

Bassonet Materials



Design Safety Sales Maintenance Industrial Storage Products & Facilities

Bassonet Materials Handling

Standards

Due to experience in past years in a somewhat unregulated industry it has become necessary to point out the minimum applicable standards which Bassonet Materials Handling (BMH) will expect and adhere to.

BMH does not print certificates to please clients, Engineering Certificates are issued to convey to the world the structure in question had been surveyed and analysed and that it would safely support loads anticipated within suitable safety factors

If Bassonet Materials Handling is engaged for a job it needs to be accepted that not consulting with the Engineer and/or Erector and/or Fabricator prior to site inspections and not making these standards available to any and all involved parties is at own risk and repeated inspections would incur costs to be invoiced or the engagement terminated.

The reasons for adhering to these standards are based in sensible engineering practice and specific storage equipment experience apart from a general expectation from the more astute client that a level of standard will be observed.

The following standards are applicable to the Storage Engineering Consulting Service conducted by Bassonet Materials Handling (it remains the prerogative of the Engineer to make the final decision on any aspect whatsoever):

1. SEMA, EN and FEM codes and standards as applicable to Storage Equipment will apply. All of these are available off the WEB to be purchased. The Engineer may not copy and distribute standards in terms of international law.
2. SEMA Erection and Damage tolerances adhered to strictly, no exception.
3. SEMA codes for "Use of Static Rack" and "Design of Static Rack" applies - refer to anchoring and stabilising rows.
4. The minimum standard for erection verticality of "plumb" is height of top loaded member divided by 500, see SEMA erection tolerances for specific erection tolerances based on different types of pallet support structures.
5. Tolerances for pallet in slots to be observed in terms of SEMA.
6. When connecting fastening bolts through rack components typically in 0.8 up to 3 mm thickness of material 3mm washers need to be used to resist pull-through and distribute stress. Bolts through bracing holes and Bolts serving as Beams lock are excepted. Shelving bolts used to assemble the shelving unit are accepted.

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7. Use of 3 mm washer for connecting row spacers inside upright face and outside if rod or bolt is used.
8. Use of minimum 3mm washer when connecting through holes that are not fit made (perforations of round or irregular shape through which bolts do not fit tightly).
9. Minimum 5 through HT bolts with tubes at splices for "bottle section"
10. Use of either two anchors per welded baseplate or a single central one as per mobile base.
11. If anchoring on steel mobile base consult on row spacer.
12. The anchor hole needs to be vertical ± 10 deg (not 45deg!)
13. Beam locks to be used – bolts acceptable.
14. Beam deflection and capacity as per engineer approved calculation and testing and to SEMA standards - consult before! Deflection of span/200.
15. Beam bending and damage tolerance accepted 3 in 1000, max total 5 mm.
16. In house factory testing not acceptable as norm for engineering certification unless observed and approved by the engineer – consult before!
17. The only substitute for a welded base is a welded base, any other base will be treated lesser - consult before!
18. Structural components adhere to SEMA erection tolerances.
19. Grouting to be used between structural base and floor, if not 80% contact must be achieved without point stresses.
20. Composite uprights need to be space welded to agreed specifications.
21. Bolted composites need to be proven to satisfaction of the engineer - consult before!
22. Welded composite specification need to satisfy the engineer - consult before! Stitch welding pitch not to exceed 600 mm.
23. Beam connectors must be proven to the satisfaction of the engineer.
24. Beam test data to be according to SEMA and verified by 3rd party or the Engineer.
25. Box beams stitch welding max pitch 900mm.
26. "Clipped" Box Beams lateral resistance to be proven equivalent to stitch welded box beam.
27. Drive-in:
 1. Full plan bracing between top tie beams.
 2. Row spacers between laced frames at the very top
 3. Top tie beams to be continuous and fixed with the help of substantial gussets. If not consult before! Half box beams in 1.5 not sufficient!
 4. A braced bay to be used 600 wide centres for every 8 bays to top tie maximum height of 6500mm – consult before!
 5. Cantilever arms to be designed for the job – consult before!
 6. Base to be welded and provided with substantial anchoring – consult before!

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7. Bases need to be shimmed to the highest base determined before any installation takes place.
 8. Shims need to cater for gross as well as minute adjustments especially when shimming for plumbing correction. When frames are more than 8m high a range of shims from 0.5 to 3 mm shims should be available to allow fine adjustment by combination.
 9. Shims should cover at least 80 % of the base area and not produce base plate bending moment when the anchor is tightened.
 10. Splices to be substantial – consult before!
 11. Same upright duty through full height.
 28. Pallets loads to be available for evaluation (if not known it may be determined by "ABC analysis" at cost)
 29. Floors Walkways supported off pallet rack or rack/shelf supported floors.
 1. Walkways and floors supported by pallet rack beams and frames need to be loaded in theory by the minimum standard loads (which is not zero) to evaluate fitness for use - consult before!
 2. A distributed load of less than 350kg/m² does not make sense in terms of the average human body load as well as decking media
 3. The walkway load needs to be added to the loads carried by the frames and beams, it cannot be ignored.
 4. Fire escape measures and paths need to be considered, it is the duty of the Engineer to consider catastrophic events and the consequences.
 30. Pallet Rack supported Mezzanine Floors
 1. Keep in mind Frame Load Tables are not created for these load cases – consult prior to erection.
 2. Cross braces need to be installed in the main beam direction to stabilise the structure if only having a beam at top to support the decking – consult!
 3. "Stabilising" beams do not serve a purpose, especially if not bolted in – consult!
 4. Staircase stringers and tread assemblies are not accepted as stabilising components. Staircase legs may be used for lateral restraint if braces are not angled at more than 45 degrees and if so "laced" – consult.
 5. If frames do not have a welded baseplate with a bolt through the base providing a moment restraint in both directions of movement perpendicular to frame plane it would lead to much lower frame capacity than expected – consult!
 31. Structural Mezzanine Floors
 1. Must be designed and fabricated to the SAISC "Red Book" and "Green Book".

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2. Beam to beam and Beam to column connections need to be gusseted against bending moments expected including fasteners. Fastener min grade 8.8. M10 and less should not be used on a structural floor.
3. Full height cross braces, distributed through the plan of sufficient section and end connection need to be used to prevent sway in two plan directions.
4. Base plates must be correctly designed for slab thickness.
5. If using racking or shelving above the decking, the base plates of these must correspond with the components below to transfer load to the bottom floor unless special designs are approved before.
6. Erection tolerance must be observed as above, as always, including verticality 1/500.
7. Any cleats need to comply with accepted engineering standards – consult!

32. Carton Flow

1. Modern carton flow application that does not include beams between uprights to support wheeled rails cannot provide the lateral stability required – consult!
2. For the above large welded bases with multiple anchors and stabilising beams in between trays and above trays bolted in with proper moment resisting connector.

33. Pallet Flow Racking

1. Slotted Beam connectors are not acceptable without min 3mm washer and Gr10.9 bolts inside and outside upright.
2. Proof need to be provided of having first constructed a braced “starter bay” to act as the template from where the rest of the rays are added including recorded plumbing measurements of “starter bay”
3. Proof need to be provided of base position elevation map created before any construction started.
4. Tray connections to uprights need to have the same moment resistance as that of a beam – consult before.
5. Walkways, ladders need to be of an acceptable engineering standard – consult before.

34. Cantilever Racking

1. Base to be longer than cantilever beams and minimum same section as upright
2. Same verticality as above – 1/500 measured from top loaded cantilever beam.
3. Cantilever beams preferably have a built in upwards slope from base to tip of 1/250 or 0.22 degrees.
4. Cross bracing between uprights sufficient for compressive stresses – consult before!

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5. Symmetrical cantilever arm sections about vertical axis – consult before!
 6. See SAISC “Red Book” and “Green Book”.
35. Dynamic Rack (including Mobile Base, Push Back, Pallet Flow)
1. A Minimum of 10% need to be added to the pallet loading to use the normal load tables – consult before!

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Safety Standards

Extracts from General Safety Regulations Applicable

Use and storage of flammable liquids

4. (1) No employer shall require or permit any person to work in a place where the vapour of any flammable liquid is generated to such an extent that it constitutes an actual or potential fire or explosion hazard or endangers the safety of any person, unless the provisions of sub regulations (2) to (12) of this regulation are complied with.

(2) No employer shall require or permit a flammable liquid to be used or applied other than in a room, cabinet or other enclosure specially constructed for this purpose of fire-resisting material or in a place which, owing to its situation or construction or any other feature or circumstance, is of such a nature that-

(a) No fire or explosion hazard is, can or may be created thereat;

(b) any vapour resulting from such use or application is efficiently dispersed and diluted into the atmosphere subject to the provisions of the Air Pollution Prevention Act, 1965 (Act 45 of 965); and

(c) No other workplace can or may be contaminated by such vapour.

(3) An employer shall cause every room, cabinet or enclosure contemplated in sub regulation (2) to be fitted with an efficient intake and exhaust ventilation system to remove any vapour therefrom and to prevent its recirculation in a manner which may lead to the contamination of any other workplace or the creation of a fire or explosion hazard: Provided that, notwithstanding any other provision of this regulation, an employer shall provide every employee doing spraying with a respirator, mask or breathing apparatus of a type approved by the chief inspector, and that any such employee shall while spraying use such apparatus provided to him.

(4) Where spraying is done in any room the employer concerned shall cause the ventilation system contemplated in sub regulation (3) to conform to the following requirements:

(a) if the air supply and extraction is horizontal, the average air speed measured at a level of 1.5 meters above the floor, or at the level of the platform on which persons stand to work, shall not be less than 0.5 meters per second;

(b) if the air supply is vertical and the extraction thereof is done through slits or a grill along the side walls at floor level, the average air speed measured at a level of 1.5 meters above the floor, or at the level of the platform on which persons stand to work, shall not be less than 0.4 meters per second; or

(c) If the air supply is vertical and the extraction thereof is done through a grill over the whole of the floor area, the average air speed measured at a level of 1.5 meters

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above the floor, or at the level of the platform on which persons stand to work, shall not be less than 0.3 meters per second.

(5) Where spraying is done into any cabinet or enclosure as contemplated in sub regulation (2), the employer concerned shall cause the ventilation system contemplated in sub regulation (3) to comply with the following requirements:

(a) Where the area of the open face of the cabinet is not more than one square metre, the average speed of air movement through the said face shall not be less than one metre per second;

(b) where the area of the open face is more than one square metre but less than two square meters, the average speed of air movement through the said face shall not be less than 0.75 meters per second; or

(c) Where the area of the open face is equal to or exceeds two square meters, the average speed of air movement through the said face shall not be less than 0.5 meters per second.

(6) With regard to the ventilation system contemplated in sub regulation (3) the employer shall cause --

(a) all ducts, trunks and enclosures of the system to be of fire resistant material with a smooth interior finish and to be constructed in such a manner as to facilitate the cleaning thereof;

(b) the system to be kept in operation during working hours as well as for at least the period of time thereafter that may be necessary to clear the vapour from the atmosphere of the room, cabinet or enclosure to below 25 per cent of the lower explosive limit of that vapour; and

(c) The work to be so organized that the flow of air towards the intake of such ventilation system is not obstructed and draws the spray or vapour of the flammable liquid away from any employee operating the equipment.

(7) With regard to any room contemplated in sub regulation (2) the employer shall cause every such room --

(a) with a floor area exceeding 20 square meters to have at least two separate entrances at opposite ends of the room, which shall be fitted with doors openings outwards that cannot be locked; and

(b) To be fitted with an inspection window of strengthened and shatterproof glass that cannot be opened.

(8) (A) an employer shall not permit--

(i) any fire, flame or naked light or anything which may generate static electricity or any other thing which may ignite a flammable liquid or its vapour, to be used in or taken into any room, cabinet or enclosure contemplated in subregulation (2) in which any such flammable liquid is used, sprayed or stored, and shall affix a suitable and conspicuous sign prohibiting any such act at all the entrances to any such room, cabinet or enclosure;

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- (ii) any person to, and no person shall, smoke in any place in which flammable liquid is used or stored, and such employer shall affix a suitable and conspicuous notice prohibiting such smoking at all the entrances to any such place; and
- (iii) any process capable of causing sparks or fire, or the application of any heat for the drying of sprayed or treated articles, to take place in any room, cabinet or enclosure used for spraying, before the space or atmosphere has been cleared of all vapour.
- (b) No person shall contravene any prohibition made known as contemplated in subparagraph (i) or (ii) of paragraph (a).
- (9) With respect to any room, cabinet or enclosure contemplated in subregulation (2), the employer concerned shall cause --
- (a) discarded cotton waste, cleaning rags or similar material to be removed daily and safely disposed of;
- (b) only that quantity of flammable liquid needed for work on one day to be taken into or kept in such room, cabinet or enclosure: Provided that partially consumed stock may be stored in a properly marked, fireproof wall cabinet inside the work place;
- (c) all drums, cans, canisters or similar containers holding flammable liquids to be kept tightly closed when not in actual use and, after their contents have been used up, to be removed from the workplace and safely disposed of daily; and
- (d) every such room, cabinet or enclosure to be kept clean and all fans, ducts, trunks and enclosures of the ventilation system contemplated in subregulation (3) to be kept clean and in good working order: Provided that any cleaning, scraping or scouring shall be done with implements that cannot cause sparking if the concentration of the vapour exceeds 25 per cent of the lower explosive limit of that vapour.
- (10) An employer shall cause every flammable liquid store to be --
- (a) separated by means of fire-resisting material with a fire-resistance of two hours from any room, cabinet or enclosure contemplated in subregulation (2);
- (b) constructed of fire-resisting material with a fire-resistance of two hours;
- (c) constructed in such a way that, in case of spillage, a volume of the flammable liquid in question equal to the quantity of flammable liquid ordinarily kept in store plus 10 per cent of that quantity, can be contained;
- (d) ventilated to the open air in such a manner that vapour cannot accumulate inside the store; and
- (e) clearly marked with a sign indicating that it is such a store and also indicating the amount of flammable liquid which may be stored therein.
- (11) Taking into account the construction and location of the premises in question and the quantity and types of flammable liquids involved, an employer shall install an adequate amount of efficient fire-fighting equipment in suitable locations in and around every building in which such substances are used, handled or stored, or as may be recommended by the fire chief of the local authority concerned.

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(12) The provisions of this regulation shall not be construed as applying to the use of flammable liquids in the course of or in connection with building work: Provided that every employer engaged in building work shall ensure that, where flammable liquids are used or applied at the workplace concerned, this is done in such a manner that no fire or explosion hazard is created, and that the workplace is effectively ventilated: Provided further that where the workplace cannot be ventilated effectively the employer shall provide every employee involved with a respirator, mask or breathing apparatus of a type approved by the chief inspector, and shall take steps to ensure that every such employee, while using or applying flammable liquid, uses the apparatus supplied to him.

Work in confined spaces

5. (1) An employer or a user of machinery shall take steps to ensure that a confined space is entered by an employee or other person only after the air therein has been tested and evaluated by a person who is competent to pronounce on the safety thereof, and who has certified in writing that the confined space is safe and will remain safe while any person is in the confined space, taking into account the nature and duration of the work to be performed therein.

(2) Where the provisions of subregulation (1) cannot be complied with the employer or user of machinery, as the case may be, shall take steps to ensure that any confined space in which there exists or is likely to exist a hazardous gas, vapour, dust or fumes, or which has or is likely to have, an oxygen content of less than 20 per cent by volume, is entered by an employee or other person only when--

(a) subject to the provisions of subregulation (3), the confined space is purged and ventilated to provide a safe atmosphere therein and measures necessary to maintain a safe atmosphere therein have been taken; and

(b) the confined space has been isolated from all pipes, ducts and other communicating openings by means of effective blanking other than the shutting or locking of a valve or a cock, or, if this is not practicable, only when all valves and cocks which are a potential source of danger have been locked and securely fastened by means of chains and padlocks.

(3) Where the provisions of subregulation (2)(a) cannot be complied with, the employer or user of machinery shall take steps to ensure that the confined space in question is entered only when the employee or person entering is using breathing apparatus of a type approved by the chief inspector and, further, that--

(a) the provisions of subregulation (2) (b) are complied with;

(b) any employee or person entering the confined space is using a safety harness or other similar equipment, to which a rope is securely attached which reaches beyond the access to the confined space, and the free end of which is attended to by a person referred to in paragraph (c);

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- (c) at least one other person trained in resuscitation is and remains in attendance immediately outside the entrance of the confined space in order to assist or remove any or persons from the confined space, if necessary; and
- (d) effective apparatus for breathing and resuscitation of a type approved by the chief inspector is available immediately out side the confined space.
- (4) An employer or user of machinery shall take steps to ensure that all persons vacate a confined space on completion of any work therein.
- (5) Where the hazardous gas, vapour, dust or fumes contemplated in subregulation (2) are of an explosive or flammable nature, an employer or user of machinery shall further take steps to ensure that such a confined space is entered only if --
- (a) the concentration of the gas, vapour, dust or fumes does not exceed 25 per cent of the lower explosive limit of the gas, vapour, dust or fumes concerned where the work to be performed is of such a nature that it does not create a source of ignition; or
- (b) such concentration does not exceed 10 per cent of the lower explosive limit of the gas, vapour, dust or fumes where other work is performed.
- (6) The provisions of this regulation shall mutatis mutandis also apply, in so far as they can be so applied, to any work which is performed in any place or space on the outside of and bordering on or in the immediate vicinity of, any confined space, and in which place or space, owing to its proximity to the confined space, any hazardous article, oxygen-deficient atmosphere or dangerous concentration of gas, vapour, dust or fumes may occur or be present.

Work in elevated positions

6. No employer shall require or permit any person to work in an elevated position, and no person shall work in an elevated position, unless such work is performed safely from a ladder or scaffolding, or from a position where such person has been made as safe as if he were working from scaffolding.

Working in danger of engulfment

7. No employer shall require or permit any person to, and no person shall, enter any place from or into which solid or particulate material is being discharged where a danger exists of a person being engulfed by such solid or particulate material, unless --

(a) such a person is provided with and properly uses a safety belt and rope;

(b) at least one other person who has been properly instructed, is and remains in attendance outside such place to keep the persons therein under continuous observation in order to render assistance in case of emergency; and

(c) the precautions prescribed by regulation 5 of these regulations are taken if dangerous gas, fumes, dust or vapour may be present in such a place.

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Stacking of articles

8. (1) No employer shall require or permit the building of stacks which consist of successive tiers, one on top of another, unless --
- (a) the stacking operation is executed by or under the personal supervision of a person with specific knowledge and experience of this type of work;
 - (b) the base is level and capable of sustaining the weight exerted on it by the stack;
 - (c) the articles in the lower tiers are capable of sustaining the weight exerted on them by the articles stacked above them;
 - (d) all the articles which make up any single tier are consistently of the same size, shape and mass;
 - (e) pallets and containers are in good condition; and
 - (f) any support structure used for the stacking of articles is structurally sound and can support the articles to be stacked on it.
- (2) An employer shall not permit --
- (a) articles to be removed from a stack except from the topmost tier or part of that tier; and
 - (b) anybody to climb onto or from a stack, except if the stack is stable and the climbing is done with the aid of a ladder or other safe facility or means.
- (3) An employer shall take steps to ensure that --
- (a) persons engaged in stacking operations do not come within reach of machinery which may endanger their safety;
 - (b) stacks that are in danger of collapsing are dismantled immediately in a safe manner; and
 - (c) the stability of stacks is not endangered by vehicles or other machinery or persons moving past them.
- (4) Unless a stack is otherwise supported an employer shall take steps to ensure that tiers of stacked material consisting of sacks, cases, cartons, tins or similar containers --
- (a) are secured by laying up articles in a header and stretcher fashion and that corners are securely bonded; and
 - (b) are stepped back half the depth of a single container at least every fifth tier or that, alternatively, successive tiers are stepped back by a lesser amount: Provided that at least the same average angle of inclination to the vertical is achieved: Provided further that where the containers are of a regular shape and their nature and size are such that the stack will be stable, they may be stacked with the sides of the stack vertical if the total height of the stack does not exceed three times the smaller dimension of the underlying base of the stack.
- (5) Notwithstanding the provisions of subregulation (4), free-standing stacks that are built with the aid of machinery may, with the approval of an inspector, be built to a

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height and in a manner permitted by the nature of the containers being stacked:
Provided that --

- (a) the stacks are stable and do not overhang; and
- (b) the operator of the stacking machinery is rendered safe as regards falling articles.

Ladders

13A (1) An employee shall ensure that every ladder is constructed of sound material and is suitable for the purpose for which it is used, and -

(a) is fitted with non-skid devices at the bottom ends and hooks or similar devices at the upper ends of the stiles which shall ensure the stability of the ladder during normal use; or

(b) is so lashed, held or secured whilst being used as to ensure the stability of the ladder under all conditions and at all times.

(2) No employer shall use a ladder, or permit it to be used, if it -

(a) (i) has rungs fastened to the stiles only by means of nails, screws, spikes or in like manner; or

(ii) has rungs which have not been properly let into the stiles: Provided that in the case of welded ladder or ladders of which the rungs are bolted or riveted to the stiles, the rungs need not be let into the sides; or

(b) has damaged stiles, or damaged or missing rungs.

(3) No employer may permit that -

(a) a ladder which is required to be leaned against an object for support be used which is longer than 9 m; and

(b) except with the approval of an inspector, the reach of a ladder be extended by fastening together two or more ladders: Provided that the provisions of this subregulation shall not apply to extension of free-standing ladders.

(4) In the case of wooden ladders the employer shall ensure that -

(a) the ladders are constructed of straight grained wood, free from defects, and with the grain running in the length of the stiles and rungs; and

(b) the ladders are not painted or covered in any manner, unless it has been established that there are no cracks or other inherent weaknesses: Provided that ladders may be treated with oil or covered with clear varnish or wood preservative.

(5) When work is done from a ladder, the employer shall -

(a) take special precautionary measures to prevent articles from falling off; and

(b) provide suitable sheaths or receptacles in which hand tools shall be kept when not being used.

(6) An employer shall ensure that a fixed ladder which exceeds 5 m in length and is attached to a vertical structure with an inclination to the horizontal level of 75° or more

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- (a) has its rungs at least 150 mm away from the structure to which the ladder is attached; and
- (b) is provided with a cage which -
- (i) extends from a point not exceeding 2.5 m from the lower level to a height of at least 900 mm above the top level served by the ladder; and
 - (ii) shall afford firm support along its whole length for the back of the person climbing the ladder, and for which purpose no part of the cage shall be more than 700 mm away from the level of the rungs:

Provided that the foregoing provisions of paragraph (b) shall not apply if platforms, which are spaced not more than 8 m apart and suitable for persons to rest on, are provided.

Ramps

13B.(1) An employer shall ensure that every ramp -

- (a) is constructed in accordance with accepted technical standards;
- (b) has a safety factor of at least two with respect to the load it is expected to carry: Provided that the design makes sufficient provision for the load on the ramp as a result of the turning, braking and acceleration of vehicles, if the ramp is used for vehicles; and
- (c) has an inclination to the horizontal level of not more than 34° or one vertical to one and one half horizontal.

(2) An employer shall ensure that every ramp -

- (a) the inclination of which renders additional foothold necessary, in every case where the inclination is more than 14° or one vertical to four horizontal, is provided with stepping laths which -
 - (i) are placed at suitable intervals; and
 - (ii) extend the full width of the ramp: Provided that the stepping laths may be interrupted over a width not exceeding 230 mm to facilitate the movement of barrows; and
- (b) which is higher than 2 m and is provided on both sides with -
 - (i) substantial guard rails which are at least 900 mm and not exceeding 1 000 mm in height, and
 - (ii) toe-boards which are at least 150 mm high and so affixed that no open space exists between the toe-board and the ramp.

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