	46
Snow, compacted	200 - 300	250	73	91
Snow, fresh fallen	50 - 150	100	100	124
Soil, dry	1200 - 1700	1400	41	51
Soil, wet	1300 - 2000	1600	39	49
Stone, solid	2200 - 2800	2500	34	42
Volcanic ash, dry fresh	500 - 1300	900	48	59
Volcanic ash, wet	1000 - 2000	1500	40	50
Water	1000	1000	46	57
Wood (dry)	450 - 750	600	55	68

